EPA

United States
Environmental Protection Agency

May 2025
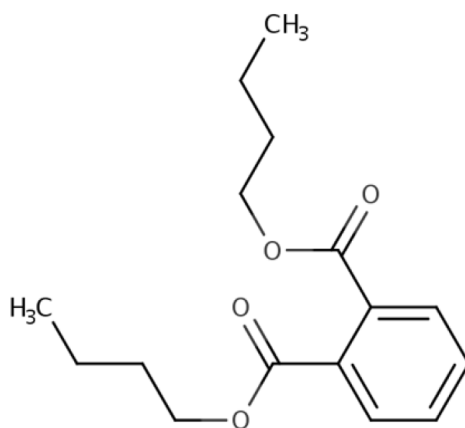Office of Chemical Safety and
Pollution Prevention

Data Quality Evaluation Information for
General Population, Consumer, and Environmental Exposure for
Dibutyl Phthalate (DBP)
(1,2-Benzenedicarboxylic acid, 1,2-dibutyl ester)

Systematic Review Support Document for the Draft Risk Evaluation

CASRN: 84-74-2

May 2025

This supplemental file contains information regarding the data quality evaluation results for data sources that met the PECO screening criteria for the *Draft Consumer and Indoor Dust Exposure Assessment for Dibutyl Phthalate (DBP)*, *Draft Environmental Media and General Population and Environmental Exposure for Dibutyl Phthalate (DBP)*, and the *Draft Biomonitoring Assessment for Dibutyl Phthalate (DBP) (NHANES)*. EPA conducted data quality evaluation and extraction based on author-reported descriptions and results; additional analyses (e.g., statistical analyses) potentially conducted by EPA are not contained in this supplemental file. EPA performs data quality evaluation as a part of the TSCA systematic review process described in the *Draft Systematic Review Protocol Supporting TSCA Risk Evaluations for Chemical Substances*. (referred hereafter as the "2021 Draft Systematic Review Protocol").The systematic review steps are further described in the *Draft Risk Evaluation for Dibutyl phthalate (DBP) – Systematic Review Protocol*.

Additionally, the overall quality determination (OQD) for each reference represents the data as a whole for each evidence stream, not for individual scenarios described within a study. For example, a reference that has both monitoring and experimental data would have OQDs using the data quality evaluation metrics for monitoring and experimental data, respectively. An OQD utilizing the data quality evaluation metrics for monitoring data, or any other single evidence stream, would consider all data pertinent to that evidence stream in the reference. Acronyms and abbreviations used within this supplemental file are defined in the table at the end of this file. This supplemental file may also be referred to as *Draft Data Quality Evaluation Information for General Population, Consumer, and Environmental Exposure for Dibutyl Phthalate (DBP)*. Consumer, and Environmental Exposure.

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Study Citation: Yasuhara, A., Morita, M. (1987). Identification of volatile organic components in mussel. Chemosphere 16(10-12):2559-2565.
HERO ID: 25095

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling of mussel tissue methodology only briefly discussed. Insufficient information on sample storage conditions and duration, equipment.
	Metric 2:	Analytical Methodology	Low	Analytic methodology discussed in terms of extraction and instrumentation. Insufficient information regarding limits of detection, recoveries.
	Metric 3:	Biomarker Selection	N/A	Biota sampling.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Sampling conducted in coastal waters of Ibaraki, Japan.
	Metric 5:	Currency	Low	Sampling conducted in 1985-1986.
	Metric 6:	Spatial and Temporal Variability	Low	Two samples of mussel tissue, one in 1985 and one in 1986 from one location.
	Metric 7:	Exposure Scenario	Low	Insufficient information regarding exposure scenario other than dates of sampling for coastal location.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Supplementary data not provided, and summary statistics not reported, however raw data for each sample reported.
	Metric 9:	Quality Assurance	Low	Quality assurance/control procedures not discussed; authors note lack of recovery data.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Authors mention limitations, uncertainties in terms of small sample size and lack of sampling analytic recovery data; raw data for each sample presented without summary statistic variability.

Overall Quality Determination   Low

Study Citation:	Vethaak, A. D., Lahr, J., Schrap, S. M., Belfroid, A. C., Rijs, G. B. J., Gerritsen, A., De Boer, J., Bulder, A. S., Grinwis, G. C. M., Kuiper, R. V., Legler, J., Murk, T. A. J., Peijnenburg, W., Verhaar, H. J. M., De Voogt, P. (2005). An integrated assessment of estrogenic contamination and biological effects in the aquatic environment of The Netherlands. Chemosphere 59(4):511-524.		
HERO ID:	70054		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	map and sampling details included
Metric 2:	Analytical Methodology	Low	"An extensive description of all the methods and materials used in our study is provided by Vethaak et al. (2002, in press). Vethaak, A.D., Schrap, M., de Voogt, P. (Eds.), in press."Estrogens and xeno-estrogens in the aquatic environment:an integrated approach for field monitoring and effect assessment. SETAC Technical Publications Series. SETACPress, Pensacola.
Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Netherlands
Metric 5:	Currency	Low	1999
Metric 6:	Spatial and Temporal Variability	Critically Deficient	sample size not reported, might be in the Vethaak 2002 paper
Metric 7:	Exposure Scenario	Medium	municipal WW, effluent, industrial WW, rainwater, surface water, suspended water, sediment, bream muscle, flounder muscle
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	range and median provided
Metric 9:	Quality Assurance	Medium	quality not discussed, but no obvious concerns
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	variability and uncertainty not discussed, but no obvious concerns

Overall Quality Determination   Uninformative

Study Citation:	Xie, Z., Ebinghaus, R., Temme, C., Caba, A., Ruck, W. (2005). Atmospheric concentrations and air-sea exchanges of phthalates in the North Sea (German Bight). Atmospheric Environment 39(18):3209-3219.		
HERO ID:	102787		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Describes water and air sample collection through pump and filter. These methods are based on previous, cited studies.
	Metric 2: Analytical Methodology	Medium	Discusses extraction, clean-up, chemical analysis, and gas chromatogram-mass spectrometry methods in detail. Includes recoveries, detection limit reported as range not for each chemical.
	Metric 3: Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	North Sea (German Bight). Includes map of sampling stations
	Metric 5: Currency	Low	2004
	Metric 6: Spatial and Temporal Variability	Medium	11 water samples (replicates not specified) and 3 air samples collected in duplicate
	Metric 7: Exposure Scenario	High	Phthalates are known to be toxic/endocrine disruptors and leached in the environment. Here, phthalates were measured in the atmosphere and sea water in the North Sea
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	raw data of phthalate concentrations in air and sea water provided with averages and standard deviations
	Metric 9: Quality Assurance	High	"Matrix spikes, breakthrough check, field blanks, and method detection limits (MDLs) were applied for quality assurance and control purposes." Included laboratory and field blanks to quantify possible contamination. Discuss recoveries, which averaged >75%
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	include uncertainty analysis, air-sea vapor fluxes and errors, and mention a limitation

Overall Quality Determination   **High**

Study Citation:	Reddy, B. S., Rozati, R., Reddy, S., Kodampur, S., Reddy, P., Reddy, R. (2006). High plasma concentrations of polychlorinated biphenyls and phthalate esters in women with endometriosis: A prospective case control study. Fertility and Sterility 85(3):775-779.		
HERO ID:	150675		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Medium. Sampling methodology described in terms of sampling equipment, procedures, sample storage conditions and study site. Insufficient information regarding duration of sample storage prior to analyses.
Metric 2:	Analytical Methodology	Low	Low. Analytical methodology described and referenced in terms of extraction, and analytical instrumentation. Insufficient information regarding instrument calibration, recoveries, and limits of detection.
Metric 3:	Biomarker Selection	N/A	N/A. Sampling for parent chemicals of interest within biological media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	High. Samples provided by participants in Andhra Pradesh, India.
Metric 5:	Currency	Low	Low. Infertile couples for study screened for infertility between 1999 and 2005.
Metric 6:	Spatial and Temporal Variability	Low	Low. Samples provided by 85 women with endometriosis and 135 control women. Temporal variability limited as single blood samples from each participant. Concern for timing of sample and adequacy of single sample representing the exposure concentrations responsible for outcome of interest due to short phthalate half-lives in blood samples.
Metric 7:	Exposure Scenario	Medium	Medium. Exposure source and population described in narrative text section detailing recent intense increase in industrialization, urbanization and lifestyle, diet changes in Andhra Pradesh area of India. Insufficient information regarding occupation of participants.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	Low. Summary statistics of phthalate concentrations reported in terms of mean and standard deviation. Insufficient information regarding range of concentrations, frequency of detection in samples, number of samples in data set and raw data.
Metric 9:	Quality Assurance	Low	Low. Quality assurance procedures not directly discussed, however can be assumed through use of standard analytic methodology referenced (Burce et al., 1994; Rozati et al., 2002).
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Low. Summary statistics report concentration standard deviation, however discussion of study limitations lacking.

Overall Quality Determination   **Low**

Domain		Metric	Rating	Comments

Study Citation: Liu, W. X., Hu, J., Chen, J. L., Fan, Y. S., Xing, B., Tao, S. (2008). Distribution of persistent toxic substances in benthic bivalves from the inshore areas of the Yellow Sea. Environmental Toxicology and Chemistry 27(1):57-66.
HERO ID: 165572

Domain 1: Reliability

	Metric	Rating	Comments
Metric 1:	Sampling Methodology	High	Collected 1.5 kg per species of bivalve. Described sites, equipment, processing and storage.
Metric 2:	Analytical Methodology	Low	Followed China's national standards for collection and pretreatment, analytical method, and quality assessment. LOD not reported; apparently less than 1 ng/g wet weight, however.
Metric 3:	Biomarker Selection	Low	Soft tissue concentrations; wet weight concentrations; species of commercial importance; however, three phthalates combined concentrations reported. Different bivalve species combined for estimate of overall proportion of each phthalate.

Domain 2: Representativeness

	Metric	Rating	Comments
Metric 4:	Geographic Area	High	China Yellow Sea, primarily coastal. Mapped.
Metric 5:	Currency	Low	1999, August to September.
Metric 6:	Spatial and Temporal Variability	Medium	Spatial variation captured by 30 bivalve sampling locations: 28 coastal and 2 outer sea. Between 1 and 3 species collected per location. Each site, however, sampled only one time.
Metric 7:	Exposure Scenario	High	In situ bivalves, which are filter feeders. Species consumed by humans.

Domain 3: Accessibility/Clarity

	Metric	Rating	Comments
Metric 8:	Reporting of Results	Low	Total concentration of three phthalates reported for each sampling location and species sampled (not individual phthalates); percent of total represented by each phthalate reported graphically after averaging across all species at location.
Metric 9:	Quality Assurance	High	Followed national guidelines for China; analysis in triplicate. For every set of 10 bivalve samples, a procedural blank and a spiked sample consisting of all the concerned chemicals were processed to test for possible interference and cross contamination. High recoveries.

Domain 4: Variability and Uncertainty

	Metric	Rating	Comments
Metric 10:	Variability and Uncertainty	Low	Discussed previously collected sediment samples and proximity to bivalve sampling locations. Discussion of local environment limited; many non-detects; two locations with high concentrations.

Overall Quality Determination Medium

| Study Citation: | Hines, E. P., Calafat, A. M., Silva, M. J., Mendola, P., Fenton, S. E. (2009). Concentrations of phthalate metabolites in milk, urine, saliva, and serum of lactating North Carolina women. Environmental Health Perspectives 117(1):86-92. |
| HERO ID: | 194817 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	pilot study for EPA methods Advancement for Milk Analysis; IRB approval; collection described
	Metric 2:	Analytical Methodology	High	methods and instruments described; LOD and LOQ provided; performed the preparation of standard solutions, quality control (QC) verification, sample preparation, and instrumental analyses as previously described (Calafat et al. 2004)
	Metric 3:	Biomarker Selection	High	Various matrix types collected. Metabolite measurement in urine is particularly known to be well correlated to phthalate exposures.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	U.S.
	Metric 5:	Currency	Low	2004-2005
	Metric 6:	Spatial and Temporal Variability	Medium	(visit 1 milk samples, n = 18; visit 2 milk samples, n = 20; visit 1 other fluids, n = 33; visit 2 other fluids, n = 30; no replicates mentioned
	Metric 7:	Exposure Scenario	High	human biomonitoring
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	10th, 25th, median, 75th, 90th, 95th percentile provided
	Metric 9:	Quality Assurance	Medium	quality control (QC) verification
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	variability and uncertainty not described, no obvious concerns

Overall Quality Determination   High

Study Citation: Brandli, R. C., Kupper, T., Bucheli, T. D., Zennegg, M., Huber, S., Ortelli, D., Muller, J., Schaffner, C., Iozza, S., Schmid, P., Berger, U., Edder, P., Oehme, M., Stadelmann, F. X., Tarradellas, J. (2007). Organic pollutants in compost and digestate. Part 2. Polychlorinated dibenzo-p-dioxins, and -furans, dioxin-like polychlorinated biphenyls, brominated flame retardants, perfluorinated alkyl substances, pesticides, and other compounds. Journal of Environmental Monitoring 9(5):465-72.

HERO ID: 198168

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling described in Brandli et al. 2006.
	Metric 2:	Analytical Methodology	Low	Analysis described in other papers.
	Metric 3:	Biomarker Selection	N/A	environmental samples
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Switzerland
	Metric 5:	Currency	Low	Timing of sample collection for monitoring data is not reported, discussed, or referenced however publication year, 2007, is used as surrogate for sampling year.
	Metric 6:	Spatial and Temporal Variability	Medium	n = 13 compost and 5 digestate, no replicates
	Metric 7:	Exposure Scenario	Low	compost
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Table S2 has raw data.
	Metric 9:	Quality Assurance	Low	QA refers to other papers.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, but raw data are presented.

Overall Quality Determination   Low

Study Citation:			Rudel, R. A., Brody, J. G., Spengler, J. D., Vallarino, J., Geno, P. W., Sun, G., Yau, A. (2001). Identification of selected hormonally active agents and animal mammary carcinogens in commercial and residential air and dust samples. Journal of the Air and Waste Management Association (1990-1992) 51(4):499-513.
HERO ID:			198234

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	No major deficiencies identified.
	Metric 2:	Analytical Methodology	High	No major methodological deficiencies identified.
	Metric 3:	Biomarker Selection	N/A	No biomarker data identified.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Massachusetts
	Metric 5:	Currency	Low	Timing of sample collection for monitoring data is not reported, discussed, or referenced however publication year, 2001, is used as surrogate for sampling year.
	Metric 6:	Spatial and Temporal Variability	Medium	No replicates and <10 samples
	Metric 7:	Exposure Scenario	High	No major deficiencies identified.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data provided
	Metric 9:	Quality Assurance	High	No major deficiencies identified.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	No gaps nor limitations reported

Overall Quality Determination   High

Study Citation:	Zeng, F., Lin, Y., Cui, K., Wen, J., Ma, Y., Chen, H., Zhu, F., Ma, Z., Zeng, Z. (2010). Atmospheric deposition of phthalate esters in a subtropical city. Atmospheric Environment 44(6):834-840.		
HERO ID:	388076		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling equipment and methods are described in excellent detail and are scientifically sound.
Metric 2:	Analytical Methodology	Medium	Analytical instrumentation and methods are described in excellent detail and are scientifically sound. However, instrumental detection limit for the chemical of interest is not reported, but rather a range of limits for all analytes.
Metric 3:	Biomarker Selection	N/A	This study is testing for the parent chemical of interest in an environmental medium.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	China
Metric 5:	Currency	Medium	2007-2008
Metric 6:	Spatial and Temporal Variability	Medium	Three sites were sampled for air twice weekly for a year. Unclear if there are replicates.
Metric 7:	Exposure Scenario	High	Air samples were taken from locations that were relatively isolated from traffic and other ground-level disturbances. Each study site was characterized as urban or suburban within a subtropical city.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data are not reported; summary statistics include the minimum, maximum, median, and mean concentrations.
Metric 9:	Quality Assurance	High	QA/QC methods included use of procedural blanks and surrogate standards. Recoveries for analytes and for surrogates were within acceptable range, and concentration determinations were adjusted to correct for recoveries.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Relative standard deviation for all analytes are reported and temporal variability is evaluated at the bulk level. Uncertainty in bulk deposition measurements related to sampling methods is acknowledged. Variation in season analyzed.

Overall Quality Determination   High

Study Citation:	Gasperi, J., Garnaud, S., Rocher, V., Moilleron, R. (2008). Priority pollutants in wastewater and combined sewer overflow. Science of the Total Environment 407(1):263-272.		
HERO ID:	473432		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	sites described thoroughly but sampling methodology not discussed in detail. No description of sampling equipment or storage conditions
Metric 2:	Analytical Methodology	High	LOQ provided; parameters were measured in accordance with standard French methods; Analyses were performed by a laboratory certified by the French Ministry of the Environment
Metric 3:	Biomarker Selection	N/A	water
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	France
Metric 5:	Currency	Low	published 2008
Metric 6:	Spatial and Temporal Variability	Medium	dry (n=10) and wet weather flows (n=13). no replicates.
Metric 7:	Exposure Scenario	Medium	water around Paris
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	median, min, max, frequency of occurrence
Metric 9:	Quality Assurance	Medium	for quality control: the COFRAC calibration certificate
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variability and Uncertainty not discussed, no obvious concerns

Overall Quality Determination   Medium

Study Citation:	Palmquist, H., Hanaeus, J. (2005). Hazardous substances in separately collected grey- and blackwater from ordinary Swedish households. Science of the Total Environment 348(1-3):151-163.		
HERO ID:	508379		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	sampling described, diagram included
Metric 2:	Analytical Methodology	Medium	accredited contract laboratory, LOD included (table 6), no instrument details- may be detailed in lab reference
Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Sweden
Metric 5:	Currency	Low	2004
Metric 6:	Spatial and Temporal Variability	Medium	No. of samples: greywater 4, blackwater 3. Unclear if there are replicates.
Metric 7:	Exposure Scenario	Medium	greywater and blackwater in households
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	average, min, max. Individual points not reported.
Metric 9:	Quality Assurance	Low	quality assurance not discussed, no obvious concerns
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Temporal variation analyzed (fig 4). There is mention of budget limitations.

Overall Quality Determination   Medium

Study Citation:	Peters, R. J. B., Beeltje, H., van Delft, R. J. (2008). Xeno-estrogenic compounds in precipitation. Journal of Environmental Monitoring 10(6):760-769.		
HERO ID:	510316		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling methodology is sufficiently detailed.
Metric 2:	Analytical Methodology	High	LOD is present. Analytical methodology is sufficiently detailed.
Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	The Netherlands.
Metric 5:	Currency	Low	Sampling from February-March 2003.
Metric 6:	Spatial and Temporal Variability	Low	50 samples were taken across 50 sampling sites.
Metric 7:	Exposure Scenario	Medium	Study site zoning was not described.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data was not provided but summary statistics are detailed.
Metric 9:	Quality Assurance	High	No quality control issues were identified or any identified issues were minor and adequately addressed.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Occurrence of some pollutants were low but this is discussed in the limitations.

Overall Quality Determination   Medium

Study Citation:	Wang, Y. Q., Hu, W., Cao, Z. H., Fu, X. Q., Zhu, T. (2005). Occurrence of endocrine-disrupting compounds in reclaimed water from Tianjin, China. Analytical and Bioanalytical Chemistry 383(5):857-863.		
HERO ID:	533749		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	1 L water sample collected at each stage of treatment of reclaimed water plant which receives secondary treatment wastewater (mainly domestic) from the Jizhuangzi sewage treatment plant; 5 mL methanol added; points of collection Fig 2
	Metric 2:	Analytical Methodology	Medium	solid phase extraction; GC-MS; compounds identified by retention times (Table 3); 0.13–0.2 μg/L for phthalates
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Tianjin, northern China
	Metric 5:	Currency	Low	October 2003 - September 2004
	Metric 6:	Spatial and Temporal Variability	Medium	7 rounds of sampling over a year
	Metric 7:	Exposure Scenario	High	water samples from reclaimed water plant intended for landscaping impoundment use and urban miscellaneous water consumption
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 4 provides the mean and range of concentrations at 4 points during treatment process (influent to after ozonation) as well as the removal efficiency; p. 862 discusses results of phthalates; no raw data provided
	Metric 9:	Quality Assurance	Medium	recoveries ranged from 83%-94%
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	results comparable to levels previously reported; influent water samples varied by season; recoveries relative std deviation of below 9%

Overall Quality Determination   Medium

Study Citation:	Sanchez-Avila, J., Bonet, J., Velasco, G., Lacorte, S. (2009). Determination and occurrence of phthalates, alkylphenols, bisphenol A, PBDEs, PCBs and PAHs in an industrial sewage grid discharging to a Municipal Wastewater Treatment Plant. Science of the Total Environment 407(13):4157-4167.		
HERO ID:	547906		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Key sampling methods reported
Metric 2:	Analytical Methodology	High	Key analytical methods reported
Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Maresme, Spain
Metric 5:	Currency	Medium	Samples collected in 2007
Metric 6:	Spatial and Temporal Variability	High	>10 samples, replicates
Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not provided
Metric 9:	Quality Assurance	Medium	Limted QA reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Limited gaps and limitations reported

Overall Quality Determination   **High**

Study Citation:	Becker, K., Guen, T., Seiwert, M., Conrad, A., Pick-Fub, H., Muller, J., Wittassek, M., Schulz, C., Kolossa-Gehring, M. (2009). Geres IV: Phthalate metabolites and bisphenol a in urine of German children. International Journal of Hygiene and Environmental Health 212(6):685-692.		
HERO ID:	551773		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Children's urine samples were taken by parents or themselves and key sampling methods and conditions were reported. Sampling methodology is clear and appropriate.
	Metric 2: Analytical Methodology	Medium	Analytical methodologies were from published paper. Key information such as LOQs, standard measurements, instruments, extraction methods were reported. No recovery sample reported.
	Metric 3: Biomarker Selection	High	Mono-n-butylphthalate (MnBP) as measured metabolite.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Germany
	Metric 5: Currency	Medium	Samples collected between May 2003 and May 2006.
	Metric 6: Spatial and Temporal Variability	Medium	Morning urine samples collected. >10 samples but no replicates collected.
	Metric 7: Exposure Scenario	High	GerES IV used questionnaires to collect exposure information. Possible exposure scenario discussed.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not provided. Lack of variation report (SD).
	Metric 9: Quality Assurance	High	Internal and external QC process applied and reported in "Methods" > "Chemical analysis" section.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Limited discussion about uncertainty and variability but not likely to have substantial impact on the results.

Overall Quality Determination   High

Study Citation:	Brucker-Davis, F., Wagner-Mahler, K., Delattre, I., Ducot, B., Ferrari, P., Bongain, A., Kurzenne, J. Y., Mas, J. C., Fénichel, P., Cryptorchidism Study Group from Nice Area (2008). Cryptorchidism at birth in Nice area (France) is associated with higher prenatal exposure to PCBs and DDE, as assessed by colostrum concentrations. Human Reproduction 23(8):1708-1718.		
HERO ID:	626047		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling equipment and methods are described in sufficient detail, but certain aspects (e.g. matrix characteristics) were absent that are unlikely to have a substantial impact on results.
	Metric 2: Analytical Methodology	High	Analytical instrumentation and methods are described in sufficient detail and are scientifically sound; quantitation and detection thresholds are reported for each medium.
	Metric 3: Biomarker Selection	Low	The monoester phthalate biomarker measured in cord blood and in colostrum is a metabolite of multiple parent chemicals, not just the chemical of interest, and there is not a stated method to apportion the estimate to just the chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study sampling was conducted in Nice or Grasse, France.
	Metric 5: Currency	Medium	The study sampling was conducted 2002-2005.
	Metric 6: Spatial and Temporal Variability	Medium	Total samples of cord blood (n = 151 for parent and n = 85 for biomarker) and colostrum (n = 125 for parent and n = 71 for biomarker) from 164 infant/mother pairs were reported, but no replicate samples were reported.
	Metric 7: Exposure Scenario	Medium	The exposed population is moderately well characterized by maternal metrics, but no information was detailed about potential exposures.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data are not reported. Summary statistics include percentage of quantifiable samples, median, minimum, maximum, and percentiles (25, 75) of concentration in each sample type for cases and for controls.
	Metric 9: Quality Assurance	Medium	QA/QC measured included determination of background contamination, recovery, and coefficients of variation. All metrics are reported to be within acceptable ranges, except background contamination; estimates for background contamination are reported at substantial levels, but data for the parent chemical are presented without correction.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Characterization of variability is reported, but methodological limitations or sources of uncertainty are only briefly discussed, including potential ex vivo enzymatic activity in samples.

Overall Quality Determination   Medium

Study Citation:	Castillo, M., Oubiña, A., Barceló, D. (1998). Evaluation of ELISA kits followed by liquid chromatography-atmospheric pressure chemical ionization-mass spectrometry for the determination of organic pollutants in industrial effluents. Environmental Science & Technology 32(14):2180-2184.		
HERO ID:	629069		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	samples described. Other article cited for sample collection details
	Metric 2: Analytical Methodology	High	LOD provided, equipment described, sample prep described
	Metric 3: Biomarker Selection	N/A	wastewater
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Spain
	Metric 5: Currency	Low	1996, 1997
	Metric 6: Spatial and Temporal Variability	Low	n = 5
	Metric 7: Exposure Scenario	Low	petrochemical plan effluent, landfill lechate
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	raw data in Table 2
	Metric 9: Quality Assurance	Low	Quality assurance not discussed, blanks included, no obvious concerns
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variability and Uncertainty not discussed, no obvious concerns

Overall Quality Determination   Low

Study Citation: Rockwell, D. C., Claff, R. E., Kuehl, D. W. (1984). 1981 Buffalo, New York, area sediment survey (Bass).
HERO ID: 645755

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The sediment sampling methodology was well described.
	Metric 2:	Analytical Methodology	Medium	The analytical methods were described, including the LOD but not recoveries.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	United States.
	Metric 5:	Currency	Low	Samples were collected in 1981.
	Metric 6:	Spatial and Temporal Variability	Low	Over 150 samples were collected from different sites along the river bank sites were rarely sampled more than once. Not all site samples were analyzed. The data reported used 77 samples from 65 sites.
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenarios related to polluted sediments.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	The raw data is presented in the supplemental materials in table 1 (Appendix C). Summary statistics were not reported.
	Metric 9:	Quality Assurance	High	Methods detailed in Appendix F.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability was not characterized, nor is uncertainty discussed or characterized.

Overall Quality Determination   Medium

Monitoring

Study Citation:	Atlas, E., Giam, C. S. (1981). Global transport of organic pollutants: Ambient concentrations in the remote marine atmosphere. Science 211(4478):163-165.		
HERO ID:	652042		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Discuss sampling method briefly (rainwater collection, air sampler filters, timing/location, equipment, storage/preservation). More information may be in the references provided in the sampling section.
	Metric 2:	Analytical Methodology	Low	detection limit mentioned but not reported; used gas chromatography
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Enewetak Atoll in the North Pacific Ocean
	Metric 5:	Currency	Low	samples collected in 1979
	Metric 6:	Spatial and Temporal Variability	Medium	n = 17 for DBP air samples and n = 16 for DBP rain samples. Unclear if there are replicates.
	Metric 7:	Exposure Scenario	Medium	Pollutants can be transported long distances in the atmosphere so this study measure pollutants in rain and air samples over the Pacific Ocean. The sampling location was very remote, away from urban/manufacturing contamination sources
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Sample concentrations and range provided. Individual points not reported.
	Metric 9:	Quality Assurance	Low	No quality control present- can be inferred.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Limited discussion of uncertainty and no mention of error but provide range of concentration variability

Overall Quality Determination   Medium

Study Citation:	Huang, W. J., Fang, G. C., Wang, C. C. (2005). The determination and fate of disinfection by-products from ozonation of polluted raw water. Science of the Total Environment 345(1-3):261-272.		
HERO ID:	657340		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Critically Deficient	The sampling methodology is not discussed.
	Metric 2: Analytical Methodology	Low	Analytical instrumentation and methods do not include detection limits.
	Metric 3: Biomarker Selection	N/A	This study is testing for the parent chemical of interest in an environmental medium.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study location is Taiwan.
	Metric 5: Currency	Low	The study timing is April 2003.
	Metric 6: Spatial and Temporal Variability	Critically Deficient	Sample size is not reported; samples are described as plural suggesting multiple samples were collected, but there is no further indication of number of samples (or summary statistics reported). Best inference suggests a single sample of raw water was analyzed for one sampling site, which also results in an uninformative rating.
	Metric 7: Exposure Scenario	High	Sampling site was the major source of public drinking water supply for an area of over 2 million people in Taiwan.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	Raw data are reported. Due to sample size of 1, summary statistics are not warranted.
	Metric 9: Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Characterization of variability is absent. Discussion of limitations or sources of uncertainty is absent.

Overall Quality Determination   **Uninformative**

Study Citation:	Becker, D. S., Ginn, T. C. (1995). Effects of storage time on toxicity of sediments from Puget Sound, Washington. Environmental Toxicology and Chemistry 14(5):829-835.		
HERO ID:	657922		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	sampling process and equipment described
Metric 2:	Analytical Methodology	Medium	DL shown in Table 1, extraction described; EPA methods cited
Metric 3:	Biomarker Selection	N/A	sediments
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	U.S. Washington
Metric 5:	Currency	Low	1989
Metric 6:	Spatial and Temporal Variability	Low	2 sites, 1 sample per site, no replicates
Metric 7:	Exposure Scenario	Low	sediments
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	raw data in Table 1
Metric 9:	Quality Assurance	Low	QA not discussed, not obvious concerns
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   Low

Study Citation: Stubin, A. I., Brosnan, T. M., Porter, K. D., Jimenez, L., Lochan, H. (1996). Organic priority pollutants in New York City municipal wastewaters: 1989-1993. Water Environment Research 68(6):1037-1044.

HERO ID: 658797

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling procedure was well described (sampling condition, equipment, storage, study site description).
	Metric 2: Analytical Methodology	Low	Analytical method was described, however, method detection limit was not provided.
	Metric 3: Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	New York City water pollution control plants
	Metric 5: Currency	Low	Sampling was performed from 1989 to 1993.
	Metric 6: Spatial and Temporal Variability	High	Volatile samples were collected 3 times within the same 24-hr period. Semi-volatile samples were collected 8 times within the course of 24-hr.
	Metric 7: Exposure Scenario	Medium	The data likely represent the relevant exposure scenario.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Supplementary or raw data were not reported.
	Metric 9: Quality Assurance	Medium	The study applied and documented quality assurance/quality control measures.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	The study has limited characterization of variability in the population/media studied.

Overall Quality Determination   Medium

Study Citation:	FDA, (1995). Accumulated pesticide and industrial chemical findings from a ten-year study of ready-to-eat foods. Journal of AOAC International 78(3):614-630.		
HERO ID:	659041		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	The sampling methodology is briefly described. Full methods from the FDA Total Diet Study need to be requested.
Metric 2:	Analytical Methodology	Medium	The analytical methodology is briefly described. Full methods from the FDA Total Diet Study need to be requested.
Metric 3:	Biomarker Selection	N/A	The study lists chemicals measured in foods.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	The study was conducted in the United States.
Metric 5:	Currency	Low	This study was conducted from 1982-1991.
Metric 6:	Spatial and Temporal Variability	Medium	Measurements were made in 234 ready-to-eat foods, each tested 37 times over the 10-year study period. No replicate sampling was conducted.
Metric 7:	Exposure Scenario	Medium	Information from full methods is needed to determine where foods were from.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	The average for each chemical is listed. The full report is needed for each data point.
Metric 9:	Quality Assurance	Medium	QA is not discussed. It is likely that this information is in the full report.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Variability is captured by 234 different foods. Uncertainty is not discussed. There are no obvious concerns.

Overall Quality Determination   Medium

| Study Citation: | Yasuhara, A., Shiraishi, H., Nishikawa, M., Yamamoto, T., Nakasugi, O., Okumura, T., Kenmotsu, K., Fukui, H., Nagase, M., Kawagoshi, Y. (1999). Organic components in leachates from hazardous waste disposal sites. Waste Management & Research 17(3):186-197. |
| HERO ID: | 659131 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Key sampling methods for landfill leachate samples were reported. Some details, such as duration of sample storage prior to analysis, were lacking.
	Metric 2:	Analytical Methodology	Medium	Analytic methodology was described in detail. Some details, such as recovery percentages, were not described.
	Metric 3:	Biomarker Selection	N/A	The chemicals of interest were measured in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The samples were described as collected in Japan.
	Metric 5:	Currency	Low	Samples were collected in 1995.
	Metric 6:	Spatial and Temporal Variability	Medium	Samples were collected from 11 landfills in 1995. Two types of landfills (open landfills and controlled landfills) were described, as authors noted that sampling from closed landfills was not permitted. Replicate sampling was not conducted.
	Metric 7:	Exposure Scenario	Medium	Exposure sources were not well characterized. Table 1 describes landfill and waste type, but no information about microenvironment was provided. Use of exposure controls was lacking.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data and median concentrations were reported in Table 3 of the manuscript. Results in Table 3 were described as presented for chemicals in the order of frequency of detection, however individual chemical-specific detection frequencies were not reported.
	Metric 9:	Quality Assurance	Low	Other than use of laboratory blanks, limited QA/QC procedures were reported, however samples were reported as analyzed at the National Institute for Environmental Studies which would utilize standard methodologies.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	This study did not report standard deviations or other measures of variance. Only a few gaps and limitations were reported.

Overall Quality Determination   Medium

Study Citation: Iannuzzi, T. J., Huntley, S. L., Schmidt, C. W., Finley, B. L., Mcnutt, R. P., Burton, S. J. (1997). Combined sewer overflows (CSOs) as sources of sediment contamination in the lower Passaic River, New Jersey. I. Priority pollutants and inorganic chemicals. Chemosphere 34(2):213-231.

HERO ID: 660098

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported such as sampler calibration
	Metric 2:	Analytical Methodology	Medium	Some analytical methods not reported, such as recovery samples
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	New Jersey, USA
	Metric 5:	Currency	Low	Samples collected in 1994
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7:	Exposure Scenario	High	Exposure sources characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	raw data reported in the manuscript
	Metric 9:	Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported

Overall Quality Determination   Medium

Study Citation:	Jay, K., Stieglitz, L. (1995). Identification and quantification of volatile organic components in emissions of waste incineration plants. Chemosphere 30(7):1249-1260.		
HERO ID:	660112		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	The study did not elaborate on sampling procedure.
Metric 2:	Analytical Methodology	Low	Analytical and extraction method were described; however, the LOD was not provided. QC: change to low
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	German
Metric 5:	Currency	Low	No sampling date is provided, but a publication date is available.
Metric 6:	Spatial and Temporal Variability	Low	The study reported that measures were taken at one municipal waste incineration plant without the exact sample size.
Metric 7:	Exposure Scenario	Medium	Air emission around a incineration plant.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Average concentrations were reported in Table 1.
Metric 9:	Quality Assurance	Low	Quality assurance techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	The study has limited discussion of key uncertainties and limitations.

Overall Quality Determination   Low

Study Citation:	Matthiessen, P., Thain, J. E., Law, R. J., Fileman, T. W. (1993). Attempts to assess the environmental hazard posed by complex mixtures of organic chemicals in UK estuaries. Marine Pollution Bulletin 26(2):90-95.
HERO ID:	660286

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Methods briefly described and cited: Law et al. (1991) and Hurfordet al. (1989).
	Metric 2:	Analytical Methodology	Low	GC-MS; equipment not described.
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	United Kingdom
	Metric 5:	Currency	Low	1988-1989
	Metric 6:	Spatial and Temporal Variability	Medium	1 sample at 10 locations
	Metric 7:	Exposure Scenario	Medium	surface waters from several UK estuaries
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	raw data provided Table 1
	Metric 9:	Quality Assurance	Low	QA not explicitly discussed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty not discussed.

Overall Quality Determination   Low

Domain	Metric	Rating	Comments
Study Citation: Otson, R., Fellin, P., Tran, Q. (1994). VOCs in representative Canadian residences. Atmospheric Environment 28(22):3563-3569. **HERO ID:** 660379			
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Some information described, such as equipment and storage. Additional details in (Otson et al., 1992a).
	Metric 2: Analytical Methodology	Medium	Analytical methods described. LOD reported as a range not for individual chemical.
	Metric 3: Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Canada
	Metric 5: Currency	Low	Timing of sample collection for monitoring data is not reported, discussed, or referenced. The article was published in 1994.
	Metric 6: Spatial and Temporal Variability	Medium	757 samples. The article mentions some replicates were done.
	Metric 7: Exposure Scenario	High	Indoor air quality in residences.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	No raw data provided. Little summary statistics given. There is mention that "An inventory of solvents used in the laboratory and analysis of OVM 3500 badges exposed in the storage refrigerator provided evidence that airborne solvents may have caused the contamination."
	Metric 9: Quality Assurance	Medium	Blanks and recoveries reported. QC was described but no section for it.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Little information provided on gaps and limitations; standard deviation nor variance reported

Overall Quality Determination   Medium

Study Citation:		Paxéus, N., Robinson, P., Balmér, P. (1992). Study of organic pollutants in municipal wastewater in G{\"o}teborg, Sweden. Water Science and Technology 25(11):249-256.	
HERO ID:		667025	

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Site characteristics provided. Only one sentence is available for sampling methodology, which doesn't mention any widely accepted protocols.
	Metric 2: Analytical Methodology	Low	Instrument calibration and recovery samples missing. Detection limits also missing, except for PAHs were an estimate was provided.
	Metric 3: Biomarker Selection	N/A	Parent chemicals measured in wastewater
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Goteborg, Sweden
	Metric 5: Currency	Low	1989-1991
	Metric 6: Spatial and Temporal Variability	Medium	No replicate samples and fewer than 10 samples per scenario
	Metric 7: Exposure Scenario	High	Samples taken from municipal wastewater
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual data points not reported
	Metric 9: Quality Assurance	Low	QA/QC procedures not discussed. Can infer that some techniques were applied through citations
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	No discussion of the uncertainties and limitations

Overall Quality Determination   **Low**

Study Citation:	Brock, J. W., Caudill, S. P., Silva, M. J., Needham, L. L., Hilborn, E. D. (2002). Phthalate monoesters levels in the urine of young children. Bulletin of Environmental Contamination and Toxicology 68(3):309-314.		
HERO ID:	673257		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Urine samples collected but missing storage condition and collect time.
	Metric 2: Analytical Methodology	Low	LOD or LOQ not provided.
	Metric 3: Biomarker Selection	High	Monobutylphthalate (MBP) measured as metabolite.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Imperial county, CA, USA
	Metric 5: Currency	Low	January to March 2000.
	Metric 6: Spatial and Temporal Variability	Medium	Urine samples collected during initial clinic visit and follow-up visit. >10 samples but no replicate collected.
	Metric 7: Exposure Scenario	High	Exposure scenario reported. Exposure information collected during first clinic visit and follow-up home visit.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	Individual data provided among children's urine samples. Mean, SD, and comparison to NHANES percentiles reported.
	Metric 9: Quality Assurance	Medium	Creatine level reported. QC samples and methods applied. Some measurement were restricted by limited urine volume.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Variation, limitation, and uncertainty due to limited urine volume of some samples were discussed.

Overall Quality Determination   **Medium**

Study Citation:	Calafat, A. M., Slakman, A. R., Silva, M. J., Herbert, A. R., Needham, L. L. (2004). Automated solid phase extraction and quantitative analysis of human milk for 13 phthalate metabolites. Journal of Chromatography B: Analytical Technologies in the Biomedical and Life Sciences 805(1):49-56.		
HERO ID:	673259		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	The study includes minimal details about the human milk sampling methodology.
	Metric 2: Analytical Methodology	High	The analytical methods were described in detail, including LODs and recoveries.
	Metric 3: Biomarker Selection	High	The study tested for metabolites closely related to the parent chemical.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was conducted by the CDC in Atlanta but the geographic data was not confirmed in the manuscript.
	Metric 5: Currency	Low	The study was published in 2004.
	Metric 6: Spatial and Temporal Variability	Low	The study did not report sample size clearly. Section 2.5 reads: "each batch consisted of 50 samples" but it is not specified if it refers to human milk.
	Metric 7: Exposure Scenario	High	The data closely represent relevant exposure scenarios related to phthalate metabolites present in human milk.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data and limited summary statistics for human milk concentrations were reported.
	Metric 9: Quality Assurance	High	QA/QC techniques were described in detail, e.g., use of controls and recoveries.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability for human milk concentrations was briefly characterized in the text (SD). Uncertainties were discussed.

Overall Quality Determination   Medium

Study Citation:	Chen, J. A., Liu, H., Qiu, Z., Shu, W. (2008). Analysis of di-n-butyl phthalate and other organic pollutants in Chongqing women undergoing parturition. Environmental Pollution 156(3):849-853.		
HERO ID:	673262		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling methodology for venous blood, umbilical cord blood, breast milk and urine samples described regarding sampling equipment, brief sampling procedures, sample storage conditions and study site location. Insufficient information regarding duration of storage prior to sample analysis.
Metric 2:	Analytical Methodology	Medium	Analytic methodology described in terms of extraction, instrumentation, limits of detection, instrument calibration and recovery rates. Insufficient information regarding creatinine adjustment.
Metric 3:	Biomarker Selection	N/A	Sampling for parent chemicals of interest in multiple biological media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples provided by participants who were long-term residents of Chongqing municipality, China.
Metric 5:	Currency	Low	Dates of sample collection were not specified. Published in 2008.
Metric 6:	Spatial and Temporal Variability	Medium	Samples collected from a total of 40 volunteers from single municipality. Single sample collected during and shortly after parturition from venous blood, umbilical cord blood, breast milk and urine.
Metric 7:	Exposure Scenario	Medium	Participant characteristics summarized in terms of age. All participants had no known history of occupational exposure.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Results reported in terms of mean, standard deviation, median, minimum and maximum concentration summary statistics. Limits and frequency of detection reported. Insufficient information regarding raw data.
Metric 9:	Quality Assurance	Low	Quality assurance/control techniques not discussed or referenced.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Statistical variability summarized within concentration summary measures (standard deviation), however robust discussion of study limitations lacking.

Overall Quality Determination   Medium

Study Citation: Hoppin, J. A., Brock, J. W., Davis, B. J., Baird, D. D. (2002). Reproducibility of urinary phthalate metabolites in first morning urine samples. Environmental Health Perspectives 110(5):515-518.

HERO ID: 673280

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Medium. Sampling methodology reported sampling procedures, sampling equipment and sample storage conditions for first morning urine samples. Insufficient information regarding duration of sample storage prior to analysis.
	Metric 2:	Analytical Methodology	Medium	Medium. Analytic methodology described in terms of extraction, analytic instrumentation, instrument calibration, limits of detection and matrix adjustment (creatinine) method. Insufficient information regarding recoveries.
	Metric 3:	Biomarker Selection	Low	Low. mBP could be a metabolite of parent DBP or BBP.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	High. Samples provided by study participants residing in Washington, D.C.
	Metric 5:	Currency	Low	Low. Sampling conducted 1996-1997.
	Metric 6:	Spatial and Temporal Variability	Medium	Medium. Two consecutive first-morning urines collected from each of 46 African American participants. Participants randomly selected as representative sample of low to high income strata of study population. Authors acknowledged lack of data regarding temporal variability.
	Metric 7:	Exposure Scenario	Medium	Medium. Exposure sources for study participants not discussed. Population demographics described in terms of race, age and range of income (low to high income strata).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Medium. Summary statistics for urinary metabolite concentration results presented in terms of description of data (location, population, year of sampling), concentration range, number of samples, frequency of detection, measure of variation (standard deviation), and measure of central tendency (mean, median). Outliers were not removed from data set to obtain measures of variability. Insufficient information regarding raw data.
	Metric 9:	Quality Assurance	Medium	Medium. Quality assurance parameters described in terms of method blanks, batch-specific quality assurance samples from pooled first morning void samples of women of similar ages, and creatinine levels. Samples described as not meeting lab quality assurance criteria excluded (mEP measures on 11 subjects and mINP in one sample).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Medium. Between- and within-subject variability indicated through intra-class correlation coefficients. Between-subject variability noted as greater than within-subject variability. Summary variability statistics reported. Authors discussed limitations of lack of data regarding temporal variability.

Overall Quality Determination   **Medium**

Study Citation:	Liu, W. L., Shen, C. F., Zhang, Z., Zhang, C. B. (2009). Distribution of phthalate esters in soil of e-waste recycling sites from Taizhou city in China. Bulletin of Environmental Contamination and Toxicology 82(6):665-667.		
HERO ID:	673295		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methods described. Sample processing and storage described.
	Metric 2:	Analytical Methodology	High	key analytical methods reported
	Metric 3:	Biomarker Selection	N/A	Soil sampling
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	Medium	Study conducted in 2009
	Metric 6:	Spatial and Temporal Variability	Medium	no replicates
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	raw data not reported
	Metric 9:	Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Few gaps and limitations reported

Overall Quality Determination   Medium

Study Citation:	Berman, T., Hochner-Celnikier, D., Calafat, A. M., Needham, L. L., Amitai, Y., Wormser, U., Richter, E. (2009). Phthalate exposure among pregnant women in Jerusalem, Israel: results of a pilot study. Environment International 35(2):353-357.		
HERO ID:	673439		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling methodology details reported for sampling procedure, sample storage conditions and duration of sample storage prior to analyses. Insufficient information regarding sampling equipment.
Metric 2:	Analytical Methodology	Medium	Analytic methodology details reported for extraction method, analytical instrumentation, chemical-specific limits of detection and matrix-adjustment method for urine sample analyses. Insufficient information regarding instrument calibration.
Metric 3:	Biomarker Selection	Low	DBP—MCPP is minor metabolite of DBP but also of DOP.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Urine samples collected from participants in Jerusalem.
Metric 5:	Currency	Medium	Urine samples collected at recruitment in 2006.
Metric 6:	Spatial and Temporal Variability	Medium	Single spot urine specimens collected from pregnant women (n=19) in Jerusalem hospital settings across different areas of city.
Metric 7:	Exposure Scenario	Medium	Authors noted participants came from diverse ethnic and socioeconomic backgrounds, with results reported stratified across age of residential building as well as for use of personal care products. Occupational data obtained from extensive questionnaire.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Statistical summary measures of urinary metabolite total number of samples, geometric mean, median, and concentration ranges reported. Description of data in terms of year of sampling, location and population characteristics summarized. Insufficient information regarding raw data and consideration for tests for outliers.
Metric 9:	Quality Assurance	Medium	Quality assurance details reported for sample analytics, reagent blanks and protocols. Results adjusted for creatinine. Lack of pre-exposure sampling and reporting of recovery data.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Statistical summary measures lacked standard deviations but reported ranges, limitations of sample size and spot urine specimens discussed.

Overall Quality Determination   **Medium**

Study Citation:	Bornehag, C. G., Sundell, J., Weschler, C. J., Sigsgaard, T., Lundgren, B., Hasselgren, M., Hägerhed-Engman, L. (2004). The association between asthma and allergic symptoms in children and phthalates in house dust: A nested case-control study. Environmental Health Perspectives 112(14):1393-1397.		
HERO ID:	673441		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Medium. Most key criteria met; lack of sample storage conditions/duration information.
	Metric 2: Analytical Methodology	Medium	Medium. Most key criteria described, detection limits reported.
	Metric 3: Biomarker Selection	N/A	N/A. Sampling for parent chemical in environmental media (dust).
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	High. Samples provided by participants in Varmland, Sweden.
	Metric 5: Currency	Low	Low. Sample collection dates noted as October, 2001 through April, 2002.
	Metric 6: Spatial and Temporal Variability	Medium	Medium. Single dust concentration sampling results from 346 homes with dust sampled from molding and shelves of participating child's bedroom, with sampling conducted within single season of 2001-2002. Non-statistical sampling methods.
	Metric 7: Exposure Scenario	Low	Low. Dust concentrations measured within participating child's bedroom with samples obtained from molding and shelves of bedroom with additional microenvironment data not provided.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Medium. Most key criteria met; lack of raw data and variation measure (other than 95% confidence interval across case-control status.
	Metric 9: Quality Assurance	Medium	Medium. Some key criteria met; lack of baseline pre-exposure sampling, DBH study methods referenced.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Medium. Variability characterized within summary statistics (95% confidence interval), potential study limitations and biases discussed.

Overall Quality Determination   **Medium**

Study Citation:	Chou, Y. Y., Huang, P. C., Lee, C. C., Wu, M. H., Lin, S. J. (2009). Phthalate exposure in girls during early puberty. Journal of Pediatric Endocrinology & Metabolism 22(1):69-77.		
HERO ID:	673445		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Medium. Sampling methodology described in terms of sampling equipment, procedures, and sample storage conditions. Insufficient information regarding duration of sample storage prior to analysis, study site characteristics.
Metric 2:	Analytical Methodology	Medium	Medium. Analytic methodology described in terms of extraction, analytical instrumentation, limits of detection, recoveries. Insufficient information on consideration of matrix adjustment method (creatinine).
Metric 3:	Biomarker Selection	High	High. Metabolites specific to parent chemicals of interest.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	High. Urine samples provided by study participants residing in Taiwan.
Metric 5:	Currency	Low	Low. Dates of sampling not detailed; study publication date 2009.
Metric 6:	Spatial and Temporal Variability	Low	Low. Urine samples described as collected in the morning (not necessarily first morning samples) for n=89 girls. No replicate samples. Single samples that do not represent all periods of time or representative locations.
Metric 7:	Exposure Scenario	Medium	Medium. Exposure scenario described in terms of structured questionnaire responses regarding food and consumer product frequency of use results correlated with exposure concentration results. Description of microenvironment (climate, time) not detailed. Lack of exposure controls.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Medium. Description of population in terms of demographics (age, weight, height), measure of central tendency (mean) and variation (standard deviation) and number of samples. Insufficient information regarding range of concentrations, raw data and frequency of detection.
Metric 9:	Quality Assurance	Medium	Medium. Study documented quality assurance measures of batch-specific blank and quality samples, recoveries. Insufficient information regarding baseline (pre-exposure) sampling.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Low. Standard deviations reported for mean concentrations. Lack of discussion of study limitations.

Overall Quality Determination   Medium

Study Citation:	Hogberg, J., Hanberg, A., Berglund, M., Skerfving, S., Remberger, M., Calafat, A. M., Filipsson, A. F., Jansson, B., Johansson, N., Appelgren, M., Hakansson, H. (2008). Phthalate diesters and their metabolites in human breast milk, blood or serum, and urine as biomarkers of exposure in vulnerable populations. Environmental Health Perspectives 116(3):334-339.		
HERO ID:	673465		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sample selection (women invited to participate) based on 130 consecutive normal births in one hospital, not stratified to represent general population characteristics of Sweden overall.
Metric 2:	Analytical Methodology	High	GC-MS; sample prep and extraction described in detail by matrix
Metric 3:	Biomarker Selection	High	Measured parent phthalates and their metabolites in breast milk, blood (or plasma), and urine.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Sweden
Metric 5:	Currency	Low	2001
Metric 6:	Spatial and Temporal Variability	Medium	Cohort of Swedish women that delivered at Lund University Hospital, 130 consecutive deliveries invited to participate; final n = 42. Time span (dates) unspecified; single hospital.
Metric 7:	Exposure Scenario	Medium	General population of pregnant Swedish women after delivery in hospital; all interviewed about lifestyle habits, use of hygiene and other products, and other relevant information.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Reported mean, SD, n, min, max, median, 75th percentile, and LOD by chemical and matrix. Raw data not provided.
Metric 9:	Quality Assurance	High	At Swedish institutes, calibration and recoveries from standard mixture of 6 phthalate esters; reported concentrations corrected for recovery. Precision, uncertainty, and recovery rates reported; high and low quality assurance spiked samples; reagent blanks included. Several techniques used to minimize contamination from sample collection through analysis.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Discussed results and correlations (or lack thereof) in conjunction with factors that might account for them.

Overall Quality Determination   High

Dibutyl Phthalate — Monitoring —

Study Citation:	Hong, Y. C., Park, E. Y., Park, M. S., Ko, J. A., Oh, S. Y., Kim, H., Lee, K. H., Leem, J. H., Ha, E. H. (2009). Community level exposure to chemicals and oxidative stress in adult population. Toxicology Letters 184(2):139-144.		
HERO ID:	673466		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Medium. Sampling methodology details of sampling procedures and sample storage conditions briefly described. Insufficient information regarding sampling equipment.
	Metric 2: Analytical Methodology	Medium	Medium. Analytic methodology details of extraction method, limits of detection, analytical instrumentation described. Insufficient information regarding instrument calibration and recovery samples.
	Metric 3: Biomarker Selection	High	High: BPA, MEHHP, MEOHP metabolites of parent chemicals only
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	High. Samples provided by participants in Korea.
	Metric 5: Currency	Medium	Medium. Samples collected in 2005
	Metric 6: Spatial and Temporal Variability	Low	Low. A total of 513 urine samples were collected. Single morning sample collected from each participant, no replicate samples.
	Metric 7: Exposure Scenario	Medium	Medium. Participant demographics, lifestyle habits, medical and employment history and environmental exposure details collected from a structured questionnaire. Potential sources of exposure through consumer products briefly discussed.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Medium. Summary statistic data described population and month, year of sampling, percentile concentrations, number of samples, frequency of detection, measure of variation (SD), and measure of central tendency (mean, median). Insufficient information regarding raw data from each participant.
	Metric 9: Quality Assurance	Low	Low. Quality assurance and control parameters not directly discussed but can be inferred from study's use of standard laboratory protocols.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Medium. Summary statistic measures of variation (SD) for participant urinary chemical concentrations. Report includes discussion of limitations, which include temporality uncertainties due to cross-sectional nature of study as well as single urine sample for characterization of chemical concentrations with known relatively short half-lives.

Overall Quality Determination   Medium

Study Citation: Huang, P. C., Kuo, P. L., Chou, Y. Y., Lin, S. J., Lee, C. C. (2009). Association between prenatal exposure to phthalates and the health of newborns. Environment International 35(1):14-20.

HERO ID: 673468

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Medium. Sampling methodology described for urine and amniotic fluid samples in terms of sampling equipment, procedures, sample storage conditions and study site characteristics. Insufficient information regarding duration of sample storage prior to analyses.
Metric 2:	Analytical Methodology	High	High. Analytic methodologies described in terms of extraction, analytical instrumentation, limits of detection, recoveries and matrix adjustment (creatinine for urine).
Metric 3:	Biomarker Selection	Low	Low: (MBP metabolite of DBP and/or BBP).
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	High. Sampling conducted on participants in Taiwan.
Metric 5:	Currency	Medium	Medium. Samples collected from participants in 2005-2006.
Metric 6:	Spatial and Temporal Variability	Low	Low. 64 amniotic fluid samples and 64 urine specimens obtained from 64 participants. Single specimens collected from each participant, including spot urine samples at time of amniocentesis medical appointment. No replicate samples.
Metric 7:	Exposure Scenario	Medium	Medium. Sources of exposure described within text briefly. Lack of data regarding employment status. Demographic characteristics of participant mothers providing samples not described.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Medium. Summary statistics of urinary and amniotic fluid concentrations reported as number of samples, minimum, maximum, 10th, median and 90th percentile concentrations and frequency of detection. Insufficient information regarding consideration for outliers in analysis of birth outcomes.
Metric 9:	Quality Assurance	Medium	Medium. Quality assurance and control parameters described in terms of laboratory blanks and quality control samples, laboratory recoveries and creatinine for urinary specimens. Authors noted failure of one amniotic fluid sample during analysis.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	High. Robust discussion of study limitations noted in referenced study (Huang et al., 2007; HERO ID 673469). Sample concentration standard deviation or standard error measures lacking, however authors reported concentration ranges.

Overall Quality Determination   Medium

Study Citation:	Koch, H. M., Rossbach, B., Drexler, H., Angerer, J. (2003). Internal exposure of the general population to DEHP and other phthalates–determination of secondary and primary phthalate monoester metabolites in urine. Environmental Research 93(2):177-185.		
HERO ID:	673472		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Some methods not reported such as sample storage conditions
Metric 2:	Analytical Methodology	Medium	recovery samples not reported. Precise LOQ not reported for all metabolites.
Metric 3:	Biomarker Selection	Low	MnBuP is a metabolite of both DBP and BBP parent chemicals
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Germany
Metric 5:	Currency	Low	Samples collected before 2004
Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
Metric 7:	Exposure Scenario	High	Exposure to phthalates among the general population was characterized. Authors provided some examples of exposure sources (e.g., foodstuff, cosmetics, air) to the general population.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not reported
Metric 9:	Quality Assurance	Medium	Missing some QA measures like recoveries
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	SDs, 95th percentiles, and min/max values provided to characterize variance. Gaps and limitations included in discussion section.

Overall Quality Determination   **Medium**

Study Citation:	Kolarik, B., Naydenov, K., Larsson, M., Bornehag, C. G., Sundell, J. (2008). The association between phthalates in dust and allergic diseases among Bulgarian children. Environmental Health Perspectives 116(1):98-103.		
HERO ID:	673473		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	A 1,600-W vacuum cleaner equipped with a phthalate-free ALK dust sampling device was used for the dust collection. The dust samples were wrapped in aluminum foil and kept in a polyethylene bag with a zip lock, so that the dust had no contact with the bag. Samples were frozen the day of sampling at –18°C.
	Metric 2: Analytical Methodology	High	LOD reported, the analytical methodology is described
	Metric 3: Biomarker Selection	High	Urine DnBP
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Bulgaria
	Metric 5: Currency	Medium	2004-2005
	Metric 6: Spatial and Temporal Variability	Medium	177 homes of Bulgarian children, no sample replicates
	Metric 7: Exposure Scenario	High	biomonitoring
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	No raw data. Table 2. The concentrations of phthalates (mg phthalate per g dust) measured in 177 homes of Bulgarianchildren shown as geometric mean with 95% CIs.
	Metric 9: Quality Assurance	Critically Deficient	QA not reported in any of the cohort studies.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Key limitations no reported. Variability presented as 95% CI

Overall Quality Determination Uninformative

Study Citation:	Lomenick, J. P., Calafat, A. M., Melguizo Castro, M. S., Mier, R., Stenger, P., Foster, M. B., Wintergerst, K. A. (2010). Phthalate exposure and precocious puberty in females. Journal of Pediatrics 156(2):221-225.
HERO ID:	673478

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Medium. Sampling methodology described in terms of urine sampling equipment container materials, sample storage conditions prior to analysis, study site (pediatric endocrinology clinic). Insufficient information regarding duration of sample storage prior to analysis.
	Metric 2:	Analytical Methodology	Low	Low. Analytic methodology described in main text in terms of extraction, analytical instrumentation, use of instrument calibration standards, and matrix-adjustment method (creatinine). Investigators reported limits of detection as a range within "low nanogram per milliliter range" but did not specify numeric range. Samples specified as analyzed at the Centers for Disease Control and Prevention (CDC). Insufficient information regarding sample recoveries and numeric specification of limits of detection.
	Metric 3:	Biomarker Selection	Low	MBP metabolite of both DBP and BBP parent phthalates; MCPP metabolite of both DBP and DOP parent phthalates.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	High. Samples provided by participants recruited from the University of Kentucky College of Medicine Department of Pediatric Endocrinology.
	Metric 5:	Currency	Medium	Medium. Recruitment specified as between 2005-2008.
	Metric 6:	Spatial and Temporal Variability	Low	Low. Single, spot urine samples collected from 28 central precocious puberty (CPP) cases and 28 control children.
	Metric 7:	Exposure Scenario	Medium	Medium. Participant demographic and baseline weight, height and BMI characteristics summarized within Table 1. Authors noted urinary phthalate metabolite concentrations similar to children of similar ages within NHANES 2001-2002.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Medium. Urinary phthalate metabolite concentrations reported with summary statistics of mean and standard error in CPP case and control children with years of recruitment, number of samples and location of clinic collecting sample specified. Insufficient information regarding phthalate metabolite concentration range or percentiles, frequency of detection, tests for outliers and raw data.
	Metric 9:	Quality Assurance	Medium	Medium. Quality assurance procedures of internal standards utilized to increase precision, calibration standards used within each analytical run, reagent blanks and quality control materials of high and low concentration to monitor for accuracy and precision. CDC analysts blinded to participant characteristics. Phthalate metabolite concentrations corrected for creatinine. Insufficient information regarding field, laboratory or storage recoveries.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Medium. Statistical variability summarized within phthalate metabolite concentration summary statistic of standard deviation. Investigators presented a relatively robust discussion of study limitations and reasoning for results. Authors detailed uncertainty in importance of timing of phthalate sampling in adequately representing the intensity, duration and potential peak exposures responsible for initiation and development of CPP case status.

Overall Quality Determination   Medium

Study Citation:	Main, K. M., Mortensen, G. K., Kaleva, M. M., Boisen, K. A., Damgaard, I. N., Chellakooty, M., Schmidt, I. M., Suomi, A. M., Virtanen, H. E., Petersen, J. H., Andersson, A. M., Toppari, J., Skakkebaek, N. E. (2006). Human breast milk contamination with phthalates and alterations of endogenous reproductive hormones in infants three months of age. Environmental Health Perspectives 114(2):270-276.		
HERO ID:	673480		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Phthalate breast milk sampling methodology described in terms of sampling equipment, procedures, sample storage conditions. Insufficient information regarding duration of sample storage time prior to analysis
	Metric 2:	Analytical Methodology	High	Phthalate analytic methodology described in terms of extraction method, analytical instrumentation, and recoveries of 93-104%. Chemical-specific limits of detection reported in Table 2 along with detection rates. Insufficient information regarding instrument calibration, however additional details referenced [Mortensen et al., 2005].
	Metric 3:	Biomarker Selection	Low	BBP—MBP is a metabolite of DBP and BBP parent chemicals
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Breast milk samples collected from women in Denmark and Finland.
	Metric 5:	Currency	Low	Breast milk sample data results from samples collected 1997-2001.
	Metric 6:	Spatial and Temporal Variability	Medium	Single breast milk sample pooled from each participant's collection of multiple breast milk samples collected over successive infant feedings over several weeks up to a maximum sample volume of 200 mL. Insufficient information with regards to sample-specific weeks of sampling time, however breast milk samples collected between one and three months after birth. Breast milk samples provided by women in Denmark (n=64) and Finland (n=65).
	Metric 7:	Exposure Scenario	Medium	Study population demographic characteristics reported in Table 1 for maternal and child characteristics. Potential non-occupational exposure sources discussed briefly in text introduction.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Summary statistics of breast milk phthalate concentrations reported median, range, frequency of detection and number of samples for reported concentrations within Table 2. Insufficient information regarding tests for outliers and timing or dates of sample collection, as well as raw data.
	Metric 9:	Quality Assurance	Medium	Quality assurance details of laboratory recoveries and coefficients of variation range. Analyses noted as conducted by personnel blinded with regard to the child's clinical examination or other outcome measures. Authors noted information on 57 of Danish mothers was noted regarding breast pump usage, rather than manual expression into provided glass jars, with 26 (46%) noting use of a pump on one or more occasions during sample collection. However study focused upon phthalate metabolites, which would not have originated from breast pump sample collection containers and equipment. Only breast milk samples with >50 mL volumes were included, however number of samples with insufficient volume not detailed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Statistical summary variability measure of concentration ranges reported. Authors discussed limitations, including knowledge that child phthalate exposure may not be adequately represented by maternal breast milk concentrations, which is only one of many potential exposure routes. Authors acknowledged and discussed lack of information on individual sources of exposure as well as potential sample contamination through breast pump use.

Overall Quality Determination   **Medium**

Study Citation:	Meeker, J. D., Hu, H., Cantonwine, D. E., Lamadrid-Figueroa, H., Calafat, A. M., Ettinger, A. S., Hernandez-Avila, M., Loch-Caruso, R., Tellez-Rojo, M. M. (2009). Urinary phthalate metabolites in relation to preterm birth in Mexico city. Environmental Health Perspectives 117(10):1587-1592.		
HERO ID:	673483		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling methodology only briefly discussed in terms of spot urine, second morning void, sampling. Insufficient information not likely to impact results includes details on sampling equipment, sample storage conditions, and duration of sample storage.
	Metric 2: Analytical Methodology	Medium	Analytic methodology described and referenced (Silva et al., 2007) in terms of extraction, analytical instrumentation, limit of detection (LOD) range, and matrix adjustment (creatinine and specific gravity). Insufficient information regarding recoveries.
	Metric 3: Biomarker Selection	Low	Measured MBP (metabolite of DBP or BBP) and MCPP (metabolite of DBP or DOP).
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples provided by participants in Mexico City prenatal clinics.
	Metric 5: Currency	Low	Recruitment during pregnancy 2001-2003.
	Metric 6: Spatial and Temporal Variability	Low	A total of n=30 preterm birth cases and n=30 normal gestational birth controls, however single spot, second morning urine samples collected from participants.
	Metric 7: Exposure Scenario	Medium	Participant demographic data collected and reported. Potential sources of exposure briefly discussed.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Statistical summary measures of number of samples, concentration percentiles, maximum concentration, measures of central tendency of geometric mean and median concentrations and frequency of detection reported. Insufficient information regarding tests for outliers and raw data.
	Metric 9: Quality Assurance	Medium	Authors reported quality assurance and control parameters of use of calibration standards, reagent blanks and quality control materials in analytic procedures quantifying chemicals of interest. Authors noted urine samples of women delivering at term were more dilute than those of women delivering preterm, as well as other potential study limitations. Authors noted high percentage (33%) of samples <LOD for MCOP and MCNP.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Authors reported statistical summary measures of variation, uncertainties were minimal, and authors discussed study limitations.

Overall Quality Determination   **Medium**

Study Citation:	Pant, N., Shukla, M., Kumar Patel, D., Shukla, Y., Mathur, N., Kumar Gupta, Y., Saxena, D. K. (2008). Correlation of phthalate exposures with semen quality. Toxicology and Applied Pharmacology 231(1):112-116.		
HERO ID:	673491		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	High. Sampling methodology described in terms of sampling equipment, procedures, and study site for collection of participant semen samples. No report of sample storage conditions, however samples reported as analyzed immediately after collection.
	Metric 2:	Analytical Methodology	Low	Low. Semen sample analytic methods described in terms of extraction, analytical instrumentation, calibration and phthalate recoveries. Insufficient information regarding limits of detection for phthalate analyses.
	Metric 3:	Biomarker Selection	N/A	N/A—Sampling for parent phthalates, not metabolites.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	High. Samples provided by participants in the rural and urban areas of Lucknow and visiting the obstetrics department of Chhatrapati Shahuji Maharaj Medical University.
	Metric 5:	Currency	Low	Low. Dates of sample collection not reported. Publication date of 2008.
	Metric 6:	Spatial and Temporal Variability	Medium	Medium. Single semen sample provided by each of n=300 participants at a single point in time. Season, dates of sampling not reported. Non-statistical sampling approach to recruitment of volunteers.
	Metric 7:	Exposure Scenario	Medium	Medium. Potential main phthalate exposure sources (dietary) discussed briefly. Questionnaire with assessments of demographics, occupation, mode of transport, dietary habits and smoking status outcomes reported.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Medium. Phthalate concentration results across categories of fertile and infertile, rural and urban participants reported. Statistical summary measures of number of samples, mean and standard error phthalate concentrations reported. Frequency of detection reported. Location of study specified as obstetrics department of a medical university. Insufficient information regarding sampling dates and raw data.
	Metric 9:	Quality Assurance	Medium	Medium. Sample analytic methods reported as conducted according to referenced methodology (Rozati et al., 2002) with minor modifications unspecified. Use of reagent blanks and laboratory recoveries reported. Other general quality assurance parameters not reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Low. Statistical summary measure of variability in reported semen phthalate standard errors of mean concentrations. Authors briefly proposed potential sources of heterogeneity between reported results within current study and others, however a robust discussion of potential study limitations is lacking.

Overall Quality Determination   Medium

Study Citation:		Adibi, J. J., Whyatt, R. M., Williams, P. L., Calafat, A. M., Camann, D., Herrick, R., Nelson, H., Bhat, H. K., Perera, F. P., Silva, M. J., Hauser, R. (2008). Characterization of phthalate exposure among pregnant women assessed by repeat air and urine samples. Environmental Health Perspectives 116(4):467-473.		
HERO ID:		673513		

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling equipment, procedures, storage conditions and duration, calibration of sampler and study site characteristics depicted
	Metric 2:	Analytical Methodology	Low	The study analyzed sample using LC-MS. LOD calculation was provided but the numbers were not provided.
	Metric 3:	Biomarker Selection	High	Biomarker (parent chemical or metabolite) is derived from exposure to the chemical of interest.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	3 New York City neighborhoods
	Metric 5:	Currency	Low	The study did not provide a date of sampling, but publication date is available - 2008.
	Metric 6:	Spatial and Temporal Variability	High	96 personal air samples, 16 mother urine samples, 19 newborn urine samples.
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenario (population/scenario/media of interest).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Mean concentrations were reported with the standard errors.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Authors compared results to published data. Methods to analyze urine variability was provided.

Overall Quality Determination   **Medium**

| Study Citation: | Blount, B. C., Silva, M. J., Caudill, S. P., Needham, L. L., Pirkle, J. L., Sampson, E. J., Lucier, G. W., Jackson, R. J., Brock, J. W. (2000). Levels of seven urinary phthalate metabolites in a human reference population. Environmental Health Perspectives 108(10):979-982. |
| HERO ID: | 673515 |

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	High. Urine samples originally collected as part of the United States Third National Health and Nutrition Examination Survey (NHANES III) 1988-1994. Non-fasting urines collected. NHANES is a series of nationally representative cross-sectional surveys on the health and nutrition of civilian, noninstitutionalized adults and children conducted by the Centers for Disease Control and Prevention (CDC). Sampling methodology not directly discussed in terms of sampling equipment, procedures, storage conditions/duration, calibration of sampler or study site characteristics, however NHANES sampling methodology with established high level of accepted methodologies.
	Metric 2: Analytical Methodology	High	High. Analytic methodology utilized NHANES III publicly available and established methodologies. Extraction method, analytical instrumentation, limits of detection and matrix adjustment method (creatinine) reported.
	Metric 3: Biomarker Selection	Low	Low: MBP—metabolite of BBP and DBP
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	High. Location of participants providing samples not reported, however data obtained through NHANES III, with publicly available methodologies for the 1988-1994 survey cycle.
	Metric 5: Currency	Low	Low. Samples provided by NHANES participants 1988-1994.
	Metric 6: Spatial and Temporal Variability	Medium	Medium. Urine sample data obtained from random sample of participants within NHANES III with established methodologies. Random sampling noted by authors to not be a representative sample of the US population but rather representative of the demographically described groups. Single urine sample analyzed from each of 289 participants.
	Metric 7: Exposure Scenario	Medium	Medium. Potential consumer product sources of exposure briefly discussed. Insufficient information regarding occupational status of participants.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Medium. Summary statistics details of population and years of sampling, concentration range (min, max), frequency of detection, measure of central tendency (geometric mean, median), concentration percentiles reported. Insufficient information regarding raw data for each participant, tests for outliers, number of samples for each reported chemical-specific summary concentration and additional measures of variation (SD).
	Metric 9: Quality Assurance	High	High. Quality assurance and control parameters of method blanks and quality control lab samples reported. NHANES methodologies with established quality control parameters. Additional methodologies to prevent sample contamination through equipment components without PVC plastics noted.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Medium. Insufficient information regarding standard summary statistic measure of variation (SD, SE), however range of concentrations provided. Brief discussion of limited study sample size and non-representative nature of random sampling.

Overall Quality Determination   Medium

Study Citation:	Latini, G., Wittassek, M., Del Vecchio, A., Presta, G., De Felice, C., Angerer, J. (2009). Lactational exposure to phthalates in Southern Italy. Environment International 35(2):236-239.		
HERO ID:	673525		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling methodology described in terms of sampling equipment, procedures, sample storage conditions and study site characteristics for in-hospital collection of breast milk samples. Insufficient information regarding duration of sample storage prior to analysis of breast milk samples.
Metric 2:	Analytical Methodology	High	Analytical methodology described in terms of extraction, analytical instrumentation, instrument calibration, chemical-specific limits of detection, recoveries and matrix adjustment (milk fat removal). LOQ/LOD provided in written form under "2.2 Chemical analysis."
Metric 3:	Biomarker Selection	High	Sampling for breast milk phthalate metabolites specific for parent chemicals.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Breast milk samples provided by participants in Brindisi and Tricase areas of Southern Italy.
Metric 5:	Currency	Medium	Participant samples described as collected during March and September 2006.
Metric 6:	Spatial and Temporal Variability	Medium	Single breast milk samples described as collected from random selection of 62 healthy mothers. Sampling conducted during one month of Spring and Fall seasons in 2006.
Metric 7:	Exposure Scenario	Medium	Participant characteristics of age reported. Potential phthalate sources discussed generally in introduction
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Median, 95% confidence interval, maximum, and 95th percentile summary measures of phthalate concentrations reported along with number of samples and a description of data sampling location (hospital) and sampling month/year. Insufficient information regarding raw data.
Metric 9:	Quality Assurance	High	Quality assurance parameters and quality control procedures reported. Internal laboratory quality control samples conducted for each analytic series. Laboratory recoveries reported. Procedures for sample collection noted avoiding use of latex gloves and/or breast pumps with participant assistance in hospital by a nurse, cleaning of breast prior to sampling and noted avoidance of use of cleansers or ointments. Sample collection noted use of glass and polypropylene devices with authentic rubber seals and stoppers.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Statistical summary measures of variability reported. Authors noted comparability of findings with previous studies, and discussed the lack of elimination of potential esterase activity in the milk resulting in potential contamination by phthalate diesters and subsequent hydrolysis to the monoesters during collection. However, this enzyme activity was assumed to be minimal due to -25°C storage and immediate treatment with phosphoric acid to eliminate all hydrolase activity.

Overall Quality Determination   High

Study Citation:	Sathyanarayana, S., Calafat, A. M., Liu, F., Swan, S. H. (2008). Maternal and infant urinary phthalate metabolite concentrations: Are they related?. Environmental Research 108(3):413-418.		
HERO ID:	673527		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Medium. Sampling methodology described in terms of sampling equipment for infant samples, procedures, study site (clinic), and sample storage conditions. Insufficient information regarding duration of maternal and infant urine sample storage prior to analysis.
	Metric 2: Analytical Methodology	Medium	Medium. Analytical methodology described in terms of extraction analytical instrumentation, instrument calibration, chemical-specific limits of detection and creatinine-adjustment. Insufficient information regarding sample recoveries. LODs provided as a range for all metabolites.
	Metric 3: Biomarker Selection	High	High. Sampling for metabolites specific to parent chemicals of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	High. Urine samples provided by participants from California, Missouri, Iowa, and Minnesota.
	Metric 5: Currency	Low	Low. Dates of urine specimen collection from SFFII study not specified. Publication date 2008.
	Metric 6: Spatial and Temporal Variability	Medium	Medium. Urine specimens provided by n=210 maternal-infant pairs. Participants resided in four different states. Single spot urine specimens provided by both mothers and infants. Insufficient information regarding timing of sample (first morning) for mothers. Non-statistical sampling approach with participants from original SFFI study that were eligible to participate within SFFII. No replicates
	Metric 7: Exposure Scenario	High	Medium. Demographic characteristics of mothers and infants provided in Table 1. Potential sources of exposure discussed in introduction and discussion.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Medium. Statistical summary measures of number of samples and geometric mean phthalate concentrations along with location (state) of sampling and frequency of detection presented for mothers and infants. Results presented as creatinine adjusted and unadjusted concentrations. Insufficient information regarding dates of sampling, range of concentrations or percentiles, measure of variation, tests for outliers within regression analyses and raw data.
	Metric 9: Quality Assurance	Medium	Medium. Quality assurance discussed in terms of sampling equipment prescreening for monoester phthalate metabolites, laboratory quality control and reagent blank samples. Insufficient information regarding recoveries.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Low. Statistical variability measures for reported concentrations (standard deviations) lacking. Some study limitations regarding creatinine, lack of home environmental or dietary phthalate measures discussed.

Overall Quality Determination   Medium

Study Citation:	Silva, M. J., Reidy, J. A., Herbert, A. R., Preau, J. L., Jr, Needham, L. L., Calafat, A. M. (2004). Detection of phthalate metabolites in human amniotic fluid. Bulletin of Environmental Contamination and Toxicology 72(6):1226-1231.		
HERO ID:	673529		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Low. Sampling methodology only briefly discussed for amniotic fluid samples reported as taken during routine amniocentesis and utilizing only residual specimens for analysis. Insufficient information regarding sampling equipment, sample storage conditions and duration.
	Metric 2: Analytical Methodology	Medium	Medium. Analytic methodology described in terms of extraction, analytical instrumentation, calibration, chemical-specific limit of detection (LOD). Insufficient information regarding recoveries.
	Metric 3: Biomarker Selection	Low	Low. Measured metabolites not specific for parent chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	Critically Deficient	Unacceptable. Geographic location of participants providing samples not reported, discussed, or referenced.
	Metric 5: Currency	Low	Low. Dates of sample collection not reported. Publication date 2004.
	Metric 6: Spatial and Temporal Variability	Low	Low. A total of 54 anonymous donors provided amniotic fluid samples for the current study. Insufficient information regarding location and dates of sample collection.
	Metric 7: Exposure Scenario	Low	Low. Participant demographic information unavailable to researchers and not reported. Potential sources of exposure discussed
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Medium. Statistical summary measures of number of samples, minimum and maximum concentrations, median and percentiles (10th, 25th, 75th, 90th and 95th). Insufficient information regarding description of data in terms of location, dates of sampling and raw data.
	Metric 9: Quality Assurance	Medium	Medium. Quality control details of quality control materials prepared from spiked human urine, reagent blanks and standards reported. Insufficient information regarding recoveries and authors noted potential for DEHP contamination of samples during collection and storage followed by production of mEHP metabolites by lipase enzyme activity in the amniotic fluid or by hydrolysis during sample work-up.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Low. Statistical summary measures of variability reported. Uncertainty with regards to potential DEHP contamination of collection and storage materials. Discussion of limitations limited to acknowledgement of potential for DEHP contamination.

Overall Quality Determination   **Uninformative**

Study Citation:	Ye, X., Pierik, F. H., Hauser, R., Duty, S., Angerer, J., Park, M. M., Burdorf, A., Hofman, A., Jaddoe, V. W., Mackenbach, J. P., Steegers, E. A., Tiemeier, H., Longnecker, M. P. (2008). Urinary metabolite concentrations of organophosphorous pesticides, bisphenol A, and phthalates among pregnant women in Rotterdam, the Netherlands: The Generation R study. Environmental Research 108(2):260-267.		
HERO ID:	673535		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sample collection followed the methodology from the Generation R cohort study
	Metric 2: Analytical Methodology	High	The analytical method is described and the LOD reported.
	Metric 3: Biomarker Selection	High	Urine MnBP
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Netherlands
	Metric 5: Currency	Low	2004
	Metric 6: Spatial and Temporal Variability	Medium	No sample replicates. Urinary phthalate metabolites of 100 women
	Metric 7: Exposure Scenario	High	Exposure to phthalate metabolites in pregnant women from Netherlands
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	No individual data points reported. Table 3 reports creatinine adjusted metabolites: GM, GSD, Min, Max and percentiles
	Metric 9: Quality Assurance	High	QA/QC included the analysis of control samples and interlaboratory calibrations
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Key limitations reported. Variability of population reported in table 3

Overall Quality Determination   High

Study Citation:	Adibi, J. J., Perera, F. P., Jedrychowski, W., Camann, D. E., Barr, D., Jacek, R., Whyatt, R. M. (2003). Prenatal exposures to phthalates among women in New York City and Krakow, Poland. Environmental Health Perspectives 111(14):1719-1722.		
HERO ID:	674904		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Study provided sampling methodology, procedure, sample storage, and matric characters.
Metric 2:	Analytical Methodology	Low	LOD was mentioned to be calculated but not reported.
Metric 3:	Biomarker Selection	High	Biomarker (parent chemical or metabolite) is derived from exposure to the chemical of interest.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	New York City
Metric 5:	Currency	Low	Sampling date is provided (March-July 2000).
Metric 6:	Spatial and Temporal Variability	Medium	Personal air samples (n=30) and urinary concentrations (n=25). No replicate sampling or analysis
Metric 7:	Exposure Scenario	High	The data likely represent the relevant exposure scenario (population/scenario/media of interest). Source of exposure was not provided.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Mean concentrations were provided with standard deviation, but individual data points were not provided.
Metric 9:	Quality Assurance	Medium	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Key uncertainties, limitations, and data gaps have been identified.

Overall Quality Determination   Medium

Study Citation:	Bornehag, C. G., Lundgren, B., Weschler, C. J., Sigsgaard, T., Hagerhed-Engman, L., Sundell, J. (2005). Phthalates in indoor dust and their association with building characteristics. Environmental Health Perspectives 113(10):1399-1404.		
HERO ID:	674952		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	High. Key criteria met, sample storage duration noted as 2-3 days.
Metric 2:	Analytical Methodology	Medium	Medium. Most key criteria described, detection limits reported but not for each chemical, analytic methods referenced.
Metric 3:	Biomarker Selection	N/A	N/A. Sampling for parent chemical in environmental media (dust).
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	High. Samples provided by participants in Varmland, Sweden.
Metric 5:	Currency	Low	Low. Sample collection dates noted as October, 2001 through April, 2002.
Metric 6:	Spatial and Temporal Variability	Medium	Medium. Single dust concentration sampling results from 346 homes with dust sampled from molding and shelves of participating child's bedroom, with sampling conducted within single season of 2001-2002. Non-statistical sampling methods. Unclear if there are replicates.
Metric 7:	Exposure Scenario	Medium	Low. Dust concentrations measured within participating child's bedroom with samples obtained from molding and shelves of bedroom with additional microenvironment data not provided.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Medium. Most key criteria met; lack of raw data.
Metric 9:	Quality Assurance	Low	Medium. QA not directly stated. Some key criteria met; lack of baseline pre-exposure sampling, DBH study methods referenced.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Medium. Variability characterized within summary statistics (95% confidence interval), variation in surface and wall material, potential study limitations and biases discussed.

Overall Quality Determination   Medium

Study Citation:	Cousins, A. P., Remberger, M., Kaj, L., Ekheden, Y., Dusan, B., Brorstroem-Lunden, E. (2007). Results from the Swedish National Screening Programme 2006. Subreport 1: Phthalates. GRA and I(GRA and I):39.		
HERO ID:	675060		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Samples of air (no other media) collected both from background and phthalate source areas; quantity of air collected per sample not specified (flow rate 1 m3/hr, duration NS).
Metric 2:	Analytical Methodology	Low	Data on target ion and qualifier ion in MS not provided.
Metric 3:	Biomarker Selection	N/A	DBP metabolite not analyzed. Only analyzed for MEHP.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Sweden.
Metric 5:	Currency	Medium	2006.
Metric 6:	Spatial and Temporal Variability	Low	Twelve air sample locations: 3 background, 3 urban, 3 near Gislaved point source, and 3 near Stenungsund point source.
Metric 7:	Exposure Scenario	High	Relevant to human inhalation exposure.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Concentrations reported graphically or by range and detection frequency depending on the medium.
Metric 9:	Quality Assurance	Low	Precautions taken against contamination of equipment; no other discussion of quality assurance; chromatogram spread with mixture of isomers introduced noise.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty not discussed; reader make some inferences from bar graphs.

Overall Quality Determination   Medium

Study Citation:	Huang, P. C., Tien, C. J., Sun, Y. M., Hsieh, C. Y., Lee, C. C. (2008). Occurrence of phthalates in sediment and biota: Relationship to aquatic factors and the biota-sediment accumulation factor. Chemosphere 73(4):539-544.		
HERO ID:	675207		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	For each of 17 rivers, collected sediments from 3 or 4 locations at midstream or downstream of existing water quality monitoring network stations; fish either caught or bought from local fisherman; small fish of same species pooled together. Location (i.e., named river) of individual fish sampled not reported.
	Metric 2: Analytical Methodology	High	Sediment samples analyzed per US EPA SW-846 Method 8270, modified. GC/MS. Same technique apparently used to analyze fish muscle tissues. LODs reported.
	Metric 3: Biomarker Selection	N/A	N/A is more appropriate. While authors did normalize fish muscle concentration to lipids and sediment concentrations to total organic carbon content, they did not measure any metabolites per se.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Taiwan rivers.
	Metric 5: Currency	Medium	2004 and 2005: dry (March-April) and wet (August-October) seasons.
	Metric 6: Spatial and Temporal Variability	Medium	For sediments, 17 different river samples. For fish, five species sampled: 12 individual O. miloticus and 7 individual L. subviridis (smaller numbers of three other species) total across all 17 rivers. No replicates.
	Metric 7: Exposure Scenario	High	Parent chemical concentration in fish muscle evaluated by species; feeding habits of species discussed.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Mean and range of chemical concentrations in sediment samples for each river and season reported in Supplemental materials. Mean and range reported for fish samples by species from all collection locations combined. No raw data.
	Metric 9: Quality Assurance	High	Two calibration curves; recovery and precision evaluated; sample concentrations corrected for recovery; duplicate analysis; spiked samples.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Inter- and intra-day variation of spiked phthalates in sediment and fish samples evaluated (<12%). Compared concentrations with wither quality parameters, chemical parameters, and fish species. Some characterization of variance with range and discussion of uncertainties/data gaps/limitations

Overall Quality Determination   High

Study Citation:	Itoh, H., Yoshida, K., Masunaga, S. (2007). Quantitative identification of unknown exposure pathways of phthalates based on measuring their metabolites in human urine. Environmental Science & Technology 41(13):4542-4547.		
HERO ID:	675229		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling methodology reported in terms of sampling equipment, procedures, sample storage and study site (city, country). Insufficient information regarding duration of sample storage prior to analysis of urinary phthalates.
	Metric 2: Analytical Methodology	High	Analytical methodology described in terms of extraction, analytical instrumentation, calibration, chemical-specific limits of detection (LOD, supplemental material), recoveries, and creatinine-adjustment of urine specimens. Methodology referenced (Itoh et al., Silva et al.)
	Metric 3: Biomarker Selection	High	Sampling for metabolites specific to parent chemicals.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Urine spot samples provided by participants described as mostly from the Tokyo-Yokohama area of Japan.
	Metric 5: Currency	Low	Samples collected May-June 2004.
	Metric 6: Spatial and Temporal Variability	Medium	Authors described participants as mostly from the Tokyo-Yokohama area of Japan. Sampling conducted only May-June 2004. Single spot urine specimen provided by each participant. A total of 36 participants provided samples.
	Metric 7: Exposure Scenario	Medium	Participant demographic characteristics gathered from questionnaire summarized. Potential sources of exposure discussed, although authors acknowledged further study is necessary to determine unknown exposure pathways.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Data described in terms of location and dates of sampling, median concentration, geometric standard deviation, number of samples, frequency of detection (supplementary material). Insufficient information regarding raw data for each participant.
	Metric 9: Quality Assurance	Medium	Quality assurance details of utilizing one method blank in each analytical batch, recoveries, creatinine adjustment and reproducibility reported.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Statistical summary measures of variation reported. Background contamination of samples considered within laboratory blank analyses. Limitations briefly discussed.

Overall Quality Determination   Medium

Dibutyl Phthalate | Monitoring | HERO ID: 675256

Study Citation:	Koo, H. J., Lee, B. M. (2005). Human monitoring of phthalates and risk assessment. Journal of Toxicology and Environmental Health, Part A: Current Issues 68(16):1379-1392.		
HERO ID:	675256		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Medium. Most sampling methodology key criteria met. Insufficient information regarding duration of urine sample storage.
	Metric 2: Analytical Methodology	High	High. Analytical methodology key criteria met and LOD's reported
	Metric 3: Biomarker Selection	N/A	N/A. Sampling for parent chemical of interest
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	High. Korea
	Metric 5: Currency	Low	Low. Sampling May 2003
	Metric 6: Spatial and Temporal Variability	Medium	Medium. N=300 subjects, single urine specimens. Non-statistical sampling approach.
	Metric 7: Exposure Scenario	Medium	Medium. Demographic characteristics reported. Occupational info lacking.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Medium. Main summary statistics reported. Raw data lacking
	Metric 9: Quality Assurance	Medium	Medium. Some key QA parameters reported, recoveries high
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Low. Only mean, 95 %iles reported, no limitation discussion

Overall Quality Determination   Medium

Study Citation:	Tan, B. L., Hawker, D. W., Muller, J. F., Leusch, F. D., Tremblay, L. A., Chapman, H. F. (2007). Modelling of the fate of selected endocrine disruptors in a municipal wastewater treatment plant in South East Queensland, Australia. Chemosphere 69(4):644-654.		
HERO ID:	675442		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Critically Deficient	sampling methodology for the primary data from Table 3 not discussed specifically
Metric 2:	Analytical Methodology	Critically Deficient	analytical methods for the primary data from Table 3 not discussed specifically
Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	South East Queensland, Australia
Metric 5:	Currency	Low	sampling data not provided; paper published originally in 2006
Metric 6:	Spatial and Temporal Variability	Critically Deficient	sample size not reported
Metric 7:	Exposure Scenario	High	concentration in effluent and point of discharge from a conventional activated sludge municipal wastewater treatment plant in Australia; influent from both domestic and industrial discharges; effluent discharged into the Brisbane River
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	Table 3 provides the measured effluent, point of discharge and 1km downstream concentrations
Metric 9:	Quality Assurance	Low	QA/QC not discussed
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed

Overall Quality Determination   Uninformative

Study Citation:	Xie, Z., Ebinghaus, R., Temme, C., Lohmann, R., Caba, A., Ruck, W. (2007). Occurrence and air-sea exchange of phthalates in the Arctic. Environmental Science & Technology 41(13):4555-4560.		
HERO ID:	675521		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Described air and water samplers which seems appropriate but is not discussed in detail. Missing equipment calibration and storage information.
	Metric 2: Analytical Methodology	Medium	Provide detection limits; used gas chromatography and mass spectrometry (GC-MS). Analytical methods described in another study.
	Metric 3: Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	North Sea to the high Arctic (60° N-85°N); includes map
	Metric 5: Currency	Low	2004
	Metric 6: Spatial and Temporal Variability	Medium	16 water samples and 6 air samples.
	Metric 7: Exposure Scenario	High	Phthalates are known to degrade in water and have long-range atmospheric transport potential so they measured air and seawater samples.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	Provided concentration mean, median, minimum, and maximum. Individual raw data points in S1.
	Metric 9: Quality Assurance	High	"The analytical quality of the data was guaranteed through the use of field blanks to derive method detection limits (MDLs), breakthrough testing of air sampling, and the recoveries of surrogates." Recoveries were > 70%
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Briefly mention uncertainty limit, uncertainty calculated. Provided minimums and maximums so can understand the range of data.

Overall Quality Determination   Medium

Study Citation:	Sathyanarayana, S., Karr, C. J., Lozano, P., Brown, E., Calafat, A. M., Liu, F., Swan, S. H. (2008). Baby care products: possible sources of infant phthalate exposure. Pediatrics 121(2):e260-268.		
HERO ID:	676348		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Most key criteria met, insufficient urine sample storage information.
	Metric 2: Analytical Methodology	Medium	Key criteria met. LOD's reported as range.
	Metric 3: Biomarker Selection	Low	Metabolites not specific for parent chemical.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Urine samples provided by children in MO, MN and CA.
	Metric 5: Currency	Low	1999-2002.
	Metric 6: Spatial and Temporal Variability	Medium	Urine samples from children in three states, single spot samples, 163 children.
	Metric 7: Exposure Scenario	Medium	Participant demographics reported.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Most key criteria reported, lacking raw data.
	Metric 9: Quality Assurance	Medium	QA parameters briefly discussed, no issues reported.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability characterized, limitations discussed.

Overall Quality Determination   Medium

Study Citation:	Aguayo, S., Munoz, M. J., de La, T. A., Roset, J., de La, P. E., Carballo, M. (2004). Identification of organic compounds and ecotoxicological assessment of sewage treatment plants (STP) effluents. Science of the Total Environment 328(1-3):69-81.		
HERO ID:	679135		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Samples of effluent, simple description.
	Metric 2: Analytical Methodology	High	Solid phase extraction; GC/MS.
	Metric 3: Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Spain, Madrid
	Metric 5: Currency	Low	June, July 2000
	Metric 6: Spatial and Temporal Variability	Medium	N = 7 sewage treatment plants (STPs): one 24-hour composite samples (twelve 2-L samples taken every 2 hours); also one 10-L grab sample at two facilities.
	Metric 7: Exposure Scenario	Low	Effluent not an exposure medium (diluted by receiving water).
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Reported # (%) of facilities (out of 7) for which chemical was detected in effluent and approximate DL.
	Metric 9: Quality Assurance	Low	Not described, but "detection" was the only endpoint.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Limited to proportion of 7 facilities for which chemical was detected in effluent.

Overall Quality Determination   Low

Study Citation:	Bauer, M. J., Herrmann, R. (1997). Estimation of the environmental contamination by phthalic acid esters leaching from household wastes. Science of the Total Environment 208(1-2):49-57.		
HERO ID:	679229		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	sample composition described; leachate collection schedule and process described. Missing a few components such as duration of sample storage
	Metric 2: Analytical Methodology	Low	equipment, extraction, and methods described; no LOD
	Metric 3: Biomarker Selection	N/A	Sampled parent chemicals in domestic waste
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Germany
	Metric 5: Currency	Low	published 1997 and no sample collection date
	Metric 6: Spatial and Temporal Variability	Medium	n = 6 or n = 9; 11 different types of waste; no replicates
	Metric 7: Exposure Scenario	Medium	domestic household waste
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	mean, min and max reported. no raw data
	Metric 9: Quality Assurance	Low	quality not discussed
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	variability and uncertainty not discussed

Overall Quality Determination   Low

Study Citation:	Fernandez, M. P., Ikonomou, M. G., Buchanan, I. (2007). An assessment of estrogenic organic contaminants in Canadian wastewaters. Science of the Total Environment 373(1):250-269.		
HERO ID:	679499		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	influent/effluent samples from 4 municipal WWTPs and effluent from a pulp mill (Table 1); grab samples taken in morning in glass bottles at sampling points indicated in Table 2; immediate sample processing
Metric 2:	Analytical Methodology	High	extracted with dichloromethane; GC-HRMS; recovery samples; MDLs average and range provided in Appendix B
Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Study conducted in Western Canada.
Metric 5:	Currency	Medium	Samples collected in 2002-2005 (refer to Table 2 for sampling time frame by site)
Metric 6:	Spatial and Temporal Variability	Medium	Site A = 6 samples; Site B= influent (8) effluent (24); Site C = influent (1) and effluent (1); Site D = influent (1) and effluent (1); Site E = influent (1) and effluent (3)
Metric 7:	Exposure Scenario	High	Influent/effluent samples from 4 municipal WWTPs and effluent from a pulp mill; Table 1 and 2 provide characteristics of each site
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	Appendix A provides raw data.
Metric 9:	Quality Assurance	High	Procedural blanks, spikes, and duplicates were run with each batch of 10 samples; recovery corrected; generally >70%
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Compared findings to previous studies.

Overall Quality Determination   High

Study Citation:	Fromme, H., Bolte, G., Koch, H. M., Angerer, J., Boehmer, S., Drexler, H., Mayer, R., Liebl, B. (2007). Occurrence and daily variation of phthalate metabolites in the urine of an adult population. International Journal of Hygiene and Environmental Health 210(1):21-33.		
HERO ID:	679517		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Medium. Most key criteria met. Lack of sample duration data.
	Metric 2: Analytical Methodology	Medium	Medium. Most key criteria met. Lack of sample recovery data.
	Metric 3: Biomarker Selection	Low	High. Metabolites not specific for parent chemicals
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	High. Munich, Germany.
	Metric 5: Currency	Medium	Medium. 2005
	Metric 6: Spatial and Temporal Variability	Medium	Medium. Replicate morning urine samples from 27 female and 23 male subjects in Munich, Germany on 8 consecutive days, for a total of 399 samples.
	Metric 7: Exposure Scenario	Medium	Medium. Demographics of participants reported, participants described as not occupationally exposed to phthalates.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Medium. Most key criteria met. Lack of raw data.
	Metric 9: Quality Assurance	Low	Low. Q/A not discussed.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Medium. Characterization of within-subject variability, study limitations not directly discussed.

Overall Quality Determination Medium

Dibutyl Phthalate

Study Citation:	Fromme, H., Kuchler, T., Otto, T., Pilz, K., Muller, J., Wenzel, A. (2002). Occurrence of phthalates and bisphenol A and F in the environment. Water Research 36(6):1429-1438.		
HERO ID:	679518		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	surface water collected from various rivers, lake and channels (fig 1) in Germany at 0.2-0.5m from mainstream flow and placed in bottle w sodium azide in the dark at 4C; single sewage treatment plants samples from final effluent; 24 hr composite samples from 5 STP; 31 sludge samples after centrifugation of sludge at STP; sediment collected manually w grab sample from 35 waterways; 10 liquid manure from central tanks of 9 agricultural factories; waste dump and compost water from collecting tanks of 4 dump sites
Metric 2:	Analytical Methodology	High	analytical method discussed in Section 2.2 (p. 1430-1431); detection limit, retention time and ions used in quantification presented in Table 1; mean recoveries given in Table 2
Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Germany (North Rhine–Westphalia, Rheinland–Pfalz, Brandenburg and Berlin)
Metric 5:	Currency	Low	1997
Metric 6:	Spatial and Temporal Variability	High	116 surface water samples, 35 sediments, 39 sewage effluent, and 38 sewage sludges; 10 liquid manure,2 waste-dump, and 2 compost-runoff water; replicate samples (Table 2)
Metric 7:	Exposure Scenario	High	concentrations in surface water, sediment, sewage treatment plant effluents, sewage sludge, dump water and liquid manure from Germany
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	single measurements of DEHP and DBP depicted in Fig 3 (hard to read exact values); mean and range provided in Section 3.2 (p. 1434)
Metric 9:	Quality Assurance	High	Table 2 provides mean recovery. Additional section on QA
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	compares results to previous studies; discusses large variations in results, especially surface water

Overall Quality Determination   High

Study Citation:	Björklund, K., Cousins, A. P., Strömvall, A. M., Malmqvist, P. A. (2009). Phthalates and nonylphenols in urban runoff: Occurrence, distribution and area emission factors. Science of the Total Environment 407(16):4665-4672.		
HERO ID:	679890		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Stormwater sampling in two urban residential areas and one catchment area dominated by a highway (Table 1) using automatic water samplers; sediment collected in sedimentation facility; 13 storm events sampled; stormwater sampled if the antecedent dry period exceeded 24 h; 3 sediment subsamples collected from chambers 1, 3, 5, and 7 with metal core sampler, once emptied of water; sediment age was 32 months; collected in glass bottle and stored in coolers to analyze same day as sampling or end of storm event.
	Metric 2:	Analytical Methodology	Medium	Unfiltered water samples extracted by liquid-liquid extraction and shaken sediment samples; GC/MS; detection limit (d.l.) for each phthalate was 0.10 μg/L, except for DEHP, which was 1.0 μg/L; recovery samples not mentioned.
	Metric 3:	Biomarker Selection	N/A	Not applicable.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Stockholm, Nybohov, Skarpnäck, and Gotegorg - all in Sweden.
	Metric 5:	Currency	Medium	June and October 2006.
	Metric 6:	Spatial and Temporal Variability	Medium	13 storm events samples in 3 catchments during June and October; sampled pooled together to represent event mean concentration from given storm event; sediment collected from 4 chambers, three subsamples each.
	Metric 7:	Exposure Scenario	Medium	Stormwater from two residential areas and a high-density traffic area, and sediment from a facility treating road runoff.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Fig 1A depicts log concentration in water samples; detection frequency and stats reported in Section 3.1.1; Fig 2 shows log sediment concentration; raw data for both sediment and stormwater provided in SI.
	Metric 9:	Quality Assurance	Low	QA/QC not directly discussed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Small series of sampled storms did not allow testing for any significant difference between the three catchment areas; briefly discuss results compared to previous studies; discussed varying concentrations by molecular weight.

Overall Quality Determination   Medium

Study Citation:	Lin, Z. P., Ikonomou, M. G., Jing, H., Mackintosh, C., Gobas, F. A. (2003). Determination of phthalate ester congeners and mixtures by LC/ESI-MS in sediments and biota of an urbanized marine inlet. Environmental Science & Technology 37(10):2100-2108.		
HERO ID:	680053		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Surficial sediments; handling described; fish seine netted and frozen, muscle dissected and homogenized; sample extraction described.
	Metric 2:	Analytical Methodology	High	Reversed-phase liquid chromatography/electrospray ionization mass spectrometry (LC/ESI-MS), described in detail, formed molecular adduct ions with sodium; compared with GC/MS.
	Metric 3:	Biomarker Selection	High	Parent chemical concentrations in striped seaperch muscle.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Vancouver Canada; False Creek.
	Metric 5:	Currency	Low	Before 2003.
	Metric 6:	Spatial and Temporal Variability	Low	Four independent sediment samples from each of 4 different locations; 3 striped bass from each of 3 sampling stations.
	Metric 7:	Exposure Scenario	High	Fish muscle concentrations - relevant to human and ecological exposure assessments.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Bar graphs of mean and 1 standard deviation by chemical and by sampling location.
	Metric 9:	Quality Assurance	High	Doubly distilled solvents; lab standards, 5-point calibration, criteria for quantitation; 2 procedural blanks per 4 real samples and 1 PE spiked sample; % recovery and precision reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Extensive analysis of variation and uncertainty in analytic methods; moderate consideration of environmental variation and uncertainty.

Overall Quality Determination   High

Study Citation:	Ogunfowokan, A. O., Torto, N., Adenuga, A. A., Okoh, E. K. (2006). Survey of levels of phthalate ester plasticizers in a sewage lagoon effluent and a receiving stream. Environmental Monitoring and Assessment 118(1-3):457-480.		
HERO ID:	680101		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Missing some sampling parameters such as detailed sampling procedure and storage duration
	Metric 2: Analytical Methodology	High	All key analytical methods reported
	Metric 3: Biomarker Selection	N/A	Measured parent chemicals sewage effluent and receiving stream
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Ife, Nigeria
	Metric 5: Currency	Low	Data collected in 2002-2003
	Metric 6: Spatial and Temporal Variability	Medium	<10 samples. Replicates might have been collected based on reported concentrations averaged for 3 samples presented in Tables 2-9
	Metric 7: Exposure Scenario	High	Exposure source characterized
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not provided in the manuscript
	Metric 9: Quality Assurance	Medium	QA metrics reported. Recoveries low for some chemicals but not ones of interest.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Few gaps and limitations reported

Overall Quality Determination   Medium

Study Citation: Parkman, H., Remberg, M. (1995). Phthalates in Swedish sediments. GRA and I(GRA and I):27.
HERO ID: 680108

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling methods, locations, and maps included.
Metric 2:	Analytical Methodology	Low	Extraction and instrumentation described; LOD approach described but LOD not provided.
Metric 3:	Biomarker Selection	N/A	Sediment.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Sweden.
Metric 5:	Currency	Low	1994.
Metric 6:	Spatial and Temporal Variability	Medium	6 samples per site for 23 sites. Unclear if there were replicates.
Metric 7:	Exposure Scenario	Low	Sediment samples.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Average and SD, no individual points.
Metric 9:	Quality Assurance	Medium	QA not directly discussed- Clean-up of phthalates prior to analysis reported.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty not discussed, no obvious concerns.

Overall Quality Determination   Medium

Study Citation:	Tsumura, Y., Ishimitsu, S., Saito, I., Sakai, H., Kobayashi, Y., Tonogai, Y. (2001). Eleven phthalate esters and di(2-ethylhexyl) adipate in one-week duplicate diet samples obtained from hospitals and their estimated daily intake. Food Additives and Contaminants 18(5):449-460.		
HERO ID:	680169		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Food samples were obtained in store or frozen from hospitals. All important details, such as storage conditions and homogenization equipment, were reported with sufficient detail and were scientifically sound.
Metric 2:	Analytical Methodology	High	Phthalates in homogenized food samples were determined using GC/MS, and all important details of instrumentation and methodology were reported, including detection limits.
Metric 3:	Biomarker Selection	N/A	This study was testing for the parent chemical of interest in environmental media (food).
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	This study analyzed samples of foodstuffs available in Osaka, Japan, and duplicate diet samples from hospitals in Osaka, Aichi, and Niigata, Japan.
Metric 5:	Currency	Low	Duplicate diet samples were collected in October or December 1999; date of collection of foodstuffs samples was not specified, but can be inferred to have similar timing. The study was published in 2001.
Metric 6:	Spatial and Temporal Variability	Medium	Four types of foodstuff samples and one-week duplicate diet samples were analyzed in this study. Use of replicates was not reported.
Metric 7:	Exposure Scenario	High	The foodstuffs and duplicate diets were obtained the same way a consumer would obtain them and represent highly relevant scenarios of exposure.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data are not reported; each datum is the average of three trials.
Metric 9:	Quality Assurance	High	QA/QC methods included performing each analysis in triplicate, use of blanks, and determination of recoveries. All recoveries were within acceptable ranges.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Quantitative characterization of variability is absent. Qualitative characterization of variability by food source is discussed. The only limitation/source of uncertainty discussed is the inherent difference between hospital meals and food in the general population as a representation of phthalate sources.

Overall Quality Determination   High

Study Citation: Wienecke, J., Kruse, H., Huckfeldt, U., Eickhoff, W., Wassermann, O. (1995). Organic compounds in the flue gas of a hazardous waste incinerator. Chemosphere 30(5):907-913.

HERO ID: 680206

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	sampled taken in September from stack of second combustion line under isokinetic conditions; extracted by a titanium probe nozzle,followed by a titanium bend; further details provided in Materials and Methods section (first paragraph)
Metric 2:	Analytical Methodology	Low	separated by capillary gas chromatography, characterized andquantified by mass spectroscopy; detection or reporting limit not provided
Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in the flue gas of an incinerator
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Biebesheim, Germany
Metric 5:	Currency	Low	September 1992
Metric 6:	Spatial and Temporal Variability	Low	sampled in September; 2 samples; no replicates
Metric 7:	Exposure Scenario	Medium	Study measured organic compounds in the flue gas of a hazardous waste incinerator. The data can represent a relevant exposure scenario, but chemical levels in flue gas can disperse in the atmosphere; these concentrations may be an overestimate.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Table 5 provides concentration per sample; no other stats provided
Metric 9:	Quality Assurance	High	discusses standard of recovery; blanks used
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	compared to other studies; little characterization of variance and some discussion of uncertainty

Overall Quality Determination   Medium

Study Citation:	Desideri, P., Lepri, L., Checchini, L. (1991). Organic compounds in sea water and pack ice in Terra Nova Bay (Antarctica). Annali di Chimica 81(7-8):395-416.		
HERO ID:	680261		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	sampling method seems appropriate but could be described in more detail; discuss depth sampled, coring, and filtration methods
	Metric 2:	Analytical Methodology	Low	describe high resolution gas chromatography/GC-MS and analysis; compare concentrations to detection limits but don't specify what the detection limits are
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Terra Nova Bay (Antarctica)
	Metric 5:	Currency	Low	1988/1989
	Metric 6:	Spatial and Temporal Variability	Medium	10 samples. No replicates.
	Metric 7:	Exposure Scenario	Medium	phthalates are present world-wide and considered a universal pollutant in the environment
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	individual concentration raw data provided however no summary stats
	Metric 9:	Quality Assurance	Low	quality assurance/quality control methods not directly discussed however they do provide recovery percentages (but half <70%)
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	only provide standard deviations for the recovery percentages; no discussion of variability or limitations. Variability in different types of water types.

Overall Quality Determination   Medium

Study Citation:	Fromme, H., Gruber, L., Schlummer, M., Wolz, G., Bohmer, S., Angerer, J., Mayer, R., Liebl, B., Bolte, G. (2007). Intake of phthalates and di(2-ethylhexyl)adipate: Results of the Integrated Exposure Assessment Survey based on duplicate diet samples and biomonitoring data. Environment International 33(8):1012-1020.		
HERO ID:	680285		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Study recruited 50 persons among employees of INES and relatives near Munich (possibly biased sample). Required consumption of "normal" diet. Participants trained to collect a duplicate diet daily (7 days) for chemical analyses.
Metric 2:	Analytical Methodology	Medium	PLE and GC/MS, LC/MS/MS, and LC-MS in SRM mode. Confidence might be higher or lower depending on analytic methods paper submitted for publication by Gruber et al. in 2007.
Metric 3:	Biomarker Selection	N/A	HERO 198184 reports urinalysis (biomarkers of exposure) for same population.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Germany.
Metric 5:	Currency	Medium	2005.
Metric 6:	Spatial and Temporal Variability	High	50 German adults (27 female 23 male) from city, suburban, and rural areas in or near Munich; participants collected daily duplicate diets over 7 consecutive days for a total of 50 x 7 = 350 diet samples.
Metric 7:	Exposure Scenario	High	Phthalates in diet and amount consumed.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	Concentrations in food not reported. Individual DBP intake estimated as median of 7 daily results; Table 2 lists min, max, median, and 95th percentile of the 50 individual median intakes.
Metric 9:	Quality Assurance	Medium	Replicate samples of homogenized food for one day, triplicate aliquots, LODs reported. QA not discussed in current report.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Relative contribution of measurements to uncertainty and variation in calculated DBP intakes not discussed.

Overall Quality Determination   Medium

Study Citation:	Law, R. J., Fileman, T. W., Matthiessen, P. (1991). Phthalate esters and other industrial organic chemicals in the North and Irish Seas. Water Science and Technology: Water Supply 24(10):127-134.		
HERO ID:	680327		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	surface water sampled in vicinities of tees Bay, Plymouth Sound and Liverpool Bay (fig 1); unfiltered; sampling details previously reported in Hurford 1989; no details provided in this document
	Metric 2: Analytical Methodology	Low	extracted with dichloromethane; GC/MS in multiple ion detection mode; extracts dried and stored at -20C; analytical technique reported previously in Hurford 1989; no detection limits provided
	Metric 3: Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Humber, Mersey, Tamar, Tees and Tyne estuaries, England
	Metric 5: Currency	Low	1988 and 1989
	Metric 6: Spatial and Temporal Variability	Medium	samples 1 to 29 collected 20 May to 6 June 1988; samples 30-38 collected between 15 Nov and 3 Dec 1989; about 9 sites. No replicates.
	Metric 7: Exposure Scenario	Medium	concentration in surface waters near the Humber, Mersey, Tamar, Tees, and Tyne estuaries near the North Sea; description of estuaries and setting not provided
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Table 1 provides the concentration in subsurface water by sampling number; no other data/stats provided
	Metric 9: Quality Assurance	Low	QA/QC not directly discussed
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	briefly compared findings to those reported previously. No discussion of variation or limitations.

Overall Quality Determination   Low

Study Citation:	Peterson, J. C., Freeman, D. H. (1984). Variations of phthalate ester concentrations in sediments from the Chester River, Maryland. International Journal of Environmental Analytical Chemistry 18(4):237-252.		
HERO ID:	680376		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sediment samples along Chester River (fig 1) with a grab sampler in June; brass coring tube through the sampler to obtain core of top 10cm; duplicate cores; stored at 3C before drying.
Metric 2:	Analytical Methodology	Low	Ultrasonic extraction of dried sediment followed by direct analysis of the concentrated crude extract by glass capillary GC-MS; no detection or reporting limits provided.
Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Chester River, Maryland.
Metric 5:	Currency	Low	1978.
Metric 6:	Spatial and Temporal Variability	High	12 sites total; Table II shows n per site; replicate samples; sampled in June only.
Metric 7:	Exposure Scenario	High	Concentration of river sediment near a plasticizer-manufacturing plant.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Table II reports mean and standard deviation and n per site; sediment concentrations as function of distance from mouth of river plotted in fig 4; fig 6 depicts concentration variation with depth of river sediment. Individual points not reported.
Metric 9:	Quality Assurance	Medium	Recovery >90% (p.240).
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Standard deviation reported in Table II; detailed discussion of variation as a function of distance along river as well as by depth of river. No discussions of limitations.

Overall Quality Determination   Medium

Study Citation:	Preston, M. R., Al-Omran, L. A. (1989). Phthalate ester speciation in estuarine water, suspended particulates and sediments. Environmental Pollution 62(2-3):183-194.		
HERO ID:	680380		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	water and sediment samples collected from river bank at three sampling sites (fig 1); water samples collected using apparatus described in earlier paper (Preston, 1986) or by hand; surface sediments collected from two sites (Runcorn and Speke) with a stainless steel spatula ad placed in jars with foil lined caps;
	Metric 2:	Analytical Methodology	Low	extracted from the filters in a Soxhlet apparatus; Dissolved phthalates were extracted from water by solvent extractionwith dichloromethane; GC/ECD and GC-MS; limits not reported
	Metric 3:	Biomarker Selection	N/A	NA - Water, suspended particles in water, and sediments. No biomarker needed
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	River Mersey Estuary, Liverpool, UK
	Metric 5:	Currency	Low	October 1, 1986
	Metric 6:	Spatial and Temporal Variability	Low	surface water: 3 sampling sites; 6 samples total; collected on one day (October 1); sediment: 2 sampling sites; unclear if replicate samples
	Metric 7:	Exposure Scenario	Medium	setting not described; contamination in river water and sediment
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 1 provides dissolved and particulate concentration by sample number; Table 4 shows concentrations in surface sediment
	Metric 9:	Quality Assurance	Low	no recoveries; QA/QC not directly discussed
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	compares findings to previous studies

Overall Quality Determination   Low

Dibutyl Phthalate   Monitoring   HERO ID: 680414

Study Citation:	Tan, G. H. (1995). Residue levels of phthalate esters in water and sediment samples from the klang river basin. Bulletin of Environmental Contamination and Toxicology 54(2):171-176.		
HERO ID:	680414		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	surface water (0.5-1.0 m deep) collected by grab samples from middle of river into glass bottles; sediment samples (0-10cm deep) dug out by excavator and stored in glass bottles; sampling stations (Fig 1); duplicates obtained every 3 months. Missing information on storage.
	Metric 2:	Analytical Methodology	High	water extracted with dichloromethane; sediment extracted using Florisil column; recoveries Table 1 and 2; Shimadzu GC 14A chromatograph fitted with a flame ionization detector; detection limits provided on p.175 under Results and Discussion; direct comparison technique using external standards used to identify and quantity the phthalate ester levels in the samples. LOD reported.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Klang River, West coast of central Peninsular Malaysia
	Metric 5:	Currency	Low	January 1992-February 1993
	Metric 6:	Spatial and Temporal Variability	High	12 stations for water; 7 stations for sediment; with average of 4 data sets for each. Duplicates reported.
	Metric 7:	Exposure Scenario	High	surface water and sediment from a river seriously affected by pollution, but serves as water supply to two million people; domestic, agricultural and industrial impacts
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Tables 4 and 5 provide the average levels in water and sediment by station. No individual data or summary statistics.
	Metric 9:	Quality Assurance	Medium	Tables 1 and 2 show the recovery of phthalates from fortified water and sediment samples. Table 3 shows the blank recoverydata using glass distilled water.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	discusses variability between monitoring stations; compares results to those previously reported. No limitations reported.

Overall Quality Determination   Medium

Study Citation:	Vitali, M., Guidotti, M., Macilenti, G., Cremisini, C. (1997). Phthalate esters in freshwaters as markers of contamination sources: A site study in Italy. Environment International 23(3):337-347.		
HERO ID:	680447		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	levels measured in surface water and sediments of rivers and lakes of central Italy (fig 1); collected in 3 series by glass bottles in surficial layer (0-20cm); stored at 4C in dark; sediment collected in stainless steel corer; top 10cm layer, dried, ground to powder, homogenized, and stored at 4C in dark
	Metric 2: Analytical Methodology	High	water samples extracted by liquid/liquid partitioning (EPA methods); 25 g dry weight sediment sonicated for 20 mi with methylene chloride (EPA methods); GC/MS; mean recoveries (Table 1); MDQ and LMD (Table 2)
	Metric 3: Biomarker Selection	N/A	Measured parent chemicals in river water and sediment
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Rieti District, central Italy
	Metric 5: Currency	Low	1994; collected in 3 series
	Metric 6: Spatial and Temporal Variability	Medium	22 sampling points (fig 1); 3 series of water samples for all sampling points (June-July; Aug; and Sept-Oct); sediment samples from 13 points. No replicates
	Metric 7: Exposure Scenario	High	sampling surface water and sediment from rivers and lakes of selected areas impacted by industrial plants, wastewater treatment plants, and cities; sites of different typology (urban, industrial, agricultural, and open country
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Table 3 provides results of the three sampling periods per sampling point. Missing most summary statistics
	Metric 9: Quality Assurance	Medium	mean recoveries and relative std deviation reported in Table 1; results are in good agreement with those reported in the literature and standard methods. Recoveries >70% for all chemicals of interest except in sediments for BBP (65%), but no indication of correction
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	discussed significant problems using sodium sulfate and glass-fiber filters and how treated with organic solvents so no PAEs were detected in procedure blanks; discussed variability between sampling locations and over time; compared findings to previous studies (Table 4). No characterization of variance but raw data are available to calculate

Overall Quality Determination   **Medium**

Study Citation:	Zeng, F., Cui, K., Xie, Z., Wu, L., Liu, M., Sun, G., Lin, Y., Luo, D., Zeng, Z. (2008). Phthalate esters (PAEs): Emerging organic contaminants in agricultural soils in peri-urban areas around Guangzhou, China. Environmental Pollution 156(2):425-434.		
HERO ID:	680472		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling equipment and methods are described in sufficient detail, but certain aspects (e.g. duration of storage) were absent that are unlikely to have a substantial impact on results.
	Metric 2: Analytical Methodology	Low	Analytical instrumentation and methods are described in sufficient detail, but limits of detection are only provided as a range for all analytes, not just the chemical of interest.
	Metric 3: Biomarker Selection	N/A	This study is testing for the parent chemical of interest in an environmental medium.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	China
	Metric 5: Currency	Medium	2006
	Metric 6: Spatial and Temporal Variability	Medium	Single soil samples were taken from 40 sites across 5 districts (n = 4 or greater for each district). No replicates were collected.
	Metric 7: Exposure Scenario	High	Soil locations from which samples were collected are very well characterized.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data are not reported; summary statistics include the detection frequency, minimum, maximum, mean, and median concentration for each district.
	Metric 9: Quality Assurance	High	QA/QC measures included the use of blanks, spike recoveries, surrogate standards, and sample duplicates. Corrections were made based on detectable levels found in procedural blanks, and recoveries were within acceptable ranges.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Relative standard deviation was reported as a a range for all analytes, spatial variation between districts is discussed in depth, and there is some discussion of uncertainty.

Overall Quality Determination   **Medium**

Study Citation:	Zeng, F., Cui, K., Xie, Z., Wu, L., Luo, D., Chen, L., Lin, Y., Liu, M., Sun, G. (2009). Distribution of phthalate esters in urban soils of subtropical city, Guangzhou, China. Journal of Hazardous Materials 164(2-3):1171-1178.		
HERO ID:	680473		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	All key sampling methods reported
Metric 2:	Analytical Methodology	High	All key analytical methods reported
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Guangzhou, China
Metric 5:	Currency	Medium	Samples collected in 2005
Metric 6:	Spatial and Temporal Variability	Medium	>10 samples, no replicates
Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	raw data not provided
Metric 9:	Quality Assurance	High	Key QA reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported

Overall Quality Determination   High

Study Citation:	Hu, X. Y., Wen, B., Shan, X. Q. (2003). Survey of phthalate pollution in arable soils in China. Journal of Environmental Monitoring 5(4):649-653.		
HERO ID:	681957		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Key sampling methods reported, missing some information such as amount of soil sampled.
Metric 2:	Analytical Methodology	High	Key analytical methods reported. LOD reported.
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Sampling points reported throughout China
Metric 5:	Currency	Low	Study published in 2003
Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
Metric 7:	Exposure Scenario	Medium	Exposure scenario not well characterized
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	Raw data reported in the manuscript. Summary statistics provided.
Metric 9:	Quality Assurance	High	Key QA methods reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported. Variation in sample locations.

Overall Quality Determination   **Medium**

| Study Citation: | Mihovec-Grdić M, Smit Z, Puntarić D, Bosnir J (2002). Phthalates in underground waters of the Zagreb area. Croatian Medical Journal 43(4):493-497. |
| HERO ID: | 682057 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	analyzed 96 water samples divided into three groups - 1) underground waters of the Sava river alluvium (n=77) collected from pipeline bores at 4 sites; 2) Sava river as the main source supplying water to the Sava alluvium (n=10), 3) drinking water collected from the water supply network and captages (n=10); underground water sampling sites and locations of solid waste disposal in the Zagreb area (fig 1). Missing some information on methodology (e.g., sampling equipment, storage conditions/duration)
	Metric 2:	Analytical Methodology	Low	extraction from neutral and acidic samples using high rpm mixer; GC-ECD. Mo mention of recoveries. Abstract noted that detection limit was 0.005 ug/L, which initially sounded like it applied broadly to all of the phthalates of interest. However, last sentence of Materials and Methods indicated that one phthalate had a higher detection limit; it's unclear what the situation is for the other ones.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in underground waters.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Zagreb, Croatia
	Metric 5:	Currency	Low	between February and June 1998
	Metric 6:	Spatial and Temporal Variability	Medium	96 samples between February and June. No replicates
	Metric 7:	Exposure Scenario	High	contamination in underground waters and tap water due to proximity of waste dump
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 1 provides pooled concentration by water source; n, DF, min, max, and mean provided. No raw data
	Metric 9:	Quality Assurance	Low	QA/QC not directly discussed
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	discusses variation between sites and compared findings to previous studies. Some characterization of variance and discussion of uncertainty, limitations, and gaps.

Overall Quality Determination   Medium

Study Citation:			Sha, Y., Xia, X., Yang, Z., Huang, G. H. (2007). Distribution of PAEs in the middle and lower reaches of the Yellow River, China. Environmental Monitoring and Assessment 124(1-3):277-287.
HERO ID:			683003

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1:	Sampling Methodology	Medium	water, sediment, and suspended particulates collected from 13 sites in middle and lower reaches of river (Fig 1 and Table 1); 3 sampling locations at each station; water samples taken from top layer (0-20cm); sediment collected using grab sampler and water using a aluminum jar with on site extraction; suspended particle samples with a press filter; all samples stored at 4C; timing of sampling not provided
	Metric 2:	Analytical Methodology	Low	RE-52 rotating evaporator; GC-FID; recovery samples; detection limits not provided
	Metric 3:	Biomarker Selection	N/A	River water. Biomarker not needed
Domain 2: Representativeness			
	Metric 4:	Geographic Area	High	Yellow River between Xiaolangdi Dam in Henan province and Dongming Bridge in the Shandong province, China
	Metric 5:	Currency	Low	sampling date not provided; paper published in 2005
	Metric 6:	Spatial and Temporal Variability	High	13 sites; 3 sampling per location; period of sampling not provided
	Metric 7:	Exposure Scenario	High	concentration in water, sediment, and suspended particulates in middle and lower reaches of the Yellow River; setting of sampling stations discussed in Results and Discussion
Domain 3: Accessibility/Clarity			
	Metric 8:	Reporting of Results	Medium	Table 2 provides concentration in water by sampling stations (mead and std deviation); Table 3 concentration in suspended particulates; and Table 6 concentration in sediments
	Metric 9:	Quality Assurance	Medium	recoveries in water samples ranged from 85.3-105.8 and in particulates ranged from 80.9-99.4 (p.280)
Domain 4: Variability and Uncertainty			
	Metric 10:	Variability and Uncertainty	High	discussed variation between sampling stations and possible causes; compared findings to other rivers around world and in China (Tables 7 and 8); std deviation provided

Overall Quality Determination   **Medium**

Study Citation:	Klamer, H. J., Leonards, P. E., Lamoree, M. H., Villerius, L. A., Kerman, J. E., Bakker, J. F. (2005). A chemical and toxicological profile of Dutch North Sea surface sediments. Chemosphere 58(11):1579-1587.		
HERO ID:	683627		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	locations and site descriptions provided, box-core samples pooled
Metric 2:	Analytical Methodology	Medium	Irgarol 1051 analyses (Steen et al., 1997; Lamoree et al., 2002); DL in text
Metric 3:	Biomarker Selection	N/A	sediment
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	The Netherlands
Metric 5:	Currency	Low	2000
Metric 6:	Spatial and Temporal Variability	Medium	10 sites one pooled sample per site, no replicates
Metric 7:	Exposure Scenario	Low	estuaries, harbours, coastal zones
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	raw data
Metric 9:	Quality Assurance	Low	QA not described, no obvious concerns
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not described, no obvious concerns

Overall Quality Determination   Medium

Study Citation:	Irvin, E., Calafat, A., Silva, M., Aguilar-Villalobos, M., Needham, L., Hall, D., Cassidy, B., Naeher, L. (2010). An estimate of phthalate exposure among pregnant women living in Trujillo, Peru. Chemosphere 80(11):1301-1307.		
HERO ID:	697305		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	recruitment and sampling described
Metric 2:	Analytical Methodology	Medium	LOD reported, refers to other publications (Kato et al., 2005; Silva et al.,2007)
Metric 3:	Biomarker Selection	High	metabolite
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Peru
Metric 5:	Currency	Low	2004
Metric 6:	Spatial and Temporal Variability	Medium	79 women, no replicates
Metric 7:	Exposure Scenario	High	bio monitoring
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	mean, 95% confidence interval
Metric 9:	Quality Assurance	Medium	Quality control was assured using calibration standards, reagentblanks, and quality control materials of high and low concentrations during each analytical run.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   Medium

| Study Citation: | Yan, X., Calafat, A., Lashley, S., Smulian, J., Ananth, C., Barr, D., Silva, M., Ledoux, T., Hore, P., Robson, M. (2009). Phthalates biomarker identification and exposure estimates in a population of pregnant women. Human and Ecological Risk Assessment 15(3):565-578. |
| **HERO ID:** | 697308 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	approved by the Institutional Review Board(IRB) at Rutgers University and the Centers for Disease Control and Prevention (CDC).
	Metric 2:	Analytical Methodology	Medium	LODs in Table 2, method by David (2000) as expressed by Koch et al. (2003a)
	Metric 3:	Biomarker Selection	High	metabolite
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	U.S.
	Metric 5:	Currency	Low	published 2009
	Metric 6:	Spatial and Temporal Variability	High	150 women, no replicates (sample size varies depending on chemical)
	Metric 7:	Exposure Scenario	High	bio monitoring
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	arithmetic mean, SE, median, 95th percentile, range
	Metric 9:	Quality Assurance	Medium	Ten percent of all samples collected were quality assurance samples.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   Medium

Domain		Metric	Rating	Comments
Study Citation:		Suzuki, Y., Niwa, M., Yoshinaga, J., Mizumoto, Y., Serizawa, S., Shiraishi, H. (2010). Prenatal exposure to phthalate esters and PAHs and birth outcomes. Environment International 36(7):699-704.		
HERO ID:		697317		
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	not much sampling detail
	Metric 2:	Analytical Methodology	Low	The detailed analytical methods were described in Suzuki et al. (2009); LOD in table 2
	Metric 3:	Biomarker Selection	High	Study presents metabolites.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Japan
	Metric 5:	Currency	Medium	2005-2008
	Metric 6:	Spatial and Temporal Variability	Low	n = 149, no replicates, urine spot samples
	Metric 7:	Exposure Scenario	High	bio metric
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	min, max, GM, 25th, 50th, 75th, detection rate
	Metric 9:	Quality Assurance	High	Internal quality control of the urinary metabolite analyses wascarried out by periodical blank measurement, recovery test and theanalysis of intra-laboratory reference urine samples. Moreover, ourlaboratory took part in Intercomparison Programme 40 of the German External Quality Assessment Scheme in 2007 for some phthalate ester metabolites
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Discussed in section 4.4, no obvious concerns.

Overall Quality Determination   **Medium**

Study Citation: Kondo, F., Ikai, Y., Hayashi, R., Okumura, M., Takatori, S., Nakazawa, H., Izumi, S., Makino, T. (2010). Determination of five phthalate monoesters in human urine using gas chromatography-mass spectrometry. Bulletin of Environmental Contamination and Toxicology 85(1):92-96.

HERO ID: 697322

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	36 participants were all staff from one institute of public health (Aichi Prefectural); ages and sex reported; selection criteria not listed; urine collection by participants not described.
	Metric 2: Analytical Methodology	High	Described in detail; urine samples spiked with radiolabeled standards; GC-MS; calibration curves reproducible and linear.
	Metric 3: Biomarker Selection	Medium	Monoester metabolite measured in urine; however, creatinine in urine sample not measured (estimated from equation incorporating age, body weight, and height).
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Japan, Nagoya
	Metric 5: Currency	Low	Sampling year not reported; likely between 2005 and 2010 according to publication year of 2010.
	Metric 6: Spatial and Temporal Variability	Medium	Urine from 36 people; however, all on staff at same institute. No scenario description.
	Metric 7: Exposure Scenario	Low	Exposure scenarios not described; presumably "general" Japanese adult exposure from all sources.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Reported frequency of detection (out of 36 urine samples) and concentration, median and range, per (a) unit volume and (b) modeled (not measured) creatinine mass in urine.
	Metric 9: Quality Assurance	High	Methods development: optimized quality of results before analyzing urine. LOD, % recovery with radiolabeled standards, quintuplicate blanks, LOQ, minimal contamination.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Measurement variation and uncertainty quantified; variation among single urine samples from 36 individuals represented by median and range only.

Overall Quality Determination   **Medium**

Study Citation:	Adeniyi, A., Okedeyi, O., Yusuf, K. (2011). Flame ionization gas chromatographic determination of phthalate esters in water, surface sediments and fish species in the Ogun river catchments, Ketu, Lagos, Nigeria. Environmental Monitoring and Assessment 172(1-4):561-569.		
HERO ID:	697358		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Water and sediment samples collected by standard procedures described in other publications. Fish capture and handling during transport not described; number of samples per medium unclear; fish sizes not specified (details my be in other publications).
	Metric 2: Analytical Methodology	Medium	GC-FID optimized for quantifying DMP, DEP, DBP, and DEHP; analytical standards used; analytic methods described, MDLs established (detailed in another reference); but some information (tissue quantity analyzed, different fish of same species pooled or not) missing.
	Metric 3: Biomarker Selection	High	Tilapia sp., Chrysichthys sp., and Synodontis sp. (fish) analyzed for parent compounds; all 3 fish species consumed by humans.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Nigeria, Ogun River
	Metric 5: Currency	Medium	2005, January to April
	Metric 6: Spatial and Temporal Variability	Medium	Six sampling locations - 24 water, sediment, and fish samples collected; however, unclear if 24 is total number of samples, total number per medium, or another option. Unclear if there are replicates.
	Metric 7: Exposure Scenario	High	All fish species consumed by humans. Biota-sediment and biota-water accumulation factors calculated by fish species.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Single concentration reported per fish species per location. Reported concentration ranges, mean, and either SE or SD (not specified which) for water and sediment samples by location.
	Metric 9: Quality Assurance	Medium	Reported chemical-specific GC retention times, detection limits, % recovery, and compared those to other reports; field and lab blanks not reported.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Compared water and sediment concentration results with other studies, primarily by comparing ranges. No limitations reported.

Overall Quality Determination   **Medium**

Study Citation:	Kanazawa, A., Saito, I., Araki, A., Takeda, M., Ma, M., Saijo, Y., Kishi, R. (2010). Association between indoor exposure to semi-volatile organic compounds and building-related symptoms among the occupants of residential dwellings. Indoor Air 20(1):72-84.
HERO ID:	697390

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling methods were described in detail. There is additional follow-up information in Takeda et al., 2009 and Kishi et al., 2009. Air sampling was performed at a height of 1.0–1.5 mfrom a floor and about 1 m from a wall. Dust sampleswere collected using a vacuum cleaner with samples from all over the floor or from multi-surfaces such as tops of doors, shelves, cupboards, and frames.
	Metric 2:	Analytical Methodology	High	Analytical methods were described in the appendix. The method detection limits were included. Details regarding equipment information were included.
	Metric 3:	Biomarker Selection	N/A	Air and dust samples were collected.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Air and dust sampling for SVOC's was conducted inside residential detached houses of Sapporo, Japan.
	Metric 5:	Currency	Medium	Data was collected from October, 2006 through January, 2007.
	Metric 6:	Spatial and Temporal Variability	Medium	There were 40 air samples collected during a 48-hour sampling time, as well as 41 multi-surface dust samples, and 41 floor dust samples collected. A single dust sample was obtained from each dwelling, and replicate sampling was not detailed.
	Metric 7:	Exposure Scenario	Medium	The potential sources of exposures were briefly described in the text, and Table 3 summarized dwelling characteristics such as wall materials, use of flame retardants and dampness. The temperature and humidity microclimate measures within dwellings were summarized. The use of exposure controls was not detailed.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not reported. Summary statistics were reported in Table 5 with method detection limits and included the median and ranges of measured concentrations along with the number of samples for each chemical.
	Metric 9:	Quality Assurance	Medium	The appendix text noted that quality assurance was described in Saito et al., 2007. The use of travel blanks was detailed within the main text. Recoveries were not detailed and baseline, pre-exposure sampling was not conducted.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study characterizes variability within reported chemical concentration summary statistic ranges. Multiple potential key study limitations were discussed, but are unlikely to have had a substantial impact on results.

Overall Quality Determination   **Medium**

Study Citation:	Liu, H., Liang, H., Liang, Y., Zhang, D., Wang, C., Cai, H., Shvartsev, S. (2010). Distribution of phthalate esters in alluvial sediment: A case study at JiangHan Plain, Central China. Chemosphere 78(4):382-388.		
HERO ID:	697396		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Key sampling methods reported
	Metric 2: Analytical Methodology	Low	Detection limits only reported as a range for all chemicals combined.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemicals in soil and sediment
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	HuBei, China
	Metric 5: Currency	Medium	Samples collected in 2007 and 2008
	Metric 6: Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7: Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not provided
	Metric 9: Quality Assurance	Low	Key QA reported, but recoveries appeared low even after correction. See last paragraph of Section 2.6.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Few gaps and limitations reported

Overall Quality Determination   **Medium**

	Study Citation:	Geiss, O., Tirendi, S., Barrero-Moreno, J., Kotzias, D. (2009). Investigation of volatile organic compounds and phthalates present in the cabin air of used private cars. Environment International 35(8):1188-1195.
	HERO ID:	697433

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Limited description of air sampling methodology
	Metric 2:	Analytical Methodology	Medium	Limited description of analytical methods, reported LOD but did not recoveries
	Metric 3:	Biomarker Selection	N/A	Analyzed air samples for parent chemical
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Italy
	Metric 5:	Currency	Medium	Sampling in 2007
	Metric 6:	Spatial and Temporal Variability	Low	n=23, in two separate occasions
	Metric 7:	Exposure Scenario	Medium	Data likely represent a relevant exposure scenario related to airborne parent chemical in vehicles. Manuscript lacks details about the population of interest.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Reported raw data, but did not report summary statistics
	Metric 9:	Quality Assurance	Low	Did not provide details on QA/QC techniques used
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Did not characterize variability, or discussed uncertainties and limitations

Overall Quality Determination   Medium

Study Citation:	Kim, M., Yun, S., Chung, G. (2009). Determination of phthalates in raw bovine milk by gas chromatography/time-of-flight mass spectrometry (GC/TOF-MS) and dietary intakes. Food Additives & Contaminants: Part A, Chemistry, Analysis, Control, Exposure & Risk Assessment 26(1):134-138.		
HERO ID:	697442		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	not much detail - 30 different dairy farms in South Korea
	Metric 2:	Analytical Methodology	Low	extraction and equipment described; The LODs werecalculated as a signal-to-noise ratio of 3. LODs not provided.
	Metric 3:	Biomarker Selection	High	parent in bovine milk
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	South Korea
	Metric 5:	Currency	Low	Timing of sample collection for monitoring data is not reported, discussed, or referenced. However publication year of 2009 is used as proxy.
	Metric 6:	Spatial and Temporal Variability	Medium	n = 30, no replicates
	Metric 7:	Exposure Scenario	High	bovine milk
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	mean, min, max, recovery%, detected frequency% provided
	Metric 9:	Quality Assurance	Low	QA not discussed, no obvious concerns
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   Medium

Study Citation: Chi, J. (2009). Phthalate acid esters in Potamogeton crispus L. from Haihe River, China. Chemosphere 77(1):48-52.
HERO ID: 697462

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sample collection briefly described, sample preparation described; dates, pH, TOC, water content, sediment composition, and % lipid reported. Missing sample storage.
	Metric 2:	Analytical Methodology	Medium	Sample extraction and GC-FID conditions briefly described; triplicate analysis; LOD determined.
	Metric 3:	Biomarker Selection	High	Concentration of parent chemical in submerged plant compared with water and sediment concentrations.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China, Haihe River
	Metric 5:	Currency	Medium	2008, March through May
	Metric 6:	Spatial and Temporal Variability	Medium	Four sampling locations along 16 km of river, water, surface sediments, near-root sediments, and submerged plant Potamogeton crispus collected three times between March and May (pre, during, and post rapid growth period). Uncertain if replicates were collected
	Metric 7:	Exposure Scenario	Medium	Parent chemical accumulation in plant; however, not a forage plant for fish or humans.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Bar graphs of mean and SD of the triplicate analysis of each medium at each sampling location.
	Metric 9:	Quality Assurance	Medium	Samples analyzed in triplicate; spiked samples used to determine recoveries; and RSD reported for water, sediment, and plant.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Vertical core sediment sample taken in the urban reach of river to evaluate historical release of PEs; some discussion of variability and uncertainty in relation to environmental factors.

Overall Quality Determination   **Medium**

Study Citation: Wu, B., Zhang, X., Zhang, X., Yasun, A., Zhang, Y., Zhao, D., Ford, T., Cheng, S. (2009). Semi-volatile organic compounds and trace elements in the Yangtze River source of drinking water. Ecotoxicology 18(6):707-714.

HERO ID: 697468

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	concentration in water samples from Yangtze River which is the source of drinking water for Nanjing; source water sampled at tap water plant; 10 L; collected in bottles and placed in ice bath; samples filtered and kept at 4C
	Metric 2: Analytical Methodology	Low	reformative liquid–liquid extraction method; GC/MS and ICP-AES; recovery samples; LODs provided in Table 1
	Metric 3: Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Yangtze River, Nanjing, Jiangsu province, China
	Metric 5: Currency	Medium	2007 and 2008
	Metric 6: Spatial and Temporal Variability	Critically Deficient	sampled in Dec 2007 and March, June, Sept and Dec 2008 (over 13 month period); all samples from one location, but sample size not provided
	Metric 7: Exposure Scenario	High	concentration in water samples from Yangtze River which is the source of drinking water for Nanjing; river flows through 11 provinces and 2 major cities; waste water, agricultural run-off and intense industrial and urban activity
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Table 1 provides mean, std dev, median and range for each chemical
	Metric 9: Quality Assurance	High	reagent blanks, standard reference materials and sample replicates taken; recovery rates were above 74.3$
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	discusses temporal trends; compares findings to other rivers in China and other countries; std dev reported in Table 1

Overall Quality Determination   Uninformative

Study Citation:	Peck, J., Sweeney, A., Symanski, E., Gardiner, J., Silva, M., Calafat, A., Schantz, S. (2010). Intra- and inter-individual variability of urinary phthalate metabolite concentrations in Hmong women of reproductive age. Journal of Exposure Science & Environmental Epidemiology 20(1):90-100.		
HERO ID:	697726		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Cohort substudy. Fox River Environment and Diet Study (FRIENDS) - IRB approved protocol. Briefly described, more information in other references.
Metric 2:	Analytical Methodology	Medium	Samples sent to CDC Division of Laboratory Sciences for processing and analysis. LOD in text MBzP, 0.11 ug/l; MnBP, 0.4 ug/l; MiBP, 0.26 ug/l; MEHP, 0.9 ug/l;
Metric 3:	Biomarker Selection	High	metabolite
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	U.S. - Wisconsin
Metric 5:	Currency	Medium	2005
Metric 6:	Spatial and Temporal Variability	Medium	n = 45, no replicates
Metric 7:	Exposure Scenario	High	urine, women of reproductive age
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	mean, SD, 25th, 50th, 75th, 95th, min and max reported; also reported by different demographics
Metric 9:	Quality Assurance	Medium	Quality control and reagent blank samples were included in each analytical batch along with the study samples.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Measurement variability was assessed using intraclass correlations (ICCs) and surrogate category analysis. Observed a large degree of variability in phthalate metabolite concentrations across all samples

Overall Quality Determination   High

Study Citation:	Cai, Q., Mo, C., Wu, Q., Zeng, Q., Katsoyiannis, A. (2007). Occurrence of organic contaminants in sewage sludges from eleven wastewater treatment plants, China. Chemosphere 68(9):1751-1762.		
HERO ID:	698313		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	sludge from 11 WWTPs; grab samples of sludge collected and stored in aluminum containers; samples dried at room temp, ground, sieved, and refrigerated. Missing description or mention of sampling contamination and care of cross contamination and prevention
	Metric 2: Analytical Methodology	High	extraction performed according to USEPA 340C methods; Soxhlet-extractor; GC–MS; detection limits and recoveries presented in Table 1
	Metric 3: Biomarker Selection	N/A	Wastewater, no biomarker needed
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	9 different cities throughout China (Beijing, Xi'an, Lanzhou, Wuxi, Guangzhou, Foshan, Shenzhen, Zhuhai and Hong Kong)
	Metric 5: Currency	Low	between 1998 and 1999
	Metric 6: Spatial and Temporal Variability	Medium	11 WWTPs sampled around China; Fig 1 provides locations; number of samples per location and duration of sampling not provided, replicates unknown
	Metric 7: Exposure Scenario	High	sewage sludge from WWTPs in China; Table 2 provides sources of the sludge and their characteristics
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	average concentrations by WWTP is presented in Table 4; percentage of total concentration provided; all other parameters/stats not provided
	Metric 9: Quality Assurance	Medium	quality assurance/quality control (QA/QC) have been presented elsewhere (Cai et al., 2007a); % recoveries provided in Table 1
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	discusses variance by plant

Overall Quality Determination   Medium

Study Citation:	Cai, Q., Mo, C., Wu, Q., Zeng, Q., Katsoyiannis, A. (2007). Quantitative determination of organic priority pollutants in the composts of sewage sludge with rice straw by gas chromatography coupled with mass spectrometry. Journal of Chromatography A 1143(1-2):207-214.		
HERO ID:	698352		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	The sampling methodology is clear, detailed, and appropriate. Details such as sampler calibration and sample storage are provided.
Metric 2:	Analytical Methodology	High	The analytical methodology is clear, detailed, and appropriate; detection limits are provided in Table 1.
Metric 3:	Biomarker Selection	N/A	Study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples were collected in China.
Metric 5:	Currency	Low	Publication date is 2007. No sample collection date provided.
Metric 6:	Spatial and Temporal Variability	Low	Only four samples were collected (1 per compost type) as shown in Table 2.
Metric 7:	Exposure Scenario	High	The study is testing for chlorobenzenes and phthalates in compost materials. This scenario is of interest for the chemical and is well characterized.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	Raw data is provided in Table 3.
Metric 9:	Quality Assurance	Medium	QA/QC measures are discussed, including the use of blanks and controls. QA/QC issues were not identified.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	No characterization of variability or uncertainty is provided.

Overall Quality Determination   Medium

Study Citation:	Zhu, J., Phillips, S., Feng, Y., Yang, X. (2006). Phthalate esters in human milk: concentration variations over a 6-month postpartum time. Environmental Science & Technology 40(17):5276-5281.		
HERO ID:	698399		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling equipment and methods are described in sufficient detail and are scientifically sound.
	Metric 2:	Analytical Methodology	High	Analytical instrumentation and methods are described in sufficient detail and are scientifically sound. Detection limit is reported.
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical of interest in a medium which is environmental to the exposure population (infants).
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Canada
	Metric 5:	Currency	Low	2003-2004
	Metric 6:	Spatial and Temporal Variability	Medium	86 breastmilk samples were collected from 21 women across five timepoints postpartum.
	Metric 7:	Exposure Scenario	High	The exposure to infants is highly relevant.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data are not reported; summary statistics include detection frequency, geometric mean, arithmetic mean and 95% confidence interval, median, maximum, and percentiles (25, 75, 95) of concentration.
	Metric 9:	Quality Assurance	Medium	QA/QC measures included duplicate analysis of select samples, use of internal standards.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Metrics of variability are reported, temporal variation is thoroughly discussed, and there are minimal concerns for uncertainties.

Overall Quality Determination   High

Study Citation:	Lin, S., Ku, H., Su, P., Chen, J., Huang, P., Angerer, J., Wang, S. (2011). Phthalate exposure in pregnant women and their children in central Taiwan. Chemosphere 82(7):947-955.		
HERO ID:	699479		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Most key criteria met, storage duration data lacking.
	Metric 2:	Analytical Methodology	Medium	Most key criteria met, LOD's not reported.
	Metric 3:	Biomarker Selection	Low	Metabolites not specific for parent chemicals.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Taiwan
	Metric 5:	Currency	Low	Sampling in 2001-2002.
	Metric 6:	Spatial and Temporal Variability	Medium	Single samples, but multiple media and sampling at multiple ages for offspring and random selection of participants.
	Metric 7:	Exposure Scenario	Medium	Participant characteristics reported.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Most key criteria met, lacking raw data.
	Metric 9:	Quality Assurance	Low	Q/A briefly mentioned, most key criteria missing, however training of collection procedures for milk samples.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Statistical characterization of variability, study limitations not discussed.

Overall Quality Determination   Low

Study Citation: Itoh, H., Iwasaki, M., Hanaoka, T., Sasaki, H., Tanaka, T., Tsugane, S. (2009). Urinary phthalate monoesters and endometriosis in infertile Japanese women. Science of the Total Environment 408(1):37-42.

HERO ID: 699484

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	High. Key criteria met
	Metric 2: Analytical Methodology	Low	Low. Most key criteria met. Calculation of LODs was explained but actual LODs not reported.
	Metric 3: Biomarker Selection	Low	Low. Metabolites not specific for parent chemicals.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Japan
	Metric 5: Currency	Low	Low. Samples collected 2000-2001
	Metric 6: Spatial and Temporal Variability	Medium	Medium. Single spot urine samples from 137 participants, non-statistical sampling approach.
	Metric 7: Exposure Scenario	Medium	Medium. Participant demographics reported. While source of exposure and other factors not described, they are less relevant to this epidemiological study.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Medium. Most key criteria met. Lack of raw data.
	Metric 9: Quality Assurance	Medium	Medium. Q/A procedures reported, most key criteria met. No recoveries
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Low. Statistical variability characterized, study limitations discussed. Some concern for duration of sample storage prior to analysis and repeated thawing of samples, but unlikely to substantially affect results.

Overall Quality Determination   **Medium**

Study Citation:	Lin, L., Wang, S., Chang, Y., Huang, P., Cheng, J., Su, P., Liao, P. (2011). Associations between maternal phthalate exposure and cord sex hormones in human infants. Chemosphere 83(8):1192-1199.
HERO ID:	699485

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Medium. Most key criteria met. Lack of sample storage/duration data.
	Metric 2: Analytical Methodology	High	High. Key criteria met. LOD's reported.
	Metric 3: Biomarker Selection	Low	Low. Metabolites not specific for parent chemicals
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	High. Taiwan
	Metric 5: Currency	Low	Low. Samples collected 2000-2001.
	Metric 6: Spatial and Temporal Variability	Medium	Single spot urine samples from 155 women in non-statistical sampling approach.
	Metric 7: Exposure Scenario	Medium	Medium. Population demographics reported and included work history in chemical factories.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Medium. Most key criteria met (Table 2), lacking raw data
	Metric 9: Quality Assurance	Medium	Medium. Q/A not detailed, however laboratory accuracy program
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Medium. Statistical variability characterized, study limitations (assumptions, misclassification of exposure potential) discussed.

Overall Quality Determination   Medium

Study Citation:	Ligocki, M. P., Leuenberger, C., Pankow, J. F. (1985). Trace organic compounds in rain{\textemdash}II. Gas scavenging of neutral organic compounds. Atmospheric Environment 19(10):1609-1617.		
HERO ID:	724845		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The sampling method was sound.
	Metric 2: Analytical Methodology	Low	Detection limits were not reported.
	Metric 3: Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Portland, Oregon
	Metric 5: Currency	Low	Study was conducted in the winter and spring of 1984.
	Metric 6: Spatial and Temporal Variability	Medium	The study reported 7 rain events during which samples were collected.
	Metric 7: Exposure Scenario	Medium	The data likely represent the relevant exposure scenario.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	Individual sample concentrations were reported. One rain event represented one sample.
	Metric 9: Quality Assurance	Medium	The study applied and documented quality assurance/quality control measures; however, one or more pieces of QA/QC information is not described.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	The study has limited discussion of key uncertainties, limitations, and data gaps.

Overall Quality Determination   Medium

Study Citation:	Woodruff, T. J., Zota, A. R., Schwartz, J. M. (2011). Environmental chemicals in pregnant women in the United States: NHANES 2003-2004. Environmental Health Perspectives 119(6):878-885.		
HERO ID:	755656		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The articles uses data from the NHANES database, which is a nationally representative survey.
	Metric 2: Analytical Methodology	High	The analysis was conducted using SUDAAN and SAS, with descriptive statistics method referenced.
	Metric 3: Biomarker Selection	High	Biomarkers are known to be related with external exposure.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was conducted in the USA.
	Metric 5: Currency	Medium	NHANES samples were from 2003-2004.
	Metric 6: Spatial and Temporal Variability	Low	1757 total samples from pregnant and nonpregnant women were taken. No replicates were reported.
	Metric 7: Exposure Scenario	Medium	The data represents pregnant women's exposure to chemicals. However, the study doesn't give information about sources.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Only summary statistics reported. Full data can be found on NHANES.
	Metric 9: Quality Assurance	High	NHANES study undergoes QA/QC procedures.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Characterized variability, limited discussion of uncertainties and limitations

Overall Quality Determination   High

Study Citation:	Kasper-Sonnenberg, M., Koch, H. M., Wittsiepe, J., Wilhelm, M. (2012). Levels of phthalate metabolites in urine among mother-child-pairs - Results from the Duisburg birth cohort study, Germany. International Journal of Hygiene and Environmental Health 215(3):373-382.		
HERO ID:	787906		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Most key criteria met. Duration of sample storage prior to analysis lacking.
	Metric 2: Analytical Methodology	Medium	Most key criteria met, analytical methodology referenced, LOQs reported as range.
	Metric 3: Biomarker Selection	Low	Sampling for metabolites not specific for parent chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples provided by participants in Duisburg, Germany.
	Metric 5: Currency	Medium	Sampling conducted 2007-2009.
	Metric 6: Spatial and Temporal Variability	Medium	Single urine samples provided by n=105 children and n=104 mothers, first-morning urine sampling, non-statistical sampling methods.
	Metric 7: Exposure Scenario	Medium	Participant characteristics summarized, occupational status unknown, lack of exposure controls.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Most key criteria met. Lack of raw data.
	Metric 9: Quality Assurance	Low	Quality assurance details not reported, however analytic methodology referenced.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Characterization of variability depicted within exposure summary statistics. Some limitations discussed.

Overall Quality Determination   Medium

Study Citation:	Liu, L., Bao, H., Liu, F., Zhang, J., Shen, H. (2012). Phthalates exposure of Chinese reproductive age couples and its effect on male semen quality, a primary study. Environment International 42(1):78-83.		
HERO ID:	787928		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Medium. Most key criteria met. Duration of sample storage prior to analysis lacking.
	Metric 2: Analytical Methodology	High	High. Key criteria met, LOD's reported.
	Metric 3: Biomarker Selection	Low	Low. Metabolite not specific for parent chemical
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	China
	Metric 5: Currency	Medium	Medium. Samples collected 2009-2010
	Metric 6: Spatial and Temporal Variability	Low	Low. Two spot urine samples from each of 150 participants
	Metric 7: Exposure Scenario	Medium	Medium. Participant demographics reported
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Medium. Most key criteria met, raw data lacking
	Metric 9: Quality Assurance	Medium	Medium. Q/A parameters reported, most key criteria met.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Medium. Statistical characterization of variability, limitations due to small sample size briefly mentioned.

Overall Quality Determination   Medium

Study Citation:	Guo, Y., Wu, Q., Kannan, K. (2011). Phthalate metabolites in urine from China, and implications for human exposures. Environment International 37(5):893-898.		
HERO ID:	787930		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Spot urine samples; stored frozen; sample size reported by location, age, sex; "subpopulations" listed.
	Metric 2: Analytical Methodology	High	Described in detail for each urinary metabolite. Deconjugation then SPE. ESI-MS/MS. LOQ reported; C13-radiolabeled standards used.
	Metric 3: Biomarker Selection	Medium	MBP in urine; not normalized to creatine by individual.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	China; cities of Shanghai, Qiqihaer, and Guangzhou.
	Metric 5: Currency	Medium	2010, May through July.
	Metric 6: Spatial and Temporal Variability	Medium	Urine spot samples. More than 10 males and 10 females sampled per city; more than 30 individuals aged 20-40 and aged > 40 of each sex included.
	Metric 7: Exposure Scenario	Medium	Exposure scenario not defined; all sources and routes.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Reported % detected, range, geometric and arithmetic means, and quartiles by sex, city, and age group. Graphically presented 10th and 90th percentiles and individual data points above and below those percentiles.
	Metric 9: Quality Assurance	High	For each batch of 30 samples, 2 method blanks, spiked blank, 1 pair matrix spiked samples, and duplicates; reported recoveries.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Discussion compared metabolites across cities by sex and age group, also across published reports; variance bars by city (Figure 3). No discussion of limited sample size.

Overall Quality Determination   Medium

Study Citation:	Casas, L., Fernández, M. F., Llop, S., Guxens, M., Ballester, F., Olea, N., Irurzun, M. B., Rodríguez, L. S., Riaño, I., Tardón, A., Vrijheid, M., Calafat, A. M., Sunyer, J., INMA Project (2011). Urinary concentrations of phthalates and phenols in a population of Spanish pregnant women and children. Environment International 37(5):858-866.
HERO ID:	787931

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Urine was collected in 100 mL non-vinyl and nonpolycarbonatecontainers and stored at −20 °C. One aliquot of eachselected individual was shipped to the CDC Environmental HealthLaboratories, and aliquots were stored at or below −20 °C. All urine samples were stored for a minimum of one year and a maximum of 5 years before analysis.
	Metric 2:	Analytical Methodology	High	The analytical methodology is described. Table 1. Limits of detection (LOD) for phthalate metabolites and phenols in urine (ng/mL).
	Metric 3:	Biomarker Selection	High	Mono-n-butyl phthalate.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Spain.
	Metric 5:	Currency	Medium	2004-2008.
	Metric 6:	Spatial and Temporal Variability	Medium	No sample replicates. 120 women and 30 children.
	Metric 7:	Exposure Scenario	High	Phthalate and phenol exposure is prevalent among the general population and of potential concern for pregnant women and children because of their suspected susceptibility to endocrine effects.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No individual samples reported. Table 2. Urinary concentrations of phthalate and phenol metabolites (ng/mL) during pregnancyand childhood. Median IQR.
	Metric 9:	Quality Assurance	Medium	The only QC reported was the potential cross contamination due to the storage containers.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Uncertainty due to the long storage time and possible cross contamination. Variability reported in summary of statistics (IQR).

Overall Quality Determination   High

Study Citation:			Fromme, H., Gruber, L., Seckin, E., Raab, U., Zimmermann, S., Kiranoglu, M., Schlummer, M., Schwegler, U., Smolic, S., Völkel, W. (2011). Phthalates and their metabolites in breast milk - Results from the Bavarian Monitoring of Breast Milk (BAMBI). Environment International 37(4):715-722.
HERO ID:			787934

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling equipment and methods are described in sufficient detail, although certain aspects (e.g. duration of storage) are missing that are unlikely to have a substantial impact on results.
	Metric 2:	Analytical Methodology	Low	Analytical instrumentation and methods are described in sufficient detail, but LOD for parent diester is missing.
	Metric 3:	Biomarker Selection	Low	The monoester phthalate is a metabolite of multiple parent chemicals, not just the chemical of interest, and there is not a stated method to apportion the estimate to only the chemical of interest
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Germany
	Metric 5:	Currency	Medium	Timing was reported as during the study period of the Bavarian Monitoring of Breast Milk (BAMBI) survey without specific years provided; external sources indicate that BAMBI took place 2007-2008
	Metric 6:	Spatial and Temporal Variability	Medium	Samples of breast milk were collected from 78 mothers (one per mother) at 4 to 8 weeks after delivery. No replicates were collected.
	Metric 7:	Exposure Scenario	High	The exposure scenario of phthalates in breastmilk is highly relevant to nursing infants.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data points are not reported; summary statistics include the minimum, maximum, median, mean, 90th percentile, and 95th percentile of concentrations.
	Metric 9:	Quality Assurance	High	QA/QC measures reported include the use of blanks, references, duplicate or triplicate analyses, and recovery calculations. Only minor issues were identified and subsequently addressed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	No measure of variance is provided, but there is qualitative discussion of limitations/uncertainty.

Overall Quality Determination   Medium

Study Citation: Guo, Y., Alomirah, H., Cho, H. S., Minh, T. B., Mohd, M. A., Nakata, H., Kannan, K. (2011). Occurrence of phthalate metabolites in human urine from several Asian countries. Environmental Science & Technology 45(7):3138-3144.

HERO ID: 787935

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported such as sample storage conditions.
	Metric 2:	Analytical Methodology	High	All key analytical methods reported. LOQ reported on lines 96-98 of SI.
	Metric 3:	Biomarker Selection	Low	Metabolites not specific to DBP.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Seven Asian countries were reported - China, India, Japan, Korea, Kuwait, Malaysia, and Vietnam.
	Metric 5:	Currency	Medium	Samples collected in 2010 for all countries except Korea, which were collected during 2006-2007.
	Metric 6:	Spatial and Temporal Variability	Medium	No replicates.
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported.
	Metric 9:	Quality Assurance	High	Key QA measures reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Gaps and limitations characterized. Variance presented with ranges in Table S3.

Overall Quality Determination   Medium

Study Citation:	Marcus, M., Christensen, K. Y., Manatunga, A., Rudra, C. B., Brock, J. W., Small, C. M. (2010). Variability of phthalate monoester levels in daily first-morning urine from adult women: A pilot study. Reviews on Environmental Health 25(4):359-368.		
HERO ID:	787937		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	The study authors reported sampling methods, participant demographics and sample storage.
Metric 2:	Analytical Methodology	Medium	The study authors reported analytical methods, instrument and LOD. Recovery samples were not reported.
Metric 3:	Biomarker Selection	Medium	The biomarkers used were acceptable.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	The study was conducted in the United States (New York and Boston).
Metric 5:	Currency	Low	The participants were recruited between 1990 and 1993.
Metric 6:	Spatial and Temporal Variability	Low	10 women were studied with no replicate samples.
Metric 7:	Exposure Scenario	Medium	The data were collected from a monitoring survey and were not linked to a specific source of exposure.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data were not reported in the study, but the study authors did report descriptive statistics.
Metric 9:	Quality Assurance	Low	The study reported some QA/QC including standards and blanks. Some QA was not reported including recoveries.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	The study analyzed variance among and between women, but did not report gaps, limitations, or uncertainties.

Overall Quality Determination   **Medium**

Study Citation:	Blair, J. D., Ikonomou, M. G., Kelly, B. C., Surridge, B., Gobas, F. A. (2009). Ultra-trace determination of phthalate ester metabolites in seawater, sediments, and biota from an urbanized marine inlet by LC/ESI-MS/MS. Environmental Science & Technology 43(16):6262-6268.		
HERO ID:	787951		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling methods, equipment, storage described for each sample type.
Metric 2:	Analytical Methodology	High	Extraction details provided. Method detection limit provided. Instrumentation (GC-MS) and calibration described. Recovery tested.
Metric 3:	Biomarker Selection	Medium	Metabolites measured seawater, sediments, and biota. It is unclear if these are direct metabolites of the parent chemicals of interest.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	British Columbia
Metric 5:	Currency	Medium	2004-2006
Metric 6:	Spatial and Temporal Variability	High	n = 50. Sample duplicates taken.
Metric 7:	Exposure Scenario	Medium	Seawater, marine sediments, invertebrates, and fish directly measured. No information provided on human exposure.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Range of data provided (Table 3), mean GM and SD provided (Figure 2). Individual points not reported.
Metric 9:	Quality Assurance	High	Described in detail. Recovery, calibration, and method Validation described.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Variability in different sample mediums. RED reported. No limitations described.

Overall Quality Determination   High

Study Citation:	Silva, M. J., Reidy, J. A., Samandar, E., Herbert, A. R., Needham, L. L., Calafat, A. M. (2005). Detection of phthalate metabolites in human saliva. Archives of Toxicology 79(11):647-652.		
HERO ID:	787994		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Some sampling methods not reported
	Metric 2: Analytical Methodology	Medium	Recovery samples not reported
	Metric 3: Biomarker Selection	Medium	Acceptable biomarkers
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	USA
	Metric 5: Currency	Low	Sample data collected before 2005
	Metric 6: Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7: Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not reported
	Metric 9: Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Few gaps and limitations reported

Overall Quality Determination   Medium

Study Citation:	Hauser, R., Meeker, J. D., Park, S., Silva, M. J., Calafat, A. M. (2004). Temporal variability of urinary phthalate metabolite levels in men of reproductive age. Environmental Health Perspectives 112(17):1734-1740.		
HERO ID:	788014		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	recruitment previously described (Hauser et al. 2003). urine sampling described
	Metric 2: Analytical Methodology	High	LOD provided in text, analytical approach developed at the CDC(Silva et al. 2003).
	Metric 3: Biomarker Selection	High	metabolite
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	U.S.
	Metric 5: Currency	Low	Timing of sample collection for monitoring data is not reported, discussed, or referenced. However, the publication year of 2004 is used as a proxy for sampling year.
	Metric 6: Spatial and Temporal Variability	High	Table 1 n = 369, Table 3 n = 10 with 9 replicates
	Metric 7: Exposure Scenario	High	human biomonitoring
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	Table 3 raw data
	Metric 9: Quality Assurance	High	One method blank, two quality control samples (human urine spiked with phthalates), and two sets of standards wereanalyzed along with every 21 unknown urine samples.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	temporal variability shown in Table 3 day 0 to 92

Overall Quality Determination   High

Study Citation:	Keil, R., Salemme, K., Forrest, B., Neibauer, J., Logsdon, M. (2011). Differential presence of anthropogenic compounds dissolved in the marine waters of Puget Sound, WA and Barkley Sound, BC. Marine Pollution Bulletin 62(11):2404-2411.		
HERO ID:	788135		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Section 2.1; Barkley Sound - water samples collected using bottle; Puget Sound - collected in LDPE cubitainers by volunteers and collected in intertidal zone a beaches; samples filtered; storage conditions not discussed; sampling methodology is brief and incomplete
	Metric 2: Analytical Methodology	Low	solid phase extraction; GC-MS; detection limits not provided
	Metric 3: Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Barkley Sound, Vancouver Island, Canada and Puget Sound
	Metric 5: Currency	Medium	March 2010
	Metric 6: Spatial and Temporal Variability	Medium	22 stations in Barkley Sound and 66 locations in Puget Sound, Washingon; sampling only between March 23-27. Unclear if there are replicates.
	Metric 7: Exposure Scenario	High	Puget Sound is highly urbanized watershed; Conversely, BarkleySound has less human influence in the watershed and a lower population density; measured chemicals commonly found in homes in marine waters
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Fig 2 depicts DF and Fig 3 depicts box and wisker plot concentrations. Individual points not reported.
	Metric 9: Quality Assurance	Medium	No section for QA- but quantities corrected for recoveries relative to recovery standard; analysis blanks were subtracted from all data reported
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	discusses variation between compounds and by location; also discussed variation by human impact. No limitations reported.

Overall Quality Determination   **Medium**

Study Citation:	Lan, Q., Cui, K., Zeng, F., Zhu, F., Liu, H., Chen, H., Ma, Y., Wen, J., Luan, T., Sun, G., Zeng, Z. (2012). Characteristics and assessment of phthalate esters in urban dusts in Guangzhou city, China. Environmental Monitoring and Assessment 184(8):4921-4929.		
HERO ID:	788137		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Most sampling information provided. Missing some pieces like sample equipment
Metric 2:	Analytical Methodology	Low	Detailed extraction methods referenced to another study but LOD/LOQ not provided
Metric 3:	Biomarker Selection	N/A	Measured parent chemicals in urban dust
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Guangzhou, China
Metric 5:	Currency	Medium	Samples collected in 2007
Metric 6:	Spatial and Temporal Variability	Medium	No replicates collected
Metric 7:	Exposure Scenario	Medium	Source of exposure not well characterized
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not reported
Metric 9:	Quality Assurance	Medium	QA/QC discussed. Recoveries not reported for all individual chemicals.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Some limitations reported

Overall Quality Determination   Medium

Study Citation:	Cirillo, T., Fasano, E., Castaldi, E., Montuori, P., Amodio Cocchieri, R. (2011). Children's exposure to di(2-ethylhexyl)phthalate and dibutylphthalate plasticizers from school meals. Journal of Agricultural and Food Chemistry 59(19):10532-10538.		
HERO ID:	788145		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Key sampling methods reported in detail
	Metric 2: Analytical Methodology	High	Key analytical methods reported. LOQ/LOD reported in text on pg 10534
	Metric 3: Biomarker Selection	N/A	Measured parent chemicals in school lunches
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Naples, Italy
	Metric 5: Currency	Medium	Samples collected in 2010
	Metric 6: Spatial and Temporal Variability	Medium	>10 samples; no replicates collected
	Metric 7: Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not reported
	Metric 9: Quality Assurance	High	Key QA reported with appropriate recoveries, blank tests, etc
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Gaps and limitations not well characterized

Overall Quality Determination   High

Study Citation:	Yolton, K., Xu, Y., Strauss, D., Altaye, M., Calafat, A. M., Khoury, J. (2011). Prenatal exposure to bisphenol A and phthalates and infant neurobehavior. Neurotoxicology and Teratology 33(5):558-566.
HERO ID:	788169

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Health Outcomes and Measures of the Environment (HOME) Study enrollment criteria and procedures are more completely described elsewhere (Geraghty et al., 2008).
	Metric 2:	Analytical Methodology	Medium	LOD range from 0.3 to 1.2 ng/mL; phthalate metabolites weremeasured at the (CDC) Environmental Health Laboratories using published methods (Silva et al., 2008; Ye et al., 2005).
	Metric 3:	Biomarker Selection	High	metabolite
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	U.S. Ohio
	Metric 5:	Currency	Medium	2003-2006
	Metric 6:	Spatial and Temporal Variability	Medium	n = 332 for week 26, and n = 346 for week 16; no replicates
	Metric 7:	Exposure Scenario	High	urinary samples
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	geometric mean and 95th percentile reported
	Metric 9:	Quality Assurance	Low	QA not discussed, no obvious concerns
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	variability and uncertainty discussed in Limitations section; no obvious concerns

Overall Quality Determination   Medium

Study Citation:	Shi, W., Zhang, F. X., Hu, G. J., Hao, Y. Q., Zhang, X. W., Liu, H. L., Wei, S., Wang, X. R., Giesy, J. P., Yu, H. X. (2012). Thyroid hormone disrupting activities associated with phthalate esters in water sources from Yangtze River Delta. Environment International 42:117-123.		
HERO ID:	788233		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Detailed description of site locations, sample collection methods, storage, and filtration
	Metric 2: Analytical Methodology	Medium	report general detection limit for pesticides/plasticizers but not specific chemicals; describe instrumentation but could be more detailed
	Metric 3: Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Yangtze River Delta (China)
	Metric 5: Currency	Medium	March 2009
	Metric 6: Spatial and Temporal Variability	High	samples collected at 15 sites
	Metric 7: Exposure Scenario	High	The Yangtze River Delta is a drinking water source for more than 20% of the area's population but there is contamination in the basin due to industrialization and inadequate water treatment
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	report concentrations in Table 4 but no error or range provided
	Metric 9: Quality Assurance	High	included blanks and recoveries all >85%
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	discuss several limitations but little mention of variability/error

Overall Quality Determination   High

Study Citation:	Rudel, R. A., Gray, J. M., Engel, C. L., Rawsthorne, T. W., Dodson, R. E., Ackerman, J. M., Rizzo, J., Nudelman, J. L., Brody, J. G. (2011). Food packaging and bisphenol A and bis(2-ethyhexyl) phthalate exposure: Findings from a dietary intervention. Environmental Health Perspectives 119(7):914-920.		
HERO ID:	788268		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	study participants recruitment described, urine sampling described, details in SI
	Metric 2: Analytical Methodology	Medium	"Most limits of detection (LODs) were around 1 ng/mL." SI has detailed extraction, analysis and quantification methods
	Metric 3: Biomarker Selection	High	metabolite
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	U.S. California
	Metric 5: Currency	Medium	2010
	Metric 6: Spatial and Temporal Variability	Medium	n = 10 children and 10 adults, no replicates
	Metric 7: Exposure Scenario	High	urine samples
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	min, median, max reported
	Metric 9: Quality Assurance	High	Samples were analyzed in batches including quality control samples: a procedural blank, one spiked reference sample, and a reference sample in duplicate using laboratory stock urine for inter- and intrabatch comparisons.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination **Medium**

Study Citation:	Shi, W., Wang, X., Hu, G., Hao, Y., Zhang, X., Liu, H., Wei, S., Wang, X., Yu, H. (2011). Bioanalytical and instrumental analysis of thyroid hormone disrupting compounds in water sources along the Yangtze River. Environmental Pollution 159(2):441-448.		
HERO ID:	788334		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	sampling method is appropriate and they discuss sampling equipment, procedures, storage, and study site characteristics
Metric 2:	Analytical Methodology	High	GC-ECD and mass spectrometer; report detection limits; all recoveries >75%
Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Yangtze River in Jiangsu Province, China
Metric 5:	Currency	Medium	2009
Metric 6:	Spatial and Temporal Variability	High	11 sampling sites; 3 samples at each site
Metric 7:	Exposure Scenario	Medium	thyroid disrupting compounds in water sources
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	raw data not reported but provide average concentration at each site and range of concentrations across sites
Metric 9:	Quality Assurance	Medium	included procedural blanks
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	no discussion of limitations, uncertainties, or variation

Overall Quality Determination   Medium

Study Citation:	Bergh, C., Torgrip, R., Emenius, G., Ostman, C. (2011). Organophosphate and phthalate esters in air and settled dust - a multi-location indoor study. Indoor Air 21(1):67-76.		
HERO ID:	788335		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	The study discusses all elements of sampling methods. Sampling sites, and air and dust sampling collection are reported.
Metric 2:	Analytical Methodology	Low	The analytical methodology is described, but the LOD or LOQ are not provided.
Metric 3:	Biomarker Selection	N/A	The study tests the parent chemical in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples were collected at the Stockholm area in Sweden.
Metric 5:	Currency	Low	Sampling date is not reported, the study was published in 2005.
Metric 6:	Spatial and Temporal Variability	High	10 samples were collected per each environment.
Metric 7:	Exposure Scenario	High	"Thirty sampling sites (in 10 private homes, 10 workplaces, and 10 daycare centers, all in the Stockholm area) were selected to represent a number of common indoor environments."
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	Raw results and summary of data are reported in the supporting information.
Metric 9:	Quality Assurance	Low	There is little discussion but can be implied via use of standards.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Variability reported in terms of different scenarios. No discussion of uncertainty.

Overall Quality Determination   **Medium**

Study Citation:	He, H., Hu, G. J., Sun, C., Chen, S. L., Yang, M. N., Li, J., Zhao, Y., Wang, H. (2011). Trace analysis of persistent toxic substances in the main stream of Jiangsu section of the Yangtze River, China. Environmental Science and Pollution Research 18(4):638-648.		
HERO ID:	788371		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	5 main sections, each with 3 sampling sites (left bank, channel line, and right bank); collected at 0.5m below surface; filled glass bottles to top; stored at 4C; extraction within 7 days; samples filtered
Metric 2:	Analytical Methodology	Medium	SPE; GC/MS; MDL 10.0 ng/L and recoveries. MDL reported for group of chemical and not individual.
Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Jiangsu section of Yangtze River, China
Metric 5:	Currency	Medium	September 2004 and January 2005
Metric 6:	Spatial and Temporal Variability	Medium	15 samples; 3 from each of the 5 main stream sections; sampled in September and then in December. Unclear if there are replicates.
Metric 7:	Exposure Scenario	Medium	concentration in Jiangsu section (downstream of whole river) of Yangtze River which is the third longest river in the world; serves as important drinking water source; economically developed and densely populated; however automobile, textile, chemical, and electric production, shipping activity, and domestic sewage - all are not monitored and controlled
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	Table 9 provides the range and mean per section of river; DBP detected in all sampling sites. Individual data not reported, little summary statistics provided.
Metric 9:	Quality Assurance	Medium	No QA section- but recoveries 67.3-110.3% indicating methods were sufficient for this study; for every set of five samples, as blank was run to check for interference and cross-contamination
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	discusses variation between the five main sections; briefly compared results to previous study; compares concentrations in River to other water systems. No limitations reported.

Overall Quality Determination   **Medium**

Study Citation:	Poças, M. F., Oliveira, J. C., Pereira, J. R., Hogg, T. (2010). Consumer exposure to phthalates from paper packaging: an integrated approach. Food Additives & Contaminants: Part A, Chemistry, Analysis, Control, Exposure & Risk Assessment 27(10):1451-1459.		
HERO ID:	788407		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	The sampling methodology is clear and appropriate; however, details such as sampler calibration and sample storage are not provided.
	Metric 2:	Analytical Methodology	High	The analytical methodology is clear, detailed, and appropriate; the LOD is provided.
	Metric 3:	Biomarker Selection	N/A	Study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Portugal.
	Metric 5:	Currency	Medium	Samples were collected in 2009.
	Metric 6:	Spatial and Temporal Variability	High	21 food samples were collected.
	Metric 7:	Exposure Scenario	High	The study is testing for phthalates in food and food packaging samples. This scenario is of interest for the chemical and is well characterized.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw concentrations are provided in Table 3.
	Metric 9:	Quality Assurance	Medium	QA/QC measures are briefly mentioned, including the use of blanks. QA/QC issues were not identified.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No characterization of variability or uncertainty is provided.

Overall Quality Determination   **High**

Study Citation:	Yano, K., Hirosawa, N., Sakamoto, Y., Katayama, H., Moriguchi, T., Asaoka, K. (2005). Phthalate levels in baby milk powders sold in several countries. Bulletin of Environmental Contamination and Toxicology 74(2):373-379.		
HERO ID:	789406		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	sampling described
Metric 2:	Analytical Methodology	Low	no LOD provided, equipment described
Metric 3:	Biomarker Selection	N/A	food
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	12 countries
Metric 5:	Currency	Low	2001-2002
Metric 6:	Spatial and Temporal Variability	Low	n = 1 to 4 samples per country
Metric 7:	Exposure Scenario	High	powdered milk
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	concentrations in bar graphs Figure 2
Metric 9:	Quality Assurance	Low	QA not discussed, not much detail
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   Low

Study Citation:	Mackintosh, C. E., Maldonado, J., Hongwu, J., Hoover, N., Chong, A., Ikonomou, M. G., Gobas, F. A. (2004). Distribution of phthalate esters in a marine aquatic food web: Comparison to polychlorinated biphenyls. Environmental Science & Technology 38(7):2011-2020.		
HERO ID:	789501		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The marine species sampling methodology was described in detail and is scientifically sound.
	Metric 2: Analytical Methodology	Medium	The analytical methods were described. Recoveries were not reported and the authors indicated that the LOD is in the SI. No information on LOQ is provided.
	Metric 3: Biomarker Selection	N/A	The authors analyzed marine species' samples.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Canada
	Metric 5: Currency	Low	The samples were collected in 1999.
	Metric 6: Spatial and Temporal Variability	Low	"9 individual samples of 18 marine species [...] Three samples of each species were collected from each of three sampling stations"
	Metric 7: Exposure Scenario	Low	The data may represent a relevant exposure scenario related to phthalates in marine species in Canada, but the small sample size and missing details about the population of interest limit the results' generalization.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Limited summary statistics were reported.
	Metric 9: Quality Assurance	Low	QA/QC details were included in the SI.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Limited characterization of variability (SD) and uncertainty.

Overall Quality Determination   Low

Study Citation:	Otake, T., Yoshinaga, J., Yanagisawa, Y. (2004). Exposure to phthalate esters from indoor environment. Journal of Exposure Science & Environmental Epidemiology 14(7):524-528.		
HERO ID:	789515		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling methodology is only briefly described, but collection media (charcoal), air flow rate, and air volume sample provided. The study cites another published work for a more complete description.
	Metric 2: Analytical Methodology	Medium	Analytical methodology is only briefly discussed. Table of basic instrumental and analytical conditions were provided. Sampling precision and recovery was assessed.
	Metric 3: Biomarker Selection	N/A	Concentrations were measured in indoor air.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was conducted in Tokyo, Japan
	Metric 5: Currency	Low	Sampling was performed in 2000.
	Metric 6: Spatial and Temporal Variability	Medium	Sampling was performed for 3 consecutive days from a total of 27 homes. The height of sampling from the floor was not specified. It is unclear how many samples per home were collected. Samples for 6 houses were collected in the spring, and samples for the remaining houses were collected in the fall.
	Metric 7: Exposure Scenario	Medium	The stated study objective was to measure concentrations in contemporary Japanese houses. Only 27 houses or apartments were included, all in one city (Tokyo). All sampled homes belonged to staff affiliated with the researchers' university department. Chemical usage in the homes and characteristics of the homes were not really described.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Summary statistics are reported, but missing information includes individual data points and the number of samples per home. Box plots were included, but symbols shown in the plots were not defined.
	Metric 9: Quality Assurance	Medium	The study tested analytical precision and recovery.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Standard deviations were reported. Uncertainties, limitations, and data gaps were not really discussed.

Overall Quality Determination   Medium

Study Citation: Afshari, A., Gunnarsen, L., Clausen, P. A., Hansen, V. (2004). Emission of phthalates from PVC and other materials. Indoor Air 14(2):120-128.
HERO ID: 789522

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The sampling procedure and storage condition were described.
	Metric 2: Analytical Methodology	Medium	GC-MS was used for analysis. LOD was reported - 0.01 ug per tube, estimated as three times the standard deviation of 13 low standards
	Metric 3: Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Denmark
	Metric 5: Currency	Low	Timing of sample collection for monitoring data is not reported, discussed, or referenced. However, publication year of 2003 was used as a proxy for sampling year.
	Metric 6: Spatial and Temporal Variability	High	11 test materials were tested in the chamber, each sample had duplicates.
	Metric 7: Exposure Scenario	High	The data closely represent relevant exposure scenario (scenario/media of interest/source of exposure/product used).
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Concentrations were reported in graphs, no individual data were reported.
	Metric 9: Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	The study compared the results to other studies. Key uncertainties have been identified.

Overall Quality Determination   Medium

Study Citation:	Ma, L. L., Chu, S. G., Xu, X. B. (2003). Organic contamination in the greenhouse soils from Beijing suburbs, China. Journal of Environmental Monitoring 5(5):786-790.		
HERO ID:	789556		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Some information missing- such as the exact locations of the 8 samples and details about the coring cylinder.
	Metric 2: Analytical Methodology	Medium	Key analytical methods reported. LOD reported as a range for group of chemical and not individual.
	Metric 3: Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Beijing, China
	Metric 5: Currency	Low	Data collected in 2001
	Metric 6: Spatial and Temporal Variability	High	8 samples; replicates (this indicates at least 16 were taken but there is no exact number described)
	Metric 7: Exposure Scenario	Medium	Soil exposure is a relevant scenario but there is not enough information about the source of the chemicals.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Raw data not provided. Only range and average provided. Little summary statistics provided.
	Metric 9: Quality Assurance	High	QA section describes analysis of blanks and spiked samples. Materials and sample clean up also described in detail.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Gaps and limitations not characterized. Standard deviations provided but there is no additional discussion of variability.

Overall Quality Determination   Medium

Study Citation:	Vikelsøe, J., Thomsen, M., Carlsen, L. (2002). Phthalates and nonylphenols in profiles of differently dressed soils. Science of the Total Environment 296(1-3):105-116.		
HERO ID:	789658		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling methodology is discussed in the data source and is generally appropriate (i.e., scientifically sound) for the chemical and media of interest, however, one or more pieces of sampling information is not described such as sample duration. The missing information is unlikely to have a substantial impact on results.
	Metric 2: Analytical Methodology	Low	The study discuss extension and improvement of the methods used in the previous study (Vikelsøe et al., 1998); no LOD discussed.
	Metric 3: Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media (soil).
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Roskilde, Denmark
	Metric 5: Currency	Low	Timing of sample collection for monitoring data (1996, 1998) is not consistent with current exposures (>15 years old) that may be expected and likely to have a substantial impact on results.
	Metric 6: Spatial and Temporal Variability	Medium	High samples for a single scenario (n = 20) however, no replicates used.
	Metric 7: Exposure Scenario	Medium	Sludge amended soils.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Supplementary or raw data (i.e., individual data points) are not reported , and therefore summary statistics cannot be reproduced.Provided means only.
	Metric 9: Quality Assurance	Medium	The study applied and documented quality assurance/quality control measures (blanks used, standards described); however, one or more pieces of QA/QC information is not described (storage recoveries). Missing information is unlikely to have a substantial impact on results.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variability and uncertainty is not discussed.

Overall Quality Determination   **Low**

Study Citation:	Suzuki, T., Yaguchi, K., Suzuki, S., Suga, T. (2001). Monitoring of phthalic acid monoesters in river water by solid-phase extraction and GC-MS determination. Environmental Science & Technology 35(18):3757-3763.			
HERO ID:	789731			

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	river water samples collected every month from May to February at six sites (Fig 1); collected in 2L glass containers; samples filtered within 8 h
	Metric 2:	Analytical Methodology	High	SPE; GC/MS; MDLs provided in Table 4; recovery samples
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Tama River in Tokyo, Japan
	Metric 5:	Currency	Low	March 1999 to February 2000
	Metric 6:	Spatial and Temporal Variability	High	six sites, collected every month from March to February; 12 times or 12 samples per site equaling 72 samples total
	Metric 7:	Exposure Scenario	High	concentration in water from Tama River which flows through Tokyo metropolitan area and empties into Tokyo Bay; densely populated area; effluent from sewage plants runs into river
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 4 provides detection times and range per site
	Metric 9:	Quality Assurance	Medium	recoveries measured but not reported for diesters; control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	discusses major problem of controlling blank values (p.3760); discussed variation by study site

Overall Quality Determination   High

Study Citation:	Jang, Y. C., Townsend, T. G. (2001). Occurrence of organic pollutants in recovered soil fines from construction and demolition waste. Waste Management 21(8):703-715.		
HERO ID:	789748		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The authors mentioned using a standard sampling method, (US EPA SW-846 Chapter nine), the authors also report sampling equipment, procedures, storage conditions.
	Metric 2:	Analytical Methodology	High	Authors reported LODs, standard EPA methods were used for analysis and extraction.
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Authors reference visiting and collecting samples from 14 construction and demolition sites in Florida.
	Metric 5:	Currency	Low	no sampling date is provided, but a publication date is available, 2000 so low anyways
	Metric 6:	Spatial and Temporal Variability	High	They collected duplicate samples, a total of >40 samples from different sample sites over a period of time to capture temporal trends.
	Metric 7:	Exposure Scenario	High	The authors described that samples were collected from construction and demolition sites, so they describe the setting.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data is not reported, only the ranges of concentrations, number of samples, detection frequencies, and there is no reporting of measure of variation.
	Metric 9:	Quality Assurance	Medium	Authors report collecting field blanks and analyzing lab blanks. The authors mentioned recoveries however it was related to the leaching experiments. There were no mentions of recoveries for extraction analysis.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No standard deviation is reported and there is no discussion on limitations or uncertainties.

Overall Quality Determination   Medium

Study Citation:	Onodera, S., Chatkittikunrong, W., Saito, K., Phongbetchara, R., Tabucanon, M. (1987). Characterization and determination of lipophilic hydrocarbons in the Chao Phraya, Bang Pakong and Tha-Chin rivers and the Upper Gulf of Thailand. Journal of Chromatography A 392(0):295-308.		
HERO ID:	790155		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	sampling procedure detailed and appropriate
	Metric 2: Analytical Methodology	High	recoveries >70%, analytical method of GS-MS is appropriate, mention detection limit in text on pg 299
	Metric 3: Biomarker Selection	N/A	Measured parent chemical in surface water
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Chao Phraya, Bang Pakong and Tha-Chin rivers and the Upper Gulf of Thailand
	Metric 5: Currency	Low	1983, 1984
	Metric 6: Spatial and Temporal Variability	Medium	17 samples, no replicates
	Metric 7: Exposure Scenario	High	known pollution, specifically crude oil and petroleum products, in the waters due to the development of industries and population density
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	raw data for chemical concentrations but no summary stats, info about replicates, variation, etc.
	Metric 9: Quality Assurance	Low	used procedural blanks but no discussion of quality control
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	briefly mention that the study was limited in scope but no discussion about uncertainty or variance

Overall Quality Determination   Medium

Study Citation:	Grigoriadou, A., Schwarzbauer, J., Georgakopoulos, A. (2008). Molecular indicators for pollution source identification in marine and terrestrial water of the industrial area of Kavala City, North Greece. Environmental Pollution 151(1):231-242.		
HERO ID:	792188		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	The study has a clear and appropriate description of sampling methodology.
Metric 2:	Analytical Methodology	High	The study provides detailed description of analytical method and instruments, and states detection limits.
Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media (surface water).
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Kavala, Greece
Metric 5:	Currency	Low	Timing of sample collection for monitoring data is not consistent with when current exposures (2003; >15 years old) may be expected and likely to have a substantial impact on results.
Metric 6:	Spatial and Temporal Variability	High	Eight terrestrial and four marine water samples.
Metric 7:	Exposure Scenario	High	Water samples collected from industrial section of Kavala to determine the occurrence of anthropogenic contaminants.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	The study provides concentrations at each site but summary stats and measure of variation is not provided.
Metric 9:	Quality Assurance	Low	There was no thorough implementation of quality controls.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	There is no discussion of variability, limitations, or uncertainty.

Overall Quality Determination   Medium

Study Citation:	Teitelbaum, S. L., Britton, J. A., Calafat, A. M., Ye, X., Silva, M. J., Reidy, J. A., Galvez, M. P., Brenner, B. L., Wolff, M. S. (2008). Temporal variability in urinary concentrations of phthalate metabolites, phytoestrogens and phenols among minority children in the United States. Environmental Research 106(2):257-269.		
HERO ID:	792230		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	epi enrollment and sampling described. Study was approved by the Institutional Review Boards of Mount Sinai School of Medicine and the CDC. No description of sampling collection equipment
	Metric 2: Analytical Methodology	High	LOD in table 1. Samples were analyzed at the National Center for Environmental Health of the Centers for Disease Control and Prevention (CDC). CDC laboratory is certified by the Health Care Financing Administration
	Metric 3: Biomarker Selection	High	metabolite
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	U.S. NYC
	Metric 5: Currency	Low	2004
	Metric 6: Spatial and Temporal Variability	Medium	n = 24, no replicates
	Metric 7: Exposure Scenario	High	urine, human biomonitoring
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	tertiles provided
	Metric 9: Quality Assurance	Medium	all analytical methods, standard quality control (QC) and reagent blank samples were included in each analytical batch along with the unknown samples. No sampling blanks to ensure no phthalate contamination during sampling.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	temporal variability discussed

Overall Quality Determination   Medium

Study Citation:		Xia, X., Yang, L., Bu, Q., Liu, R. (2011). Levels, distribution, and health risk of phthalate esters in urban soils of Beijing, China. Journal of Environmental Quality 40(5):1643-1651.	
HERO ID:		792359	

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Detailed information of sample collection and pretreatment in page 2
	Metric 2:	Analytical Methodology	High	MDL reported and complete analytical method described.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in soil samples
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Beijing, China
	Metric 5:	Currency	Medium	Samples collected in 2008
	Metric 6:	Spatial and Temporal Variability	Medium	8 samples were collected in BU, 9 samples in CL, 9samples in CU, 12 samples in LA, and 12 samples inRE
	Metric 7:	Exposure Scenario	High	Urban soil from Beijing.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Results reported as min, max, mean, SD, median and GM. No replicates (Table 1)
	Metric 9:	Quality Assurance	High	Key QA reported. Recoveries above 70%. For every 10 field samples, a method blank (diatomite), a spiked blank (diatomite spiked with standards), a matrix spike (pre-extracted soil spiked with standards), and a procedural blank (pre-extracted soil) were processed; duplicatedsamples were performed simultaneously.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported. Variability reported as SD

Overall Quality Determination   High

Study Citation:	Martí, N., Aguado, D., Segovia-Martínez, L., Bouzas, A., Seco, A. (2011). Occurrence of priority pollutants in WWTP effluents and Mediterranean coastal waters of Spain. Marine Pollution Bulletin 62(3):615-625.		
HERO ID:	1002160		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling procedures were well described- some information missing such as equipment.
	Metric 2:	Analytical Methodology	High	Analytical method (GC-FID or GC-ECD) was used. LOD was reported for each of the pollutant.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Spain
	Metric 5:	Currency	Medium	Sampling took place from 2008 to 2009.
	Metric 6:	Spatial and Temporal Variability	Medium	160 surface water samples were analyzed. 84 wastewater effluent samples were analyzed. No replicates.
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenario (surface water/wastewater).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Supplementary or individual data points were not reported.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study has limited characterization of variability. No limitations reported.

Overall Quality Determination   Medium

Study Citation:	Mo, C. H., Cai, Q. Y., Li, Y. H., Zeng, Q. Y. (2008). Occurrence of priority organic pollutants in the fertilizers, China. Journal of Hazardous Materials 152(3):1208-1213.		
HERO ID:	1003896		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	The sampling procedures were not reported. The study only mentioned they collected 22 samples from widely-used fertilizers in China from different factories/companies. It is unclear how they chose those fertilizers or how they selected the factories to obtain the samples. Storage conditions and storage duration time was not reported but they referenced another paper in describing precautions taken during sampling.
	Metric 2: Analytical Methodology	Medium	LODs and recoveries were reported by authors. They used a modified standard EPA method for extraction and analysis. Authors did not report any instrument calibration.
	Metric 3: Biomarker Selection	N/A	Study measured parent compounds in fertilizers.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Authors collected samples from China
	Metric 5: Currency	Low	No sampling data reported, but the publication date is 2007.
	Metric 6: Spatial and Temporal Variability	Medium	Study reports collecting 22 different fertilizers across China. I am assuming this is 22 different samples. No replicates were reportedly collected. Timing on data collection was not reported so it is unclear the temporal nature of the study.
	Metric 7: Exposure Scenario	Medium	Study measured concentration of key chemicals in a consumer product, fertilizer. The actual scenario of use was not described, the authors looked at chemical concentration in the product.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data reported, but missing some summary statistics.
	Metric 9: Quality Assurance	Low	The authors reported, "The detailed quantification method, the details of the quality assurance/quality control(QA/QC) have been presented elsewhere," but they did not mention collecting and analyzing control samples.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	No characterization of variance and little discussion about gaps, uncertainties, and limitations.

Overall Quality Determination   **Low**

Study Citation:	Langer, S., Weschler, C. J., Fischer, A., Bekö, G., Toftum, J., Clausen, G. (2010). Phthalate and PAH concentrations in dust collected from Danish homes and daycare centers. Atmospheric Environment 44(19):2294-2301.
HERO ID:	1007791

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling procedure, equipment, matrix characters are clearly described and detailed description was provided in the supplementary materials.
	Metric 2:	Analytical Methodology	High	GC/MS was used to analyze the dust samples and recoveries were reported. LOQs were reported in Table S1.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Odense, Denmark
	Metric 5:	Currency	Medium	The dust samples were collected in 2008.
	Metric 6:	Spatial and Temporal Variability	High	The study has large sample size and can capture the variability of environmental contamination in population and scenario.
	Metric 7:	Exposure Scenario	Medium	The data likely represent the relevant exposure scenario.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Supplementary or raw data or individual data points are not reported.
	Metric 9:	Quality Assurance	High	Quality assurance was conducted. Recoveries for samples were reported and all above 90%.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	The study has a robust comparison to other publications and discussion of limitations. It provides evidence for the consistency of the data.

Overall Quality Determination   High

Study Citation:	Kotowska, U., Bieganska, K., Isidorov, V. A. (2012). Screening of trace organic compounds in municipal wastewater by gas chromatography-mass spectrometry. Polish Journal of Environmental Studies 21(1):129-138.		
HERO ID:	1106739		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Insufficient description of sampling methodology. Missing details on sampling equipment and procedures
	Metric 2: Analytical Methodology	Low	No LOD or LOQ reported
	Metric 3: Biomarker Selection	N/A	Study tested for parent chemical in wastewater.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Poland
	Metric 5: Currency	Low	No date of sampling reported, but publication date (2011) was available
	Metric 6: Spatial and Temporal Variability	Low	The only information authors provided about sample size is "Average daily samples of influent and effluent wastewater were taken five times between February and November." It is unclear what the total number of samples is. Ten samples between Feb and Nov, or 10 samples per month, or somewhere in between?
	Metric 7: Exposure Scenario	High	Discharge of contaminated municipal wastewater to surface water
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Raw data unavailable. Table 1 appears to provide a range or mean of concentrations and SD for influent and effluent sewage. This is an assumption because of the +/- symbol. Note that the column heading says "Content, [%]" so it's also possible that these are frequency of detection and the SD for them. Metric is being scored as low because of the guesswork.
	Metric 9: Quality Assurance	Medium	no recoveries or blanks reported
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Limited characterization of variability and no uncertainties, data gaps, or limitations reported

Overall Quality Determination   **Medium**

Dibutyl Phthalate | Monitoring | HERO ID: 1229018

Study Citation:	Wang, G., Kawamura, K., Lee, S., Ho, K., Cao, J. (2006). Molecular, seasonal, and spatial distributions of organic aerosols from fourteen Chinese cities. Environmental Science & Technology 40(15):4619-4625.		
HERO ID:	1229018		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling methodology is scientifically sound and comprehensive. Site, equipment, storage, and methods described. Missing instrument calibration.
Metric 2:	Analytical Methodology	Low	LOQ, LOD not reported. Extraction methods and analytical instrument described (GC-MS). Missing instrument calibration. Recovery samples reported.
Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental sample.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	China.
Metric 5:	Currency	Low	Samples from 2003
Metric 6:	Spatial and Temporal Variability	Medium	Two 24 h samples in each city (14) in two seasons. 56 samples in total. No replicates.
Metric 7:	Exposure Scenario	Medium	Likely to represent exposure scenario but there isn't sufficient description about population that would be exposed.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Individual data points are provided in SI. Average concentrations reported but little summary statistics.
Metric 9:	Quality Assurance	Medium	QA/QC was conducted but lacks thorough description. Average recoveries of all the standards were better than 80%. Collected field blanks.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Variation in cities and seasons analyzed. SD reported in article and S1. No discussion of uncertainties, limitations or data gaps.

Overall Quality Determination   Medium

Study Citation:		Schlumpf, M., Kypke, K., Wittassek, M., Angerer, J., Mascher, H., Mascher, D., Vökt, C., Birchler, M., Lichtensteiger, W. (2010). Exposure patterns of UV filters, fragrances, parabens, phthalates, organochlor pesticides, PBDEs, and PCBs in human milk: correlation of UV filters with use of cosmetics. Chemosphere 81(10):1171-1183.		
HERO ID:		1249442		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling methodology discussed extensively in terms of sampling equipment, procedures, storage, and study site (participants' homes). Insufficient information on duration of sample storage time prior to sample analysis.
	Metric 2:	Analytical Methodology	Medium	Extraction methodology, analytical instrumentation (phthalates: LC/LC-MS/MS), and LOD only as a range for phthalates. Analytic methods noted as following modified referenced procedures. Insufficient information on instrument calibration, recovery rates for chemicals of interest.
	Metric 3:	Biomarker Selection	High	Sampling for metabolite of chemical of interest.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Switzerland
	Metric 5:	Currency	Medium	Phthalates sampling in 2006.
	Metric 6:	Spatial and Temporal Variability	Medium	Daily breast milk samples pooled and analyzed for n=20 samples for DEHP, BBP, DBP, and DIBP, n=6 DINP samples, however non-statistical sampling approach.
	Metric 7:	Exposure Scenario	Medium	Breast milk samples from women with insufficient information on profession/occupation (although present and past profession data collected within survey, authors noted it as not sufficiently detailed for use within analysis). Lack of field blank/exposure controls.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Breast milk sample lipid-adjusted concentration summary statistics reported as means with SD, median, 95th percentile, and range for year of sampling with number of samples analyzed and number of positive detected samples. Location of sampling described as at home of participant. Insufficient information on raw data sampling results.
	Metric 9:	Quality Assurance	Medium	Quality assurance measures in sampling procedures described in terms of trained personnel assistance in breast milk sampling, training of mothers in procedures and adherence to procedures insuring lack of sample contamination. Insufficient information on correction for blank concentrations, lack of baseline/pre-exposure sampling.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Sampling variability characterized and ranges of exposures for each chemical presented. Authors note most reported concentrations for DBP notably lower compared to previous European publications, however discussion of study limitations/uncertainties lacking.

Overall Quality Determination   Medium

Study Citation:	Bergh, C., Aberg, K. M., Svartengren, M., Emenius, G., Oestman, C. (2011). Organophosphate and phthalate esters in indoor air: a comparison between multi-storey buildings with high and low prevalence of sick building symptoms. Journal of Environmental Monitoring 13(7 (Jul 2011)):2001-2009.		
HERO ID:	1249459		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling methodology for indoor air was sound and sufficiently detailed. Duration of sample storage was not detailed.
	Metric 2: Analytical Methodology	High	Analytical methodology was sound and sufficiently detailed. Method detection limits were reported within Table 2.
	Metric 3: Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	This study collected indoor air samples within multistory buildings in Stockholm, Sweden participating in the Healthy Sustainable Houses study in Stockholm (3H).
	Metric 5: Currency	Low	Sample collection dates were not provided, however study publication date was 2011.
	Metric 6: Spatial and Temporal Variability	High	Duplicate 24-hour active air samples were collected from two to four apartments (a total of 169 apartments) in each of 45 multistory buildings.
	Metric 7: Exposure Scenario	High	The exposure scenario was well characterized within this study of indoor air within apartments of multistory buildings. Identification of the potential sources of indoor air contaminants was one of the study's main objectives, and a robust discussion of potential sources was presented.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data and detection frequency was not presented. Summary statistics were presented and included mean, median and minimum and maximum concentration levels.
	Metric 9: Quality Assurance	Medium	Quality assurance (QA) methods, such as replicate sampling and use of field blanks, were reported and although QA details were not reported in detail, standard procedures were followed. Authors referenced another study for additional sampling and analytic details (C. Bergh, R. Torgrip and C. € Ostman, Rapid Commun. MassSpectrom., 2010, 24, 2859–2867).
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability was described in sampling summary statistics. Median concentration levels were compared with results from previous studies within tables, however a robust discussion of potential study limitations is lacking.

Overall Quality Determination   **Medium**

Study Citation:	Salapasidou, M., Samara, C., Voutsa, D. (2011). Endocrine disrupting compounds in the atmosphere of the urban area of Thessaloniki, Greece. Atmospheric Environment 45(22):3720-3729.		
HERO ID:	1249468		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling equipment and methods are described in sufficient detail and are scientifically sound.
Metric 2:	Analytical Methodology	Low	Analytical instrumentation and methods are described in sufficient detail and are scientifically sound. However, neither LOD nor LOQ is reported.
Metric 3:	Biomarker Selection	N/A	This study is testing for the parent chemical of interest in an environmental medium.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Greece
Metric 5:	Currency	Medium	2007
Metric 6:	Spatial and Temporal Variability	High	24-hour air samples from two sites (10 at each site)
Metric 7:	Exposure Scenario	High	Each air sampling site was characterized as either urban-traffic or urban-industrial. Pertinent meteorological data were also incorporated into analysis.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data are not reported; summary statistics include frequency of detection, mean, standard deviation, median, minimum, and maximum concentration at each site.
Metric 9:	Quality Assurance	High	Authors followed criteria concerning the performance of analytical methods as reported in Commission Decision 2002/657/EC as well as quantification by internal standard. Matrix spiked recoveries were within acceptable ranges. For phthalates, blank values were high but consistent, and mean blank values were subtracted from sample results.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Standard deviation is reported and indicates high variability at each sampling site. There is some discussion of limitations or sources of uncertainty in the methodology.

Overall Quality Determination   High

Study Citation:	Björklund, K., Strömvall, A. M., Malmqvist, P. A. (2011). Screening of organic contaminants in urban snow. Water Science and Technology 64(1):206-213.		
HERO ID:	1249477		

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Collected roadside snow few days after snowfall at 3 sites (Karra, Garda, Jarnbrott) and sample snow 3 deposits (Gardamotet, Heden, Valhamra) at end of winter (Table 1); urban background sample collected in Delsjon forest area; collected in glass containers or stainless-steel containers; thawed at room temperature before extraction.
	Metric 2:	Analytical Methodology	Low	LL extracted with n-hexane; GC-MS; DL 0.1-2.0 ug/L; recoveries not mentioned. LOD not reported.
	Metric 3:	Biomarker Selection	N/A	Parent compound in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Gothenburg, Sweden.
	Metric 5:	Currency	Medium	2009 and 2010.
	Metric 6:	Spatial and Temporal Variability	Medium	11 samples; samples 2/5/2009 and 1/26, 3/5, 3/30 2010 (Table 1); not clear if replicate samples were taken at same time.
	Metric 7:	Exposure Scenario	High	Contamination in urban snow.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Fig 2d shows concentration by sampling site and date; DF, ranges, max provided in text p.211- hard to see values. Individual data not reported, little summary statistics.
	Metric 9:	Quality Assurance	Medium	No individual QC section. No recoveries mentioned; procedural blanks used.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Discussed variability between sites and time; compared results to other studies. Some limitations discussed.

Overall Quality Determination   Medium

Study Citation:	Braun, J. M., Smith, K. W., Williams, P. L., Calafat, A. M., Berry, K., Ehrlich, S., Hauser, R. (2012). Variability of urinary phthalate metabolite and bisphenol A concentrations before and during pregnancy. Environmental Health Perspectives 120(5):739-745.		
HERO ID:	1249501		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	IRB approval by Harvard and CDC
	Metric 2: Analytical Methodology	Medium	LOD range provided; previously described methods (Silva et al. 2007; Ye et al. 2008)
	Metric 3: Biomarker Selection	High	metabolites
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	U.S.
	Metric 5: Currency	Medium	2004-2009
	Metric 6: Spatial and Temporal Variability	Medium	n = 137 women, no replicates
	Metric 7: Exposure Scenario	High	urine
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	GM, median, 25th and 75th percentile
	Metric 9: Quality Assurance	Medium	previously described quality procedures (Silva et al. 2007; Ye et al. 2008)
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	variability analyses conducted

Overall Quality Determination   High

Dibutyl Phthalate

Study Citation:	Reyes-Contreras, C., Matamoros, V., Ruiz, I., Soto, M., Bayona, J. M. (2011). Evaluation of PPCPs removal in a combined anaerobic digester-constructed wetland pilot plant treating urban wastewater. Chemosphere 84(9):1200-1207.		
HERO ID:	1249709		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Methodology description is brief. No mention of how sampling equipment was cleaned before sampling.
	Metric 2:	Analytical Methodology	High	GC-MS method described and LOD provided.
	Metric 3:	Biomarker Selection	N/A	Chemical measured in wastewater
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Galicia, Spain
	Metric 5:	Currency	Medium	2008-2009
	Metric 6:	Spatial and Temporal Variability	Medium	24 water samples collected for each campaign. 3 sludge samples per campaign. No indication of replicate sampling or analysis.
	Metric 7:	Exposure Scenario	Medium	Sampling was at experimental pilot plant and potential exposure scenario did not seem directly relevant to a population.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data provided. Summary statistics used for presenting results.
	Metric 9:	Quality Assurance	Low	Very little description of QA/QC methods. Surrogate spiking and recovery mentioned but numbers not reported. Procedural blanks briefly mentioned but other controls were not clear.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Little discussion of variability of results and limitations of study.

Overall Quality Determination — Medium

Study Citation:	Krotz, S. P., Carson, S. A., Tomey, C., Buster, J. E. (2012). Phthalates and bisphenol do not accumulate in human follicular fluid. Journal of Assisted Reproduction and Genetics 29(8):773-777.		
HERO ID:	1249856		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	IRB approval
Metric 2:	Analytical Methodology	Low	AXYS method MLA-059 - previously described; equipment described; no LOD
Metric 3:	Biomarker Selection	Critically Deficient	metabolites
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	U.S.
Metric 5:	Currency	Medium	2008
Metric 6:	Spatial and Temporal Variability	Medium	n = 5, no replicates
Metric 7:	Exposure Scenario	High	human follicular fluid
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	raw data, mean and SD in Table 1
Metric 9:	Quality Assurance	Low	QA not described, no obvious concerns
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not described, no obvious concerns

Overall Quality Determination   Uninformative

| | | Study Citation: | Shi, W., Hu, X., Zhang, F., Hu, G., Hao, Y., Zhang, X., Liu, H., Wei, S., Wang, X., Giesy, J. P., Yu, H. (2012). Occurrence of thyroid hormone activities in drinking water from eastern China: Contributions of phthalate esters. Environmental Science & Technology 46(3):1811-1818. |
| | | HERO ID: | 1249969 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Described sampling sites, equipment, preparation, storage.
	Metric 2:	Analytical Methodology	High	Described analytical instrumentation extraction method; report limit of quantification; recoveries all > 90%.
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media (water).
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Yangtze River Delta in eastern China.
	Metric 5:	Currency	Medium	2010.
	Metric 6:	Spatial and Temporal Variability	High	5 sampling sites, 3 types of water sources at each site, n = 3 per sample type (so 45 samples total).
	Metric 7:	Exposure Scenario	Medium	Measuring phthalate esters in water sources.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data for individual samples but thorough summary of concentrations; provides averages and standard deviations.
	Metric 9:	Quality Assurance	Medium	Used blanks and standards.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Provide standard deviations and measures of variability but no discussion of limitations/uncertainty.

Overall Quality Determination   **High**

Study Citation:	Teitelbaum, S. L., Mervish, N., Moshier, E. L., Vangeepuram, N., Galvez, M. P., Calafat, A. M., Silva, M. J., Brenner, B. L., Wolff, M. S. (2012). Associations between phthalate metabolite urinary concentrations and body size measures in New York City children. Environmental Research 112:186-193.		
HERO ID:	1249979		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	IRB from Mount Sinai School of Medicine and CDC.
	Metric 2: Analytical Methodology	Low	CDC laboratory is certified by the Health Care Financing Administration. LOD not provided.
	Metric 3: Biomarker Selection	High	metabolites
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	U.S.
	Metric 5: Currency	Medium	2004-2007
	Metric 6: Spatial and Temporal Variability	Medium	girls n=299; boys n=80, no replicates
	Metric 7: Exposure Scenario	High	urine
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	median provided
	Metric 9: Quality Assurance	Medium	Quality control samples were evaluated according to standard statistical probability rules (www.westgard.com).
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   Medium

Study Citation:	Marttinen, S. K., Kettunen, R. H., Rintala, J. A. (2003). Occurrence and removal of organic pollutants in sewages and landfill leachates. Science of the Total Environment 301(1-3):1-12.		
HERO ID:	1249997		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Key sampling methods reported in detail
	Metric 2: Analytical Methodology	Medium	Recovery samples not reported. LOQ reported in text on pg 4 as 1ug/L for phthalates.
	Metric 3: Biomarker Selection	N/A	Measured parent chemicals in stormwater and landfill leachate
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Finland
	Metric 5: Currency	Low	Studies conducted between 1998 and 2001
	Metric 6: Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7: Exposure Scenario	High	Phthalates levels measured in the effluent of sewage treatment plants, sludges, and landfill leachates
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	raw data reported in the manuscript but missing most summary statistics
	Metric 9: Quality Assurance	Low	Limited QA/QC reported
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Few gaps and limitations reported and limited characterization of variance

Overall Quality Determination   Medium

Study Citation:	Zhang, L., Dong, L., Ren, L., Shi, S., Zhou, L., Zhang, T., Huang, Y. (2012). Concentration and source identification of polycyclic aromatic hydrocarbons and phthalic acid esters in the surface water of the Yangtze River Delta, China. Journal of Environmental Sciences 24(2):335-342.		
HERO ID:	1250079		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	surface water collected in June 2010 from 14 sites in urbanized Yangtze River Delta region; from top layer (0-40 cm) using stainless steel barrel; collected in brown glass containers; transported and processed immediately. No transport temperature or conditions noted.
	Metric 2: Analytical Methodology	High	liquid-liquid extraction with methylene chloride; GC/MS; MDL around 2.0 ng/L for the six PAEs; recovery samples
	Metric 3: Biomarker Selection	N/A	Surface water sampling
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Yangtze River Delta, China
	Metric 5: Currency	Medium	June 2010
	Metric 6: Spatial and Temporal Variability	Medium	14 samples (Fig 1 and Table 1) from 8 sites in Suzhou City, 3 sites in Wuxi City, an 3 in Nantong City; no replicate samples discussed; sampled in a single month
	Metric 7: Exposure Scenario	High	surface water of rapidly urbanized and economic development Yangtze River Delta region
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	Table 2 provides concentration at the different sampling sites (raw data); DF at the 14 sample locations provided in text (p. 338)
	Metric 9: Quality Assurance	High	recoveries varied from 86.3-93.7 for water samples (p. 337); field blanks and spiked blanks used; concentrations corrected by field blanks data but not further corrected by surrogate recovery data
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	compared concentrations by the different sampling locations and to previous studies and locations (Table 3)

Overall Quality Determination   High

Study Citation: Gu, Z., Feng, J., Han, W., Wu, M., Fu, J., Sheng, G. (2010). Characteristics of organic matter in PM2.5 from an e-waste dismantling area in Taizhou, China. Chemosphere 80(7):800-806.

HERO ID: 1256038

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Scientifically sound, well described methods. Some information missing such as instrument calibration.
	Metric 2:	Analytical Methodology	Low	Analytical methods described. Missing LOQ/LOD
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Taizhou, China
	Metric 5:	Currency	Medium	Samples collected in 2006 and 2007
	Metric 6:	Spatial and Temporal Variability	Medium	6-7 samples per scenario, in duplicates
	Metric 7:	Exposure Scenario	High	Source of exposure is identified, microenvironment is described
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not provided, only summary statistics
	Metric 9:	Quality Assurance	High	QA details are provided e.g. field and lab control samples.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Key uncertainties, limitations and data gaps not discussed. Seasonal variability and types of waste analyzed.

Overall Quality Determination   Medium

Study Citation:	Tang, C. Y., Li, A. Q., Guan, Y. B., Li, Y., Cheng, X. M., Li, P., Li, S. Q., Luo, Y. X., Huang, Q., Chen, H. Y., Cui, L. X. (2012). Influence of polluted SY river on child growth and sex hormones. Biomedical and Environmental Sciences 25(3):291-296.		
HERO ID:	1256742		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	sampling methodology only briefly discussed; describe sampling site but no information about sampling equipment or protocol- referenced in another study.
	Metric 2:	Analytical Methodology	Low	No information about analytical methods except "indicators were tested in accordance with the monitoring and analytic methods for surface water and wastewater"- referenced in another study
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	Low	published in 2011
	Metric 6:	Spatial and Temporal Variability	High	9 river samples and 15 drinking water samples, plus use of replicates
	Metric 7:	Exposure Scenario	High	describe source of exposure (wastewater flows into the river without any sewage disposal; it's one of the most polluted rivers in the Huai River Basin; domestic sewage, industrial effluents, and agricultural pollutants have been dumped in the river due to industrialization and urbanization
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	provide summary statistics with average concentration and standard deviation, but no raw data presented
	Metric 9:	Quality Assurance	Low	Quality assurance/control techniques and results were not directly discussed
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	provide standard deviation; used ANOVA and t tests; discuss some limitations but in the context of children's hormones not water pollutants

Overall Quality Determination   **Medium**

Study Citation: Deleon, I. R., Byrne, C. J., Peuler, E. A., Antoine, S. R., Schaeffer, J., Murphy, R. C. (1986). Trace organic and heavy metal pollutants in the Mississippi River USA. Chemosphere 15(6):795-805.

HERO ID: 1267509

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling method was described in details, including equipment, storage, and study site characteristics.
	Metric 2:	Analytical Methodology	Low	GC/MS was used for the analysis. LOQ or reporting limits were not reported.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Mississippi River
	Metric 5:	Currency	Low	Sampling took place in summer of 1984.
	Metric 6:	Spatial and Temporal Variability	Medium	Sampling took place at 11 stations along the Mississippi River. Only few samples had replicates.
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenario (surface water).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Individual data were provided in the main article but a lot of summary statistics are missing.
	Metric 9:	Quality Assurance	Low	Quality assurance was not directly discussed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study has limited discussion of key uncertainties, limitations, and data gaps. There is variation in the sites sampled along the river.

Overall Quality Determination   Medium

Study Citation:	Wilkie, P. J., Hatzimihalis, G., Koutoufides, P., Connor, M. A. (1996). The contribution of domestic sources to levels of key organic and inorganic pollutants in sewage: The case of Melbourne, Australia. Water Science and Technology 34(3-4):63-70.		
HERO ID:	1268223		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	NATA approved sampling protocols; discussed by run in Sampling Program (p. 67-68); equipment not defined
	Metric 2: Analytical Methodology	Low	NATA approved analytical procedures; no other discussion on analytical methodology; LOD/LO not provided
	Metric 3: Biomarker Selection	N/A	Measured parent compounds in sewage
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Melbourne, Australia
	Metric 5: Currency	Low	1994
	Metric 6: Spatial and Temporal Variability	Medium	8 sites; 7 separate sampling runs (March, June, Aug, Aug, Nov, Nov, December - 1994); 60 samples total. Duplicates collected for some sites but on different runs.
	Metric 7: Exposure Scenario	High	concentrations in sewage from range of residential areas
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Table 3 provides concentration mean, range, std, and outliers in domestic sewage as well as mean conc in domestic water supply and mean in treated plant influents. No raw data.
	Metric 9: Quality Assurance	Low	QA/QC not discussed but implied by use of standard protocols
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	briefly discusses variability between results, comparison with other cities, and time-related trends. Little characterization of limitations, gaps, and uncertainties

Overall Quality Determination   Medium

Study Citation:	PFAUDLER CO, (1985). Comments to reports of groundwater contamination at Pfaudler plant site with attached hydrogeologic report.		
HERO ID:	1269532		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	The sampling methodology is described in the field investigation section
Metric 2:	Analytical Methodology	Medium	LOD is not reported, analytical methodology described in table 3
Metric 3:	Biomarker Selection	N/A	DBP in groundwater
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Wheatfield, N.Y.
Metric 5:	Currency	Low	1984
Metric 6:	Spatial and Temporal Variability	Medium	10 samples , sample triplicates
Metric 7:	Exposure Scenario	High	Ground water contamination from a graphite plant
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Table 3, VI and XI presents summary of data, but there is not report on the statistics analysis
Metric 9:	Quality Assurance	High	QA parameter presented in table XI
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	No information on variability or key limitations

Overall Quality Determination   Medium

Study Citation: Burgess & Niple, (1981). Chemical and biological sampling program on Scippo Creek. 870002032:#86-870002032.
HERO ID: 1269709

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	The sampling procedure was generally described, lacking important information.
	Metric 2: Analytical Methodology	Medium	GC/MS was used for analysis. LOQ was reported to be less than 0.01 ug/L. No information on other parameters like extraction method.
	Metric 3: Biomarker Selection	N/A	Measured parent chemicals in creek
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Scippo Creek, Ohio
	Metric 5: Currency	Low	Sampling took place in July 1980.
	Metric 6: Spatial and Temporal Variability	Low	Sampling size was not clearly provided, but at least 3 stations were reported in the study.
	Metric 7: Exposure Scenario	High	The data represents a relevant exposure scenario with the chemicals' possible harm to aquatic life.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual data for the stations reported were available for some of the stations, but lacked standard deviation and a few other important summary statistics.
	Metric 9: Quality Assurance	Low	No quality assurance measure was directly provided, but can be implied based on the study.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	The study has limited discussion of key uncertainties, limitations, and data gap. No characterization of variance

Overall Quality Determination   Low

Study Citation:	AT&T, (1990). Letter from AT{\&}T to USEPA submitting enclosed initial submission concerning the preliminary soil contamination study with attachments.		
HERO ID:	1270143		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Critically Deficient	Sampling methodology not reported
Metric 2:	Analytical Methodology	High	Methodology summary reported in page 7
Metric 3:	Biomarker Selection	N/A	Parent chemical in soils
Domain 2: Representativeness			
Metric 4:	Geographic Area	Critically Deficient	Geographic location not reported
Metric 5:	Currency	Low	Samples collected in 1990
Metric 6:	Spatial and Temporal Variability	Low	4 samples
Metric 7:	Exposure Scenario	Critically Deficient	Exposure scenario not reported
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data reported in page 24
Metric 9:	Quality Assurance	High	The study used standardized EPA methods
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Critically Deficient	Variability and uncertainty can't be assessed

Overall Quality Determination   Uninformative

Study Citation:	SUNY, (2009). Concentration of phthalate in dorm rooms and its association with asthma and allergy. 2:1012-1020.		
HERO ID:	1312101		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling methodology briefly described and appropriate, missing information on blanks, and cross contamination care during sample
	Metric 2:	Analytical Methodology	Low	very limited description, no limits of detection, QC, blanks, recoveries
	Metric 3:	Biomarker Selection	N/A	Dust samples, biomarker not needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	Medium	2007
	Metric 6:	Spatial and Temporal Variability	High	175 dust samples
	Metric 7:	Exposure Scenario	High	College dorms
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Some stats in Figure 1 and Table 2 median
	Metric 9:	Quality Assurance	Low	Analytical not described or reported, did have sampling controls, but unknown how these were collected and assessed
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	some discussion on the variability, but without the QC and details of sampling is tough to know if discussion is correct

Overall Quality Determination   **Low**

| Study Citation: | Harada, K., Hara, K., Wei, C. N., Ohmori, S., Matsushita, O., Ueda, A. (2007). Case study of volatile organic compounds in indoor air of a house before and after repair where sick building syndrome occurred. International Journal of Immunopathology and Pharmacology 20(2 Suppl 2):69-74. |
| **HERO ID:** | 1313640 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Not all sample methods reported, including sample storage conditions and calibration of the sampler
	Metric 2:	Analytical Methodology	Low	Analytical methods described- but LOD nor LOQ reported
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Japan
	Metric 5:	Currency	Low	Data collected in 2001
	Metric 6:	Spatial and Temporal Variability	Low	2 samples- before and after remodeling. No duplicates.
	Metric 7:	Exposure Scenario	High	Indoor air quality from renovation.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Concentrations given before and after remodeling. Little summary statistics given.
	Metric 9:	Quality Assurance	Low	no QA/QC reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	No limitations reported. The study measured different rooms and temperatures.

Overall Quality Determination   Medium

Dibutyl Phthalate

Study Citation: Blanchard, M., Teil, M. J., Dargnat, C., Alliot, F., Chevreuil, M. (2013). Assessment of adult human exposure to phthalate esters in the urban centre of Paris (France). Bulletin of Environmental Contamination and Toxicology 90(1):91-96.

HERO ID: 1315297

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Most details provided- the study reported to use reference 506 to 606 (US EPA) as the guidance methods to perform the sampling. The food intake calculation was not provided, however.
	Metric 2:	Analytical Methodology	High	HRGC was used for the analysis, detection limits were reported for each chemical.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Urban district in Paris, France
	Metric 5:	Currency	Medium	2006-2008
	Metric 6:	Spatial and Temporal Variability	Medium	tap water (n = 3) and bottled water (plain springwater n = 3, plain mineral water n = 8 and sparklingmineral water n = 4), food (4 items in lunch tray over 4 days), air (6 sampling period of 10 days). Unclear if replicates.
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenario (i.e., the urban environment).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Mean concentrations were provided but lacked summary statistics. Individual data were not provided.
	Metric 9:	Quality Assurance	Medium	No discussed directly- Recoveries were reported to be used, and recovery rates were all above 75% for the chemicals of interest.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study compared its results to other publications and standards in other countries and had robust discussion of the variability. No limitations reported.

Overall Quality Determination   Medium

Study Citation:	Carlstedt, F., Jönsson, B. A., Bornehag, C. G. (2013). PVC flooring is related to human uptake of phthalates in infants. Indoor Air 23(1):32-39.		
HERO ID:	1315309		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling population described, methodology described but handling of sampling material not well described
Metric 2:	Analytical Methodology	Medium	Recoveries not reported
Metric 3:	Biomarker Selection	High	Biomarker derived from exposure
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Varmland, Sweden
Metric 5:	Currency	Medium	Study published in 2013
Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
Metric 7:	Exposure Scenario	High	Exposure source characterized
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not provided
Metric 9:	Quality Assurance	Medium	QA implied but not well reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Gaps and limitations not well characterized

Overall Quality Determination   Medium

Study Citation:	De Vault, D. S. (1985). Contaminants in fish from great lakes harbors and tributary mouths. Archives of Environmental Contamination and Toxicology 14(5):587-594.		
HERO ID:	1315838		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	sampling described in detail
Metric 2:	Analytical Methodology	Low	GC method described. detection limit for compound of interest not reported
Metric 3:	Biomarker Selection	N/A	parent chemical in environmental media
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	harbor and tributary mouth sites in the Great Lakes basin
Metric 5:	Currency	Low	1980/1981
Metric 6:	Spatial and Temporal Variability	Medium	between 1-15 samples per fish in the different river locations
Metric 7:	Exposure Scenario	Medium	pesticides in runoff into the waters of the Great Lakes Harbours and Tributaries
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	individual sample concentrations and raw data reported
Metric 9:	Quality Assurance	Low	QA/QC not discussed but implied
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	variability shown in samples but not explicitly identified or discussed

Overall Quality Determination   Medium

Study Citation: Mcfall, J. A., Antoine, S. R., Deleon, I. R. (1985). Organics in the water column of Lake Pontchartrain. Chemosphere 14(9):1253-1266.
HERO ID: 1315842

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	8 replicate water samples collected at depth of 1.5 m on ebb tide on May 6 and 2 samples collected at depth of 1.5 m and 10m on flood tide on June 23 at Inner Harbor Navigation Canal; collected with a drop sampler; stored in amber glass bottles; immediately chilled and kept at 4C
	Metric 2:	Analytical Methodology	Low	serially extracted with 125 x 50 x 50 ml portions of dichloromethane; GC-MS; detection limits not provided; no recovery samples
	Metric 3:	Biomarker Selection	N/A	Measured parent chemicals in water column
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Inner Harbor Navigation Canal of Lake Pontchartrain, New Orleans, LA
	Metric 5:	Currency	Low	1980
	Metric 6:	Spatial and Temporal Variability	Medium	8 replicate samples collected at depth of 1.5 m on ebb tide on May 6 and 2 samples at depths of 1.5 m and 10 m on flood tide on June 23. Scoring for metric based on # samples from ebb tide
	Metric 7:	Exposure Scenario	High	surface water levels of Lake Pontchartrain which serves an adjacent metropolitan area as a major recreational area and source of crabs, shrimp and other aquatic foods
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Table 1 provides concentration of ebb and flood tide; ebb is mean of 8 samples (no raw data); flood is concentration of a single sample. Missing most summary statistics.
	Metric 9:	Quality Assurance	Low	QA/QC not directly discussed
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	brief comparison of results between ebb and flood tides and differences in two different depths. No characterization of variance or discussion of limitations, uncertainties, and data gaps.

Overall Quality Determination   Medium

Study Citation:	Atwater, J. W., Jasper, S. E., Parkinson, P. D., Mavinic, D. S. (1990). Organic contaminants in Canadian coal wastewaters and associated sediments. Water Pollution Research Journal of Canada 25(2):187-200.		
HERO ID:	1315873		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methodology is fully explained
	Metric 2: Analytical Methodology	Medium	Detection limits were somewhat reported, but are overall unclear. Authors noted that for wastewater, a lower limit LOQ of 10ug/L was established, as well as a practical detection limit of 5ug/L (pg 192). For sediment, a detection limit of 0.1ug/g was established (pg 192). It is unclear if these limits apply to all chemicals analyzed.
	Metric 3: Biomarker Selection	N/A	Parent chemical measured in sediment and wastewater
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Canada
	Metric 5: Currency	Low	Samples were collected from 1982 to 1984
	Metric 6: Spatial and Temporal Variability	Low	Samples were grab samples. No replicates.
	Metric 7: Exposure Scenario	High	Samples taken from coal operations
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual data points not reported
	Metric 9: Quality Assurance	Low	Study has a quality control section. Recoveries ranged from 46 to 132% and not specified by individual chemicals. Authors did assert that this is an acceptable range.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Limited characterization of variance and some discussion of limitations.

Overall Quality Determination   Medium

Domain	Metric	Rating	Comments
Study Citation:	Camanzo, J., Rice, C. P., Jude, D. J., Rossmann, R. (1987). Organic priority pollutants in nearshore fish from 14 Lake Michigan USA tributaries and embayments 1983. Journal of Great Lakes Research 13(3):296-309.		
HERO ID:	1315876		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methodology is discussed and pertinent sampling information is provided in the data source such as sampling equipment, sampling procedures, sample storage conditions and sampling sites.
	Metric 2: Analytical Methodology	High	Samples were extracted according to publicly available US EPA SOP. Analytical instrumentation is described. Detection limits provided.
	Metric 3: Biomarker Selection	N/A	The study is testing the parent chemical in fish.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Geographic location is reported and discussed. Figure 1 also shows all 14 collection sites throughout Michigan, U.S.
	Metric 5: Currency	Low	Timing of sample collection is not consistent with current or recent exposures may be expected (> 15 years). Sampling period was in 1983.
	Metric 6: Spatial and Temporal Variability	Medium	Sampling approach accurately captures variability. The study used a large sample size (14 sites, 3 to 11 fish per composite sample), and sampling occurred over a sufficient period of time (fall of one year). Some replicate samples are used.
	Metric 7: Exposure Scenario	High	The data represent the relevant exposure scenario (i.e., fish exposure in Lake Michigan). The study describes the setting (location).
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Some of the raw data i.e., individual data points are not reported (some of raw data are means of replicates), and therefore summary statistics cannot be reproduced.
	Metric 9: Quality Assurance	Low	The study applied quality assurance/quality control measures; however, one or more pieces of QA/QC information is not described. Recoveries are on the low side 67 to 76% (<70%) but they didn't correct for recovery.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variability shown in 14 locations and 2 different fish species per site. Minimal quantitative analysis of variability is discussed such as SD of replicate samples and there is no uncertainty discussion in the study.

Overall Quality Determination   **Medium**

Study Citation:	Castillo, M., Alonso, M. C., Riu, J., Barcelo, D. (1999). Identification of polar, ionic, and highly water soluble organic pollutants in untreated industrial wastewaters. Environmental Science & Technology 33(8):1300-1306.		
HERO ID:	1315909		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	sample collection and storage were described but lacked calibration procedure.
Metric 2:	Analytical Methodology	High	extraction was described in detail – SPE and SSPE methods were used. LOD reported.
Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	2 factories, one in Portugal, and one in Spain
Metric 5:	Currency	Low	samples were collected in 1997
Metric 6:	Spatial and Temporal Variability	Medium	effluent waters were collected as 24-h, 3 different samples were collected from each factory were analyzed. Unclear if replicates.
Metric 7:	Exposure Scenario	High	the data closely represent exposure scenario (wastewater) including the source of exposure, type of chemicals and products involved.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	samples were reported as average concentrations not individual data points.
Metric 9:	Quality Assurance	Medium	QA/QC process was not directly reported, but sample recoveries were reported in the result section and all chemicals have higher than 70% recovery rate.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	there's limited discussion about the uncertainty of the data, most discussion was o the method. Variability in tannery vs textiles.

Overall Quality Determination   **Medium**

Study Citation:	Hall, L. W., Jr, Pinkney, A. E., Horseman, L. O., Finger, S. E. (1985). Mortality of striped bass larvae in relation to contaminants and water-quality in a Chesapeake Bay tributary. Transactions of the American Fisheries Society 114(6):861-868.		
HERO ID:	1315913		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling methodology was discussed in the data source, but lacked a few details.
Metric 2:	Analytical Methodology	Low	Analytic method was provided but no LOD/LOQ was reported.
Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Chesapeake Bay Tributary
Metric 5:	Currency	Low	April, 1984
Metric 6:	Spatial and Temporal Variability	Low	3 river locations were sampled. Replicate samples taken.
Metric 7:	Exposure Scenario	Medium	The data likely represent the relevant exposure scenario.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Individual data were not reported in the main article or SI. Little summary statistics given.
Metric 9:	Quality Assurance	Medium	The study mentioned that quality assurance measures were applied but no details were elaborated.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	The study has limited discussion of key uncertainties, limitations, variation, and data gaps.

Overall Quality Determination   **Medium**

Study Citation: Pitt, R., Field, R., Lalor, M., Brown, M. (1995). Urban stormwater toxic pollutants: Assessment, sources, and treatability. Water Environment Research 67(3):260-275.
HERO ID: 1315962

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	The authors reported the sample collection methods and equipment but did not explain the sampling design. Sample storage conditions and duration were also not reported but they referenced a standard EPA method for sample handling and preservation. Authors did report on sampling site characteristics.
	Metric 2:	Analytical Methodology	High	The authors cited a standard EPA method for analysis. They also reported the analytical method and detection limit.
	Metric 3:	Biomarker Selection	N/A	Measured parent chemical in urban stormwater
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Birmingham, Alabama
	Metric 5:	Currency	Low	The article did not report a sample collection date, but the publication date is 1995.
	Metric 6:	Spatial and Temporal Variability	Medium	The authors collected and analyzed 87 samples. The authors did not report collecting replicate samples.
	Metric 7:	Exposure Scenario	High	The exposure scenario is relevant.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	The authors report the detection frequency, number of samples, mean and range. They did not report a standard deviation. The authors did not report the individual sample concentrations.
	Metric 9:	Quality Assurance	Low	The authors do not mention explicitly anything about QA/QC procedures but they did report following a standard EPA protocol for their analysis.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The authors did not report a standard deviation, but did have a range. There was some discussion of uncertainties, limitations, and data gaps.

Overall Quality Determination   Medium

Study Citation: Guidotti, M., Colasanti, G., Chinzari, M., Ravaioli, G., Vitali, M. (1998). Investigation on the presence of aromatic hydrocarbons, polycyclic aromatic hydrocarbons, persistent organochloride compounds, phthalates and the breathable fraction of atmospheric particulate in the air Rieti urban area. Annali di Chimica 88(5-6):419-427.

HERO ID: 1315986

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Missing storage conditions and calibration
	Metric 2:	Analytical Methodology	Low	Analytical methods described briefly. LOQ or LOD not reported
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Italy
	Metric 5:	Currency	Low	Published in 1998
	Metric 6:	Spatial and Temporal Variability	Medium	Includes replicates, but less than 10 samples collected per pollutant of interest
	Metric 7:	Exposure Scenario	Low	No detailed description of the source of pollution and microenvironment
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only average given- no summary statistics presented, missing standard deviation
	Metric 9:	Quality Assurance	Low	Blanks were used , recoveries not reported, limited discussion on quality assurance
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability in seasons measured. Limitations and key uncertainties are not discussed

Overall Quality Determination   Low

Study Citation:	Hutchins, S. R., Tomson, M. B., Wilson, J. T., Ward, C. H. (1984). Fate of trace organics during rapid infiltration of primary waste water at Fort Devens, Massachusetts (USA). Water Research 18(8):1025-1036.		
HERO ID:	1316091		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	The sampling methodology for wastewater, equipment, study site, and storage information is well described for both preliminary and final sampling trip.
Metric 2:	Analytical Methodology	Medium	No LOD reported. The study described the extraction and analytical methodology, instrument in detail, but missing some information such as calibration.
Metric 3:	Biomarker Selection	N/A	Study measure parent chemical in wastewater.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples collected in Fort Devens, Massachusetts
Metric 5:	Currency	Low	Samples were collected in 1978-1983
Metric 6:	Spatial and Temporal Variability	Low	There were 3 samples, one in basin floodwater, one in well 4, and one well 5. 2 more trip replicate samples were taken.
Metric 7:	Exposure Scenario	High	Samples were collected through infiltration of wastewater at Fort Devens, Massachusetts.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	Only individual data provided for basin floodwater, well 4, and well 5, found in table 1. No summary statistics were provided.
Metric 9:	Quality Assurance	Medium	The paper describes a series of QC measurements with the recovery efficiencies ranging from 12% to 78%.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Characterized variability in different types of wastewater sites studied. The uncertainty described was related to the analytical method.

Overall Quality Determination   Medium

Study Citation:	Monsanto, (1983). Investigation of phthalate ester concentrations in a Michigan sewage pond.			
HERO ID:	1316180			

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Only briefly described. Missing most sampling information
	Metric 2:	Analytical Methodology	Low	Referenced Environmental Sciences Methods ES-78-M7 and ES-78-M6. LOD not reported
	Metric 3:	Biomarker Selection	N/A	Tested for parent chemical in Daphnia and water lagoon
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Michigan, USA
	Metric 5:	Currency	Low	Published in 1983. No sampling date
	Metric 6:	Spatial and Temporal Variability	Low	3 Daphnia samples, 6 water samples (Table 1), no replicates
	Metric 7:	Exposure Scenario	Low	Data lack key pieces of information so unclear how to characterize the exposure scenario
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual concentrations, limited summary statistics
	Metric 9:	Quality Assurance	Low	Analyzed control samples, did not describe QA/QC techniques
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Did not characterize variance nor discuss uncertainties and study limitations

Overall Quality Determination   Low

Study Citation: TDH, (1982). Study plan and data on hexachlorocyclopentadiene from 8 fish samples analyzed by GC/MS with cover letter dated 082082.
HERO ID: 1316227

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Sampling methods only briefly described
	Metric 2: Analytical Methodology	Critically Deficient	Analytical methods are not described
	Metric 3: Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	USA
	Metric 5: Currency	Low	Published in 1982
	Metric 6: Spatial and Temporal Variability	Medium	6 samples from 12 sampling sites
	Metric 7: Exposure Scenario	Medium	Data likely represent relevant exposure scenarios, missing details about the population of interest
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Only individual sample concentrations, no summary statistics
	Metric 9: Quality Assurance	Low	QA/QC techniques only briefly discussed
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variability only briefly discussed, uncertainties and study limitations not discussed

Overall Quality Determination   **Uninformative**

Study Citation:	Hazleton Labs, (1986). Pollutant analyses on effluent discharge - phenol - with cover letter dated 072387.		
HERO ID:	1316229		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Critically Deficient	Sampling methods not described
	Metric 2: Analytical Methodology	Critically Deficient	Analytical methods not described
	Metric 3: Biomarker Selection	N/A	The authors analyzed environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Wisconsin, USA
	Metric 5: Currency	Low	Sampling in 1986
	Metric 6: Spatial and Temporal Variability	Critically Deficient	Sample size is not reported
	Metric 7: Exposure Scenario	Low	Data lacks key pieces of information and this impacts the exposure scenario characterization
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Only individual sample concentrations, no summary statistics
	Metric 9: Quality Assurance	Low	QA/QC techniques were not discussed
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variability was not characterized, uncertainties and limitations were not discussed

Overall Quality Determination   Uninformative

Study Citation: Ciba-Geigy, (1987). Briefing for the assistant administrator - Record for decision on the Lone Pine Landfill.
HERO ID: 1316232

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Critically Deficient	Sampling methodology not described
	Metric 2: Analytical Methodology	Critically Deficient	Analytical methodology not described
	Metric 3: Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	New Jersey
	Metric 5: Currency	Low	Published in 1987
	Metric 6: Spatial and Temporal Variability	Critically Deficient	Sample size is not reported
	Metric 7: Exposure Scenario	Low	Data may represent a relevant exposure scenario but lacks key data details to support its validity
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Only reported maximum concentrations detected, no summary statistics
	Metric 9: Quality Assurance	Low	QA/QC details not discussed
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variability, uncertainties and limitations were not characterized

Overall Quality Determination   Uninformative

Study Citation:	Geraghty & Miller Inc, (1990). Phase II - Site investigation: Borden site Carson, California (volume I) with attached appendices and cover letter dated 032790.		
HERO ID:	1316237		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Sampling methodology only briefly described
Metric 2:	Analytical Methodology	Critically Deficient	Not described
Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	California
Metric 5:	Currency	Low	Sampling began in 1987
Metric 6:	Spatial and Temporal Variability	Low	10 soil samples, 15 water samples
Metric 7:	Exposure Scenario	High	Provided an exposure assessment
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Individual sample concentrations, no summary statistics
Metric 9:	Quality Assurance	High	Detailed QA/QC description
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variability was not characterized, uncertainties were briefly discussed

Overall Quality Determination   Uninformative

Study Citation:	Ecology and Environment, (1991). Letter from Vulcan Chemicals to USEPA submitting enclosed final report concerning RCRA facility assessment with tetrachloroethylene and trichloromethane with attachments.		
HERO ID:	1316245		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Well described sampling methods
Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology was not described
Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples collected in USA
Metric 5:	Currency	Low	Published in 1991
Metric 6:	Spatial and Temporal Variability	Low	n=15, no replicates
Metric 7:	Exposure Scenario	Medium	Limited description about the population of interest
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Only individual sample concentrations, no summary statistics
Metric 9:	Quality Assurance	Low	Only briefly described
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Did not characterize variability or discussed uncertainties and limitations

Overall Quality Determination   **Uninformative**

Study Citation:	Ritsema, R., Cofino, W. P., Frintrop, P. C., Brinkman, U. A. (1989). Trace-level analysis of phthalate esters in surface water and suspended particulate matter by means of capillary gas chromatography with electron-capture and mass-selective detection. Chemosphere 18(11-12):2161-2176.		
HERO ID:	1316257		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	describe sampling instruments, sites, and procedures
Metric 2:	Analytical Methodology	High	discuss analytical method and instruments, recoveries >70%, report detection limit
Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media (water).
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	the Netherlands (Rhine River and Lake Yesel)
Metric 5:	Currency	Low	1986
Metric 6:	Spatial and Temporal Variability	High	12 samples from River Rhine and 6 samples from Lake Yesel
Metric 7:	Exposure Scenario	Medium	studying phthalate esters in Dutch inland waters but aren't specific about pollution source
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	no raw data or measures of variation; concentrations presented on bar graph are difficult to read
Metric 9:	Quality Assurance	Medium	procedural blanks but not much discussion about quality control
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	no real discussion of uncertainty; no measures of variability but data shows variability day to day;

Overall Quality Determination — Medium

Study Citation:	Mcdowell, D. C., Metcalfe, C. D. (2001). Phthalate esters in sediments near a sewage treatment plant outflow in Hamilton Harbour, Ontario: SFE extraction and environmental distribution. Journal of Great Lakes Research 27(1):3-9.		
HERO ID:	1322016		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	sampling described, no map
Metric 2:	Analytical Methodology	High	method limit of detection provided on p.6; equipment and extraction described; methods paper
Metric 3:	Biomarker Selection	N/A	sediment
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Ontario
Metric 5:	Currency	Low	1997
Metric 6:	Spatial and Temporal Variability	Medium	5 samples in triplicate
Metric 7:	Exposure Scenario	Medium	sediments near a sewage treatment plant
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	text page 6 - below MDL
Metric 9:	Quality Assurance	Low	QA not discussed; no obvious concerns
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   Medium

Study Citation:	Dargnat, C., Blanchard, M., Chevreuil, M., Teil, M. J. (2009). Occurrence of phthalate esters in the Seine River estuary (France). Hydrological Processes 23(8):1192-1201.		
HERO ID:	1322123		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	detailed description of site characteristics, collection, storage; referred to EPA method
Metric 2:	Analytical Methodology	High	detailed description of analytical methods and instruments, determined detection limits
Metric 3:	Biomarker Selection	N/A	Surface water sampling
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Seine River estuary in France
Metric 5:	Currency	Medium	2005-2006
Metric 6:	Spatial and Temporal Variability	High	used replicates; n = 7 at 5 sampling stations so 35+ samples (Figure 2)
Metric 7:	Exposure Scenario	High	sewage overflow, runoff, treatment plant discharge
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	no raw data but provide graphs and tables with averages and summary stats; no measure of variation
Metric 9:	Quality Assurance	High	laboratory blanks and used replicates
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	discuss flux due to flooding and variable flows but no measure of standard deviations and no discussion about uncertainties/limits

Overall Quality Determination   High

		Domain	Metric	Rating	Comments

Study Citation: Ebinghaus, R., Xie, Z. (2006). Occurrence and air/sea-exchange of novel organic pollutants in the marine environment. Journal de Physique IV 139:211-237.
HERO ID: 1322127

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	detailed description of sample instrumentation, filtration, sampling stations, etc.
	Metric 2: Analytical Methodology	High	describe analytical instruments and detection limits
	Metric 3: Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media (water and air).
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	North Sea
	Metric 5: Currency	Low	2004
	Metric 6: Spatial and Temporal Variability	High	40 sampling stations, 11 water samples, 3 air samples (collected in duplicate)
	Metric 7: Exposure Scenario	High	phthalates in the North Sea, toxic to aquatic organisms
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	thorough with raw results, averages, standard deviations
	Metric 9: Quality Assurance	High	included blanks and standards
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	include standard deviation but there appears to be a large variation and not much discussion about uncertainty or limitations

Overall Quality Determination   **High**

Study Citation:	Kong, X. J.,i, Li, D., Cao, L., Zhang, X., Zhao, Y.,an, Lv, Y., Zhang, J.,ie (2008). Evaluation of municipal sewage treatment systems for pollutant removal efficiency by measuring levels of micropollutants. Chemosphere 72(1):59-66.		
HERO ID:	1322141		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Details on sampling methods such as how samples were collected are lacking. Collection container described.
	Metric 2:	Analytical Methodology	High	Described in detail, all pertinent information discussed
	Metric 3:	Biomarker Selection	N/A	environmental media
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Harbin municipal sewage treatment system, China
	Metric 5:	Currency	Medium	May 2007
	Metric 6:	Spatial and Temporal Variability	Medium	Unclear if replicate sampling was conducted. No statistics reported in quantification of chemicals
	Metric 7:	Exposure Scenario	High	source of exposure identified
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	raw data reported but unclear if there were replicates in each sample to yield summary statistics
	Metric 9:	Quality Assurance	High	QA/QC issues identified & described
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	not discussed

Overall Quality Determination   Medium

Study Citation:	Olujimi, O. O., Fatoki, O. S., Odendaal, J. P., Daso, A. P. (2012). Chemical monitoring and temporal variation in levels of endocrine disrupting chemicals (priority phenols and phthalate esters) from selected wastewater treatment plant and freshwater systems in Republic of South Africa. Micro-chemical Journal 101(Elsevier):11-23.		
HERO ID:	1322160		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	six WWTPs; surface water from 5 rivers collected (grab sample) 1 to 2 km upstream and downstream of WWTPs; locations, treatment processes, and people equivalence described in Table 1; collected with 1L glass bottles; samples kept cold on ice; extracted and analyzed within 12 h
	Metric 2:	Analytical Methodology	Low	SPE; GC-MS; detection limit discussed but not provided; does not discuss recovery samples for this study
	Metric 3:	Biomarker Selection	N/A	Water sampling
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Athlone (Vygekraal River); Bellville (Kuils River); Kraaifontein (Mosselbank River); Potsdam (Diep River); Zandvliet (Kuils River) and Stellenbosch (Veldwachters River), South Africa
	Metric 5:	Currency	Low	sampling date not provided; published in 2012
	Metric 6:	Spatial and Temporal Variability	Medium	6 WWTPs and rivers; 108 samples per site - upstream, influent, effluent and downstream; sampled each quarter (summer, autumn, winter, and spring. No indication of replicate sampling or analysis
	Metric 7:	Exposure Scenario	High	surface water from rivers collected upstream and downstream of WWTP that emptied final effluents into the rivers; concentrations of influent and effluent of WWTP
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	seasonal mean and standard error reported per quarter and per site (Tables 2, 3, 4, 5, 6, and 7)
	Metric 9:	Quality Assurance	Medium	compare results to control site (Table 7 - Kirstenbosch Botanical Garden)
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	discusses variability by season and site; compares findings to previous studies

Overall Quality Determination   Medium

Study Citation: Kolarik, B., Bornehag, C. G., Naydenov, K., Sundell, J.,an, Stavova, P., Nielsen, O. (2008). The concentrations of phthalates in settled dust in Bulgarian homes in relation to building characteristic and cleaning habits in the family. Atmospheric Environment 42(37):8553-8559.

HERO ID: 1322255

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The children taken part of the study were selected from the ALLHOME-I. Sampling of settled dust was performed in the child's room, above the floor level by using a vacuum cleaner equipped with a phthalate-free ALK dust collector and filter.
	Metric 2:	Analytical Methodology	Medium	LOD not reported, the analytical methodology is described
	Metric 3:	Biomarker Selection	High	Urine DnBP
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Bulgaria
	Metric 5:	Currency	Medium	2004-2005
	Metric 6:	Spatial and Temporal Variability	Medium	177 homes of Bulgarian children, no sample replicates
	Metric 7:	Exposure Scenario	High	The concentrations of phthalates in settled dust in Bulgarianhomes in relation to building characteristic and cleaninghabits in the family
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No war data. Table 1 The concentrations of phthalates (mg g1 dust) measured in 177 homes of Bulgarian children GM (95%CI), median
	Metric 9:	Quality Assurance	Critically Deficient	QA no reported in any of the cohort studies
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Key limitations no reported. Variability presented as 95% CI

Overall Quality Determination   Uninformative

Study Citation:	Tsumura, Y., Ishimitsu, S., Kaihara, A., Yoshii, K., Tonogai, Y. (2002). Phthalates, adipates, citrate and some of the other plasticizers detected in Japanese retail foods: a survey. Journal of Health Science 48(6):493-502.		
HERO ID:	1325814		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Minimal sampling details- it is unclear if same brands used or not.
Metric 2:	Analytical Methodology	High	extraction and equipment described for each type of food; LOD in Table 3
Metric 3:	Biomarker Selection	N/A	food
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Japan
Metric 5:	Currency	Low	2000-2001
Metric 6:	Spatial and Temporal Variability	Medium	n = 3 to 11 per food type, 93 samples total; unclear if there are replicates
Metric 7:	Exposure Scenario	High	food
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	median, minimum and maximum included. Individual data not reported.
Metric 9:	Quality Assurance	High	QA not discussed-recoveries assessed.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	uncertainty not discussed, no obvious concerns; variability shown through 19 different food types

Overall Quality Determination   Medium

Study Citation:	Fierens, T., Van Holderbeke, M., Willems, H., De Henauw, S., Sioen, I. (2013). Transfer of eight phthalates through the milk chain - A case study. Environment International 51:1-7.		
HERO ID:	1332529		

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	sampling sites and methods described in detail
	Metric 2:	Analytical Methodology	High	LOQ in table 2, extraction and equipment described in detail
	Metric 3:	Biomarker Selection	N/A	food - milk
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Belgium
	Metric 5:	Currency	Medium	2010-2011
	Metric 6:	Spatial and Temporal Variability	Medium	n = 1 to 10 for 17 different sample types, no replicates
	Metric 7:	Exposure Scenario	High	milk, butter, cheese
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	min, max, and median included
	Metric 9:	Quality Assurance	Medium	QA briefly described, not reported no obvious concerns
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	variability included via different sample types, uncertainty not described, no obvious concerns

Overall Quality Determination Medium

Study Citation:	Santhi, V. A., Mustafa, A. M. (2013). Assessment of organochlorine pesticides and plasticisers in the Selangor River basin and possible pollution sources. Environmental Monitoring and Assessment 185(2):1541-1554.		
HERO ID:	1332544		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	4L grab samples from depth of 0.5m collected glass bottles from 7 sampling sites (fig 1); filtered; stored at 4C in dark and analyzedwithin 48 h
Metric 2:	Analytical Methodology	High	sample percolated through a cartridge; GC-MS; LOD and recoveries(Table 1)
Metric 3:	Biomarker Selection	N/A	Water samples, biomarker not needed.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Selangor River, Malaysia
Metric 5:	Currency	Medium	November 2008 - July 2009
Metric 6:	Spatial and Temporal Variability	High	7 sampling sites; n=4 at each site; taken at rainy ad dry season; total of 28 samples across sites per season. Duplicate samples were analyzed, but unclear how many dups were done if samples were collected in dups or analyzed in dups
Metric 7:	Exposure Scenario	High	measuring surface water for a river in the most industrialized state in Malaysia which provides over 60% of the potable water
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Table 3 provides the mean at each site during rainy and dry season; DF discussed p. 1548 (DBP detected in all samples)
Metric 9:	Quality Assurance	High	procedural blank, spiked blank and duplicate samples; recovery % Table 1
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	compared to other studies and locations (Table 5); compared variation between rainy and dry season; std deviation Table 1

Overall Quality Determination   **High**

Study Citation:	Jeong, J. Y., Lee, J. H., Kim, E. Y., Kim, P. G., Kho, Y. L. (2011). Determination of phthalate metabolites in human serum and urine as biomarkers for phthalate exposure using column-switching LC-MS/MS. Safety and Health at Work 2(1):57-64.		
HERO ID:	1332549		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	minimal information on sampling, age and location of participants included, samples pooled
Metric 2:	Analytical Methodology	Medium	Analytical method described in detail. Table 1 includes LOD and LOQ
Metric 3:	Biomarker Selection	High	metabolites
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Korea
Metric 5:	Currency	Low	published 2011
Metric 6:	Spatial and Temporal Variability	Medium	pooled sample of 322 persons, no replicates
Metric 7:	Exposure Scenario	High	serum and urine
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	one value for a pooled sample
Metric 9:	Quality Assurance	Medium	No specific QA section but blanks and recovery discussed
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	pooled sample for each sample type, variability and uncertainty not described. Limitations described at the end.

Overall Quality Determination   Medium

Study Citation:	Rohm and Haas, (1981). Landfill monitoring wells and stream survey attach cover letter.		
HERO ID:	1332944		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Critically Deficient	Sampling methods not described
Metric 2:	Analytical Methodology	Critically Deficient	Analytical methods not described
Metric 3:	Biomarker Selection	N/A	Landfill samples no biomarker needed.
Domain 2: Representativeness			
Metric 4:	Geographic Area	Critically Deficient	Geographic location not reported
Metric 5:	Currency	Low	Published in 1982
Metric 6:	Spatial and Temporal Variability	Low	7 sampling sites, no replicates
Metric 7:	Exposure Scenario	Low	Lack of location details, population of interest and methods make this metric uncertain.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Only individual sample concentration data, no summary statistics
Metric 9:	Quality Assurance	Low	QA/QC was not discussed
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variability, uncertainties and limitations were not discussed

Overall Quality Determination   Uninformative

Study Citation: Radian Corp, (1982). Final report analysis of polybutene pipe leachate for selected organic species prepared by Radian Corp.
HERO ID: 1332954

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Limited sampling methodology description
	Metric 2:	Analytical Methodology	Medium	Limited analytical methodology description, LOD reported
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Ohio, USA
	Metric 5:	Currency	Low	Report from 1982
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size not reported
	Metric 7:	Exposure Scenario	Medium	Missing details about the population of interest, microenvironment and sample size
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual sample concentrations only
	Metric 9:	Quality Assurance	Medium	Limited description of QA/QC techniques, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability was not characterized, uncertainties and limitations were not discussed

Overall Quality Determination   **Uninformative**

Study Citation:	ERM, (1988). Hydrogeological investigation at the Union Carbide solvents and materials coating plant with cover letter dated 070688.		
HERO ID:	1332986		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Only briefly described
Metric 2:	Analytical Methodology	Critically Deficient	Analytical methods not described
Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	USA
Metric 5:	Currency	Low	Sampling began in 1985
Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size not reported
Metric 7:	Exposure Scenario	Low	The exposure scenario is unclear
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	Individual sample concentrations, no summary statistics
Metric 9:	Quality Assurance	Medium	Limited description of QA/QC techniques, analyzed control samples
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variability and uncertainties were not characterized

Overall Quality Determination   Uninformative

Study Citation:	Roy F. Weston Inc, (1980). Characterization and fate of the discharge of priority pollutants from the Rohm and Haas Philadelphia plant into the Delaware low level collector of the Philadelphia sewer.		
HERO ID:	1333014		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling performed according to an EPA protocol from 1977 - Sampling and Analysis Procedures for Screening of Industrial Effluents for Priority Pollutants.
Metric 2:	Analytical Methodology	High	Four standard protocols were followed - three from EPA and one from the American Public Health Association.
Metric 3:	Biomarker Selection	N/A	Measured parent chemicals in wastewater
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Philadelphia, PA
Metric 5:	Currency	Low	April 1979 and December 1979
Metric 6:	Spatial and Temporal Variability	Medium	No replicate samples
Metric 7:	Exposure Scenario	High	Samples collected from contaminated effluent, city water, and river water
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Individual data points are not reported.
Metric 9:	Quality Assurance	Low	QA/QC techniques are not directly discusses. Can be implied through study's use of standard protocols.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Characterization of variability is absent

Overall Quality Determination   Medium

PUBLIC RELEASE DRAFT
May 2025

Dibutyl Phthalate   Monitoring   HERO ID: 1333150

Study Citation:		Schouten, M. J., Peereboom, J. W. C., Brinkman, U. A. T. (1979). Liquid chromatographic analysis of phthalate esters in Dutch river water. International Journal of Environmental Analytical Chemistry 7(1):13-23.		
HERO ID:		1333150		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Rhine, IJssel and Meuse (Fig 1); 500mL samples of river water taken close to the bank in an upstream direction; poured in glass bottles; taken to lab and immediately transferred to a glass separatory funnel
	Metric 2:	Analytical Methodology	High	phase separation and total extract evaporated to a volume of 1mL; HPLC; LOD 5-10 ng; recovery samples not mentioned
	Metric 3:	Biomarker Selection	N/A	River water no biomarker needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Dutch rivers Rhine, IJssel and Meuse
	Metric 5:	Currency	Low	1977 (Table 1)
	Metric 6:	Spatial and Temporal Variability	Medium	21 location sample stations (fig 1) (7 from Rhine, 5 from Ijssel, and 9 from Meuse River); all samples collected on single day
	Metric 7:	Exposure Scenario	Medium	setting of rivers not described; concentration in 3 rivers
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	concentration in each samples taken from the various rivers (Tables I-III)
	Metric 9:	Quality Assurance	Medium	blank values were subtracted;
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	compared variation between the rivers and compared findings to previous studies (Table IV)

Overall Quality Determination   Medium

Dibutyl Phthalate

Study Citation: Thuren, A., Larsson, P. (1990). Phthalate esters in the Swedish atmosphere. Environmental Science & Technology 24(4):554-559.
HERO ID: 1333295

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling technique very briefly described. Method used cited elsewhere (Sodergren). No details on deployment of sampling equipment or handling after sampling.
	Metric 2:	Analytical Methodology	High	Included minimum detectable quantity (not LOD), extraction method, analytical instrumentation and recovery efficiencies
	Metric 3:	Biomarker Selection	N/A	Environmental media
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Reported, 14 sampling locations across Sweden
	Metric 5:	Currency	Low	1984
	Metric 6:	Spatial and Temporal Variability	Medium	Hi number of samples (>50) taken over the course of 1 year. No indication of replicate sampling or analysis.
	Metric 7:	Exposure Scenario	High	Data closely represents relevant exposure scenario, manuscript mentions potential source of exposure and describes the microenvironment
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data are not reported, only summary statistics
	Metric 9:	Quality Assurance	High	Field and laboratory controls were conducted
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Key limitations and uncertainties not discussed

Overall Quality Determination   Medium

Study Citation:	Kirchmann, H., Tengsved, A. (1991). Organic pollutants in sewage sludge: 2. Analysis of barley grains on sludge-fertilized soil. Swedish Journal of Agricultural Research 21(3):115-119.		
HERO ID:	1333321		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Sampling equipment not described, three randomly selected fields 60 square meters, three treatments, replicate plant samples collected, but only pools samples analyzed.
	Metric 2: Analytical Methodology	Low	Extraction methods described; GC-MS; LOD not reported.
	Metric 3: Biomarker Selection	N/A	Phthalate concentration in barley grains compared with concentrations of same chemicals in amendment added to soil; plants also exposed to phthalates in air.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Sweden
	Metric 5: Currency	Low	1989
	Metric 6: Spatial and Temporal Variability	Low	single sample for 3 scenarios
	Metric 7: Exposure Scenario	Medium	Amendments to soils are real-world scenarios; air plus soil exposures contributed to grain concentrations.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Single concentration values reported (presumably single analysis of pooled field samples).
	Metric 9: Quality Assurance	Low	Spiked media with known quantities of several organic compounds to estimate losses during extraction; trace analyses not replicated and only pooled samples analyzed.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	No variance measures provided for single chemicals; variation among chemicals presented.

Overall Quality Determination   **Low**

Study Citation:	U.S. EPA, (1974). Pesticides in the Illinois waters of Lake Michigan.		
HERO ID:	1333424		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	sampling maps provided, sampling methods and materials described
Metric 2:	Analytical Methodology	Medium	LOD (Appendix A table 2); recovery percentage (Appendix A table 1); separation procedures described; instrumentation described; descriptions complete, but instrumentation is old
Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Michigan
Metric 5:	Currency	Low	1971 and 1972
Metric 6:	Spatial and Temporal Variability	Medium	255 fish from commercial fishermen; 50 sediment; 45 open water/water treatment plants/tributary streams/effluent; no replicates
Metric 7:	Exposure Scenario	High	fish used as food
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	raw data points reported (ppb)
Metric 9:	Quality Assurance	High	quality control includes percent recovery, LOD, controls
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   Medium

Study Citation:	Jacobs, M. W., Coates, J. A., Delfino, J. J., Bitton, G., Davis, W. M., Garcia, K. L. (1993). Comparison of sediment extract microtox{\textregistered} toxicity with semi-volatile organic priority pollutant concentrations. Archives of Environmental Contamination and Toxicology 24(4):461-468.		
HERO ID:	1333591		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Some sampling information missing, such as exact site location.
	Metric 2: Analytical Methodology	Low	extractions were modifications of US EPA Method 3550 and a method developed by Marble and Delfino (1988). equipment described; no LOD
	Metric 3: Biomarker Selection	N/A	sediment
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	U.S. Florida
	Metric 5: Currency	Low	1989-1990
	Metric 6: Spatial and Temporal Variability	Medium	n = 105 sediments, no replicates
	Metric 7: Exposure Scenario	Low	sediments- no details given on exposure scenarios
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	mean, median, range included. Individual points not reported.
	Metric 9: Quality Assurance	Low	QA not discussed, no obvious concerns
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variability and Uncertainty not discussed, no obvious concerns. No limitations reported.

Overall Quality Determination   Low

Study Citation:	Giam, C. S., Chan, H. S., Neff, G. S. (1978). Phthalate ester plasticizers, DDT, DDE and polychlorinated biphenyls in biota from the Gulf of Mexico. Marine Pollution Bulletin Pollut(9):249-251.		
HERO ID:	1333719		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Little information given- Fish collected with net or hook & line; kept frozen; only inner or subdermal tissues; invertebrates also sampled; usually a single specimen per species per location; no more than three individuals of the same species across Gulf.
Metric 2:	Analytical Methodology	High	High quality for its time (1975); extreme care to avoid equipment contamination. Tissue preparation described in this report. GC with ECD (gas chromatography with electron capture detector).
Metric 3:	Biomarker Selection	Medium	Parent compounds in muscle, liver, or whole animal (without shell or epidermis); many unrelated species sampled.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Gulf of Mexico (around Texas and Louisiana); mapped in Figure 1.
Metric 5:	Currency	Low	Sampling year not specified- published in 1978.
Metric 6:	Spatial and Temporal Variability	Low	14 sampling locations; include near shore and offshore; however, only one to four species sampled per location; diverse phyla sampled. No replicates.
Metric 7:	Exposure Scenario	Medium	Marine environment; however, both free-swimming and some bottom dwelling animals sampled.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Individual data reported. No summary statistics.
Metric 9:	Quality Assurance	Medium	Details in HERO 5774605 (1975); high quality for its time; however, not detected in any sample.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Different areas sampled. No limitations discussed.

Overall Quality Determination   Medium

Study Citation:	Bono-Blay, F., Guart, A., de la Fuente, B., Pedemonte, M., Pastor, M. C., Borrell, A., Lacorte, S. (2012). Survey of phthalates, alkylphenols, bisphenol A and herbicides in Spanish source waters intended for bottling. Environmental Science and Pollution Research 19(8):3339-3349.
HERO ID:	1333834

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	sampled water sources (springs and boreholes) - Table 2; from boreholes 24 and 400 m depth; 1L collected using glass bottle and capped; stored room temp until analysis within 15 days; samples unfiltered
	Metric 2:	Analytical Methodology	High	SPE; GC-MS; recoveries; LOD and LOQ provided Table 3
	Metric 3:	Biomarker Selection	N/A	Measured parent chemical in source water
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	all over Spain; specific regions provided in Table 2
	Metric 5:	Currency	Medium	2007 - 2008
	Metric 6:	Spatial and Temporal Variability	Medium	131 water sources (40 springs;91 boreholes) all over Spain; sampled from 2007 to 2008. No replicates
	Metric 7:	Exposure Scenario	High	concentrations in source waters intended for bottling (spring waters and boreholes)
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data. Table 4 provides n, DF, range, mean, and SD
	Metric 9:	Quality Assurance	High	recoveries ranged from 77-124% (Table 3); blank analysis. Explained how background contamination was corrected.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	no discussion of uncertainties, limitation, data gaps

Overall Quality Determination   High

Study Citation: Asakura, H., Matsuto, T., Tanaka, N. (2004). Behavior of endocrine-disrupting chemicals in leachate from MSW landfill sites in Japan. Waste Management 24(6):613-622.

HERO ID: 1333892

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	landfill leachate sampled at two sites 4 times over a year and half; sampling points (fig 1); collected using a bucket or ladle; stored and sealed in glass bottles; filtered; storage temp and duration not defined
	Metric 2:	Analytical Methodology	High	liquid liquid or cartridge extraction (Table 2); GC/MS; recoveries; LOD reported Table 4
	Metric 3:	Biomarker Selection	N/A	Parent chemicals were tested in landfill leachate
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Japan
	Metric 5:	Currency	Low	2000 and 2001
	Metric 6:	Spatial and Temporal Variability	Medium	2 landfills sampled 4 times over a year and half; total number of samples for raw leachate (17), processed leachate (24). No replicates
	Metric 7:	Exposure Scenario	High	concentration in leachate from two MSW landfills sampled over a year and half to determine seasonal-variation; sampling points within and along the leachate treatment facilities (Fig 1)
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 4 provides the concentration range and DF for raw leachate and processed leachate from the two sites combined; Fig 3 provides DEHP concentration by landfill (range, median, average, and DF). No raw data
	Metric 9:	Quality Assurance	Low	Blanks were tested. Recoveries for phthalates, alkylphenols, and BPA ranged between 60 and 80%; no details provided on recoveries for individual chemicals and correction.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	compared concentration between raw, within process, and effluent; discussed seasonal changes; and compared between sites. Some characterization of variance and limited discussion of gaps and uncertainties.

Overall Quality Determination   Medium

Study Citation: Peterson, J. C., Freeman, D. H. (1982). Phthalate ester concentration variations in dated sediment cores from the Chesapeake Bay, USA. Environmental Science & Technology 16(8):464-469.

HERO ID: 1335216

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling method, equipment, and site described, map included. Some information missing, such as storage and equipment calibration.
Metric 2:	Analytical Methodology	Low	LOD not reported; "detailed description of extraction and analysis procedure is in preparation and will be published elsewhere."
Metric 3:	Biomarker Selection	N/A	sediment
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	U.S.
Metric 5:	Currency	Low	1979
Metric 6:	Spatial and Temporal Variability	High	2 sites- 10-12 depth samples per site, replicates done.
Metric 7:	Exposure Scenario	Low	sediment core samples- little information given for exposure scenarios
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Table 1 raw data. Some summary statistics reported.
Metric 9:	Quality Assurance	Medium	QA not discussed, no obvious concerns- recoveries and blanks reported.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Variability in sediment depth and time analyzed. Limitations not discussed.

Overall Quality Determination   Medium

| Study Citation: | Chem-Dyne, (1987). CRA sampling and analytical tables on nine chemicals with attachments. |
| HERO ID: | 1335590 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Critically Deficient	Sampling methodology not reported
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology is not described
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Hamilton, Ohio
	Metric 5:	Currency	Low	1984
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size not reported or hard to read
	Metric 7:	Exposure Scenario	Critically Deficient	The exposure scenario is not reported
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Critically Deficient	There is no explanation regarding the data
	Metric 9:	Quality Assurance	Medium	the study reports key QA parameters
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Critically Deficient	Key limitations or sample variability not reported

Overall Quality Determination   Uninformative

Study Citation:		Teil, M. J., Blanchard, M., Dargnat, C., Larcher-Tiphagne, K., Chevreuil, M. (2007). Occurrence of phthalate diesters in rivers of the Paris district (France). Hydrological Processes 21(18):2515-2525.		
HERO ID:		1337950		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	info about sampling sites, sampling filters, treatments, storage
	Metric 2:	Analytical Methodology	Medium	include detection limits; detailed description of analytical instruments and methods
	Metric 3:	Biomarker Selection	N/A	Water sampling
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Paris (River Seine, River Marne, River Oise)
	Metric 5:	Currency	Low	2002-2004
	Metric 6:	Spatial and Temporal Variability	Medium	n = 85. no indication of replicate sampling or analysis
	Metric 7:	Exposure Scenario	Medium	thought to be related to population density, wastewater treatment plants, and industrial distribution
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	include averages at each site and range limits but no raw data; also include annual variation in chemical concentration
	Metric 9:	Quality Assurance	Low	assumed but no discussion of blanks/controls
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	display annual variability but no discussion of uncertainties and limits

Overall Quality Determination   Medium

Study Citation:	Antizar-Ladislao, B. (2009). Polycyclic aromatic hydrocarbons, polychlorinated biphenyls, phthalates and organotins in northern Atlantic Spain's coastal marine sediments. Journal of Environmental Monitoring 11(1):85-91.		
HERO ID:	1338995		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Key sampling methods reported
Metric 2:	Analytical Methodology	High	Key analytical methods reported that followed standard methods at an accredited laboratory.
Metric 3:	Biomarker Selection	N/A	Measured parent chemical in marine sediment
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Cantabria, North Spain
Metric 5:	Currency	Medium	Samples collected in 2007
Metric 6:	Spatial and Temporal Variability	High	>10 samples, triplicates
Metric 7:	Exposure Scenario	High	Exposure sources characterized throughout the paper. Exposure to marine sediments that are fishing points is relevant.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data reported in the manuscript but missing most summary statistics.
Metric 9:	Quality Assurance	Medium	Standard QA/QC procedures but not completely reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Gaps and limitations not well characterized. Variance not characterized.

Overall Quality Determination   High

Study Citation: Hargis, (1986). Phase III: Investigation of groundwater quality and hydrogeologic conditions, Summa Corporation Facility, Culver City, California (final report) with attach and letter dated 013192.

HERO ID: 1356129

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling methods briefly described
	Metric 2:	Analytical Methodology	Medium	Cited EPA method 624, included LOD, did not describe the method
	Metric 3:	Biomarker Selection	N/A	Did not test for biomarkers
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	California, USA
	Metric 5:	Currency	Low	Samples from 1985
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size was not reported
	Metric 7:	Exposure Scenario	Medium	Data may represent a relevant exposure scenario but the report doesn't have details about the population or microenvironment of interest
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	Medium	Limited description of QA/QC techniques
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty were not characterized

# Overall Quality Determination				Uninformative

Study Citation: Westinghouse Electric Corporation, (1991). Hydrogeological investigation of the Hoechst Celanese facility Spartanburg, South Carolina - Westinghouse project 4122-90-022A with attachments and cover letter dated 052291.

HERO ID: 1356133

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Well described sampling methods
	Metric 2:	Analytical Methodology	Low	Limited description of analytical methods
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Report from 1991
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size not reported
	Metric 7:	Exposure Scenario	Medium	Missing details about the population of interest
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual sample concentrations only
	Metric 9:	Quality Assurance	Medium	Analyzed control samples, techniques briefly described
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability and uncertainties were not characterized

Overall Quality Determination   Uninformative

Dibutyl Phthalate HERO ID: 1356178

Study Citation:	Great Lakes Chemical Corp, (1987). Exposure assessment for hazardous waste landfill with cover letter dated 072187.		
HERO ID:	1356178		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Sampling methodology not described, only briefly mentioned
Metric 2:	Analytical Methodology	High	Analytical reports included in the appendix
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	El Dorado, AR
Metric 5:	Currency	Low	1986
Metric 6:	Spatial and Temporal Variability	Medium	7 waste samples analyzed along with air samples collected in the months of Jan-March (33 samples) and May 1985 (14 days). No replicates.
Metric 7:	Exposure Scenario	High	Report characterizes facility and sources as well as nearby residential communities and explores various exposure pathways through different medias.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Individual data points available for waste samples but only monthly averages and summaries available for air samples. No other statistics were used
Metric 9:	Quality Assurance	Low	QA/QC was not mentioned but lab reports for analyses and air data from the Arkansas Dept of Pollution Control Ecology imply SOP and methods.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Key limitations and data gaps not addressed.

Overall Quality Determination   Medium

| Study Citation: | de Los Ríos, A., Juanes, J. A., Ortiz-Zarragoitia, M., López de Alda, M., Barceló, D., Cajaraville, M. P. (2012). Assessment of the effects of a marine urban outfall discharge on caged mussels using chemical and biomarker analysis. Marine Pollution Bulletin 64(3):563-573. |
| HERO ID: | 1401402 |

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Study area and sampling methods were described. Caged mussels were exposed to natural waters in different locations then evaluated for contaminants.
	Metric 2:	Analytical Methodology	Low	Analytical methods and equipment described. Detection limits provided for only one phthalate, DMP, which isn't a TSCA chemical.
	Metric 3:	Biomarker Selection	N/A	Study tested parent chemicals in wastewater effluent in water and sediments. Biomarkers of endocrine disruption were measured for mussels, but focusing on monitoring data here.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Spain
	Metric 5:	Currency	Medium	2007
	Metric 6:	Spatial and Temporal Variability	Low	25 mussel composite sample from each site and timepoint. No replicates
	Metric 7:	Exposure Scenario	Medium	Study was performed at ''Virgen del Mar'' coastal environment, 8 miles on the west of Santander Bay, Cantabria, North of Iberian Peninsula that receives WWTP effluent.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Mean and SD provided for composite samples by outfall vs control site for water and sediment samples. No raw data
	Metric 9:	Quality Assurance	Low	quality not discussed, no obvious concerns
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Some characterization of variance. Uncertainty not discussed.

Overall Quality Determination   Medium

Study Citation:	Jackson, J., Sutton, R. (2008). Sources of endocrine-disrupting chemicals in urban wastewater, Oakland, CA. Science of the Total Environment 405(1-3):153-160.		
HERO ID:	1408465		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling methods were described and a map of study area was included.
	Metric 2: Analytical Methodology	Low	Samples were analyzed using well-established method EPA 625; LOD was not reported.
	Metric 3: Biomarker Selection	N/A	The analyte measured is the TSCA chemical.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in the United States.
	Metric 5: Currency	Medium	Samples were collected in 2006.
	Metric 6: Spatial and Temporal Variability	Medium	There are 16 wastewater samples. No replicates were reported.
	Metric 7: Exposure Scenario	Low	The sources of exposure were not well characterized, the data closely represent a relevant wastewater exposure scenario.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were reported, but no LOD was provided.
	Metric 9: Quality Assurance	Low	Key QA process reported included used of field blanks. Quality control was not discussed, but there was no obvious concerns.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variability and uncertainty were not discussed, but there was no obvious concerns of study quality.

Overall Quality Determination   **Low**

| Study Citation: | Tan, B. L., Hawker, D. W., Müller, J. F., Tremblay, L. A., Chapman, H. F. (2008). Stir bar sorptive extraction and trace analysis of selected endocrine disruptors in water, biosolids and sludge samples by thermal desorption with gas chromatography-mass spectrometry. Water Research 42(1-2):404-412. |
| **HERO ID:** | 1411500 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	sampling described, missing a few details like materials used and contamination prevention for phthalates
	Metric 2:	Analytical Methodology	High	extraction and equipment described; LOD in Table 2 footnotes
	Metric 3:	Biomarker Selection	N/A	environmental samples
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Australia
	Metric 5:	Currency	Low	Grab samples were taken at two different times (November 2004 and March 2005)
	Metric 6:	Spatial and Temporal Variability	Medium	n = 1 for each date and sampling station. Three replicates for the experimental part, no replicates for environmental monitoring
	Metric 7:	Exposure Scenario	High	raw influent and biosolids, unclear if it applies to US
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	raw data in Table 2
	Metric 9:	Quality Assurance	High	Analytical QA discussed, no obvious concerns
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   Medium

Dibutyl Phthalate

Study Citation:	Tan, B. L., Hawker, D. W., Müller, J. F., Leusch, F. D., Tremblay, L. A., Chapman, H. F. (2007). Comprehensive study of endocrine disrupting compounds using grab and passive sampling at selected wastewater treatment plants in South East Queensland, Australia. Environment International 33(5):654-669.		
HERO ID:	1412614		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Authors described the sampling sites, equipment, procedure, and storage conditions.
	Metric 2: Analytical Methodology	Medium	Authors described GC-MS procedure, instrumentation, extraction methods, and recoveries. However, LODs were only reported as a range for all chemicals combined.
	Metric 3: Biomarker Selection	N/A	The study tested for parent chemicals in wastewater treatment plants.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was conducted in southeast Queensland, Australia
	Metric 5: Currency	Medium	Samples were collected in 2005.
	Metric 6: Spatial and Temporal Variability	High	15 grab samples were collected from 5 different sites on 3 sampling days in duplicate.
	Metric 7: Exposure Scenario	High	The WWTPs studied discharge their effluent into rivers, creeks, dams, or the open sea.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Mean concentrations, standard deviation, and sample size for each site were reported, but raw data are missing.
	Metric 9: Quality Assurance	Medium	Some QA/QC procedures discussed, such as recovery ranges which were acceptable.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Authors used standard deviations to characterize variance. There was some discussion, albeit limited, on uncertainties, data gaps, and limitations.

Overall Quality Determination   Medium

Study Citation:	Céspedes, R., Lacorte, S., Ginebreda, A., Barceló, D. (2006). Chemical monitoring and occurrence of alkylphenols, alkylphenol ethoxylates, alcohol ethoxylates, phthalates and benzothiazoles in sewage treatment plants and receiving waters along the Ter River basin (Catalonia, N. E. Spain). Analytical and Bioanalytical Chemistry 385(6):992-1000.		
HERO ID:	1414429		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	detailed info about sampling site, instruments, procedure, storage, and extraction
	Metric 2: Analytical Methodology	High	LC-MS analysis and report limit of detection
	Metric 3: Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Ter River Basin (Catalonia, Spain)
	Metric 5: Currency	Low	2001
	Metric 6: Spatial and Temporal Variability	Medium	19 samples. No replicates
	Metric 7: Exposure Scenario	Medium	pollutants in surface waters of the Ter River Basin
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	provide raw data for each sample concentration but missing detailed summary stat analysis
	Metric 9: Quality Assurance	Medium	No QA section but provided details standards and blanks used
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	no discussion of variability or uncertainties

Overall Quality Determination   Medium

Study Citation:	Brossa, L., Marcé, R. M., Borrull, F., Pocurull, E. (2005). Occurrence of twenty-six endocrine-disrupting compounds in environmental water samples from Catalonia, Spain. Environmental Toxicology and Chemistry 24(2):261-267.		
HERO ID:	1418117		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	describe sampling site, equipment, filtration, storage
Metric 2:	Analytical Methodology	Medium	used SPE-GC-MS; mention detection limits but not what they were for each chemical
Metric 3:	Biomarker Selection	N/A	Tested for parent chemical in surface water
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Catalonia, Spain
Metric 5:	Currency	Low	2001-2002
Metric 6:	Spatial and Temporal Variability	Medium	72 total, no replicates
Metric 7:	Exposure Scenario	High	Sampled river water that is a source of tap water, irrigation canal used for agriculture, and seawater that is a recreational site
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	no individual sample concentrations but did report min-max in table and average in text
Metric 9:	Quality Assurance	Low	QA/QC can be assumed but not discussed
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	report range but missing discussion of uncertainties or limitations

Overall Quality Determination   **Medium**

Study Citation:	Koch, H. M., Lorber, M., Christensen, K. L. Y., Pälmke, C., Koslitz, S., Brüning, T. (2013). Identifying sources of phthalate exposure with human biomonitoring: Results of a 48h fasting study with urine collection and personal activity patterns. International Journal of Hygiene and Environmental Health 216(6):672-681.		
HERO ID:	1464613		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Each participant collected all urine voids over a 48-hr fasting period. Each void stored separately, frozen at -18 °C; collection bags phthalate free. Also pre- and post-fast voids collected. Creatine adjusted.
	Metric 2:	Analytical Methodology	Medium	Deconjugated, internal isotope standards, and LC/LC-MS/MS using methods of Koch et al. (2003, 2007) and Preuss et al. (2005). LOD and LOQ reported. Instrument calibration missing but may be detailed in the methods referenced in the previous sentence.
	Metric 3:	Biomarker Selection	High	Table 1 lists parent chemicals and their metabolites. Four metabolites of DEHP analyzed in urine: MEHP, MECPP, MEOHP, and MEHHP. It seems like the study is measuring each metabolite from the chemicals of interest.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Germany, Bochum.
	Metric 5:	Currency	Medium	2009.
	Metric 6:	Spatial and Temporal Variability	Medium	Five adults (2 male, 3 female) participated. All urine voided over 48-hr fasting period collected. No replicates.
	Metric 7:	Exposure Scenario	High	Study to examine exposure via medications and personal care products without contribution of foods or beverages to phthalate exposure. No known occupational exposures.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Reported mean, (SD), median, and 95th percentile values as well as detection frequency (Table 2). Metabolite concentrations normalized to creatinine. Raw data by individual subject presented graphically in Supplemental materials.
	Metric 9:	Quality Assurance	High	Quality control, prepared from pooled native urine, and reagent blank samples included in each analytic batch. The lab participated in the EU Consortium to Perform Human Biomonitoring on a European Scale (COPHES). Creatinine concentrations measured by Jaffe method.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Supplemental materials show individual variation in pattern of metabolite concentrations for each urine void collected over 48-hr period (and pre and post). Discussed uncertainties and variability in results relative to other studies and to daily diaries of product use. SD reported.

Overall Quality Determination   High

| | Study Citation: | Kubwabo, C., Rasmussen, P. E., Fan, X., Kosarac, I., Wu, F., Zidek, A., Kuchta, S. L. (2013). Analysis of selected phthalates in Canadian indoor dust collected using a household vacuum and a standardized sampling techniques. Indoor Air 23(6):506-514. |
| | **HERO ID:** | 1588869 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The sampling methodology is described in detail in the materials and methods section.
	Metric 2:	Analytical Methodology	High	Method described in detail, the LODs are reported in the SI.
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in dust.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Data collected in Canada.
	Metric 5:	Currency	Low	Timing of sampling is not reported
	Metric 6:	Spatial and Temporal Variability	High	A total of 126 samples were collected.
	Metric 7:	Exposure Scenario	High	Exposure to phthalates in Canadian indoor houses.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	The SI table S1 reports data as mean, median and range.
	Metric 9:	Quality Assurance	High	Samples were collected and analyzed by Health Canada, the study reports a series of QA and QC.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability is reported in terms of range, limitations are not repoted.

Overall Quality Determination — High

Study Citation:	Frederiksen, H., Nielsen, J. K., Mørck, T. A., Hansen, P. W., Jensen, J. F., Nielsen, O., Andersson, A. M., Knudsen, L. E. (2013). Urinary excretion of phthalate metabolites, phenols and parabens in rural and urban Danish mother-child pairs. International Journal of Hygiene and Environmental Health 216(6):772-783.		
HERO ID:	1588874		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Most key criteria met. Duration of sample storage prior to analysis lacking.
	Metric 2: Analytical Methodology	High	Key criteria met.
	Metric 3: Biomarker Selection	High	Metabolites specific for parent chemicals.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Denmark.
	Metric 5: Currency	Medium	Sampling in 2011.
	Metric 6: Spatial and Temporal Variability	Medium	145 participants, single first morning urine samples, urban and rural.
	Metric 7: Exposure Scenario	High	Participant demographic characteristics reported.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Most key criteria met. Lack of raw data.
	Metric 9: Quality Assurance	High	Key criteria met.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Statistical variability reported within summary measures, lacking robust discussion of potential study limitations.

Overall Quality Determination   **High**

Study Citation:	Enke, U., Schleussner, E., Pälmke, C., Seyfarth, L., Koch, H. M. (2013). Phthalate exposure in pregnant women and newborns - The urinary metabolite excretion pattern differs distinctly. International Journal of Hygiene and Environmental Health 216(6):735-742.		
HERO ID:	1588876		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Most key criteria met. Duration of sample storage prior to analysis lacking.
	Metric 2: Analytical Methodology	Medium	Medium. Most key criteria met and LOQs reported. Recovery data lacking.
	Metric 3: Biomarker Selection	High	Metabolites specific for parent chemicals.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Germany.
	Metric 5: Currency	Medium	Samples collected 2008-2010.
	Metric 6: Spatial and Temporal Variability	Medium	Total samples (n=47) from women (n=7) during pregnancy and those women (n=9) with newborns providing first urine (n=9) and urine on days 2-5 (n=20); some replicate sampling from pregnant women (3-12 replicates), non-statistical sampling approach.
	Metric 7: Exposure Scenario	High	Participant demographic characteristics reported and relevant exposure scenario. Children and pregnant women susceptible populations.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Most key criteria met. Lack of raw data. Summary statistics provided.
	Metric 9: Quality Assurance	Medium	Most key criteria met, QA considerations in sampling equipment reported. Lack of recovery data.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Statistical variability reported within summary measures, discussion of potential reasons for results, however robust discussion of study limitations.

Overall Quality Determination   Medium

Study Citation:	Zeman, F. A., Boudet, C., Tack, K., Floch Barneaud, A., Brochot, C., Péry, A. R., Oleko, A., Vandentorren, S. (2013). Exposure assessment of phthalates in French pregnant women: Results of the ELFE pilot study. International Journal of Hygiene and Environmental Health 216(3):271-279.		
HERO ID:	1588878		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Urine samples of the mothers were collected in high-densitypolyethylene vials of 250 mL in the delivery room. Several aliquotsof 10 mL were drawn and stored in polypropylene vials at−80C until analysis.
Metric 2:	Analytical Methodology	High	Analytical methodology is described. The limits of quantification (LQ) of each metabolite are presented in Table 2.
Metric 3:	Biomarker Selection	High	Urine MnBP
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	France
Metric 5:	Currency	Medium	2007
Metric 6:	Spatial and Temporal Variability	Medium	Sample replicates no reported. 279 urine samples collected.
Metric 7:	Exposure Scenario	High	Exposure of French pregnant women to a large number of phthalates.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Individual data not reported. Table 2. Urinary phthalate metabolites concentrations (ug/L or ug/g creatinine); Median, Mean SD, Minimum, Maximum, 95th percentile (P95).
Metric 9:	Quality Assurance	High	The quality controls consisted in: (1) analyzing blanks (solvent and experimental blank); (2) analyzing quality standards (QC standard), prepared at different concentrations; (3) systematicallyadding concentration of QC standards in a control chart toverify the repeatability and the reproducibility.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Table 2 describes the variability of the population. No key limitations reported.

Overall Quality Determination — **High**

Study Citation:	Sathyanarayana, S., Alcedo, G., Saelens, B. E., Zhou, C., Dills, R. L., Yu, J., Lanphear, B. (2013). Unexpected results in a randomized dietary trial to reduce phthalate and bisphenol A exposures. Journal of Exposure Science & Environmental Epidemiology 23(4):378-384.		
HERO ID:	1597638		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	described enrollment, eligibility criteria, and urine collection
	Metric 2: Analytical Methodology	Low	referred to CDC method 6306.03; no LOD provided
	Metric 3: Biomarker Selection	High	biomarker is metabolite
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	U.S.
	Metric 5: Currency	Medium	2011
	Metric 6: Spatial and Temporal Variability	Medium	urine 3 timepoints (1 timepoint pooled); 10 families
	Metric 7: Exposure Scenario	High	urine
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	GM, 95%CI, % below LOD reported
	Metric 9: Quality Assurance	Medium	blanks included, samples not corrected, lab personnel were blinded
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	95%CI included; uncertainty not discussed, no obvious concerns

Overall Quality Determination   Medium

Study Citation:	Wan, H. T., Leung, P. Y., Zhao, Y. G., Wei, X., Wong, M. H., Wong, C. K. (2013). Blood plasma concentrations of endocrine disrupting chemicals in Hong Kong populations. Journal of Hazardous Materials 261:763-769.		
HERO ID:	1597652		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling method and storage described. Missing other information on equipment and procedures/regime
	Metric 2: Analytical Methodology	Medium	LOD and LOQ range provided; equipment and extraction described
	Metric 3: Biomarker Selection	N/A	Tested for parent chemicals in plasma, not metabolites or other biomarkers
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Hong Kong
	Metric 5: Currency	Medium	2010-2011
	Metric 6: Spatial and Temporal Variability	Medium	153 blood samples, no replicates
	Metric 7: Exposure Scenario	High	Study described possible exposure sources. It tested parent chemicals in plasma, so people were already exposed
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	mean, SD, median, min, max, and % of samples below LOD provided. No replicates
	Metric 9: Quality Assurance	High	Blanks, standards, and recoveries were described. Recovery percentages were acceptable.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability captured with SD, min and max. Limited discussion of uncertainties and gaps

Overall Quality Determination   Medium

Study Citation:	Ma, T. T., Christie, P., Luo, Y. M., Teng, Y. (2013). Phthalate esters contamination in soil and plants on agricultural land near an electronic waste recycling site. Environmental Geochemistry and Health 35(4):465-476.		
HERO ID:	1597686		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling and storage described clearly.
	Metric 2: Analytical Methodology	High	Equipment, methods, detection limits well described.
	Metric 3: Biomarker Selection	N/A	Soil and plant samples no biomarkers needed.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	China
	Metric 5: Currency	Medium	2010
	Metric 6: Spatial and Temporal Variability	High	Each point shown is a mean of 3 replicates. 9 sites
	Metric 7: Exposure Scenario	Medium	sampling site 250meters from an E-waste recycling site
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Numeric data not presented. Concentrations shown in bar graphs
	Metric 9: Quality Assurance	High	Quality discussed: recovery rates, DLs, internal standards, blanks, parallel samples
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability and uncertainty discussed briefly. No concerns.

Overall Quality Determination   High

Study Citation:	Arukwe, A., Eggen, T., Moeder, M. (2012). Solid waste deposits as a significant source of contaminants of emerging concern to the aquatic and terrestrial environments - A developing country case study from Owerri, Nigeria. Science of the Total Environment 438(Elsevier):94-102.
HERO ID:	1597705

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	site and sampling discussed
	Metric 2:	Analytical Methodology	High	GC–MS; limits of quantification range from 1-10 ng/L (p.97)
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Owerri municipal solid waste dump site in Imo State, Nigeria
	Metric 5:	Currency	Medium	October 2011
	Metric 6:	Spatial and Temporal Variability	Low	sampled 1 day, 2 h after heavy rain; 4 sampling locations within the dump site selected arbitrarily to scan entire site
	Metric 7:	Exposure Scenario	High	sediment from a solid waste dump site
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 1 provides concentration; no measured variation
	Metric 9:	Quality Assurance	Medium	blank analysis performed; two replicates for each calculation; std of sample duplicates ranged from 2-23% (p.97)
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	compared finding to previous studies p. 101 and Table 3

Overall Quality Determination   Medium

Study Citation:	Beko, G., Weschler, C. J., Langer, S., Callesen, M., Toftum, J., Clausen, G.,eo (2013). Children's phthalate intakes and resultant cumulative exposures estimated from urine compared with estimates from dust ingestion, inhalation and dermal absorption in their homes and daycare centers. PLoS ONE 8(4):e62442.		
HERO ID:	1597735		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The study described the sampling procedure for dust and urinary sample. Urinary concentration sampling were briefly described in the present study. Storage conditions were described. All pertinent sampling information for indoor dust is provided in the supplementary information in another study of the same cohort, Langer et al., 2010(HERO ID: 1007791).
	Metric 2:	Analytical Methodology	High	Analytical methods for both urinary concentrations (LC/MS) and dust concentrations (GC-MS) were provided. Detection limits were reported. (Dust - Langer et al., 2010 supp table S1 HERO ID: 1007791; Urinary - Langer et al., 2013 table 1 HERO ID: 600114).
	Metric 3:	Biomarker Selection	High	Biomarker (parent chemical or metabolite) is derived from exposure to the chemical of interest.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Odense, Denmark
	Metric 5:	Currency	Medium	The dust samples and urinary samples were collected in 2008.
	Metric 6:	Spatial and Temporal Variability	High	The study has large sample size and can capture the variability of environmental contamination in population and scenario.
	Metric 7:	Exposure Scenario	Medium	The data likely represent the relevant exposure scenario.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Supplementary or raw data or individual data points are not reported.
	Metric 9:	Quality Assurance	High	Quality assurance was conducted for both dust concentration and urinary concentration. Recoveries for urinary concentrations were provided in Langer et al 2013 (1600114). Recoveries for dust concentrations were reported in Langer et al 2010 (1007791).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	The study has a robust comparison to other publications and discussion of limitations. It provides evidence for the consistency of the data.

Overall Quality Determination   High

| Study Citation: | Llompart, M., Sanchez-Prado, L., Pablo Lamas, J., Garcia-Jares, C., Roca, E., Dagnac, T. (2013). Hazardous organic chemicals in rubber recycled tire playgrounds and pavers. Chemosphere 90(2):423-431. | | |
| HERO ID: | 1597738 | | |

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Key sampling methods reported.
	Metric 2: Analytical Methodology	High	Key analytical methods reported.
	Metric 3: Biomarker Selection	N/A	N/A.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Spain.
	Metric 5: Currency	Medium	Study published in 2013.
	Metric 6: Spatial and Temporal Variability	Medium	9 to 21 samples, no replicates.
	Metric 7: Exposure Scenario	High	Exposure source well characterized.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not provided, stats in Table 2, analytical summary in Table 1.
	Metric 9: Quality Assurance	Medium	QA factors implied and summarize in Table 1.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Limited gaps and limitations reported.

Overall Quality Determination   High

Study Citation:	Mortamais, M., Chevrier, C., Philippat, C., Petit, C., Calafat, A. M., Ye, X., Silva, M. J., Brambilla, C., Eijkemans, M. J., Charles, M. A., Cordier, S., Slama, R. (2012). Correcting for the influence of sampling conditions on biomarkers of exposure to phenols and phthalates: a 2-step standardization method based on regression residuals. Environmental Health 11(1):29.		
HERO ID:	1597770		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	This paper is about sampling. Methods were well-characterized. They describe a 2-step standardization method to limit the impact of between-subject variations in sampling conditions.
	Metric 2: Analytical Methodology	Medium	LODs would be found in the second SI file. Samples were sent to the National Center for Environmental Health laboratory at the Centers for Disease Control and Prevention in the US for analysis a few years after collection. Analytical methods are summarized.
	Metric 3: Biomarker Selection	High	Metabolites were measured in urine. 4 metabolites of DEHP were summed. 7 other metabolites were reported individually. One metabolite could be metabolites of two different parent chemicals (DINP and DBP). No effort was made to apportion them.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	France
	Metric 5: Currency	Medium	2002-2006
	Metric 6: Spatial and Temporal Variability	Medium	287 samples were collected, but no replicates. Urine samples were collected in the morning.
	Metric 7: Exposure Scenario	Medium	Samples reflect amount of phthalate metabolites in urine of pregnant women in the vicinity of 3 cities in France. The questionnaire the women completed did not go into detail about potential sources of exposure to phthalates, but information such as whether the women smoked was collected.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Median values and the 25th and 75th percentiles were provided, but not means, ranges, or standard deviations. Raw data was not included. This article shows only a subset of the data collected. For more detailed results, see Chevrier C, Petit C, Philippat C, Mortamais M, Slama R, Rouget F, Calafat AM, Ye X, Silva MJ, Charles MA, et al: Maternal Urinary Phthalates and Phenols and Male Genital Anomalies. Epidemiology 2012, 23(2):353–356.
	Metric 9: Quality Assurance	Low	QA was not discussed, but no obvious concerns came to mind during review.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Some limitations are discussed, e.g., possible factors not characterized that could have affected results. One data table provides information about the association between sampling conditions (time, season, gestational age, duration of sample storage at room temperature, etc.) and concentrations of log-transformed phthalate metabolites. These are the only elements pf the paper that address variability and uncertainty.

Overall Quality Determination   Medium

Study Citation:	He, F., Song, H., Cheng, S., Liang, W.,ei, Wu, Z. (2008). Distribution of 25 semi-volatile organic compounds of two urban lakes in Wuhan, China. Fresenius Environmental Bulletin 17(1):20-26.		
HERO ID:	1597996		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	detailed description of sampling sites, instruments, procedure, filtration, and storage
	Metric 2: Analytical Methodology	Medium	detailed and include detection limits, but detection limits not reported for individual chemicals.
	Metric 3: Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Wuhan, China
	Metric 5: Currency	Medium	2006
	Metric 6: Spatial and Temporal Variability	Medium	36 samples. Unclear if there are replicates.
	Metric 7: Exposure Scenario	High	Wuhan is highly industrialized and the lakes are polluted with SVOCs
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	individual sample concentrations are not reported but overall the reporting of the results is very thorough; provide concentration at each lake, average, range, and standard deviation
	Metric 9: Quality Assurance	High	included standards, recovery rates were almost all much greater 70%, and state that "all data were subject to strict quality control procedures"
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	include spatial variability metrics but don't really discuss uncertainties

Overall Quality Determination   High

Study Citation:	Liu, Y.,u, Chen, Z., Shen, J. (2013). Occurrence and Removal Characteristics of Phthalate Esters from Typical Water Sources in Northeast China. Journal of Analytical Methods in Chemistry 2013:419349.		
HERO ID:	1598198		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Described sampling site in detail. Sparse information on sample collection, equipment, and procedures.
	Metric 2: Analytical Methodology	High	Detection limits were provided as a range from 6 to 30 ng/L. Extraction procedure followed EPA method. Extracted with GC and referenced other publications for more details.
	Metric 3: Biomarker Selection	N/A	Tested for parent chemicals in water sources
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	China
	Metric 5: Currency	Medium	2008 and 2011
	Metric 6: Spatial and Temporal Variability	Medium	16 sampling sites. No replicates
	Metric 7: Exposure Scenario	Medium	presence of phthalate esters in environment, specifically drinking water sources
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Reported mean, range, and detection frequency but not individual sample stats
	Metric 9: Quality Assurance	Medium	used procedural blanks, describe sterilization procedure. Most mean recoveries >70%, but low end of some compounds were <70%
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Provide range and discuss variation BETWEEN different chemical concentrations at different sites but not variation within samples. Some discussion of limitations and data gaps

Overall Quality Determination   Medium

Study Citation:	Pei, X. Q., Song, M., Guo, M., Mo, F. F., Shen, X. Y. (2013). Concentration and risk assessment of phthalates present in indoor air from newly decorated apartments. Atmospheric Environment 68:17-23.		
HERO ID:	1598351		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling procedure, equipment, and transport were described.
Metric 2:	Analytical Methodology	High	GC was used for analysis, LOD was reported for each chemical.
Metric 3:	Biomarker Selection	N/A	NA - indoor air samples no biomarker needed.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	residential homes in Hangzhou, China
Metric 5:	Currency	Medium	2011-2012
Metric 6:	Spatial and Temporal Variability	High	10 newly decorated apartments were sampled
Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenario (indoor air).
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Average concentrations were reported with summary statistics.
Metric 9:	Quality Assurance	High	QA/QC methods were described and recovery rates ranged from 91.75% to 115.1%.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	The study compared its results to other studies in other countries; discussion of variability and limitation is limited.

Overall Quality Determination   **High**

Study Citation:	Zhang, Q.,i, Lu, X., Zhang, X. L., Sun, Y. G., Zhu, D., Wang, B. L., Zhao, R., Zhang, Z. D. (2013). Levels of phthalate esters in settled house dust from urban dwellings with young children in Nanjing, China. Atmospheric Environment 69:258-264.		
HERO ID:	1598628		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Brief description, more details in supplemental information. Sampling materials not included in main text, supplemental not available.
	Metric 2: Analytical Methodology	Medium	Brief description, missing some details about the analytical setup
	Metric 3: Biomarker Selection	N/A	NA - Dust sample no biomarker needed
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Nanjing, China
	Metric 5: Currency	Medium	Data collected in 2011
	Metric 6: Spatial and Temporal Variability	Medium	No replicates collected
	Metric 7: Exposure Scenario	High	Urban dwellings and behavior patterns
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	raw data not provided, missing outdoor dust
	Metric 9: Quality Assurance	High	Analytical QA described and reported
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Sources of uncertainty and variability within the data discussed.

Overall Quality Determination   High

Study Citation:	Yano, K., Hirosawa, N., Sakamoto, Y., Katayama, H., Moriguchi, T., Joung, K. E., Sheen, Y. Y., Asaoka, K. (2002). Phthalate levels in beverages in Japan and Korea. Bulletin of Environmental Contamination and Toxicology 68(4):463-469.		
HERO ID:	1598698		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported
Metric 2:	Analytical Methodology	High	Analytical method described. detection limit reported
Metric 3:	Biomarker Selection	N/A	Beverage sampling
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Japan and Korea
Metric 5:	Currency	Low	Study published in 2002
Metric 6:	Spatial and Temporal Variability	Medium	5-10 samples per scenario; no replicates
Metric 7:	Exposure Scenario	High	exposure scenario ingestion of beverages
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not provided
Metric 9:	Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Few gaps and limitations reported

Overall Quality Determination   Medium

Study Citation:	Otake, T., Yoshinaga, J., Yanagisawa, Y. (2001). Analysis of organic esters of plasticizer in indoor air by GC-MS and GC-FPD. Environmental Science & Technology 35(15):3099-3102.		
HERO ID:	1598712		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Samples were collected according to publicly available SOPs that are scientifically sound and widely accepted (i.e., from trusted or authoritative source) for the chemical and media of interest.
	Metric 2: Analytical Methodology	High	Samples were analyzed according to publicly available analytical methods that are scientifically sound and widely accepted (i.e., from trusted or authoritative source) and are appropriate for the chemical and media of interest.
	Metric 3: Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Japan.
	Metric 5: Currency	Low	Timing of sample collection for monitoring data is not reported, discussed, or referenced. However, publication year of 2001 is used as a proxy for sampling year.
	Metric 6: Spatial and Temporal Variability	Medium	There were 5-10 samples collected for a single scenario. No replicates were reported.
	Metric 7: Exposure Scenario	Low	The data somewhat represents relevant indoor air exposure scenarios.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not reported. Summary statistics were included.
	Metric 9: Quality Assurance	Medium	The study applied and documented quality assurance/quality control measures; however, one or more pieces of QA/QC information is not described. Missing information is unlikely to have a substantial impact on results.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Gaps and limitations not reported. There was only a minimal characterization of variability and uncertainty.

Overall Quality Determination   Medium

Study Citation:	Cheng, Z., Nie, X. P., Wang, H. S., Wong, M. H. (2013). Risk assessments of human exposure to bioaccessible phthalate esters through market fish consumption. Environment International 57-58:75-80.
HERO ID:	1600107

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling procedure was only briefly mentioned and lacked details. It is mentioned there is more information in S1 (not in HERO link for QCer).
	Metric 2:	Analytical Methodology	High	Analytical procedure -GCMS was described, along with LOQ.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Hong Kong
	Metric 5:	Currency	Medium	May-November 2009
	Metric 6:	Spatial and Temporal Variability	High	20 species of commonly consumed fish were sampled, varying with 3-36 replicates depending on the fish type (table 1)
	Metric 7:	Exposure Scenario	High	Exposure matrix was relevant - food/diet/aquatic species
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Data were reported as average and not individual samples. Some summary statistics provided.
	Metric 9:	Quality Assurance	High	QA/QC was performed. The target compounds have high recovery rates >73.1% and recoveries of internal standards in method blanks and in fish samples were >70%
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study compared the results to previous studies and other publications. No limitations provided.

Overall Quality Determination   High

Study Citation:	Langer, S., Bekö, G., Weschler, C. J., Brive, L. M., Toftum, J., Callesen, M., Clausen, G. (2014). Phthalate metabolites in urine samples from Danish children and correlations with phthalates in dust samples from their homes and daycare centers. International Journal of Hygiene and Environmental Health 217(1):78-87.		
HERO ID:	1600114		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling procedure, equipment, matrix characters, calibration are clearly described and detailed description was provided in the main text.
Metric 2:	Analytical Methodology	High	Analytical methods for both urinary concentrations (LC/MS) and dust concentrations (GC-MS) were provided. Detection limits were reported. (Dust concentrations provided in Langer et al., 2010 Table S1; HERO ID is 1007791. Urinary results presented in Table 1 of this study). Authors did not adjust for creatinine but explained why.
Metric 3:	Biomarker Selection	Low	MnBP is a biomarker for both DBP and BBP.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Study was performed in Odense, Denmark.
Metric 5:	Currency	Medium	The dust samples and urinary samples were collected in 2008.
Metric 6:	Spatial and Temporal Variability	Medium	The study has large sample size and can capture the variability of environmental contamination in population and scenario. There were no replicates, which might not be appropriate for a large study analyzing urine samples, but monitoring guide instructs that medium is the highest score if replicates are missing.
Metric 7:	Exposure Scenario	High	The study explained the many possible sources of exposure to phthalates and their population of interest. This is a biomonitoring study to assess exposure to the chemicals.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Supplementary or raw data or individual data points are not reported.
Metric 9:	Quality Assurance	High	Quality assurance was conducted for both dust concentration and urinary concentration. Recoveries for urinary concentrations were provided in this study. Recoveries for dust concentrations were reported in another study Langer et al 2010 (HERO ID: 1007791).
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	The study has a robust characterization of variance with standard deviations for both the geometric and arithmetic means, as well as percentiles. There is some discussion of uncertainties, limitations, and gaps.

Overall Quality Determination   High

Study Citation: Shell Oil, (1986). Fate of some specific compounds in the Norco chemical biotreater and their effect on the outcome of effluent bioassays.
HERO ID: 1629033

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	There is limited description included. It says water samples were daily composites, but there is little other information about water sampling protocol. Missing information includes sampling equipment for water, sampling procedures, sample storage, and performance/calibration of sampler. Page 35 explains in some detail sampling and analysis procedures for the vapor samples collected with TENAX traps, including calibration information.
	Metric 2: Analytical Methodology	Medium	There is limited description included. They used GC/MS. MDLs listed for water samples, based on EPA published values. Analytical methodologies for water samples were EPA-approved. It appears standards were used, but their use is not well-explained. Recoveries are only mentioned for SVOCs. Spiking is only mentioned for the June 1984 samples. Although MDLs are not listed for air samples, p. 35 explains in some detail sampling and analysis procedures for the vapor samples collected with TENAX traps, including calibration information. Medium applies to water, the primary medium analyzed; low applies to air samples due to missing MDLs and generally limited information.
	Metric 3: Biomarker Selection	N/A	Samples were from environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	USA
	Metric 5: Currency	Low	Sampling began in 1984
	Metric 6: Spatial and Temporal Variability	Low	Sampling approach poorly captures variability of environmental contamination. Samples collected from 8 locations on June 11, 1984 (see p. 44) were analyzed for this chemical. For results, see pp. 49 and 51. However, there were no replicates/duplicates.
	Metric 7: Exposure Scenario	Medium	Data may represent a relevant exposure scenario, but come from "pilot plants," with different aeration methods and temperatures to actual WWTPs. Data are missing details about the population of interest, the climate, and contextual information such as what types of manufacturing facilities the wastewater treated is coming from.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Only individual sample concentrations are provided, no summary statistics.
	Metric 9: Quality Assurance	Low	There was only one blank water sample, from June 1984. Spiking of a blank air sample for calibration is mentioned too. Recoveries are only discussed for samples analyzed for SVOCs but were from 11 to 38 percent. They did not correct for low recoveries.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variability was not characterized, and there was minimal discussion of uncertainties. No standard deviations were reported.

Overall Quality Determination   Low

Study Citation:	Téllez-Rojo, M. M., Cantoral, A., Cantonwine, D. E., Schnaas, L., Peterson, K., Hu, H., Meeker, J. D. (2013). Prenatal urinary phthalate metabolites levels and neurodevelopment in children at two and three years of age. Science of the Total Environment 461-462:386–390.		
HERO ID:	1639217		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sample collection procedure was reported with details; standard method to measure human urinary concentration was used.
Metric 2:	Analytical Methodology	High	Analytical process was reported. LOD for each metabolite was reported in Table 2.
Metric 3:	Biomarker Selection	High	Biomarker (parent chemical or metabolite) is derived from exposure to the chemical of interest.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Mexico City
Metric 5:	Currency	Low	Samples were archived urine samples from 1997-2003
Metric 6:	Spatial and Temporal Variability	Medium	Final sample consisted of 135 children. No indication of replicate analysis or sampling
Metric 7:	Exposure Scenario	High	Exposure matrix was highly relevant - metabolite of target chemicals.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Geometric mean were reported, no raw data were provided.
Metric 9:	Quality Assurance	Medium	QA/QC was conducted but briefly discussed.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	The study has a robust discussion of its limitations and comparisons to other publications.

Overall Quality Determination   High

Study Citation:	Hongjun, Y., Wenjun, X., Qing, L., Jingtao, L., Hongwen, Y., Zhaohua, L. (2013). Distribution of phthalate esters in topsoil: a case study in the Yellow River Delta, China. Environmental Monitoring and Assessment 185(10):8489-8500.		
HERO ID:	1639226		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Key sampling methods reported
Metric 2:	Analytical Methodology	High	Key analytical methods reported
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Yellow River Delta, China
Metric 5:	Currency	Medium	Samples collected in September 2009
Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
Metric 7:	Exposure Scenario	Medium	Soil samples in various locations, urban, suburban and rural. Unclear if is applicable to US soils
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not reported
Metric 9:	Quality Assurance	High	QA reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Gaps and limitations not well characterized

Overall Quality Determination   High

Study Citation:	Sun, J., Huang, J., Zhang, A., Liu, W., Cheng, W. (2013). Occurrence of phthalate esters in sediments in Qiantang River, China and inference with urbanization and river flow regime. Journal of Hazardous Materials 248-249(1):142-149.		
HERO ID:	1639231		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Key sampling methods reported
	Metric 2: Analytical Methodology	High	Key analytical methods reported. See SI for detection limits
	Metric 3: Biomarker Selection	N/A	Parent chemicals were tested in river sediment
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Qiantang River, China
	Metric 5: Currency	Medium	Samples collected in 2011
	Metric 6: Spatial and Temporal Variability	Medium	No replicates
	Metric 7: Exposure Scenario	Medium	Exposure source characterized - unclear how population can be exposed to the river sediment (i.e., how do they use the river).
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not provided
	Metric 9: Quality Assurance	Medium	Key QA reported. Some recoveries were low if considering the reported range and not just the mean.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Few gaps and limitations reported. Variance characterized in SI (Table SM-3)

Overall Quality Determination   Medium

Study Citation:	Westinghouse Savannah River Company, (1997). Sanitary landfill groundwater monitoring report. Fourth quarter 1996 and 1996 summary. 14(GRA and I):506.		
HERO ID:	1740826		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported such as sample storage conditions and sampler calibration
	Metric 2:	Analytical Methodology	High	Key analytical methods reported
	Metric 3:	Biomarker Selection	N/A	the study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Samples collected in 1996
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7:	Exposure Scenario	High	Exposure source characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw data reported
	Metric 9:	Quality Assurance	High	Key QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Few gaps and limitations reported

Overall Quality Determination   Medium

| Study Citation: | Westinghouse Savannah River Company, (1992). Sanitary Landfill 1991 annual groundwater monitoring report. |
| HERO ID: | 1740870 |

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Sampling methodology is only briefly discussed, therefore, most sampling information is missing and likely to have a substantial impact on results. The type of monitoring wells are reported.
Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology was not described, including analytical instrumentation.
Metric 3:	Biomarker Selection	N/A	The study tested for the parent chemical in environmental media (groundwater).
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	The samples were collected in Savannah River Site, Aiken, SC.
Metric 5:	Currency	Low	The samples were collected in 1991.
Metric 6:	Spatial and Temporal Variability	Low	The collection of replicates was not reported. Fifty-seven wells were sampled, but sample size is not reported. It's inferred that at least one sample was collected from each well.
Metric 7:	Exposure Scenario	Medium	Groundwater samples were collected from monitoring wells beneath a sanitary landfill. The use of exposure controls are not described.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	Raw data is reported in tables for each monitoring well starting on page 168. Summary statistics are not reported.
Metric 9:	Quality Assurance	Low	QA/QC techniques and results were not directly discussed and recoveries were not reported.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	The characterization of variability is absent (no measure of variance reported). Key uncertainties, limitations, and data gaps are not discussed.

Overall Quality Determination   Uninformative

Study Citation: Geraghty & Miller Inc, (1983). Hydrogeology of the Hill Site: The Bendix corporation: Sidney, New York with cover letter.
HERO ID: 1745520

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	There is some (limited) sampling methodology reported for soil collection on pg 62, but half of that page is illegible. Sampling methods for groundwater were almost nonexistent, as the report primarily focused on boring installation.
Metric 2:	Analytical Methodology	High	Volatile organic compounds analyzed by EPA method 601. LODs are reported in Appendix E at the bottom of the table on page 81.
Metric 3:	Biomarker Selection	N/A	Parent chemicals were tested in soil and water.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Sampling conducted at the Bendix Corporation plant in Sidney, New York.
Metric 5:	Currency	Low	Samples collected in 1983.
Metric 6:	Spatial and Temporal Variability	Low	Samples were collected from the wells five times as the drillings proceeded. There is no report of number of samples. Duplicate sampling occurred some but not all of the time.
Metric 7:	Exposure Scenario	High	Soil and ground water were sampled to investigate the extent of contamination at this site.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	Table 3 presents the results but due to the quality of the scan it is impossible to read. Appendix E contains the laboratory reports.
Metric 9:	Quality Assurance	Low	The laboratory followed an EPA method so QA/QC can be inferred.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	There is no information on sample variability or statistics. The document reports the need to keep monitoring the next steps.

Overall Quality Determination   Low

Study Citation: Geraghty & Miller Inc, (1988). Results of the second phase of a hydrogeologic investigation at the Allied-Signal Inc facility, Morristown, New Jersey with cover letter dated 012089.

HERO ID: 1745619

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Critically Deficient	The study did not report storage conditions, sampling equipment or procedures.
Metric 2:	Analytical Methodology	Low	The study did not describe analytical methods or reported LODs however it cited EPA Method 601.
Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media (water).
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Geographic location is reported; New Jersey, USA.
Metric 5:	Currency	Low	Timing of sample collection for monitoring data is not consistent with when current exposures (sampling occurred in 1987; >15 years old) may be expected and likely to have a substantial impact on results.
Metric 6:	Spatial and Temporal Variability	Low	Sampling approach does not captures variability of environmental contamination in population/scenario/media of interest. The study used 20 samples and no replicates.
Metric 7:	Exposure Scenario	Medium	The study did not provide details about the population of interest or exposure assessment.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Individual sample concentrations (raw data) reported but there is no summary statistics.
Metric 9:	Quality Assurance	Medium	Limited description of QA/QC techniques.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Did not characterize variability, or discussed uncertainties and limitations.

Overall Quality Determination   Uninformative

Study Citation:	Dames & Moore, (1989). Ground water and soils data summary report with attachments, appendices, cover sheets and letter dated 080989.		
HERO ID:	1745621		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Limited description of sampling methodology
Metric 2:	Analytical Methodology	Critically Deficient	Analytical methods not described
Metric 3:	Biomarker Selection	N/A	Did not sample for biomarkers
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Illinois, USA
Metric 5:	Currency	Low	Samples from 1987
Metric 6:	Spatial and Temporal Variability	Low	5 samples, no replicates
Metric 7:	Exposure Scenario	Medium	Data likely represents a relevant exposure scenario, missing details about the population of interest and microenvironment
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Only individual sample concentrations, no summary statistics
Metric 9:	Quality Assurance	Medium	Limited description of QA/QC techniques, analyzed control samples
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty were not characterized or described

Overall Quality Determination   Uninformative

Study Citation:	Kong, S., Ji, Y., Liu, L., Chen, L.,i, Zhao, X., Wang, J., Bai, Z., Sun, Z. (2013). Spatial and temporal variation of phthalic acid esters (PAEs) in atmospheric PM10 and PM2.5 and the influence of ambient temperature in Tianjin, China. Atmospheric Environment 74:199-208.		
HERO ID:	1935999		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling methodology described in detail in terms of sampling equipment, procedures, storage conditions, calibration of sampler, study site (urban residential/industrial, season, temperature) and matrix (ambient air) characteristics (height of samplers, distance from road). Insufficient information regarding duration of storage of samples prior to analyses.
	Metric 2:	Analytical Methodology	High	High: Analytical methodology described in detail in terms of extraction method, analytical instrumentation, instrument calibration, chemical-specific limits of detection, recoveries.
	Metric 3:	Biomarker Selection	N/A	Not applicable: no biomonitoring conducted.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Sampling conducted in Tianjin, China.
	Metric 5:	Currency	Medium	Sampling conducted in winter, summer, and spring of 2010.
	Metric 6:	Spatial and Temporal Variability	High	Spatial variability in terms of seven sampling locations described as across urban functional (residential, industrial, traffic, commercial) zones with height of sampler placement specified; relatively large sample size of n=21 PM10 at each of seven sampling sites and n=15 PM2.5 samples collected at each of three sampling sites (replicate sampling). Temporal variability described for 24-hour sampling conducted across winter, spring and summer of 2010.
	Metric 7:	Exposure Scenario	High	Exposure scenario described for sampling results in terms of residential, traffic, residential/commercial, residential/traffic, and industrial functional areas. Use of field blanks described. Concentrations by microenvironment in terms of season and temperature reported.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Summary statistics reported as mean and standard deviation of concentration results across location and dates of sampling with numbers of samples, frequency of detection specified. Insufficient information on raw data results.
	Metric 9:	Quality Assurance	Medium	Quality assurance procedures outlined in detail in terms of use of cleaning of sampling equipment within a clean laboratory, calibration of samplers, baking of filters to remove organic compounds prior to sampling, use of field blanks and blank-correction of concentration results. Pre-exposure sampling not conducted.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability in terms of reported concentration standard deviations, as well as concentration results across variable locations, seasons, temperatures, specified. Authors discussed and analyzed potential sources of exposure concentrations, as well as differences between reported concentrations within this study and others, however insufficient robust discussion of potential study limitations, uncertainties and data gaps.

Overall Quality Determination   High

Study Citation:	Dirtu, A. C., Geens, T., Dirinck, E., Malarvannan, G., Neels, H., Van Gaal, L., Jorens, P. G., Covaci, A. (2013). Phthalate metabolites in obese individuals undergoing weight loss: Urinary levels and estimation of the phthalates daily intake. Environment International 59(Elsevier):344–353.		
HERO ID:	1936010		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	ENDORUP trial described, 24-hour urine at 4 timepoints described. Some information missing such as sampling equipment and storage.
Metric 2:	Analytical Methodology	High	LOQ in Table SI.3. Equipment and extraction described. Calibration described in SI. Creatinine adjusted.
Metric 3:	Biomarker Selection	High	Metabolite in urine. The study indicates that the metabolites are from the parent chemicals of interest.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Belgium
Metric 5:	Currency	Medium	2009-2012
Metric 6:	Spatial and Temporal Variability	High	152 participants, 24-hour urine samples. Blind sample duplicates (at least 2 blind duplicate samples per batch of 20 samples)
Metric 7:	Exposure Scenario	High	Biomonitoring in humans, more specifically obese individuals.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Summary statistics provided, including median, 10th, 90th, 25th, 75th. Individual points not reported.
Metric 9:	Quality Assurance	High	LOQ, spike level, recovery, method precision, blind duplicate samples, internal blanks described; also participated in inter-laboratory comparison exercise GERMAN EQUAS 2012.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Variability discussed and compared to other studies. No limitations reported.

Overall Quality Determination   High

Study Citation:	Upson, K., Sathyanarayana, S., De Roos, A. J., Thompson, M. L., Scholes, D., Dills, R., Holt, V. L. (2013). Phthalates and risk of endometriosis. Environmental Research 126:91-97.		
HERO ID:	1936011		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	WREN study enrollment described and refers to other papers; Non-fasting spot urine samples
	Metric 2: Analytical Methodology	High	LOQ, extraction, and equipment described
	Metric 3: Biomarker Selection	High	metabolite in urine
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	U.S.
	Metric 5: Currency	Low	1996-2001
	Metric 6: Spatial and Temporal Variability	Medium	n = 92 cases and n = 195 controls, no replicates
	Metric 7: Exposure Scenario	High	urine
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	median and IQR provided
	Metric 9: Quality Assurance	Medium	quality process described; inter batch reliability reported
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   High

Study Citation:	Orecchio, S., Indelicato, R., Barreca, S. (2013). The distribution of phthalate esters in indoor dust of Palermo (Italy). Environmental Geochemistry and Health 35(5):613-624.		
HERO ID:	1936014		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling methods reference European Standard EN12341 but does not detail sampler calibration, filter handling, or equipment for dust collection and whether is was cleaned prior.
	Metric 2: Analytical Methodology	High	Extraction and GC/MS method described. Limit of detection and limit of quantification generally reported.
	Metric 3: Biomarker Selection	N/A	air sampling
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Palermo, Italy
	Metric 5: Currency	Medium	Study conducted in 2013
	Metric 6: Spatial and Temporal Variability	Medium	No replicate samples collected
	Metric 7: Exposure Scenario	High	Exposure from indoor air characterized.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	no raw data provided
	Metric 9: Quality Assurance	High	Recovery experiments used for correction, blank analysis, and replicate analysis to test precision of method were conducted
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability in results discussed. Limitations of study itself not well described

Overall Quality Determination — **High**

Study Citation:	Yoshida, T., Matsunaga, I., Tomioka, K., Kumagai, S. (2006). Interior air pollution in automotive cabins by volatile organic compounds diffusing from interior materials: I. Survey of 101 types of Japanese domestically produced cars for private use. Indoor and Built Environment 15(5):425-444.		
HERO ID:	1949033		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	A detailed description of the sampling methodology is provided.
	Metric 2: Analytical Methodology	Low	The description of the analytical methodology provided has a few flaws.
	Metric 3: Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was conducted in Japan.
	Metric 5: Currency	Low	The study was conducted in the summer season (June–September) of 2001 (n=14), 2002 (n=28), 2003 (n=47) or 2004 (n=12).
	Metric 6: Spatial and Temporal Variability	High	There were ≥ 10 samples for a single scenario.
	Metric 7: Exposure Scenario	High	The exposure scenario discussed in the monitored study represents the exposure scenario of interest for the chemical.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	The presentation of results was good.
	Metric 9: Quality Assurance	Low	The description of QA/QC was poor.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	The presentation of variability and uncertainty was good.

Overall Quality Determination   Medium

Study Citation: Muszkat, L., Raucher, D., Magaritz, M., Ronen, D. (1994). Groundwater contamination by organic pollutants. Environmental Science and Pollution Control, vol. 11 11:257-271.

HERO ID: 1992405

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Critically Deficient	The sampling methodology is not reported.
Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology is not described.
Metric 3:	Biomarker Selection	N/A	Testing parent chemical in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	The geographic areas are reported in figures 1 and 6.
Metric 5:	Currency	Low	Sampling from 1988 to 1991
Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size is not reported.
Metric 7:	Exposure Scenario	High	Groundwater contamination by prolonged irrigation by sewage effluents.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	Individual data points are not reported and there is no information of the data corresponding to a single point or an average.
Metric 9:	Quality Assurance	Critically Deficient	There is no report of QA/QC applications for the study.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variability or uncertainty is not reported in the study.

Overall Quality Determination   Uninformative

Study Citation:	Lewis, R. C., Meeker, J. D., Peterson, K. E., Lee, J. M., Pace, G. G., Cantoral, A., Téllez-Rojo, M. M. (2013). Predictors of urinary bisphenol A and phthalate metabolite concentrations in Mexican children. Chemosphere 93(10):2390-2398.		
HERO ID:	2000737		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	ELEMENT cohort described; urine sampling not described in detail.
	Metric 2: Analytical Methodology	Medium	An in-house method was developed, which was a slight modification of the CDC Laboratory Procedure Manuals for phthalate metabolites in urine (method no. 6306.03, revised: July 3, 2010) - modification not described; LOQ provided
	Metric 3: Biomarker Selection	High	The study is looking at parent chemical/metabolites in urine.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was conducted among children/mothers in Mexico.
	Metric 5: Currency	Medium	Timing of sample collection for monitoring data is less consistent with current or recent exposures may be expected (.5 yrs). Sampling period was from 2010. However some prior data from a 1994 cohort study was also used.
	Metric 6: Spatial and Temporal Variability	Low	The study used a large sample size (n = 49 boys and 50 girls). However, urine sampling not described well enough (the study is not clear if urine samples were 24 hrs samples collected vs. first morning).
	Metric 7: Exposure Scenario	High	Biomonitoring to quantify the exposure from Mexican boys and girls from the ELEMENT cohort.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Supplementary or raw data (i.e., individual data points) are not reported , and therefore summary statistics cannot be reproduced.Geometric mean, 10th, 25th, 50th, 75th, 90th, 95th, max provided.
	Metric 9: Quality Assurance	Low	Quality control samples mentioned. However, no other details provided.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability reported as percentiles. Some uncertainties have been identified, but are unlikely to have a substantial impact on results.

Overall Quality Determination   Medium

Study Citation:	Kim, M., Song, N. R., Choi, J. H., Lee, J., Pyo, H. (2014). Simultaneous analysis of urinary phthalate metabolites of residents in Korea using isotope dilution gas chromatography-mass spectrometry. Science of the Total Environment 470-471:1408-1413.		
HERO ID:	2000812		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Critically Deficient	The sampling methodology is not discussed. The only information that is given is "Twelve-hour urine samples were collected by the Korea Food and Drug Administration (KFDA) through local health departments on May 2011. One hundred eleven samples were collected from adults in urban (Seoul) and rural (Chuncheon) regions"
	Metric 2: Analytical Methodology	Medium	LOD; some extraction and equipment description
	Metric 3: Biomarker Selection	High	metabolite in urine
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Korea
	Metric 5: Currency	Medium	2011
	Metric 6: Spatial and Temporal Variability	Low	n = 5, no replicates, urine sampling not described
	Metric 7: Exposure Scenario	Low	urine
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	mean, range, and frequency
	Metric 9: Quality Assurance	Medium	recovery and precision discussed
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   **Uninformative**

Study Citation:	Chen, C., Chen, C. F., Dong, C. D. (2013). Distribution of phthalate esters in sediments of Kaohsiung Harbor, Taiwan. Soil and Sediment Contamination 22(2):119-131.		
HERO ID:	2002284		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Key sampling methods reported. No details on how sampling equipment was cleaned prior to sampling.
	Metric 2: Analytical Methodology	High	Key analytical methods reported. LOD range reported
	Metric 3: Biomarker Selection	N/A	Sediment sampling
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Taiwan
	Metric 5: Currency	Medium	Samples collected in 2006
	Metric 6: Spatial and Temporal Variability	Medium	>10 samples; no indication of replicate sampling or analysis
	Metric 7: Exposure Scenario	High	Exposure source characterized. Harbor with likely wastewater discharge
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not provided
	Metric 9: Quality Assurance	Medium	Key QA reported. Recovery not based on chemicals of interest. Precision assessed but nor reported
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Limited gaps and limitations reported

Overall Quality Determination   Medium

Study Citation: Monsanto Chemical Company, (1995). Whole effluent and chemical specific evaluation (o-dichlorobenzene) of Monsanto's Antwerp plant aqueous discharge, with cover letter dated 07/10/95.
HERO ID: 2048254

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Critically Deficient	Sampling method was not described
	Metric 2: Analytical Methodology	Critically Deficient	Analytical methods not described
	Metric 3: Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	St. Louis Missouri
	Metric 5: Currency	Low	1995
	Metric 6: Spatial and Temporal Variability	Critically Deficient	Sample size is not reported
	Metric 7: Exposure Scenario	Low	Data may represent relevant exposure scenario but lacks sufficient details about methods, population of interest, exposure characteristics
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual sample concentrations, no summary statistics
	Metric 9: Quality Assurance	Low	QA/QC details were not provided
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variability, uncertainties and limitations were not characterized

Overall Quality Determination   Uninformative

Study Citation:	Dames & Moore, (1988). Report of hydrogeologic and environmental assessment for sixteen chemicals at the former Allied Automotive Plant with cover letter dated 033188.		
HERO ID:	2048351		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Samples were collected according to publicly available SOPs that are scientifically sound and widely accepted. VOCs were collected according to EPA Analytical Methods 601 and 602. Base/neutral extractable organic compounds were collected according to EPA Analytical Method 625 for groundwater and Method 8270 for soil. Sampling methodology described in section 1.1, groundwater sampling methods in section 1.1.2, and soil in section 1.1.3.
Metric 2:	Analytical Methodology	High	Samples were analyzed according to publicly available analytical methods. VOCs were analyzed according to EPA Analytical Methods 601 and 602. Base/neutral extractable organic compounds were analyzed according to EPA Analytical Method 625 for groundwater and Method 8270 for soil. The detection level used is specified in the standard methods, but the values are listed in the report.
Metric 3:	Biomarker Selection	N/A	The study tested for the parent chemical in environmental media (groundwater and soil).
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	The samples were collected in Port Huron, Michigan.
Metric 5:	Currency	Low	The samples were collected in 1987.
Metric 6:	Spatial and Temporal Variability	Medium	The collection of replicates was not reported. Composite soil samples were collected from five sites at three different depths. One sample was collected from three different monitoring wells.
Metric 7:	Exposure Scenario	Medium	Groundwater and soil samples were collected from monitoring wells and the land on the site of a former automotive plant with previous contamination. The use of exposure controls are not described.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data is reported in Appendix C for groundwater and Appendix D for soil samples. Summary statistics are not reported.
Metric 9:	Quality Assurance	Low	The study applied QA/QC measures like preventing cross contamination while collecting samples; however, recoveries and baseline samples are not reported. It's implied that QA/QC techniques were used through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	The characterization of variability is absent (no measure of variance reported). Key uncertainties, limitations, and data gaps are not discussed.

Overall Quality Determination   Medium

Study Citation:	Yoshida, T., Matsunaga, I. (2006). A case study on identification of airborne organic compounds and time courses of their concentrations in the cabin of a new car for private use. Environment International 32(1):58-79.		
HERO ID:	2095300		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling methods described for all air pollutants of interest.
Metric 2:	Analytical Methodology	Low	LOD not reported
Metric 3:	Biomarker Selection	N/A	Air sampling
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Cars in Osaka, Japan
Metric 5:	Currency	Low	Data collected in 1999
Metric 6:	Spatial and Temporal Variability	Medium	Sampling done 44 times during time period. No indication of replicate sampling for all samples or replicate analysis.
Metric 7:	Exposure Scenario	High	Car interior
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Note raw data reported in a figure so will be difficult to extract
Metric 9:	Quality Assurance	Low	QA/QC not explicitly described. Detection limits for instruments and recovery not measured.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	No limitations nor gaps reported

Overall Quality Determination   Medium

Study Citation: Teil, M. J., Tlili, K., Blanchard, M., Labadie, P., Alliot, F., Chevreuil, M. (2014). Polychlorinated biphenyls, polybrominated diphenyl ethers, and phthalates in roach from the Seine River Basin (France): Impact of densely urbanized areas. Archives of Environmental Contamination and Toxicology 66(1):41-57.

HERO ID: 2149497

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sample methods and location described. Insufficient information on some parameters such as sampling equipment and storage conditions.
	Metric 2: Analytical Methodology	High	Extract, analytical instruments, detection limits, and recovery were described.
	Metric 3: Biomarker Selection	N/A	Study tested parent chemical
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	France
	Metric 5: Currency	Low	Text does not include sampling date, but might be able to infer that sampling occurred around 2010 based on Figure 1. However, that date can correspond to when the map was created and not actual sampling date. Paper was published in 2014
	Metric 6: Spatial and Temporal Variability	Medium	15 sites with sample sizes 2 to 12. No replicates
	Metric 7: Exposure Scenario	High	Scenario is relevant to aquatic organisms and anyone who consumes or accesses the Orge and Seine Rivers basins
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	mean and SD Table 4. No raw data.
	Metric 9: Quality Assurance	Medium	Quality not discussed except for recoveries, which were acceptable
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	No discussion of uncertainties, gaps, or limitations.

Overall Quality Determination   Medium

| Study Citation: | Shen, L., Xia, B., Dai, X. (2013). Residues of persistent organic pollutants in frequently-consumed vegetables and assessment of human health risk based on consumption of vegetables in Huizhou, South China. Chemosphere 93(10):2254-2263. |
| HERO ID: | 2149595 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methods described.
	Metric 2:	Analytical Methodology	Low	LOD not reported and missing QA/QC.
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	Low	Sampling date not reported, published in 2013.
	Metric 6:	Spatial and Temporal Variability	High	17 types of vegetables each with >10 samples.
	Metric 7:	Exposure Scenario	Medium	Consumption of vegetables and questionnaire.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Critically Deficient	No specific chemical concentrations reported.
	Metric 9:	Quality Assurance	Low	Missing QA/QC discussion, included calibration range.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Discussed distribution and differences between women and men and other studies.

Overall Quality Determination   Uninformative

Domain		Metric	Rating	Comments
Study Citation:		Almqvist, H., Hanaeus, J. (2006). Organic hazardous substances in graywater from Swedish households. Journal of Environmental Engineering 132(8):901-908.		
HERO ID:		2151800		
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	site description and sampling described
	Metric 2:	Analytical Methodology	Low	Accredited contract laboratory conducted analyses, no LOD
	Metric 3:	Biomarker Selection	N/A	environmental samples
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Sweden
	Metric 5:	Currency	Low	2001
	Metric 6:	Spatial and Temporal Variability	Low	n = 3
	Metric 7:	Exposure Scenario	Low	graywater
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	range and average provided
	Metric 9:	Quality Assurance	Low	QA not discussed, no obvious concerns
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   Low

Study Citation:	Mackintosh, C. E., Maldonado, J. A., Ikonomou, M. G., Gobas, F. A. (2006). Sorption of phthalate esters and PCBs in a marine ecosystem. Environmental Science & Technology 40(11):3481-3488.		
HERO ID:	2158899		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Well described, scientifically sound methodology
	Metric 2: Analytical Methodology	High	Thorough description, reports LODs. Values in Supporting Information.
	Metric 3: Biomarker Selection	N/A	Water and sediment sample
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Canada
	Metric 5: Currency	Low	Published in 2006 but sampling date not reported
	Metric 6: Spatial and Temporal Variability	Medium	4 locations for water samples and sediment sample. With replicate, 12 water samples in total, 17 sediment samples in total
	Metric 7: Exposure Scenario	High	Limited details regarding population and scenario of interest
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Does not report raw data, only summary statistics
	Metric 9: Quality Assurance	High	Used control samples, reported recoveries
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Limited discussion on key uncertainties and limitations

Overall Quality Determination   High

Study Citation:	Murray HE, Ray, L. E., Giam, C. S. (1981). Analysis of marine sediment, water and biota for selected organic pollutants. Chemosphere 10(11-12):1327-1334.		
HERO ID:	2197876		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling described with location, collection equipment, method, and transport all provided.
	Metric 2: Analytical Methodology	Medium	Some analytical methods not reported, such as recovery samples
	Metric 3: Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	USA
	Metric 5: Currency	Low	Samples collected in 1980
	Metric 6: Spatial and Temporal Variability	Low	<5 samples
	Metric 7: Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Average of duplicates and average of sites provided. No raw data
	Metric 9: Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Few gaps and limitations reported

Overall Quality Determination   Medium

Study Citation:	Kim, S., Kang, S., Lee, G., Lee, S., Jo, A., Kwak, K., Kim, D., Koh, D., Kho, Y. L., Kim, S., Choi, K. (2014). Urinary phthalate metabolites among elementary school children of Korea: Sources, risks, and their association with oxidative stress marker. Science of the Total Environment 472:49-55.		
HERO ID:	2215380		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	enrollment and sampling described
Metric 2:	Analytical Methodology	Medium	LOD in text; equipment described
Metric 3:	Biomarker Selection	High	metabolite in urine
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Korea
Metric 5:	Currency	Medium	2011
Metric 6:	Spatial and Temporal Variability	Medium	first morning void urine; N = 39; no replicates
Metric 7:	Exposure Scenario	High	biomonitoring
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	median and IQR
Metric 9:	Quality Assurance	High	duplicates analyzed, accuracy and precision reported, SI has details
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	variability discussed; uncertainty not discussed, no obvious concerns

Overall Quality Determination   High

Study Citation:	Wang, I. J., Lin, C. C., Lin, Y. J., Hsieh, W. S., Chen, P. C. (2014). Early life phthalate exposure and atopic disorders in children: A prospective birth cohort study. Environment International 62(Elsevier):48-54.		
HERO ID:	2215403		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling equipment/container not reported.
	Metric 2: Analytical Methodology	High	Analytical methods, equipment (UPLC–MS/MS), LOD reported.
	Metric 3: Biomarker Selection	High	Metabolite derived from parent chemical: monobutylphthalate (MBP).
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Taiwan
	Metric 5: Currency	Low	Samples collected in 2004
	Metric 6: Spatial and Temporal Variability	Medium	483 total samples. Pregnancy (N = 161) Age 2 (N = 218) Age 5 (N = 191). No replicates.
	Metric 7: Exposure Scenario	High	Measuring phthalate exposure to pregnant women and children.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Raw data not reported. Only geometric means and correlations between ages reported.
	Metric 9: Quality Assurance	Medium	Recoveries of phthalate metabolites spiked into artificial urine ranged from 93% to 102%. No blanks reported.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	The study mentions there are some potential limitations to this study and results should be cautiously interpreted. Geometric mean and standard errors reported for different subject demographics and factors.

Overall Quality Determination   **Medium**

Study Citation:	Cantonwine, D. E., Cordero, J. F., Rivera-González, L. O., Anzalota Del Toro, L. V., Ferguson, K. K., Mukherjee, B., Calafat, A. M., Crespo, N., Jiménez-Vélez, B., Padilla, I. Y., Alshawabkeh, A. N., Meeker, J. D. (2014). Urinary phthalate metabolite concentrations among pregnant women in Northern Puerto Rico: Distribution, temporal variability, and predictors. Environment International 62:1-11.
HERO ID:	2215404

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sample collection conducted according to CDC protocols developed for NHANES.
	Metric 2:	Analytical Methodology	Low	Processing procedures conducted according to CDC protocols developed for NHANES; LODs in the "low ng/ml range".
	Metric 3:	Biomarker Selection	High	Metabolite in urine.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Puerto Rico.
	Metric 5:	Currency	Medium	2010-2012.
	Metric 6:	Spatial and Temporal Variability	Medium	n = 139; up to 3 samples per woman; spot urine samples, no replicates.
	Metric 7:	Exposure Scenario	High	Biomonitoring.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	GM, 25th, 50th, 75th, 95th, max provided.
	Metric 9:	Quality Assurance	Medium	To monitor for accuracy and precision, each analytical run included calibration standards, reagent blanks, and quality control materials of high and low concentrations.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Assessed between- and within-person variability (i.e., temporal reliability) in urinary metabolite concentrations.

Overall Quality Determination   **Medium**

Study Citation:	Fromme, H., Lahrz, T., Kraft, M., Fembacher, L., Dietrich, S., Sievering, S., Burghardt, R., Schuster, R., Bolte, G., Völkel, W. (2013). Phthalates in German daycare centers: Occurrence in air and dust and the excretion of their metabolites by children (LUPE 3). Environment International 61:64-72.		
HERO ID:	2215411		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology provided and described. Indoor air samples were collected once on a glass fiber filter and additionallyon polyurethane foam using a GGP sampler which allows a standardized particle collection on filters and the adsorption of volatile phthalates to downstream PU foam. Dust sampling was conducted by slowly vacuuming the floor for approximately 5 to 10 min using an ALK dust filter holder connected to a vacuum cleaner.
	Metric 2:	Analytical Methodology	Medium	Some analytical methods not reported, such as recovery samples.
	Metric 3:	Biomarker Selection	High	List of metabolites and parent chemical in Table 1.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Germany.
	Metric 5:	Currency	Medium	Data collected in 2012.
	Metric 6:	Spatial and Temporal Variability	Medium	No replicates collected.
	Metric 7:	Exposure Scenario	High	Children in daycare centers, before and after metabolites and indoor air and particulate characterization.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not provided.
	Metric 9:	Quality Assurance	Medium	QA/QC implied, some info available in supplemental.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported.

Overall Quality Determination   High

Study Citation:	Liu, X., Shi, J., Bo, T., Zhang, H., Wu, W., Chen, Q., Zhan, X. (2014). Occurrence of phthalic acid esters in source waters: A nationwide survey in China during the period of 2009-2012. Environmental Pollution 184:262-270.		
HERO ID:	2215414		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	groundwater and surface water (river, reservoir and lake) used for drinking water sampled across seven regions of China (Fig 1); sampled during two campaigns (specific sampling period for each site in Table S1); collected in glass bottles, cooled at 4C and analyzed immediately at lab; water filtered; sampling equipment or how specifically collected not discussed
	Metric 2:	Analytical Methodology	High	SPE; GC-MS; recoveries; MDLs provided in Table S6
	Metric 3:	Biomarker Selection	N/A	NA - water samples no biomarker needed
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	7 geographic zones in China: Northwest China (Heilongjiang Province, Jilin Province, Liaoning Province and eastern region of Inner Mongolia); North China (Beijing City, Tianjin City, Hebei Province, Shanxi Province and the western region of Inner Mongolia); Northwest China (Shǎnxi Province, Gansu Province, Qinghai Province, Ningxia Hui Autonomous Region andXinjiang Uygur Autonomous Region; Southwest China (ChongqingCity, Sichuan Province, Yunnan Province, Guizhou Province and Tibet Autonomous Region; South China (Guangdong Province, Guangxi Province and Hainan Province; East China (Shanghai City, Jiangsu Province, Zhejiang Province, Fujian Province, Shandong Province, Anhui Province and Jiangxi Province; Central China (Henan Province, Hubei Province and Hunan Province)
	Metric 5:	Currency	Medium	December 2009 - May 2012
	Metric 6:	Spatial and Temporal Variability	Medium	152 water sample (18 gw, 64 river, 70 lake and reservoir) during 2 sampling campaigns (80 from December 2009-March 2011 and others from Aug 2011 to May 2012). No replicates
	Metric 7:	Exposure Scenario	High	contamination in ground water and surface water that are sources of drinking water
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 1 provides summary of DF, max, median, IQR of total concentration in all the waters; raw data not provided
	Metric 9:	Quality Assurance	High	recoveries provided in Table S6; blank and duplicate samples; corrected for contamination (p264)
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	compared results to previous studies from other countries; compared results between various types of water sources, the 7 geographical zones, and the 7 major river basins

Overall Quality Determination   High

Study Citation:	Stewart, M., Olsen, G., Hickey, C. W., Ferreira, B., Jelić, A., Petrović, M., Barcelo, D. (2014). A survey of emerging contaminants in the estuarine receiving environment around Auckland, New Zealand. Science of the Total Environment 468-469:202-210.		
HERO ID:	2215424		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling approach described (grab samples) and sites also described.
	Metric 2: Analytical Methodology	High	Key analytical methods reported
	Metric 3: Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Auckland, New Zealand
	Metric 5: Currency	Medium	Samples collected in 2008
	Metric 6: Spatial and Temporal Variability	Medium	>10 samples
	Metric 7: Exposure Scenario	Medium	Estuarine environment. Description of sites provided, outdoor environment could be used for gen pop, environmental and certain animals and plants that live in these environments
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not provided
	Metric 9: Quality Assurance	High	Key QA reported
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Gaps and limitations not well characterized

Overall Quality Determination   **High**

Study Citation: Bamai, Y. A., Araki, A., Kawai, T., Tsuboi, T., Saito, I., Yoshioka, E., Kanazawa, A., Tajima, S., Shi, C., Tamakoshi, A., Kishi, R. (2014). Associations of phthalate concentrations in floor dust and multi-surface dust with the interior materials in Japanese dwellings. Science of the Total Environment 468-469:147-157.

HERO ID: 2215426

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Briefly described, more information found in Kanazawa et al 2010. Missing description on materials used and contamination prevention.
	Metric 2:	Analytical Methodology	Medium	Briefly described, more information found in Kanazawa et al 2010. LOD provided and other details, but missing QA/QC description, recoveries
	Metric 3:	Biomarker Selection	N/A	NA - Dust samples biomarker not needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Sapporo, Japan
	Metric 5:	Currency	Medium	2009-2010
	Metric 6:	Spatial and Temporal Variability	High	128 samples
	Metric 7:	Exposure Scenario	High	Children dwelling patterns and exposure to dust. Unclear if scenario will apply to US children.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 3 Stats only
	Metric 9:	Quality Assurance	Low	Not well described, briefly mentioned, not reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability and uncertainty for the studies goal are well described, sampling uncertainty could be better described to fully trust results and conclusions

Overall Quality Determination   Medium

Study Citation:	Berman, T., Goldsmith, R., Göen, T., Spungen, J., Novack, L., Levine, H., Amitai, Y., Shohat, T., Grotto, I. (2013). Urinary concentrations of environmental contaminants and phytoestrogens in adults in Israel. Environment International 59:478-484.		
HERO ID:	2215430		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	recruiting and enrollment described, urine sampling described
	Metric 2:	Analytical Methodology	High	LOD and LOQ in Table 2, LC–MS/MS method - Göen et al., 2011
	Metric 3:	Biomarker Selection	High	metabolite in urine
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Israel
	Metric 5:	Currency	Medium	2011
	Metric 6:	Spatial and Temporal Variability	Medium	urine spot samples, n = 248. no replicates
	Metric 7:	Exposure Scenario	High	urine
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	GM, 50th and 90th provided
	Metric 9:	Quality Assurance	Medium	Quality control of the chemical analyses was performed by the determination of control samples in each series and assessment of the results in control charts for each parameter (internal quality control); German External Quality Assessment Scheme (Göen et al., 2012).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	variability discussed

Overall Quality Determination   **High**

Study Citation:	Hu, X., Shi, W., Wei, S., Zhang, X., Feng, J., Hu, G., Chen, S., Giesy, J. P., Yu, H. (2013). Occurrence and potential causes of androgenic activities in source and drinking water in China. Environmental Science & Technology 47(18):10591-10600.		
HERO ID:	2215435		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling locations identified. Sampling methods on how water was collected not detailed. Preparation of sampling bottles not included and storage conditions after sampling not described.
Metric 2:	Analytical Methodology	High	GC-MS/MS and LC-MS used for analysis. Mean recoveries and LOQs given in supplemental information.
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Yangtze River Basin, Huai River Basin, Tai Lake Basin, andgroundwater in eastern China
Metric 5:	Currency	Medium	Samples collected in August 2009
Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	Raw data reported in the manuscript
Metric 9:	Quality Assurance	High	Key QA/QC conducted and details reported in supplement.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Limited gaps and limitations reported

Overall Quality Determination   High

Study Citation:	Teil, M. J., Blanchard, M., Moreau-Guigon, E., Dargnat, C., Alliot, F., Bourges, C., Desportes, A., Chevreuil, M. (2013). Phthalate Fate in the Hydrographic Network of the River Seine Basin (France) Under Contrasted Hydrological Conditions. Water, Air, and Soil Pollution 224(6):1592-p. 1592.		
HERO ID:	2215488		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Detailed site description and other pertinent sampling methodologies (e.g., matrix characteristics and equipment) were explained.
Metric 2:	Analytical Methodology	High	Samples were extracted by ultrasonic treatment with 20 mL of hexane/acetone, centrifuged, and analyzed by GC/MS. Instrument detection limits, MDLs, and recoveries provided in text in Section 2.2
Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in water.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples were collected from the Seine river basin, which runs through the Ile-de-France area.
Metric 5:	Currency	Medium	Samples were collected from 2008 through 2010.
Metric 6:	Spatial and Temporal Variability	Medium	Samples were collected from 17 river station, 3 tributaries, and Clichy combined sewer overflow over various hydrologic conditions. No replicates were reported.
Metric 7:	Exposure Scenario	High	Study evaluated phthalate concentrations in surface waters based on urban and industrial hot spots, as well as storm overflow emissions.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Table 2 provides concentration by sampling station; Table 4 provides concentration of low and high flow conditions at rural station (Marnay) and downstream from Paris (Bougival and Triel). Figs 4 and 5 provides more concentration data graphically. No raw data are provided.
Metric 9:	Quality Assurance	Medium	There was some report of QA/QC techniques, which did not suggest any major concerns. Recoveries were acceptable.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Variance was characterized with standard deviation, but there was limited discussion of limitations, uncertainties, and data gaps.

Overall Quality Determination   High

Study Citation:	Shin, H. M., Mckone, T. E., Nishioka, M. G., Fallin, M. D., Croen, L. A., Hertz-Picciotto, I., Newschaffer, C. J., Bennett, D. H. (2014). Determining source strength of semivolatile organic compounds using measured concentrations in indoor dust. Indoor Air 24(3):260-271.		
HERO ID:	2215665		

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	The sampling method was discussed in detail, including sampling procedure, storage conditions, and matrix characterization. Information regarding duration of sample storage prior to analysis was lacking.
	Metric 2:	Analytical Methodology	High	The analytical method (GC/MS) was described in terms of instrumentation, extraction, calibration, and recovery, with limits of detection reported within Table S1.
	Metric 3:	Biomarker Selection	N/A	This study sampled for chemicals of interest within indoor dust.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected from residences in Northern California, Southeast Pennsylvania, and Northeast Maryland.
	Metric 5:	Currency	Medium	Samples were collected during 2009 and 2010.
	Metric 6:	Spatial and Temporal Variability	Medium	A total of 30 indoor surface dust samples, one from a single main living room of each house, were collected in an area described as the equivalent of the entire floor surface area of participating homes within Northern California, Southeast Pennsylvania, and Northeast Maryland between 2009 and 2010. Replicate sampling was not detailed.
	Metric 7:	Exposure Scenario	High	The exposure scenario was described and was highly relevant (indoor air) and the study used fugacity-based modeling to predict the emission, fate and movement of chemicals in the indoor environment from various consumer product exposure sources. Use of exposure controls was not detailed.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No individual raw data points were provided. Statistical summary measures included mean, standard deviation, median and maximum concentrations as well as frequency of detection in Table S1.
	Metric 9:	Quality Assurance	Medium	Quality assurance measures were applied and described in robust details. Solvent method blanks were used and recoveries were reported. Baseline, pre-exposure sampling was not conducted.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	The study had a robust discussion of uncertainty and compared results to results of other studies. The study also characterized limitations in details.

Overall Quality Determination   **High**

Study Citation:	He, W., Qin, N., Kong, X. Z., Liu, W. X., He, Q. S., Wang, Q. M., Yang, C., Jiang, Y. J., Yang, B., Wu, W. J., Xu, F. L. (2014). Water quality benchmarking (WQB) and priority control screening (PCS) of persistent toxic substances (PTSs) in China: Necessity, method and a case study. Science of the Total Environment 472:1108-1120.		
HERO ID:	2219809		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling methodology included a site characterization, maps of collection points in Figure S1, and amount of water collected. There was no information, however, on the equipment used, storage conditions, etc.
Metric 2:	Analytical Methodology	High	The SI described a detailed and scientifically sound analytical methodology in the SI and included LODs and recoveries in Table S1.
Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in surface water.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Study was performed in eastern China.
Metric 5:	Currency	Medium	Samples were collected in 2010-2011.
Metric 6:	Spatial and Temporal Variability	Medium	Authors collected 12 monthly samples at 4 sampling sites but no replicates.
Metric 7:	Exposure Scenario	High	The pollution levels can have implications for the lake's aquatic life and local residents who use it.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Individual sample concentration data were not provided.
Metric 9:	Quality Assurance	Medium	Recoveries were acceptable, but overall there is limited information regarding laboratory and field controls.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	The discussion of uncertainties and study limitations was limited. There was some characterization of variance in Table S2 with percentiles.

Overall Quality Determination   Medium

Study Citation:	HEW, (2013). Spatio-temporal distributions and the ecological and health risks of phthalate esters (PAEs) in the surface water of a large, shallow Chinese lake. Science of the Total Environment 461:672-680.		
HERO ID:	2219885		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Detailed sampling methodology, equipment, and storage. Missing equipment calibration.
	Metric 2: Analytical Methodology	High	Analytical extraction, methods, recoveries, equipment calibration, and equipment (GC-MS) described. Quantitation limits reported.
	Metric 3: Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	China
	Metric 5: Currency	Medium	2010-2011
	Metric 6: Spatial and Temporal Variability	Medium	44 samples from 3-4 sites over the course of a year. Unclear if there are replicates.
	Metric 7: Exposure Scenario	High	Water from lakes that could be exposed to the population.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Only summary statistics (mean, median, SD, range). No individual data reported.
	Metric 9: Quality Assurance	Medium	Detailed QA/QC, analyzed control samples. Three to four parallel samples with three procedural blanks were processed for each monthly sampling site. Some recoveries below 70%.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Temporal and spatial variability discussed. No discussion of limitations.

Overall Quality Determination   Medium

| Study Citation: | Blanchard, O., Glorennec, P., Mercier, F., Bonvallot, N., Chevrier, C., Ramalho, O., Mandin, C., Le Bot, B. (2014). Semivolatile organic compounds in indoor air and settled dust in 30 French dwellings. Environmental Science & Technology 48(7):3959-3969. |
| **HERO ID:** | 2241683 |

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling is well described on page 3960 and includes dust and air sampling procedures. This is also presented in Table 2.
	Metric 2:	Analytical Methodology	High	The analytical procedures are presented sufficiently on page 3960.
	Metric 3:	Biomarker Selection	N/A	Biomarkers were not identified or relevant for this study.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study location is Brittany, Western France.
	Metric 5:	Currency	Medium	Sampling was done in 2011.
	Metric 6:	Spatial and Temporal Variability	High	Generally, there were at least 10 samples per scenario.
	Metric 7:	Exposure Scenario	High	The exposure scenario studied is relevant to TSCA-related exposure scenarios.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Results are well presented and discussed.
	Metric 9:	Quality Assurance	High	Replicates and recovery sampling were considered.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Relative standard deviations were considered in this study.

Overall Quality Determination   High

Study Citation: Zheng, X., Zhang, B. T., Teng, Y. (2014). Distribution of phthalate acid esters in lakes of Beijing and its relationship with anthropogenic activities. Science of the Total Environment 476-477:107-113.
HERO ID: 2241688

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Well described and scientifically sound methodology
	Metric 2:	Analytical Methodology	High	Well described, includes LODs and recoveries
	Metric 3:	Biomarker Selection	N/A	Water sampling
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	Medium	Samples collected in 2012
	Metric 6:	Spatial and Temporal Variability	Medium	4-10 samples per site
	Metric 7:	Exposure Scenario	Medium	Data are likely to represent a relevant exposure scenario, but the manuscript has limited description of the population of interest and microenvironment
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual data points are not provided, only summary statistics
	Metric 9:	Quality Assurance	Medium	Limited details on field control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Key uncertainties, limitations and data gaps are not discussed

Overall Quality Determination   Medium

Study Citation:		Liu, P., Tian, T., Barreto, J., Chou, J. (2013). Assessment and analysis of phthalate esters, in Lake Pontchartrain, by SPME combining with GC-MS. Environmental Technology 34(1-4):453-462.	
HERO ID:		2241701	

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	lake water collected from two studied areas (Table 1); timing discussed in "Study areas and waste sample collection"; samples taken in spillway area and the central lake area prior to spillway opening and after the opening of the spillway; central lake area only sampled after; collected in glass bottles and stored in 4C; repeated samples taken from same area over time. Uncertain how deep water was collected and how sample bottles were precleaned to ensure no phthalate contamination
	Metric 2:	Analytical Methodology	High	SPME; GC-MS; Table 2 provides LOD per chemical; recoveries
	Metric 3:	Biomarker Selection	N/A	Water sampling
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Lake Pontchartrain, Louisiana
	Metric 5:	Currency	Medium	2008-2009
	Metric 6:	Spatial and Temporal Variability	Medium	Bonnet Carre Spillway had 6 sampling sites, taken in April and continued after opening (May, June, and October 2008 and April and June 2009) - totalling 42 samples; Central lake area had 6 location sites, taken in April then again June and October 2008 and continued January, March, May and June of 2009 - totaling 54 samples. No replicate sampling or analysis
	Metric 7:	Exposure Scenario	High	concentration in largest lake in Louisiana and examined effect of spillway opening on contamination
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Figures 6 and 7 provide concentrations of sum of total phthalates; text starting p.459 provides range and DF per site as well as a few other stats.
	Metric 9:	Quality Assurance	High	Recovery rate provided in Table 3
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	average and relative standard deviation provided in Table 3; compares total phthalate concentrations before and after spillway opening

Overall Quality Determination   Medium

Study Citation: Das, M. T., Ghosh, P., Thakur, I. S. (2014). Intake estimates of phthalate esters for South Delhi population based on exposure media assessment. Environmental Pollution 189:118-125.
HERO ID: 2298077

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methodology is thoroughly described and scientifically sound. No key details are omitted.
	Metric 2: Analytical Methodology	High	Analytical method is thoroughly described and sound. MDL is provided in supplemental material.
	Metric 3: Biomarker Selection	N/A	Study is testing for parent chemical in dust.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples collected in China.
	Metric 5: Currency	Medium	Samples collected in 2011.
	Metric 6: Spatial and Temporal Variability	Low	No replicates provided and fewer than 10 samples were collected per scenario.
	Metric 7: Exposure Scenario	Medium	The source of exposure was not well characterized, but this is an exposure scenario of interest.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	Raw data is provided.
	Metric 9: Quality Assurance	High	QA/QC methods are provided and no issues were identified.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Robust discussion of limitations and uncertainty is provided.

Overall Quality Determination   High

Study Citation:	Mercier, F., Gilles, E., Saramito, G., Glorennec, P., Le Bot, B. (2014). A multi-residue method for the simultaneous analysis in indoor dust of several classes of semi-volatile organic compounds by pressurized liquid extraction and gas chromatography/tandem mass spectrometry. Journal of Chromatography A 1336:101-111.		
HERO ID:	2298081		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Dust collected from household vacuum bags, sieved before sealed/frozen storage.
	Metric 2: Analytical Methodology	High	Analysis via PLE-GC/MS/MS explained in detail with LOQ, matrix interference, etc.
	Metric 3: Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	France, Brittany.
	Metric 5: Currency	Medium	September 2009 through October 2012.
	Metric 6: Spatial and Temporal Variability	Medium	N = 7 vacuum bags, 1 per dwelling.
	Metric 7: Exposure Scenario	High	Indoor dust from family dwellings.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	Raw data reported (n = 7).
	Metric 9: Quality Assurance	High	Extensive QA to evaluate analytic methods; used SRM from US NIST; 3-level quantitative calibration.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Indoor dust, 1 analytic measure/dwelling, n = 7 dwellings; focus on performance of GC/MS/MS methods.

Overall Quality Determination   High

Study Citation:	Christensen, K., Sobus, J., Phillips, M., Blessinger, T., Lorber, M., Tan, Y. M. (2014). Changes in epidemiologic associations with different exposure metrics: A case study of phthalate exposure associations with body mass index and waist circumference. Environment International 73:66-76.		
HERO ID:	2345925		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling procedure was reported throughout the first half of the paper; Simulation section has the most details.
	Metric 2:	Analytical Methodology	Low	Analytical method was not reported. However, data came from NHANES dataset which uses scientifically sound and robust methods.
	Metric 3:	Biomarker Selection	High	Biomarker is specific to parent chemical.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Data were collected from the US population.
	Metric 5:	Currency	Medium	Data were collected from 2009-2010.
	Metric 6:	Spatial and Temporal Variability	Medium	Sample data include 10537 individuals. To be consistent with the guidance, metric is not scored as high because of missing replicates.
	Metric 7:	Exposure Scenario	Medium	The data represent relevant exposure scenario, but did not have much information on exposure pathway/product use.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Average data were reported. While sample size exceeded 10,000 so presenting raw data is less feasible, to be consistent with the guidance, the metric is not scored high.
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not discussed, but can be inferred from use of NHANES data.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study had some characterization of variance and discussion on its strength and limitation regarding the simulation.

Overall Quality Determination   Medium

Study Citation:	Arbuckle, T. E., Davis, K., Marro, L., Fisher, M., Legrand, M., Leblanc, A., Gaudreau, E., Foster, W. G., Choeurng, V., Fraser, W. D. (2014). Phthalate and bisphenol A exposure among pregnant women in Canada–results from the MIREC study. Environment International 68:55-65.		
HERO ID:	2345941		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Scientifically sound sampling methodology.
	Metric 2: Analytical Methodology	High	Detailed analytical methodology, reported LOD.
	Metric 3: Biomarker Selection	Low	Metabolite (MnBP) derived from multiple parent chemicals (both DnBP and BBzP), not only the chemical of interest (DnBP), and there is not a stated method to apportion the estimate to only the chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Canada
	Metric 5: Currency	Medium	Sampling began in 2008 and ended in 2011.
	Metric 6: Spatial and Temporal Variability	Low	n = 1788, no replicates, single spot urine samples.
	Metric 7: Exposure Scenario	High	Data closely represent relevant exposure scenarios.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data is not reported.
	Metric 9: Quality Assurance	Low	Limited description of QA/QC techniques and recoveries not reported.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Characterized variability, discussed uncertainties and limitations.

Overall Quality Determination   Medium

Study Citation:	Ait Bamai, Y., Shibata, E., Saito, I., Araki, A., Kanazawa, A., Morimoto, K., Nakayama, K., Tanaka, M., Takigawa, T., Yoshimura, T., Chikara, H., Saijo, Y., Kishi, R. (2014). Exposure to house dust phthalates in relation to asthma and allergies in both children and adults. Science of the Total Environment 485-486(Elsevier):153-163.		
HERO ID:	2345943		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Methods, equipment, storage described. Additional methods were published in previous manuscripts (Araki et al., 2014; Kanazawa et al., 2010; Saito et al., 2007)
	Metric 2: Analytical Methodology	High	Extraction methods, analytical instrument (GC/MS), MDL, and recoveries reported. A calibration curve was constructed for GC/MS analysis.
	Metric 3: Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Japan
	Metric 5: Currency	Medium	sampling in 2006
	Metric 6: Spatial and Temporal Variability	High	More than 100 samples per matrix with replicates.
	Metric 7: Exposure Scenario	High	Exposure to children and adults.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Only summary statistics. No individual data.
	Metric 9: Quality Assurance	High	Control samples were analyzed, QA/QC method was described. High recoveries (over 70%).
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Variability measured in the characteristics of subjects. Uncertainties and limitations were discussed.

Overall Quality Determination   **High**

Study Citation:	Ferguson, K. K., Mcelrath, T. F., Ko, Y. A., Mukherjee, B., Meeker, J. D. (2014). Variability in urinary phthalate metabolite levels across pregnancy and sensitive windows of exposure for the risk of preterm birth. Environment International 70(Elsevier):118-124.		
HERO ID:	2345949		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Sampling methods were reported as CDC guidelines, detailed elsewhere.
	Metric 2: Analytical Methodology	Low	Analytical methods were assumed to be appropriate (following CDC guidelines) but not detailed
	Metric 3: Biomarker Selection	High	Biomarker (parent chemical or metabolite) is derived from exposure to the chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Boston
	Metric 5: Currency	Medium	2006 to 2008
	Metric 6: Spatial and Temporal Variability	Medium	The study included 130 mothers who delivered preterm, aswell as 352 controls selected randomly from subjects who had a urine sample from Visit 1 and from at least one additional visit. No indication of replicates
	Metric 7: Exposure Scenario	Medium	The data likely represent the relevant exposure scenario.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual data points were not reported, but supplementary tables provided information with detailed summary statistics.
	Metric 9: Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	The study has limited discussion of key uncertainties, limitations, and data gaps, though the study mainly provided its strengths.

Overall Quality Determination   Medium

Study Citation:	Serrano, S. E., Karr, C. J., Seixas, N. S., Nguyen, R. H., Barrett, E. S., Janssen, S., Redmon, B., Swan, S. H., Sathyanarayana, S. (2014). Dietary phthalate exposure in pregnant women and the impact of consumer practices. International Journal of Environmental Research and Public Health 11(6):6193-6215.		
HERO ID:	2345950		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling procedure was provided and included details on equipment, storage, and calibration. A copy of the survey questions is in the supplemental information.
	Metric 2: Analytical Methodology	High	Analytical procedure was reported (HPLC-ESI-MS/MS). LOD was reported (0.2 and 2.0 ng/mL for the UW samplesand 0.2 and 0.6 ng/mL for the CDC samples). Data below LOD was properly addressed.
	Metric 3: Biomarker Selection	High	Biomarker (parent chemical or metabolite) is derived from exposure to the chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Participants are from hospitals in several states in the US
	Metric 5: Currency	Medium	2010-2012
	Metric 6: Spatial and Temporal Variability	High	656 final samples were included
	Metric 7: Exposure Scenario	High	The data closely represent relevant exposure scenario - concentrations in serum and dietary exposure/consumer practices was explored in details.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Average concentrations of metabolites were reported, no raw data were reported. Demographics, education, food consumption, personal care products and other consumer related practices summaries available in Table 2, 3, and 4.
	Metric 9: Quality Assurance	High	QC was performed, no major concerns were seen.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	The study had a robust discussion of limitations and variability.

Overall Quality Determination   High

		Study Citation:	Mervish, N., Mcgovern, K. J., Teitelbaum, S. L., Pinney, S. M., Windham, G. C., Biro, F. M., Kushi, L. H., Silva, M. J., Ye, X., Calafat, A. M., Wolff, M. S., BCERP (2014). Dietary predictors of urinary environmental biomarkers in young girls, BCERP, 2004-7. Environmental Research 133C:12-19.
		HERO ID:	2345954

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Assumed samples were collected according to publicly available SOPs that are scientifically sound and widely accepted. The study is part of the Breast Cancer and Environment Research Program (BCERP). Urinary sample collection is not reported. However, the methodology has been described in other publication mentioned in the study and the samples were analyzed at the National Center for Environmental Health at the CDC. Also the study mention that all "specimen collection and storage materials were supplied by the CDC".
	Metric 2:	Analytical Methodology	High	Samples were analyzed according to publicly available analytical methods that are scientifically sound and widely accepted. LOD reported. Quantitation achieved by isotope dilution tandem mass spectrometry. QC samples used.
	Metric 3:	Biomarker Selection	High	Urinary metabolites used. Metabolites have precise quantitative relationship with external exposure and are derived from exposure to the chemical of interest.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Geographic locations are reported: New York City, Cincinnati, and San Francisco Bay Area.
	Metric 5:	Currency	Medium	Sample collected 2004-2007.
	Metric 6:	Spatial and Temporal Variability	High	The study used a large sample size over a sufficient period of time to characterize trends (2004-2007). Used replicates.
	Metric 7:	Exposure Scenario	High	The study uses urinary phthalate biomarker as a dietary predictor.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Data reported by dietary intake. Also, supplementary or raw data (i.e., individual data points) are not reported , and therefore summary statistics cannot be reproduced.
	Metric 9:	Quality Assurance	High	Quality assurance reported in analytical methods.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Variability per serving and dietary. Limitations reported.

Overall Quality Determination   High

Study Citation:	Gaspar, F. W., Castorina, R., Maddalena, R. L., Nishioka, M. G., Mckone, T. E., Bradman, A. (2014). Phthalate exposure and risk assessment in California child care facilities. Environmental Science & Technology 48(13):7593-7601.		
HERO ID:	2345959		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methodology was thoroughly described including the study population, visits, dust and indoor air sample collection procedures and sample storage.
	Metric 2: Analytical Methodology	High	Analytical methodologies for dust and indoor air samples were described in detail including extraction method, analytical instrumentation, reproducible samples. The method detection limit (MDL) for dust and instrument limit of detection (IDL) for indoor air were reported in text on page 7594. Recovery percentages are reported in the SI table S1.
	Metric 3: Biomarker Selection	N/A	This study measured the parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was completed at the Alameda and Monterey Counties, California.
	Metric 5: Currency	Medium	Samples were collected from May 2010 to May 2011.
	Metric 6: Spatial and Temporal Variability	Medium	40 early childhood education facilities were enrolled in the study. Indoor air samples were collected from all 40 locations and dust samples were collected from 39 locations. Replicate samples were not reported.
	Metric 7: Exposure Scenario	High	This data in this study suggests chemical exposure to children through dust and indoor air in early childhood education facilities. There were no exposure control samples.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Summary statistics of dust and indoor air concentrations were detailed including mean, standard deviation, range, detection frequency, and percentiles. Raw data were not reported.
	Metric 9: Quality Assurance	High	QA/QC procedures were reporting including relative percent difference, field duplicates, field blanks, field spikes, and laboratory spikes are presented in SI Table S1.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Variability of dust and indoor air were well characterized. The study reported the standard deviation, range, 5th, 25th, 50th, 75th, and 95th percentiles of concentrations. Limitations were reported in the discussion section.

Overall Quality Determination   **High**

Study Citation:	Meng, X. Z., Wang, Y., Xiang, N., Chen, L., Liu, Z., Wu, B., Dai, X., Zhang, Y. H., Xie, Z., Ebinghaus, R. (2014). Flow of sewage sludge-borne phthalate esters (PAEs) from human release to human intake: implication for risk assessment of sludge applied to soil. Science of the Total Environment 476-477(Elsevier):242-249.		
HERO ID:	2345986		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	WWTP details included, map in SI, and storage conditions reported. Sampling methods reported previously (Yang, et al., 2011).
	Metric 2:	Analytical Methodology	High	Instrument DL and method DL in Table S2. Extraction and instruments also described in detail.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	Medium	2010
	Metric 6:	Spatial and Temporal Variability	Medium	25 WWTP samples, no replicates
	Metric 7:	Exposure Scenario	High	Measuring sewage sludge from WWTP.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Mean, median, min, max reported in Table 1. Raw data not reported.
	Metric 9:	Quality Assurance	High	Recoveries, DLs, blanks discussed. Recoveries above 70%.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability, limitations, and uncertainty not discussed, but there are no obvious concerns.

Overall Quality Determination   Medium

Dibutyl Phthalate HERO ID: 2346041

Study Citation:	Wang, W., Li, M.,ei, Cui, Y., Gao, X., Chen, K.,un, Qian, X.,in (2014). Potential health impact and genotoxicity analysis of drinking source water from Liuxihe Reservoir (PR China). Ecotoxicology 23(4):647-656.		
HERO ID:	2346041		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Methodology is well described.
	Metric 2:	Analytical Methodology	High	Key analytical methods, such as sample extraction and analytical instrument, LODs/LOQs, and recoveries were described.
	Metric 3:	Biomarker Selection	N/A	The study tested for parent chemicals in a drinking water reservoir.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study collected samples from a reservoir in Guangzhou, China.
	Metric 5:	Currency	Medium	Samples were collected in 2010.
	Metric 6:	Spatial and Temporal Variability	Low	Four samples and no replicates were collected from the drinking water reservoir.
	Metric 7:	Exposure Scenario	High	Exposure to contaminants to drinking water is a relevant exposure scenario.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual data are presented, but summary statistics are missing parameters (e.g. SD, detection frequency).
	Metric 9:	Quality Assurance	Low	There is some discussion on the potential genotoxicity experiment, but not on the monitoring/sampling data of the drinking water source, which is the primary piece of interest. For recoveries, authors reported that they were all above 66.4% and provided no further details.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	There is no characterization of variance or discussion of uncertainties and study limitations related to the sampling data.

Overall Quality Determination   Medium

Study Citation:	Watkins, D. J., Eliot, M., Sathyanarayana, S., Calafat, A. M., Yolton, K., Lanphear, B. P., Braun, J. M. (2014). Variability and Predictors of Urinary Concentrations of Phthalate Metabolites during Early Childhood. Environmental Science & Technology 48(15):8881-8890.		
HERO ID:	2347098		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Spot urine samples collected either at home or in clinic (some in both); diaper inserts used for ages 1 to 3 years.
Metric 2:	Analytical Methodology	Low	Described in SI. SPE-HPLC-MS/MS. Analyses performed by CDC laboratory following strict CLIA QC guidelines. Followed 2011-2012 NHANES protocols for phthalate metabolites. LOD reported only as range (0.1 to 1 ng/mL), however.
Metric 3:	Biomarker Selection	High	Concentration of MCPP and MnBP in urine; however, results for MnBP limited to ages 4 and 5 years due to contamination by diaper inserts.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Ohio, Cincinnati
Metric 5:	Currency	Medium	2004 through 2011
Metric 6:	Spatial and Temporal Variability	Low	Spot urine samples: compared at home versus clinic collection; compared samples taken 2 weeks apart to those taken 1 year apart for same individual. Total 296 children ages 1 through 5 years.
Metric 7:	Exposure Scenario	Medium	Questionnaires covered diet, food packaging, consumption of fast food, and personal product use. Child population was divided into those born 2003-2004 and 2005-2006 (relevant to 2008 U.S. ban on DnBP in children's toys and other child care products).
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Reported in Supplemental Information: concentrations (ug/L)reported - median, 25th, and 75th percentiles (Table S3); box-and-whisker plots also showed arithmetic mean, min, and max (Figure S1).
Metric 9:	Quality Assurance	High	CDC followed quality control as per the Clinical Laboratory Improvement Act QC guidelines and German External Quality Assessment Scheme.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Evaluated metabolite concentrations relative to demographic characteristics, food packaging and personal care products, age, and other factors.

Overall Quality Determination   Medium

Study Citation:	Frederiksen, H., Kuiri-Hänninen, T., Main, K. M., Dunkel, L., Sankilampi, U. (2014). A longitudinal study of urinary phthalate excretion in 58 full-term and 67 preterm infants from birth through 14 months. Environmental Health Perspectives 122(9):998-1005.		
HERO ID:	2347101		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Most key criteria met - including equipment and storage. Duration of sample storage prior to analysis lacking.
	Metric 2: Analytical Methodology	Medium	Most key criteria met - instrument described, recoveries, analytic methods referenced (Frederiksen et al. 2010) with more information, LOD's reported, creatine adjusted concentrations.
	Metric 3: Biomarker Selection	High	Sampling for metabolites specific for parent chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples collected from participants in Kuopio, Finland.
	Metric 5: Currency	Medium	Sampling conducted 2006-2008.
	Metric 6: Spatial and Temporal Variability	Medium	Spot urine sampling conducted with repeated samples provided by n=125 children at days 1-3, day 7, monthly at months 1-6 and month 14, with a total of 894 urine specimens provided, non-statistical sampling approach.
	Metric 7: Exposure Scenario	Medium	Participant characteristics described, occupational status of mother not reported, lack of exposure controls however repeated sampling provided over 14 months.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Most key criteria met. Lack of raw data. Summary statistics and mean reported.
	Metric 9: Quality Assurance	High	Key criteria met, lack of baseline pre-exposure data however repeated sampling over 14 months. Recoveries reported.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Variability characterized within summary statistics and different variables, potential limitations discussed, including the potential for reverse causality within premature infants.

Overall Quality Determination   **High**

Study Citation:	Bergé, A., Gasperi, J., Rocher, V., Gras, L., Coursimault, A., Moilleron, R. (2014). Phthalates and alkylphenols in industrial and domestic effluents: case of Paris conurbation (France). Science of the Total Environment 488-489(1):26-35.		
HERO ID:	2347158		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	effluent sources described, sampling described. Limited information on sampling equipment and storage conditions/duration
	Metric 2:	Analytical Methodology	Low	accredited labs; equipment and extraction described; quantification limit was 0.2ug/l for all congeners in liquid phase and 0.05 mg/kg in dry weight
	Metric 3:	Biomarker Selection	N/A	parent compounds measured in industrial and domestic discharges
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	France
	Metric 5:	Currency	Low	published 2014. no sampling date provided
	Metric 6:	Spatial and Temporal Variability	Medium	n = 2 to 45 depending on sector, no replicates
	Metric 7:	Exposure Scenario	High	Study measured chemical concentrations in different types of industrial and domestic waste discharges. Data can be used to predict how this might affect receiving waters.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	min, median, max provided. No raw data
	Metric 9:	Quality Assurance	Low	QA/QC were not directly discussed, but can be implied through use of French accreditation procedures (NF—T 90-210 and NF—T90-220standards).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Some discussion of variance and uncertainty

Overall Quality Determination   Medium

Study Citation: Xu, Y., Liang, Y., Urquidi, J. R., Siegel, J. A. (2015). Semi-volatile organic compounds in heating, ventilation, and air-conditioning filter dust in retail stores. Indoor Air 25(1):79-92.

HERO ID: 2347161

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sample procedures and storage conditions reported
	Metric 2:	Analytical Methodology	High	Instrumental detection limit and method detection limits reported in table 2.
	Metric 3:	Biomarker Selection	High	DBP concentrations in HVAC filter dust
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Texas and Pennsylvania
	Metric 5:	Currency	Medium	Timing of sample collection is not reported, siegel 2013 has sample dates in table 3.1.
	Metric 6:	Spatial and Temporal Variability	High	Triplicate samples, filters were placed for 30 days.
	Metric 7:	Exposure Scenario	High	Occurrence of phthalates in dust samples of U.S. retail stores.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual samples not reported. Table 2 Distribution of phthalate and PBDE concentrations in HVAC filter dust (mean, SD, percentiles and max).
	Metric 9:	Quality Assurance	High	Analytical recovery efficiencies between 77% and 92%
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Standard deviation, and reports key limitations

Overall Quality Determination   High

Study Citation:	Valton, A. S., Serre-Dargnat, C., Blanchard, M., Alliot, F., Chevreuil, M., Teil, M. J. (2014). Determination of phthalates and their by-products in tissues of roach (Rutilus rutilus) from the Orge river (France). Environmental Science and Pollution Research 21(22):12723-12730.		
HERO ID:	2347469		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sample collection described for fish (roach) upstream and downstream. Location and map provided plus site description and some history. River surface water collected via grab sample method. Fish livers and muscles were collected after dissection in the lab. Missing approaches to avoid phthalate contamination, missing surface grab water description such as approximate thickness of surface layer sampled.
	Metric 2:	Analytical Methodology	High	Sample processing, methods, and equipment provided. Phthalates diesters were analyzed by high resolution gas chromatography/mass spectrometry. Phthalate monoesters were quantified as triplicates, by high performance liquid chromatography (1200 series; Agilent Technologies, Massy, France)–tandem mass spectrometry, (HPLC-MS/MS). Limits of quantification (LOQs) for roach tissues are indicated in Appendix 2 and 4.
	Metric 3:	Biomarker Selection	High	Biomarkers selected are appropriate for parent phthalates, see table 3 for DEHP metabolites. Table 2 has metabolites for other phthalates.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	France
	Metric 5:	Currency	Low	publication date 2014, sampling date not provided
	Metric 6:	Spatial and Temporal Variability	Low	n = 4 for liver and muscle, unclear about surface water
	Metric 7:	Exposure Scenario	Medium	fish from the Orge River and surface water
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	mean and SD reported in Table 1
	Metric 9:	Quality Assurance	High	Analytical QA/QC described and reported in appendices. Blanks, internal standards, recoveries, LOQs and triplicate analysis of each sample.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Sources of uncertainty and variability discussed in Roach contamination Section of the paper starting page 8.

Overall Quality Determination   Medium

Study Citation:	Liu, H., Cui, K., Zeng, F., Chen, L., Cheng, Y., Li, H., Li, S., Zhou, X., Zhu, F., Ouyang, G., Luan, T., Zeng, Z. (2014). Occurrence and distribution of phthalate esters in riverine sediments from the Pearl River Delta region, South China. Marine Pollution Bulletin 83(1):358-365.		
HERO ID:	2349860		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Key sampling methods reported
Metric 2:	Analytical Methodology	Medium	Key analytical methods reported. Only provided a range of MDLs for all phthalates analyzed
Metric 3:	Biomarker Selection	N/A	Measured parent chemical in riverine sediments
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Pearl River Delta region, South China
Metric 5:	Currency	Low	Paper published in 2014. No sample collection date reported
Metric 6:	Spatial and Temporal Variability	Medium	>10 samples, no replicates
Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	raw data not reported
Metric 9:	Quality Assurance	Medium	Some QA/QC reported, such as blanks and recoveries. However, the lower bound of recoveries were <70% for some compounds albeit not significantly.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported

Overall Quality Determination   **Medium**

Study Citation:	Van Holderbeke, M., Geerts, L., Vanermen, G., Servaes, K., Sioen, I., De Henauw, S., Fierens, T. (2014). Determination of contamination pathways of phthalates in food products sold on the Belgian market. Environmental Research 134:345-352.		
HERO ID:	2501473		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported such as sample storage conditions
Metric 2:	Analytical Methodology	High	analytical methods described
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Belgium
Metric 5:	Currency	Medium	Samples collected in 2010 and 2011
Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
Metric 7:	Exposure Scenario	High	Exposure source characterized
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not reported
Metric 9:	Quality Assurance	Medium	Limited QA reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported

Overall Quality Determination   Medium

Study Citation:	Sakhi, A. K., Lillegaard, I. T., Voorspoels, S., Carlsen, M. H., Løken, E. B., Brantsæter, A. L., Haugen, M., Meltzer, H. M., Thomsen, C. (2014). Concentrations of phthalates and bisphenol A in Norwegian foods and beverages and estimated dietary exposure in adults. Environment International 73:259-269.		
HERO ID:	2501495		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Food selection criteria and pertinent sampling methods were described. Note that some of the sampling parameters (e.g., equipment) do not apply to this study because food were purchased as sold from grocery stores.
	Metric 2:	Analytical Methodology	High	LOQs were provided in Table S1. Extraction, preparation, and instrumentation were described, including reference to previously published protocol.
	Metric 3:	Biomarker Selection	N/A	Parent chemicals were measured in food.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Food samples were collected in Norway.
	Metric 5:	Currency	Medium	Samples were collected in 2012.
	Metric 6:	Spatial and Temporal Variability	Medium	37 different food items and beverages were selected, and the top 1-3 brands for each item were pooled into one sample. No replicates were reported.
	Metric 7:	Exposure Scenario	High	Exposure to typical Norwegian food purchases from local grocery store is relevant.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Summary statistics, such as median, min, and max were reported. No raw data were provided.
	Metric 9:	Quality Assurance	High	Method performance described blanks, reference samples, LOQ, recovery, and intralaboratory reproducibility in both main text and SI.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variance characterized with ranges and some limitations were discussed.

Overall Quality Determination   High

Study Citation:		Domínguez-Morueco, N., González-Alonso, S., Valcárcel, Y. (2014). Phthalate occurrence in rivers and tap water from central Spain. Science of the Total Environment 500-501:139-146.	
HERO ID:		2510737	

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	single sampling collected 100m from discharge points of 7 WWTPs that discharge into the Jarama and Manzanares rivers (Fig 1; Table S1); drinking water from 7 taps (Fig 2; Table S2); time of day collected provided; collected in opaque bottles and stored frozen
	Metric 2:	Analytical Methodology	High	SPE; GC-MS; recoveries; LOD and LOQ provided in Table 1
	Metric 3:	Biomarker Selection	N/A	Tested parent chemicals in river near WWTP discharge and tap water
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Madrid, Central Spain
	Metric 5:	Currency	Medium	2012
	Metric 6:	Spatial and Temporal Variability	Low	Single sampling event in February that collected from 4 sites along the Manzanares and 3 sites along the Jarama. Drinking water collected from 7 private taps in December. No replicates
	Metric 7:	Exposure Scenario	High	concentration in rivers from region in Spain that is most densely populated and large number of industries; also concentration in drinking water
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Table 2 provides raw data per site as well as mean, std, and DF in river water. Table 3 provides the same information for drinking water.
	Metric 9:	Quality Assurance	High	Recoveries reported in Table 1 and all were acceptable. Blank analysis was performed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Compared values to previous studies within Spain and other countries, between the sampling sites and the two rivers, and between the rivers and drinking water. Variance characterized with SD when applicable. Limited discussion of uncertainties and gaps.

Overall Quality Determination   High

Study Citation:	Larsson, K., Ljung Björklund, K., Palm, B., Wennberg, M., Kaj, L., Lindh, C. H., Jönsson, B. A., Berglund, M. (2014). Exposure determinants of phthalates, parabens, bisphenol A and triclosan in Swedish mothers and their children. Environment International 73:323-333.		
HERO ID:	2510755		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The sampling methodology is based on the European consensus protocol of COPHES/DEMOCOPHES
	Metric 2: Analytical Methodology	High	Samples were analyzed following an interlaboratory SOP. LOD is reported
	Metric 3: Biomarker Selection	Medium	Initial reviewer commented that "DnBP is a metabolite of di-n-butyl phthalate (DnBP)." QCer believes they meant MnBP as noted in the paper. However, MnBP can also be a minor metabolite for BBP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Sweden in urban and rural areas following a protocol.
	Metric 5: Currency	Low	QCer cannot verify that samples were collected between 2010-2012, as initial reviewer noted. Paper was published in 2014.
	Metric 6: Spatial and Temporal Variability	Medium	95 mothers and 97 children. No replicate samples
	Metric 7: Exposure Scenario	High	Mother and children living in urban and rural areas
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	No individual sample concentrations. Table 1 presents the levels of phthalate metabolites in GM (95% CI) and percentiles
	Metric 9: Quality Assurance	High	The study had two interlaboratory comparison investigations and two external quality assessment schemes (ICI/EQUAS).
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	The study characterizes variability in the results with 95% CI and percentiles, but does not report limitations

Overall Quality Determination   Medium

Study Citation:	Whyatt, R. M., Perzanowski, M. S., Just, A. C., Rundle, A. G., Donohue, K. M., Calafat, A. M., Hoepner, L. A., Perera, F. P., Miller, R. L. (2014). Asthma in inner-city children at 5-11 years of age and prenatal exposure to phthalates: the Columbia Center for Children's Environmental Health Cohort. Environmental Health Perspectives 122(10):1141-1146.		
HERO ID:	2510815		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Low. Most key criteria not described. Sampling equipment, sample storage conditions, duration of sample storage, lacking.
Metric 2:	Analytical Methodology	Low	Low. Some key criteria briefly described, samples analyzed by CDC with methodology referenced, lack of LOD data.
Metric 3:	Biomarker Selection	Low	Low. Sampling for metabolites not specific for parent chemical of interest.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	High. Samples provided by participants in Harlem and New York, New York hospitals.
Metric 5:	Currency	Medium	Medium. Prenatal spot urine samples collected 1998-2006. Only prenatal concentrations reported.
Metric 6:	Spatial and Temporal Variability	Low	Low. Single prenatal 3rd trimester spot urine specimens obtained from n=300 participants
Metric 7:	Exposure Scenario	Medium	Medium. Participant characteristics summarized, lack of information on pre-exposure or control samples.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Medium. Most key criteria met; lack of raw data.
Metric 9:	Quality Assurance	Medium	Medium. Quality assurance procedures not described however analytic methods referenced and samples noted as analyzed at CDC labs.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	High. Variability characterized within summary statistics in Table 2. Study limitations discussed.

Overall Quality Determination   Medium

Study Citation:	Wang, J., Bo, L., Li, L., Wang, D., Chen, G., Christie, P., Teng, Y. (2014). Occurrence of phthalate esters in river sediments in areas with different land use patterns. Science of the Total Environment 500:113-119.		
HERO ID:	2510816		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	All key sampling methods reported, including reference to another study for treatment and analysis.
	Metric 2: Analytical Methodology	Medium	Most key analytical methods described except MDLs, which were reported as a range for all phthalates combined.
	Metric 3: Biomarker Selection	N/A	Tested for parent chemical in river sediment
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Changshu, China
	Metric 5: Currency	Medium	Samples collected in 2012
	Metric 6: Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7: Exposure Scenario	High	Exposure scenario characterized and is relevant
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	raw data not reported
	Metric 9: Quality Assurance	High	QA reported with blank procedures and acceptable recoveries
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	No gaps and limitations reported

Overall Quality Determination   Medium

Domain		Metric	Rating	Comments
Study Citation:		Frederiksen, H., Kranich, S. K., Jørgensen, N., Taboureau, O., Petersen, J. H., Andersson, A. M. (2013). Temporal variability in urinary phthalate metabolite excretion based on spot, morning, and 24-h urine samples: considerations for epidemiological studies. Environmental Science & Technology 47(2):958-967.		
HERO ID:		2516456		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Detailed sampling methods, including timing of collection, storage, and equipment used.
	Metric 2:	Analytical Methodology	High	Well described analytical methods, including instrument, calibration curve, LOD, blank urine pool provided.
	Metric 3:	Biomarker Selection	High	Metabolites known to be derived from parent chemical (MBP, MnBP).
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Denmark
	Metric 5:	Currency	Medium	Samples taken in 2008
	Metric 6:	Spatial and Temporal Variability	High	n=33, with triplicates over a three month period. 24 hr, morning void, and spot samples all collected.
	Metric 7:	Exposure Scenario	Medium	Men sampled but there is little information given about them and source of exposure.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics (min, max, percentiles). No individual points.
	Metric 9:	Quality Assurance	High	Described QA/QC techniques described in another study, analyzed control samples. High recoveries (over 70%).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Characterized variability, discussed uncertainties and limitations, and compared the different modes of urine collection.

Overall Quality Determination   High

| Study Citation: | Kong, S., Ji, Y., Liu, L., Chen, L., Zhao, X., Wang, J., Bai, Z., Sun, Z. (2012). Diversities of phthalate esters in suburban agricultural soils and wasteland soil appeared with urbanization in China. Environmental Pollution 170(Elsevier):161-168. |
| HERO ID: | 2518980 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported
	Metric 2:	Analytical Methodology	High	Key analytical methods reported
	Metric 3:	Biomarker Selection	N/A	Tested parent chemicals in soil
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Tianjin, China
	Metric 5:	Currency	Medium	Samples collected in 2009
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7:	Exposure Scenario	High	Exposure source characterized. Exposure scenario is relevant.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported
	Metric 9:	Quality Assurance	High	QA reported. Recoveries acceptable
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Gaps and limitations not well characterized

Overall Quality Determination   High

| **Study Citation:** | Takeuchi, S., Kojima, H., Saito, I., Jin, K., Kobayashi, S., Tanaka-Kagawa, T., Jinno, H. (2014). Detection of 34 plasticizers and 25 flame retardants in indoor air from houses in Sapporo, Japan. Science of the Total Environment 491-492:28-33. |
| **HERO ID:** | 2519043 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling methodology is mostly adequately described, but some details are missing (e.g., sample storage conditions/duration). The study does cite some other published works for more complete details.
	Metric 2:	Analytical Methodology	Medium	The analytical methods were described, including LOD but not recoveries.
	Metric 3:	Biomarker Selection	N/A	Concentrations were measured in indoor air.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Sapporo, Japan.
	Metric 5:	Currency	Medium	Samples were collected in 2012.
	Metric 6:	Spatial and Temporal Variability	Medium	It appears that only one sample per home was collected. Six homes were sampled.
	Metric 7:	Exposure Scenario	Medium	The data may represent relevant exposure scenarios related to indoor air in Sapporo Japan but only 6 homes were sampled. One home was sampled during a different season from the other homes.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual sample concentrations were reported, without summary statistics.
	Metric 9:	Quality Assurance	Critically Deficient	This compound was detected at low concentrations even in the extracts of the rinsed filters, including those of travel blanks. The indoor air concentration of this compound were calculated by subtracting the travel blank value from the indoor air sample value.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability was not characterized. Very limited discussion of limitations, uncertainties, and data gaps.

Overall Quality Determination   Uninformative

Study Citation:			Tran, B. C., Teil, M. J., Blanchard, M., Alliot, F., Chevreuil, M. (2014). BPA and phthalate fate in a sewage network and an elementary river of France. Influence of hydroclimatic conditions. Chemosphere 119C:43-51.
HERO ID:			2519056

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Well described sampling methodology.
	Metric 2:	Analytical Methodology	Low	Limited data on recovery samples and detection limits not reported by chemical.
	Metric 3:	Biomarker Selection	N/A	Tested for parent chemical in wastewater and river water.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	France.
	Metric 5:	Currency	Medium	Sampling in 2010-2011.
	Metric 6:	Spatial and Temporal Variability	Medium	4 sites sampled 12 times. No replicates.
	Metric 7:	Exposure Scenario	Medium	Limited data on population of interest and microenvironment.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics, raw data not provided.
	Metric 9:	Quality Assurance	Medium	Laboratory control samples were analyzed, limited information on field controls and recoveries.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Limited discussion of limitations, data gaps and uncertainties.

Overall Quality Determination   Medium

Study Citation:	Selvaraj, K. K., Sundaramoorthy, G., Ravichandran, P. K., Girijan, G. K., Sampath, S., Ramaswamy, B. R. (2015). Phthalate esters in water and sediments of the Kaveri River, India: environmental levels and ecotoxicological evaluations. Environmental Geochemistry and Health 37(1):83-96.		
HERO ID:	2519070		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Surface water and sediment were collected from 16 locations (Fig 1) during dry season of 2012. Water was collected using glass bottles and stored at 4C until extraction within a week. Grab samples of sediments were collected in bags and stored at -20C until extraction.
	Metric 2:	Analytical Methodology	High	Authors cited a peer reviewed paper for their solid-phase extraction procedure for water samples. Ultrasonic methods used for extraction from sediment. Chemicals were analyzed using GC-MS. Table 1 provides recoveries, LOD, and LOQ per chemical.
	Metric 3:	Biomarker Selection	N/A	The study tested the parent chemicals in riverine water and sediment.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in the Kaveri River, India.
	Metric 5:	Currency	Medium	Samples were collected between 2010 and 2012 (2010-2011 for sediment samples and 2012 for water samples).
	Metric 6:	Spatial and Temporal Variability	Medium	Samples were collected from 16 locations along the river during dry season and sediment samples were archived from 2010-2011. SI provides more details on sampling sites. Replicate samples were not collected.
	Metric 7:	Exposure Scenario	High	Authors measured chemical concentrations in water and sediment of one of the largest rivers in southern India, where water is abstracted for irrigation, drinking, and industrial processes. Sampling was conducted in rural and urban environments in proximity to agricultural areas, cities, and industries
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Concentration data are provided in Figures 2 and 3 for riverine water and sediment, as well as in text starting on p.88. Summary statistics include detection frequencies, mean, and range. Raw data provided in SI.
	Metric 9:	Quality Assurance	Medium	QA/QC techniques included spiking, blanks, and recovery samples. However, Table 1 showed that the extraction method for water showed recovery of 33% for BBP; it is unclear if/how authors corrected for the low recovery.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	There is no discussion of limitations, uncertainties, or data gaps. Characterization of variance is minimal with just graphical representations of phthalate distribution in water and sediment along the river (Fig 3).

Overall Quality Determination — High

Study Citation:	Niu, L., Xu, Y., Xu, C., Yun, L., Liu, W. (2014). Status of phthalate esters contamination in agricultural soils across China and associated health risks. Environmental Pollution 195:16-23.		
HERO ID:	2519080		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methods, equipment, storage reported.
	Metric 2:	Analytical Methodology	Medium	Extraction methods, analytical methods, equipment, calibration, recovery samples reported. LOD reported as a range.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	Medium	Samples collected in 2013
	Metric 6:	Spatial and Temporal Variability	Medium	123 samples. No replicates collected.
	Metric 7:	Exposure Scenario	High	Exposure sources characterized (application of agricultural plastic films and activities for soil fertility).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Mean, median, min, max provided. Raw data not reported.
	Metric 9:	Quality Assurance	High	Key QA reported. Recoveries over 70% and blank samples included.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	No gaps and limitations reported. Spatial variation analyzed and SD reported.

Overall Quality Determination   High

Study Citation:	Watkins, D. J., Téllez-Rojo, M. M., Ferguson, K. K., Lee, J. M., Solano-Gonzalez, M., Blank-Goldenberg, C., Peterson, K. E., Meeker, J. D. (2014). In utero and peripubertal exposure to phthalates and BPA in relation to female sexual maturation. Environmental Research 134:233-241.		
HERO ID:	2519083		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The study population and sample collection methods were described.
	Metric 2: Analytical Methodology	Medium	LOD provided in Table 1. Samples were analyzed at NSF International using ID-LC-MS/MS and specific gravity was accounted for. Other details were not reported.
	Metric 3: Biomarker Selection	High	MnBP is specific to DBP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was performed in Mexico.
	Metric 5: Currency	Medium	Study was performed in 2010.
	Metric 6: Spatial and Temporal Variability	Low	Over 100 samples were collected from both mothers and children without replicates. Furthermore, only un-pooled urine spot samples were collected.
	Metric 7: Exposure Scenario	High	This is a biomonitoring study were exposure already occurred in utero for children.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Geometric means and percentiles were provided, but not raw data.
	Metric 9: Quality Assurance	Low	QA/QC techniques were not discussed.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variance was not characterized and uncertainties, limitations, and data gaps were not discussed.

Overall Quality Determination   Medium

Study Citation:	Cutanda, F., Koch, H. M., Esteban, M., Sánchez, J., Angerer, J., Castaño, A. (2015). Urinary levels of eight phthalate metabolites and bisphenol A in mother-child pairs from two Spanish locations. International Journal of Hygiene and Environmental Health 218(1):47-57.		
HERO ID:	2519084		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Standard Operation Procedures (SOPs) were followed in the collection of samples (Schindler et al., 2014). Missing approaches to avoid contamination, although it could be described in Schindler et al.
	Metric 2:	Analytical Methodology	Medium	Assessment done by Institute for Prevention and Occupational Medicine (IPA) laboratory (Koch et al., 2012, 2013; Kasper-Sonnenberg et al., 2012a,b). LOQ provided. Use on-line LC/LC–MS/MS with isotope dilution after enzymatic deconjugation.
	Metric 3:	Biomarker Selection	High	Metabolite in urine, see Table 1
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Spain
	Metric 5:	Currency	Medium	2011-2012
	Metric 6:	Spatial and Temporal Variability	High	n = 118 mothers and 119 children, no replicates, urine morning void
	Metric 7:	Exposure Scenario	High	Biomonitoring, mother and child
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not provided, summary tables in supplemental: GM, P95, max.
	Metric 9:	Quality Assurance	Medium	external quality assurance by the Quality Assessment Unit of COPHES/DEMOCOPHES as described in detail by Schindler et al. (2014).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Variability between rural and urban locations was described as well as food consumption as a source of the variability among groups.

Overall Quality Determination   High

Study Citation: Geens, T., Bruckers, L., Covaci, A., Schoeters, G., Fierens, T., Sioen, I., Vanermen, G., Baeyens, W., Morrens, B., Loots, I., Nelen, V., de Bellevaux, B. N., Larebeke, N. V., Hond, E. D. (2014). Determinants of bisphenol A and phthalate metabolites in urine of Flemish adolescents. Environmental Research 134:110-117.

HERO ID: 2519090

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Flemish Environment and Health Study (FLEHS) 2007–2012 enrollment described, morning urine samples
	Metric 2:	Analytical Methodology	Medium	LOQ in text; analysis - Koch et al.(2003). method performance (Servaes et al.,2013). Provided sufficient details describing metabolite detection, but not much about the creatinine
	Metric 3:	Biomarker Selection	High	metabolite in urine
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Belgium
	Metric 5:	Currency	Medium	2008-2009
	Metric 6:	Spatial and Temporal Variability	Medium	n = 206, no replicates
	Metric 7:	Exposure Scenario	High	General population children 14-15 years of age, biomonitoring data (urine).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	GM, median, P25, P75, P90, P95, min, max
	Metric 9:	Quality Assurance	Medium	QA briefly described in analytical recoveries and duplicate sample analysis. Missing analytical blanks and field sample blanks mention.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	variability and uncertainty discussed according to the study goals

Overall Quality Determination   High

Study Citation:	Zhang, Y., Meng, X., Chen, L., Li, D., Zhao, L., Zhao, Y., Li, L., Shi, H. (2014). Age and Sex-Specific Relationships between Phthalate Exposures and Obesity in Chinese Children at Puberty. PLoS ONE 9(8):e104852.		
HERO ID:	2519091		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported
	Metric 2:	Analytical Methodology	Medium	Recovery samples not reported, missing analytical blanks
	Metric 3:	Biomarker Selection	Medium	acceptable biomarkers for DEHP. Authors did not link metabolites MBP, MMP, and MEP to other phthalates, but they were measured.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	Medium	Samples collected in 2011
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7:	Exposure Scenario	Medium	General Population, children of various age groups and gender in China. Link to obesity and phthalates, may be useful for PESS analysis. Unclear of its applicability to US children
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported
	Metric 9:	Quality Assurance	Medium	QA/QC reported, missing analytical recoveries, analytical blanks, field blanks. However, described process to assess variability and uncertainty from various measurements.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Described sources of variability and uncertainty within the study goals. Although missing a few QA/QC parameters other descriptions provide confidence in the measurements.

Overall Quality Determination   Medium

Domain	Metric		Rating	Comments
Study Citation:		Chan, W. R., Cohn, S., Sidheswaran, M., Sullivan, D. P., Fisk, W. J. (2014). Contaminant levels, source strengths, and ventilation rates in California retail stores. Indoor Air 25(4):381-392.		
HERO ID:		2535652		
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling method criteria not reported, such as storage conditions/duration
	Metric 2:	Analytical Methodology	Medium	Some analytical method criteria not reported, such as recoveries
	Metric 3:	Biomarker Selection	N/A	No biomarkers
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA, California
	Metric 5:	Currency	Medium	Data collected between 2011 and 2013
	Metric 6:	Spatial and Temporal Variability	Medium	No sample replicates.
	Metric 7:	Exposure Scenario	High	Measure indoor air concentrations at retail stores
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data reported.
	Metric 9:	Quality Assurance	Low	Limited QA/QC reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Limited information provided on gaps and limitations

Overall Quality Determination   Medium

Dibutyl Phthalate

Study Citation:	Fu, P., Kawamura, K., Barrie, L. A. (2009). Photochemical and other sources of organic compounds in the Canadian high Arctic aerosol pollution during winter-spring. Environmental Science & Technology 43(2):286-292.		
HERO ID:	2592659		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methodology reported.
	Metric 2: Analytical Methodology	High	Analytical methodology well described.
	Metric 3: Biomarker Selection	N/A	Chemical in environmental media (air).
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Geographic location is reported; Canadian high Arctic.
	Metric 5: Currency	Low	Data collected Feb to June 1991. Timing of sample collection for monitoring data is not consistent with when current exposures (>15 years old) may be expected and likely to have a substantial impact on results.
	Metric 6: Spatial and Temporal Variability	Low	Sample size not reported but samples collected weekly from February to June.
	Metric 7: Exposure Scenario	High	Chemicals in the Canadian high Arctic aerosol.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	Supplementary or raw data (i.e., individual data points) are reported in the supplemental file, allowing summary statistics to be calculated or reproduced.
	Metric 9: Quality Assurance	High	The study applied QA/QC measures such as field and lab control samples. Recoveries were high. No QA/QC issues identified.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	No limitations and uncertainties discussed. However, no standard deviation or other measure of variance is provided.

Overall Quality Determination   Medium

Study Citation:	Pollack, A. Z., Buck Louis, G. M., Chen, Z., Sun, L., Trabert, B., Guo, Y., Kannan, K. (2014). Bisphenol A, benzophenone-type ultraviolet filters, and phthalates in relation to uterine leiomyoma. Environmental Research 137C:101-107.		
HERO ID:	2718036		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Most key criteria not reported. However, reference to another paper was cited for complete details on study methods.
Metric 2:	Analytical Methodology	Medium	Most key criteria met. LODs were reported in Table 2. Recovery data were missing.
Metric 3:	Biomarker Selection	High	Sampling for metabolites specific for parent chemical of interest.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Urine samples collected from participants in Salt Lake City, Utah and San Francisco, California.
Metric 5:	Currency	Medium	Sampling conducted during 2007-2009.
Metric 6:	Spatial and Temporal Variability	Low	Single spot urine samples collected from n=431 participants in Utah and n=63 participants in California (non-statistical sampling method). There was no report of replicate sampling.
Metric 7:	Exposure Scenario	High	Participant characteristics were summarized. Potential sources were described as widespread exposure to personal care products.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data were missing.
Metric 9:	Quality Assurance	High	Quality assurance procedures reported.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Variability was characterized within statistical summary data. Potential study limitations were only briefly reported.

Overall Quality Determination   Medium

Study Citation:	Den Hond, E., Govarts, E., Willems, H., Smolders, R., Casteleyn, L., Kolossa-Gehring, M., Schwedler, G., Seiwert, M., Fiddicke, U., Castaño, A., Esteban, M., Angerer, J., Koch, H. M., Schindler, B. K., Sepai, O., Exley, K., Bloemen, L., Horvat, M., Knudsen, L. E., Joas, A., Joas, R., Biot, P., Aerts, D., Koppen, G., Katsonouri, A., Hadjipanayis, A., Krskova, A., Maly, M., Mørck, T. A., Rudnai, P., Kozepesy, S., Mulcahy, M., Mannion, R., Gutleb, A. C., Fischer, M. E., Ligocka, D., Jakubowski, M., Reis, M. F., Namorado, S., Gurzau, A. E., Lupsa, I. R., Halzlova, K., Jajcaj, M., Mazej, D., Snoj Tratnik, J., López, A., Lopez, E., Berglund, M., Larsson, K., Lehmann, A., Crettaz, P., Schoeters, G. (2014). First steps toward harmonized human biomonitoring in Europe: Demonstration project to perform human biomonitoring on a European scale. Environmental Health Perspectives 123(3):255-263.		
HERO ID:	2718042		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The sampling methodology is based on the European consensus protocol of COPHES.
	Metric 2: Analytical Methodology	High	Samples were analyzed following a interlaboratory SOP, more information found in (Becker et al. 2014, Schindler et al. 2014). LOQ are reported per country and metabolite.
	Metric 3: Biomarker Selection	High	Metabolite known to be derived from parent chemical (MnBP).
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in 17 European countries in urban and rural areas following a protocol.
	Metric 5: Currency	Medium	2010-2012
	Metric 6: Spatial and Temporal Variability	Medium	1844 paired children and mother. No replicate samples. Morning urine samples.
	Metric 7: Exposure Scenario	High	Mother and children living in 17 European countries in urban and rural areas
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	No individual results reported, but GM and (95%CI) reported.
	Metric 9: Quality Assurance	High	The study had two interlaboratory comparison investigations and two external quality assessment schemes (ICI/EQUAS).
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	The study characterizes variability in the demographics and behaviors of the study population, but does not report limitations.

Overall Quality Determination   High

Study Citation:	Kong, L., Kadokami, K., Wang, S., Duong, H. T., Chau, H. T. (2015). Monitoring of 1300 organic micro-pollutants in surface waters from Tianjin, North China. Chemosphere 122:125-130.		
HERO ID:	2718045		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The sampling method summary was brief but comprehensive.
	Metric 2:	Analytical Methodology	High	Extraction methods and use of various mass spectrometry was described.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Sampling occurred in three watersheds in China.
	Metric 5:	Currency	Medium	Data was collected in 2013.
	Metric 6:	Spatial and Temporal Variability	Medium	No replicates were collected.
	Metric 7:	Exposure Scenario	High	Potential sources of exposure in surface water were identified.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw data was provided in supplemental Excel file.
	Metric 9:	Quality Assurance	High	QA/QC was reported and included blanks, spiked samples, and cleaning procedures.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	No gaps nor limitations were reported.

Overall Quality Determination   High

Study Citation:	Wang, I. J., Karmaus, W. J. (2015). The effect of phthalate exposure and filaggrin gene variants on atopic dermatitis. Environmental Research 136:213-218.		
HERO ID:	2718048		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Medium. Most key criteria met. Duration of sample storage prior to analysis lacking. Sampling containers not described.
Metric 2:	Analytical Methodology	Medium	Medium. Most key criteria met. Recovery of internal standard and native standard of phthalates conducted but data not provided.
Metric 3:	Biomarker Selection	High	High. Sampling for metabolites specific for parent chemicals
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	High. Taiwan.
Metric 5:	Currency	Medium	Medium. Samples collected in 2010.
Metric 6:	Spatial and Temporal Variability	Medium	Medium. Single spot urine samples collected from 106 cases and 347 controls, non-statistical sampling approach. No indication of replicate sampling or analysis.
Metric 7:	Exposure Scenario	Medium	Medium. Participant characteristics reported for cases and controls for relevant exposure scenario.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Medium. Most key criteria met. Lack of detection frequency and raw data.
Metric 9:	Quality Assurance	Medium	Medium. Most key criteria met. Lack of recovery data.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Medium. Most key criteria met, study limitations only briefly discussed.

Overall Quality Determination   **Medium**

Study Citation:	Holmes, A. K., Koller, K. R., Kieszak, S. M., Sjodin, A., Calafat, A. M., Sacco, F. D., Varner, D. W., Lanier, A. P., Rubin, C. H. (2014). Case-control study of breast cancer and exposure to synthetic environmental chemicals among Alaska Native women. International Journal of Circumpolar Health 73(1):25760.		
HERO ID:	2718053		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not described in details such as storage and handling of blood samples
	Metric 2:	Analytical Methodology	Low	Analytical methods not reported or described, missing LOD and limits
	Metric 3:	Biomarker Selection	High	acceptable biomarker
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Alaska
	Metric 5:	Currency	Low	Samples collected between 1999 and 2002
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples no replicates
	Metric 7:	Exposure Scenario	High	Alaskan native women, collection of demographic information.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	raw data not reported
	Metric 9:	Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Limitations reported

Overall Quality Determination   Low

Study Citation:	Vagi, S. J., Azziz-Baumgartner, E., Sjödin, A., Calafat, A. M., Dumesic, D., Gonzalez, L., Kato, K., Silva, M. J., Ye, X., Azziz, R. (2014). Exploring the potential association between brominated diphenyl ethers, polychlorinated biphenyls, organochlorine pesticides, perfluorinated compounds, phthalates, and bisphenol a in polycystic ovary syndrome: a case-control study. BMC Endocrine Disorders 14(1):86.
HERO ID:	2718073

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Key sampling methods were reported.
Metric 2:	Analytical Methodology	Medium	Recovery samples not reported.
Metric 3:	Biomarker Selection	High	Biomarker is acceptable.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Study performed in California.
Metric 5:	Currency	Medium	Samples were collected in 2007 and 2008.
Metric 6:	Spatial and Temporal Variability	Low	52 patients and 50 controls were recruited to the study. No replicates were collected and only single spot urine samples were provided.
Metric 7:	Exposure Scenario	Medium	Exposure scenario not well characterized. However, note that the aim of this study was to determine if there was an association between patients with polycystic ovarian syndrome and environmental contaminants in their body. As a result, some of this metric's criteria are less applicable.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data were not reported.
Metric 9:	Quality Assurance	Low	Limited QA/QC techniques were reported.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Gaps and limitations were reported but little characterization of variance.

Overall Quality Determination — **Medium**

Study Citation:	Fisher, M., Arbuckle, T. E., Mallick, R., Leblanc, A., Hauser, R., Feeley, M., Koniecki, D., Ramsay, T., Provencher, G., Bérubé, R., Walker, M. (2015). Bisphenol A and phthalate metabolite urinary concentrations: Daily and across pregnancy variability. Journal of Exposure Science & Environmental Epidemiology 25(3):231-239.		
HERO ID:	2718085		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Medium. Most key criteria met. Duration of sample storage prior to analysis lacking.
	Metric 2:	Analytical Methodology	Medium	Medium. Most key criteria met. Lack of recovery data
	Metric 3:	Biomarker Selection	Low	Low. Sampling for metabolites not specific for parent chemicals.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	High. Canada.
	Metric 5:	Currency	Medium	Medium. Sampling 2009-2010.
	Metric 6:	Spatial and Temporal Variability	High	High. Temporal variability high: 24-hour spot urine specimens collected from subjects in Ottowa during early pregnancy on weekdays (n=64 samples) and weekends (n=66 samples), followed by single spot urine specimens for each participant during 2nd (n=70 samples) and 3rd (n=71 samples) trimesters as well as postpartum (n=63 samples).
	Metric 7:	Exposure Scenario	Medium	Medium. Participant characteristics summarized for relevant exposure scenario. Occupation not reported.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Medium. Most key criteria met. Lack of raw data.
	Metric 9:	Quality Assurance	Medium	Medium. Most key criteria met. Lack of recovery data.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Medium. Most key criteria met, variability summarized within statistical summary measures, lack of robust discussion of potential study limitations.

Overall Quality Determination   Medium

| | Study Citation: | Song, M., Chi, C., Guo, M., Wang, X., Cheng, L., Shen, X. (2015). Pollution levels and characteristics of phthalate esters in indoor air of offices. Journal of Environmental Sciences 28:157-162. |
| | HERO ID: | 2804025 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported, such as storage conditions and calibration of the sample
	Metric 2:	Analytical Methodology	High	The sample was analyzed by a gas chromatograph (FULI 9790, Wenling, China) with a DB-5 capillary column (30 m × 0.25 mm ID × 0.25 μm, Agilent Technology Inc, America).
	Metric 3:	Biomarker Selection	N/A	NA - Particle samples no biomarker needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Hangzhou, China
	Metric 5:	Currency	Medium	Data collected in 2013
	Metric 6:	Spatial and Temporal Variability	High	Ten offices, 8-10 hr sampling for air and 1-2 hr sampling for particulate.
	Metric 7:	Exposure Scenario	Medium	Workplace and offices. Could be useful for home office scenarios.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	raw data not provided
	Metric 9:	Quality Assurance	Medium	Done but not reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported

Overall Quality Determination   Medium

Study Citation:	Wu, W., Hu, J., Wang, J., Chen, X., Yao, N., Tao, J., Zhou, Y. K. (2015). Analysis of phthalate esters in soils near an electronics manufacturing facility and from a non-industrialized area by gas purge microsyringe extraction and gas chromatography. Science of the Total Environment 508:445-451.		
HERO ID:	2804032		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported
	Metric 2:	Analytical Methodology	High	Key analytical methods reported
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	Medium	Samples collected in 2013
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7:	Exposure Scenario	High	Exposure source characterized. Soil samples around source and removed from source
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported
	Metric 9:	Quality Assurance	Medium	QA/QC described, but still missing some aspects like field blanks (sampling, transportation) or any mention of addressing these aspects.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability between sampling locations discussed. Uncertainty to the measurements in soil samples was not recognized. Soil have some of the largest variability and hence uncertainties due to the complexities of the media. This needed to be addressed, described, and recognized better.

Overall Quality Determination   High

Study Citation:	Zhang, Y., Wang, P., Wang, L., Sun, G., Zhao, J., Zhang, H., Du, N. (2015). The influence of facility agriculture production on phthalate esters distribution in black soils of northeast China. Science of the Total Environment 506-507:118-125.		
HERO ID:	2804035		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Most sampling methods reported, except some details were missing (e.g., sampling equipment, storage conditions).
	Metric 2:	Analytical Methodology	High	Key analytical methods (e.g., extraction methods, GC-MS analysis) were reported. MDLs provided in text under Section 2.6.
	Metric 3:	Biomarker Selection	N/A	The study tested for parent chemicals in soil.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected from nine cities in China.
	Metric 5:	Currency	Medium	Samples were collected in 2013.
	Metric 6:	Spatial and Temporal Variability	Medium	There were a total of 27 samples collected with no replicates.
	Metric 7:	Exposure Scenario	High	Exposure scenario was characterized, including possible sources of exposure (i.e., via contaminated agricultural soil).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Summary statistics were provided but not raw data.
	Metric 9:	Quality Assurance	High	QA/QC techniques were described and included procedural blank, spike blank, sample duplicates, and recoveries. Recovery ranges were acceptable.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Key gaps and limitations were not discussed.

Overall Quality Determination   Medium

Monitoring

Study Citation:	Huang, Y., Lu, W. W., Chen, B., You, J., Wu, M., Li, S. G. (2014). Phthalates in commercial chinese rice wines: concentrations and the cumulative risk assessment to adult males in shanghai. Biomedical and Environmental Sciences 27(10):819-823.		
HERO ID:	2804038		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Several sampling methods not reported such as sample storage conditions and sampler calibration
Metric 2:	Analytical Methodology	Medium	Some analytical methods not reported such as instrument calibration
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Shanghai, China
Metric 5:	Currency	Medium	Study conducted in 2014
Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
Metric 7:	Exposure Scenario	Medium	Consumption of rice wine, may be applicable to certain demographic groups within general population.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	raw data not reported
Metric 9:	Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Few gaps and limitations reported

Overall Quality Determination   Medium

Study Citation:	Xu, Y., Liang, Y., Urquidi, J. R., Siegel, J. A. (2014). Phthalates and polybrominated diphenyl ethers in retail stores. Atmospheric Environment 87:53-64.		
HERO ID:	2804046		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The study reports two sampling approaches indicating sample procedures, equipment, and storage.
	Metric 2: Analytical Methodology	Low	Analytical methods described in detail, and detection limits were discussed but not reported.
	Metric 3: Biomarker Selection	N/A	The study reports the parent compound in indoor air.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Texas and Pennsylvania, USA.
	Metric 5: Currency	Low	Timing for sample collection is not reported, but paper's publication date is 2013.
	Metric 6: Spatial and Temporal Variability	High	Twelve retail stores were sampled, and more than one sample was collected at some stores. Duplicate air samples were collected for 48 h to a total volume of 72 m3, and a field blank was prepared at each sampling location.
	Metric 7: Exposure Scenario	High	The study measured the indoor air quality in retail environments.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual sample concentrations are not reported. Table 3 provided the mean, SD, and range for indoor air concentrations and whole building emission rates.
	Metric 9: Quality Assurance	High	The study reported field blanks and analytical recovery efficiencies. While recoveries were reported as a range for chemical types combined, the lower bound is still above 70%.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	The study reported standard deviations, concentration uncertainty (Supporting Information) and potential limitations.

Overall Quality Determination   High

Study Citation: Vandermarken, T., De Galan, S., Croes, K., Van Langenhove, K., Vercammen, J., Sanctorum, H., Denison, M. S., Goeyens, L., Elskens, M., Baeyens, W. (2016). Characterisation and implementation of the ERE-CALUX bioassay on indoor dust samples of kindergartens to assess estrogenic potencies. Journal of Steroid Biochemistry and Molecular Biology 155(Pt B):182-189.

HERO ID: 2807610

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Dust samples were collected in 12 kindergarten classrooms in Belgium. Used a vacuum cleaner with a phthalate free glass fiber thimble in addition to other teflon and stainless steel parts to avoid contamination. Vacuum was set to collect 2cm above the ground to avoid scraping floors. Collected approx. 250 mg of dust after 2 min of 1m square surface. Classroom interior was documented and reported.
	Metric 2:	Analytical Methodology	High	This study was about comparing sample collection to a bioassay technique. We are interested in the collected dust samples. The collected dust samples were extracted using EPA method 3620c and analyzed via gas chromatography mass spectrometry. Internal standards, blanks, and LODs reported. Details of analysis and extraction reported in their own sections.
	Metric 3:	Biomarker Selection	N/A	NA - Dust samples no biomarker needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Flanders and Brussels, Belgium
	Metric 5:	Currency	Low	Sampling date not specified, publication date 2016.
	Metric 6:	Spatial and Temporal Variability	Medium	One sample in 12 locations, no replicate.
	Metric 7:	Exposure Scenario	High	Children indoor environment and dust concentrations.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 4 concentrations in dust. Blank corrected, so no raw data provided.
	Metric 9:	Quality Assurance	High	Analytical QA/QC was reported and is reliable.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Sources of variability and uncertainty between the two approaches were discussed, also discussed the various classroom content and potential sources of variability and uncertainty.

Overall Quality Determination   High

Study Citation:	Yang, G. C. C., Liou, S. H., Wang, C. L. (2014). The Influences of Storage and Further Purification on Residual Concentrations of Pharmaceuticals and Phthalate Esters in Drinking Water. Water, Air, and Soil Pollution 225(5):1-11.		
HERO ID:	2816161		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Drinking water was from 2 sites at 1700 hrs on Friday and 800 hrs on Monday. Each sampling site included 1 tap water pipeline, 5 water storage tanks, and 5 drinking fountains. Samples were collected following method NIEA W101.54A, store at 4C, and analyzed within 14 days.
	Metric 2:	Analytical Methodology	High	Extraction methods (SPE), analytical procedures and methods (LC–ESI-MS/MS), recoveries, and LOQ (1ng/L from Tables 4 and 5) were reported.
	Metric 3:	Biomarker Selection	N/A	Study tested parent chemicals in drinking water.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in northern and southern Taiwan.
	Metric 5:	Currency	Medium	Samples were collected between July 8, 2011 and November 21, 2012.
	Metric 6:	Spatial and Temporal Variability	Medium	Samples collected at 2 sites. At each site, researchers sampled from 1 tap water pipeline, 5 water storage tanks, and 5 drinking fountains. Replicates were not collected.
	Metric 7:	Exposure Scenario	High	Study measured phthalate concentrations in drinking water from tap water, water storage tank, and drinking fountains.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 5 provides average concentrations per site collected from each drinking water type along with DF. Table provides concentration in two batches from water storage tank at both sites. Raw data are not reported.
	Metric 9:	Quality Assurance	High	QA/QC techniques were described, including spiked recoveries (94-100%) for phthalate and blanks.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Report of variance and uncertainties, gaps, and limitations is missing.

Overall Quality Determination   High

Study Citation:	Li, T., Yin, P., Zhao, L., Wang, G., Yu, Q. J., Li, H., Duan, S. (2015). Spatial-temporal distribution of phthalate esters from riverine outlets of Pearl River Delta in China. Water Science and Technology 71(2):183-190.		
HERO ID:	2816369		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	water and sediment samples collected from 7 outlets during January and April (fig 1); surface water from top 0-50cm collected in stainless steel barrel and stored in glass; sediment taken using gravity corer and sliced at 5-10cm intervals; all samples conducted in triplicate; 1L water filtered; sediment air-dried, ground, and homogenized
	Metric 2:	Analytical Methodology	High	extraction discussed on p.185; GC-MS; LOD was 0.010 ug/L for water and 0.008 ug/g for sediment; recoveries reported
	Metric 3:	Biomarker Selection	N/A	Water and sediment sampling
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Pearl River Delta (PRD) in China
	Metric 5:	Currency	Medium	2013
	Metric 6:	Spatial and Temporal Variability	High	7 riverine outlets sampled during dry and wet season; all sampling conducted in triplicate
	Metric 7:	Exposure Scenario	High	surface water and sediments of a river delta in China contaminated by various industrial chemicals from local industries
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Table 1 provides concentration is surface water for each sampling site in both wet and dry season; range, mean, and DF provided; Table 3 provides concentration the mean, range, and DF of the 7 outlets combined in total as well as wet and dry season; Table 4 provides the individual sediment concentrations per site by depth in wet season
	Metric 9:	Quality Assurance	High	procedural blank, a spiked blank, a matrix-spiked, a sample duplicate and a solvent blank were processed every 10 field samples; recoveries ranged from 76.3-106%
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	compared spatial-temporal distribution; compared findings to those measured in other regions of the world

Overall Quality Determination   **High**

Study Citation:	Wei, X., Gu, P., Zhang, G., Huang, J. (2015). Occurrence of emerging and priority pollutants in municipal reverse osmosis concentrates. Environmental Science: Processes & Impacts 17(2):488-494.		
HERO ID:	2816370		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The sampling methods were described in detail.
	Metric 2: Analytical Methodology	High	Analytical methods were sufficiently described. LOD was reported in Table 2.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemical in environment.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Tianjin, China.
	Metric 5: Currency	Medium	Samples were collected in 2011-2013
	Metric 6: Spatial and Temporal Variability	Low	There were 4 samples collected. There were no replicates mentioned.
	Metric 7: Exposure Scenario	Medium	The sources of exposures were explained and measured in wastewater treatment. There was little information on the population of exposure.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Tables 2 and 4 report individual concentrations. Only a few summary statistics were reported.
	Metric 9: Quality Assurance	High	The QC techniques were explained in detail. They discussed recoveries and blanks.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Limitations and uncertainties were not discussed.

Overall Quality Determination   Medium

Study Citation:	Dodson, R. E., Camann, D. E., Morello-Frosch, R., Brody, J. G., Rudel, R. A. (2015). Semivolatile organic compounds in homes: strategies for efficient and systematic exposure measurement based on empirical and theoretical factors. Environmental Science & Technology 49(1):113-122.		
HERO ID:	2816371		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling equipment and methods are reported in detail and scientifically sound.
	Metric 2: Analytical Methodology	High	Analytical instrumentation and methods are reported in detail and scientifically sound. Method reporting limit calculation is based off of analytical detection limit, which is reported in the supplementary information.
	Metric 3: Biomarker Selection	N/A	This study is testing for the parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was performed in California.
	Metric 5: Currency	Medium	Samples were collected in 2006.
	Metric 6: Spatial and Temporal Variability	Medium	49 dust and indoor and outdoor air samples were collected from 50 homes in California without replicates.
	Metric 7: Exposure Scenario	Medium	Dust samples were collected from common exposure sites (rugs, upholstery, wood floors, windowsills, ceiling fans, and furniture) in the primary living area of residential homes. Additional information about study communities is available in other publications, although there is little mention of potential product/chemical use in the sampled homes.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Summary statistics reported include percent of samples above method reporting limit, median, 95th percentile, and maximum concentration of compound of interest in dust. Individual sample concentrations are not reported.
	Metric 9: Quality Assurance	High	QA/QC measures included use of blanks, split-sample duplicates, and measures of spike recovery, which ranged from 78-108%
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	The characterization of variability is absent. However, authors discuss the limitations presented by various approaches to measurement of household exposures to semivolatile organic compounds

Overall Quality Determination   Medium

Study Citation:	Yang, G. C. C., Wang, C. L., Chiu, Y. (2015). Occurrence and distribution of phthalate esters and pharmaceuticals in Taiwan river sediments. Journal of Soils and Sediments 15(1):198-210.		
HERO ID:	2816375		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods were briefly summarized with reference to Taiwan's NIEA S102.61B standard method.
	Metric 2:	Analytical Methodology	High	Key analytical methods reported (e.g., sample extraction using NIEA M167.01C standard method, spiked and blank smaples, recovery, LC-ESI-MS/MS analytical methods, instruments).
	Metric 3:	Biomarker Selection	N/A	Study tested parent chemicals in river sediment.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study performed in Dianbao River, Taiwan.
	Metric 5:	Currency	Medium	Samples collected in 2011 to 2012.
	Metric 6:	Spatial and Temporal Variability	Medium	35 samples were collected with no replicates.
	Metric 7:	Exposure Scenario	Medium	Exposure scenario is not well characterized, other than some information on pollutant sources (i.e., factories along its flow and their products).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not reported. Most summary statistics are missing except for average concentrations and detection frequencies.
	Metric 9:	Quality Assurance	High	QA/QC reported with acceptable recovery.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variance characterized with standard deviation, but limitations, data gaps, and uncertainties were not described.

Overall Quality Determination   **Medium**

Study Citation:	Wang, X., Tao, W., Xu, Y., Feng, J., Wang, F. (2014). Indoor phthalate concentration and exposure in residential and office buildings in Xi'an, China. Atmospheric Environment 87(Elsevier):146-152.		
HERO ID:	2816655		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methods for gas phase, particulate and dust provided. Particulate sampler was up to 10 microm. Samplers described, blanks used, dust samples collected in glass fiber membrane
	Metric 2:	Analytical Methodology	Medium	LOD not reported in text or supplemental. All other analytical method were described in text and supplemental. If LOD was provided this would be high.
	Metric 3:	Biomarker Selection	N/A	NA - Gas, particulate and dust samples no biomarker needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	Medium	Data collected in 2012 and 2013
	Metric 6:	Spatial and Temporal Variability	Medium	no replicates collected
	Metric 7:	Exposure Scenario	Medium	Indoor air, particulate and dust concentrations provided. The summary table 1 mixes offices (working) with residential which might not be applicable to our separate worker and general population scenarios.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	no raw data reported
	Metric 9:	Quality Assurance	High	Described in supplemental analytical methods
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	No gaps nor limitations reported

Overall Quality Determination   **Medium**

Study Citation:	Bae, J., Kim, S., Kannan, K., Buck Louis, G. M. (2015). Couples' urinary bisphenol A and phthalate metabolite concentrations and the secondary sex ratio. Environmental Research 137:450-457.		
HERO ID:	2816865		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	population described, urine sampling not described
	Metric 2: Analytical Methodology	Medium	LOD range provided. published methods (Guo et al., 2011; Zhang et al., 2011)
	Metric 3: Biomarker Selection	High	metabolite in urine
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Michigan and Texas
	Metric 5: Currency	Medium	2005 and 2009
	Metric 6: Spatial and Temporal Variability	Medium	n = 213 mothers and n = 212 fathers, no replicates
	Metric 7: Exposure Scenario	High	biomonitoring
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	geometric mean and 95%CI
	Metric 9: Quality Assurance	Medium	quality assurance and control procedures included in published methods (Guo et al., 2011; Zhang et al., 2011)
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	variability briefly discussed, uncertainty not discussed.

Overall Quality Determination   Medium

Study Citation:	Hassanzadeh, N., Sari, A. E., Khodabandeh, S., Bahramifar, N. (2014). Occurrence and distribution of two phthalate esters in the sediments of the Anzali wetlands on the coast of the Caspian Sea (Iran). Marine Pollution Bulletin 89(1-2):128-135.		
HERO ID:	2816867		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling area described. Sampling methods described and included description of sampling equipment, storage, and transport.
	Metric 2: Analytical Methodology	High	GC-MS method described. Method detection limit reported for individual phthalate.
	Metric 3: Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Anzali wetlands, Iran
	Metric 5: Currency	Medium	Study published in 2014
	Metric 6: Spatial and Temporal Variability	High	Sediment samples from 43 stations with each sample consisting of three sub-samples from surrounding of site. Sample duplicates analyzed.
	Metric 7: Exposure Scenario	High	Point and non-point sources described leading to potential exposures in Anzali Weland.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not provided
	Metric 9: Quality Assurance	High	QA/QC described and included running blanks and quantifying recoveries.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability of data well described but limitations of study are not well described.

Overall Quality Determination   **High**

Study Citation:	Robledo, C. A., Peck, J. D., Stoner, J., Calafat, A. M., Carabin, H., Cowan, L., Goodman, J. R. (2015). Urinary phthalate metabolite concentrations and blood glucose levels during pregnancy. International Journal of Hygiene and Environmental Health 218(3):324-330.		
HERO ID:	2816868		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methods, equipment, storage reported.
	Metric 2: Analytical Methodology	Medium	Extraction methods, analytical methods and equipment reported. Recovery samples and calibration not reported.
	Metric 3: Biomarker Selection	High	Metabolites derived from parent compound (MnBP, MiBP).
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Oklahoma
	Metric 5: Currency	Medium	Samples collected in 2008
	Metric 6: Spatial and Temporal Variability	Low	110 samples. No replicates. Spot urine samples.
	Metric 7: Exposure Scenario	High	Measuring exposure in pregnant women.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Only geometric mean and percentiles reported. Raw data not provided.
	Metric 9: Quality Assurance	Low	QA not reported but can be implied.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Gaps and limitations reported. No measure of variability.

Overall Quality Determination   **Medium**

Study Citation:	Chen, C. Y., Chou, Y. Y., Lin, S. J., Lee, C. C. (2015). Developing an intervention strategy to reduce phthalate exposure in Taiwanese girls. Science of the Total Environment 517C:125-131.		
HERO ID:	2816869		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methods included equipment and collecting first morning spot urine pre- and post-intervention. Participants characteristics were not described in detail, but cited a previous study (Chen et al., 2013) where participants were re-enrolled from.
	Metric 2: Analytical Methodology	High	Extraction, equipment, LOD, and other details were reported.
	Metric 3: Biomarker Selection	High	MBP is a metabolite specific to DBP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was performed in Taiwan.
	Metric 5: Currency	Medium	Study was done in 2010.
	Metric 6: Spatial and Temporal Variability	Medium	Samples were collected from 30 participants without replicates. First morning voids were also collected.
	Metric 7: Exposure Scenario	High	This is a biomonitoring study.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not reported.
	Metric 9: Quality Assurance	Medium	There was some but not a robust report of QA/QC. Authors described that one blank and one quality control (QC) sample were included in each batch. Recovery for metabolites spiked into artificially pooled urine ranged from 82-131%. For 13C-labeled internal standard of each monoester, the recovery was only reported as >40% for all monoesters.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	There was a limited characterization of variance and no discussion of uncertainties or data gaps.

Overall Quality Determination   **High**

Study Citation:		Tran, T. M., Kannan, K. (2015). Occurrence of phthalate diesters in particulate and vapor phases in indoor air and implications for human exposure in Albany, New York, USA. Archives of Environmental Contamination and Toxicology 68(3):489-499.	
HERO ID:		2816872	

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling method, matrix, equipment, and storage were described.
	Metric 2:	Analytical Methodology	Medium	GC/MS was used to analyze the samples. MDL and MQL were determined and reported in the SI, but SI is not available. Text provides a range for all chemicals analyzed.
	Metric 3:	Biomarker Selection	N/A	Study tested for parent chemicals in indoor air.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study was performed in Albany, NY.
	Metric 5:	Currency	Medium	Samples were collected in 2014.
	Metric 6:	Spatial and Temporal Variability	Medium	Samples were collected in 6 categories and each category has 6 to 20 data points. No replicates were collected.
	Metric 7:	Exposure Scenario	High	The data represents a relevant exposure scenario (indoor air in homes, offices, schools, labs, schools, salons, and some public places).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Mean concentrations were reported with summary statistics. No individual data were reported.
	Metric 9:	Quality Assurance	High	QA/QC were performed and no major concerns were seen. Recoveries were above 90% for PUFs and above 82% for the glass fiber filter.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	There is a limited discussion of uncertainties, limitations, and data gaps.

Overall Quality Determination   Medium

Study Citation:	Bao, J., Zeng, X. W., Qin, X. D., Lee, Y. L., Chen, X., Jin, Y. H., Tang, N. J., Dong, G. H. (2015). Phthalate metabolites in urine samples from school children in Taipei, Taiwan. Archives of Environmental Contamination and Toxicology 69(2):202-207.		
HERO ID:	2823270		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Spot urine samples; collected in polypropylene tubes and stored at -20 C until analysis. 225 children selected from pool of "control" school children for a cohort study of asthma. Collection not described.
	Metric 2:	Analytical Methodology	High	Deconjugation followed by SPE and HPLC-MS/MS, thoroughly described; radiolabeled internal standards; creatinine also measured. LOD for MBP 0.1 ng/mL.
	Metric 3:	Biomarker Selection	Medium	MnBP metabolite of DnBP analyzed; MCPP metabolite not analyzed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Taiwan, Taipei
	Metric 5:	Currency	Medium	2009 to 2010
	Metric 6:	Spatial and Temporal Variability	Low	Single spot urine samples from 225 healthy school children, 102 males and 123 females, ages 12 through 15 years.
	Metric 7:	Exposure Scenario	Low	All sources of exposures; possible exposure scenarios not evaluated.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Reported frequency of detection (MBP=93%); concentrations corrected and uncorrected (for creatinine); mean, median, 25th, and 75th percentiles (Table 2).
	Metric 9:	Quality Assurance	High	Procedural and solvent blanks included; duplicate injections and calibration check standards (after every 20 samples); extraction blanks indicated no contamination above LOD; recoveries reported by metabolite (>60%); same urine analyzed in 9 batches to determine precision and accuracy.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Limited discussion of uncertainties; compared results with those from studies in other countries. Variance depicted by presenting quartiles.

Overall Quality Determination   **Medium**

| | Study Citation: | Bekö, G., Callesen, M., Weschler, C. J., Toftum, J., Langer, S., Sigsgaard, T., Høst, A., Kold Jensen, T., Clausen, G. (2015). Phthalate exposure through different pathways and allergic sensitization in preschool children with asthma, allergic rhinoconjunctivitis and atopic dermatitis. Environmental Research 137:432-439. |
| | HERO ID: | 2823294 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	The sampling methodology was outlined and seemed high-quality, but specific details were lacking in this paper (though covered in depth in other papers).
	Metric 2:	Analytical Methodology	Low	Analytical methods were described in a previous publication and are not summarized. They mention assuming non-detects were half the limits of detection but do not identify individual LODs.
	Metric 3:	Biomarker Selection	Low	Metabolites of phthalates were measured in urine (and the parent phthalates were analyzed in dust). One of these metabolites could be a metabolite of either DBP or BBP; no effort was made to apportion it.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Denmark
	Metric 5:	Currency	Medium	The study began in 2008 and was submitted for publication in 2014.
	Metric 6:	Spatial and Temporal Variability	Medium	There were 200 study participants with allergic conditions and 166 controls. Duplicates of both dust and urine samples were analyzed. Urine samples were first-morning voids, so assigned this metric as medium.
	Metric 7:	Exposure Scenario	High	Data closely represent a relevant exposure scenario.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Only summary statistics are provided - medians and means. Even in the supplementary files, there are no raw data, ranges, standard deviations, etc. The narrative and a footnote to the table say there were 166 controls, but the table then lists n=164 controls, a possible minor error. Consult the other papers associated with this study for more detailed data, particularly:(1) Callesen, M., Bekö, G., Weschler, C.J., Sigsgaard, T., Jensen, T.K., Clausen, G., et al., 2014a. Associations between selected allergens, phthalates, nicotine, PAHs and bedroom ventilation and clinically confirmed asthma, rhinoconjunctivitis and atopic dermatitis in preschool children. Indoor Air 24 (2), 136–147. (2) Callesen, M., Bekö, G., Weschler, C.J., Langer, S., Brive, L., Clausen, G., et al., 2014b. Phthalate metabolites in urine and asthma, allergic rhinoconjunctivitis and atopic dermatitis in preschool children. Int. J. Hyg. Environ. Health 217, 645–652.
	Metric 9:	Quality Assurance	Low	Blanks were analyzed, but there are no details regarding QA/QC in this paper. It was discussed in one of the prior papers that further elaborated on methods.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	There was a brief discussion of a few uncertainties/limitations. The only discussion of variability was the comment that the data suggest that associations between phthalate exposures and allergic sensitization among children with allergic symptoms may be more pronounced in the non-healthy children.

Overall Quality Determination   **Medium**

Study Citation: Gong, M., Weschler, C. J., Liu, L., Shen, H., Huang, L., Sundell, J., Zhang, Y. (2015). Phthalate metabolites in urine samples from Beijing children and correlations with phthalate levels in their handwipes. Indoor Air 25(6):572-581.

HERO ID: 2823304

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Parents were asked to collect their children's first morning urine in a 60 ml pre-cleaned brown glass jar on the day after handwipe sampling and then store the sample in a freezer before the investigators' visit. After transporting the urine samples to the laboratory on ice, they were stored at 36°C until analysis.
	Metric 2:	Analytical Methodology	Medium	Analytical methods used a method modified from Silva et al. (2007) and described in our previous study (Liu et al., 2012).
	Metric 3:	Biomarker Selection	Medium	Metabolite known to be derived from parent chemical (MnBP).
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	Medium	Samples collected in 2013 and 2014
	Metric 6:	Spatial and Temporal Variability	Medium	67 samples. No replicates. Morning urine samples.
	Metric 7:	Exposure Scenario	High	Looking at association between phthalate exposure in children handwipes and children urine.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported. Summary statistics (mean, min, max) reported.
	Metric 9:	Quality Assurance	Medium	QA not directly discussed, but Fudan University's Ethical Review Board approved the study protocol prior to collection of allhandwipe and urine samples (IRB00002408 and 573 Phthalates in handwipes; metabolites in urine FWA00002399).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability in seasons measured and results compared to other studies. No gaps and limitations reported.

Overall Quality Determination   Medium

Study Citation:	Khalil, M. M. H., Gomaa, A. M., Sebaei, A. S., Moustapha, N. M. (2014). Distribution of phthalate esters in Egyptian edible oil. Journal of Essential Oil Bearing Plants 17(6):1343-1351.		
HERO ID:	2823325		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Sampling methods only reported the total number of samples and collection date. There is no information about equipment, procedure, regimen, storage, etc.
	Metric 2: Analytical Methodology	High	Key analytical methods reported, including extraction method, instrumentation, GC-MS, calibration, and LOD/LOQ in Table 1.
	Metric 3: Biomarker Selection	N/A	Study tested for parent compounds in food.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was conducted in Egypt.
	Metric 5: Currency	Medium	Samples were collected in 2013 and 2014.
	Metric 6: Spatial and Temporal Variability	Medium	A total of 27 samples were collected with no replicates.
	Metric 7: Exposure Scenario	High	Exposure to phthalates migrated from food packing materials to the food inside is relevant.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Raw data were not reported. Summary statistics are missing. There is no concentration data, only detection frequency in Figure 4.
	Metric 9: Quality Assurance	Low	There is limited QA/QC reported.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Uncertainties are reported, but no characterization of variance.

Overall Quality Determination   Medium

Study Citation:	Agay-Shay, K., Martinez, D., Valvi, D., Garcia-Esteban, R., Basagaña, X., Robinson, O., Casas, M., Sunyer, J., Vrijheid, M. (2015). Exposure to Endocrine-Disrupting Chemicals during Pregnancy and Weight at 7 Years of Age: A Multi-pollutant Approach. Environmental Health Perspectives 123(10):1030-1037.		
HERO ID:	2854577		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Enrollment described. Study protocol was not described but cited as provided elsewhere (Guxens et al. 2012).
	Metric 2: Analytical Methodology	Low	Table 1 attempted to describe LOD, but overall was not informative.
	Metric 3: Biomarker Selection	Low	MnBP is not specific to DBP (can also be a minor metabolite of BBP).
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was performed in Spain.
	Metric 5: Currency	Low	Samples were collected between 2004 and 2006.
	Metric 6: Spatial and Temporal Variability	Medium	There were 470 samples but no replicates.
	Metric 7: Exposure Scenario	High	This is a biomonitoring where (prental) exposure has occurred.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Table 1 shows GM, mean, max, and min. Raw data were not provided.
	Metric 9: Quality Assurance	Low	QA/QC was not discussed.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	There was a limited characterization of variance (through range) and no discussion of uncertainties, gaps, or limitations.

Overall Quality Determination   Low

Study Citation:	Li, B., Hu, X., Liu, R., Zeng, P., Song, Y. (2015). Occurrence and distribution of phthalic acid esters and phenols in Hun River Watersheds. Environmental Earth Sciences 73(9):5095-5106.		
HERO ID:	2855033		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Authors provided a detail site description and sampling sites along the two rivers in Figure 1. Surface water was collected in 2L glass bottles during the spring, summer, and autumn. Samples were filtered, stored at 4C, and processed within one day.
	Metric 2:	Analytical Methodology	High	Extraction, instrumentation, analytical methods, and recoveries were described. A range for LODs/LOQs were provided in the main text, and individual values are available in Table S1.
	Metric 3:	Biomarker Selection	N/A	Study tested parent chemicals in surface water.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected at the Xi River (XR) and Pu River (PR), tributaries of Hun River Watersheds (HRW) in Liao River Basin (LRB), northeast China.
	Metric 5:	Currency	Medium	Samples were collected in 2013.
	Metric 6:	Spatial and Temporal Variability	Medium	It is unclear what the total number of samples were. However, eight sites in Xi River and 11 in Pu River were selected for sampling in May, August, and October of 2013. If one sample was collected per site per month, that will well exceed 10 samples. No replicates were collected.
	Metric 7:	Exposure Scenario	High	Surface water levels from two rivers historically polluted by printing and dyeing enterprises and pharmaceutical and chemical industries. This pollution can expose aquatic life and local residents to harmful chemicals.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 1 provides the range, mean, and std by season and river. Raw data were not provided.
	Metric 9:	Quality Assurance	High	All data subject to strict QC procedures (e.g., blank contamination control) that were well described. Average recoveries ranged from 91-126% (RSD 7-12%).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Standard deviations provided, but little discussion of limitations, uncertainties, and data gaps.

Overall Quality Determination   High

| Study Citation: | Yang, L., Cheng, S., Wu, Z. (2009). Anthropogenic organic contaminants in water and surface sediments of large shallow eutrophic Chaohu Lake, China. Fresenius Environmental Bulletin 18(11):2052-2058. |
| HERO ID: | 2868264 |

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Figure 1 maps the sampling locations. Water was collected in glass bottles. Surface sediment were collected in a grab sampler at the same position as the water samples. Water and sediment samples were stored at 4C and -20C, respectively. Water samples were filtered; sediment was freeze-dried, pulverized, and finer fraction was homogenized.
	Metric 2:	Analytical Methodology	High	SPE and Soxhlet extraction for water and surface sediment samples, respectively. GC-MS was conducted for analysis. Recoveries and detection limits (0.02ng/L and 0.015ng/g dry weight for water and sediment, respectively) were reported in text.
	Metric 3:	Biomarker Selection	N/A	Study tested parent chemicals in lake water and sediment.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study performed in Chaohu Lake, China.
	Metric 5:	Currency	Medium	Samples were collected in 2007.
	Metric 6:	Spatial and Temporal Variability	Low	Seven sites were selected for sampling, where it appears that a single/grab water and sediment sample was collected per site in a one day. No replicate samples were not reported.
	Metric 7:	Exposure Scenario	High	Exposure scenario is relevant. Study measured chemical concentrations in the water and sediment of the fifth largest freshwater lake in China that is important for municipal and industrial use, irrigation, flood prevention, shipping, fishery, and tourism.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Tables 3 and 4 provide raw data for each sampling site. However, summary statistics are missing.
	Metric 9:	Quality Assurance	Medium	QA/QC techniques reported on pg 2054 that included procedural blanks and recoveries. Recoveries were reported as a range for spiked water and sediment samples. The lower bound of the range is <70% for both, and authors noted that the results were revised with recoveries. However, no details were provided about how they were revised.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	There is no characterization of variance, but the range can be easily determined given the presence of raw data and small sample size. There is no discussion of limitations, uncertainties, and gaps either.

Overall Quality Determination   **Medium**

Study Citation:	Ishikawa, S., Sakazaki, Y., Eguchi, Y., Suetomi, R., Nakamura, E. (2005). Identification of chemical substances in industrial wastes and their pyrolytic decomposition products. Chemosphere 59(9):1343-1353.		
HERO ID:	2889692		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	A lot of information was missing, including sample regimen, equipment, and storage conditions/duration. Only relevant information that was described was site/sample characteristics.
	Metric 2: Analytical Methodology	Low	No LOD/LOQs were reported.
	Metric 3: Biomarker Selection	N/A	Study measured parent compounds in industrial wastes.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study performed in Tokyo, Japan.
	Metric 5: Currency	Low	Study was published in 2005. No sampling date was provided.
	Metric 6: Spatial and Temporal Variability	Medium	11 types of industrial wastes were sampled. No replicates were reported.
	Metric 7: Exposure Scenario	Medium	Exposure source not well characterized.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not provided.
	Metric 9: Quality Assurance	Low	Recoveries ranged from 70-120% for all chemicals. In general, little QA/QC was described.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Few gaps and limitations were reported. Variance was characterized in Table 3 with standard deviation for chemicals that were quantified.

Overall Quality Determination   Low

Study Citation:	Philippat, C., Bennett, D. H., Krakowiak, P., Rose, M., Hwang, H. M., Hertz-Picciotto, I. (2015). Phthalate concentrations in house dust in relation to autism spectrum disorder and developmental delay in the CHildhood Autism Risks from Genetics and the Environment (CHARGE) study. Environmental Health 14(1):56.		
HERO ID:	2914664		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling equipment and methods are sufficiently described, but certain details such as duration of sample storage are missing (unlikely to have a substantial impact on results).
	Metric 2: Analytical Methodology	Low	Analytical instrumentation and methods are sufficiently described, but limit of detection is not reported.
	Metric 3: Biomarker Selection	N/A	The study tested for the parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was conducted in California.
	Metric 5: Currency	Medium	Children were eligible if enrolled during 2010-2011, or before 2010 and under 60 months at the time of enrollment.
	Metric 6: Spatial and Temporal Variability	Medium	Dust samples were collected from 145 homes with no replicates.
	Metric 7: Exposure Scenario	High	Samples were collected from carpet or rugs in the main living area of homes in California. The types of flooring in each room of the homes were considered in exposure assessment. No other possible exposure sources were evaluated, but that was beyond the aim of the study.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Summary statistics for compound concentration included the percent of samples with detectable levels and percentiles of exposure (5th, 25th, 50th, 75th, 95th). Individual sample concentrations were not reported.
	Metric 9: Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Statistical characterization of variability was not reported, but there is some discussion of key uncertainties and limitations in results.

Overall Quality Determination   **Medium**

Study Citation:	Myridakis, A., Fthenou, E., Balaska, E., Vakinti, M., Kogevinas, M., Stephanou, E. G. (2015). Phthalate esters, parabens and bisphenol-A exposure among mothers and their children in Greece (Rhea cohort). Environment International 83:1-10.		
HERO ID:	2914665		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Well-described sampling methodology, scientifically sound.
Metric 2:	Analytical Methodology	High	Detailed analytical methods, reported LOD, described recoveries.
Metric 3:	Biomarker Selection	High	Biomarker is known to be related to external exposure to phthalates.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Greece
Metric 5:	Currency	Low	Sampling began in 2007.
Metric 6:	Spatial and Temporal Variability	Low	n=478 in total, no replicates.
Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenarios related to phthalates.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Only summary statistics (mean, geometric mean, median, range, 95th percentile).
Metric 9:	Quality Assurance	High	Well described QA/QC techniques.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Characterized variability, limited discussion of uncertainties and limitations.

Overall Quality Determination   **High**

Study Citation: Tran, B. C., Teil, M. J., Blanchard, M., Alliot, F., Chevreuil, M. (2015). Fate of phthalates and BPA in agricultural and non-agricultural soils of the Paris area (France). Environmental Science and Pollution Research 22(14):11118-11126.

HERO ID: 2914670

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sample locations and WWTP characteristics were described. Sludge was sampled from a storage area and kept at -18°C. Appendix contains additional information on sampling timing. Soil and sludge were freeze-dried for 3 days, homogenized, and sieved.
	Metric 2:	Analytical Methodology	High	Authors described extraction procedures (extracted with 15mL of mixture of hexane 50 vol/acetone 50 vol in a Bransonic 2510 ultra-sonic bath (VWR) for 20 min), analytical methods (GC/MS), recoveries (Appendix 5), and LOD/LOQ (Appendix 5).
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in sewage sludge.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study performed in Essonne, France.
	Metric 5:	Currency	Medium	Samples were collected in 2010-2011 and then 2012.
	Metric 6:	Spatial and Temporal Variability	Low	The number of sludge samples was not defined. Four sampling events were conducted in 2010-2011 after a single sludge application. Samples were collected at four different depths during each event and presumably one sample was taken at each depth. A second sampling campaign occurred in 2012 for only surface soil where five samples were collected. There was no mention of replicates for any of them.
	Metric 7:	Exposure Scenario	High	The concentration in sewage sludge from WWTP receiving wastewater from domestic and hospital were determined. This sludge was then applied to agricultural soil and chemical concentrations were compared with those of urban, rural, and forestry soils.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Figures and tables provide mean levels; raw data were not provided.
	Metric 9:	Quality Assurance	High	Recoveries ranged from 55-106% and were corrected by procedural blanks, as reported in Appendix 5.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	There was limited to no characterization of variance and some characterization of uncertainty in Appendix 5.

Overall Quality Determination   Medium

Study Citation:	Zhang, Y., Cao, Y., Shi, H., Jiang, X., Zhao, Y., Fang, X., Xie, C. (2015). Could exposure to phthalates speed up or delay pubertal onset and development? A 1.5-year follow-up of a school-based population. Environment International 83:41-49.		
HERO ID:	2915540		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Some information missing, such as location of samples taken.
	Metric 2: Analytical Methodology	Medium	Extraction methods, analytical instrument (ESI-MS/MS), LOD reported as a range. Calibration and recovery information missing.
	Metric 3: Biomarker Selection	High	Metabolite is known to be related with parent chemical (MnBP).
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	China
	Metric 5: Currency	Medium	Sampling in 2011
	Metric 6: Spatial and Temporal Variability	Low	n=500 at baseline (430 at follow-up). No replicates. Spot urine samples.
	Metric 7: Exposure Scenario	High	Biomonitoring in school aged boys and girls.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Only geometric means reported.
	Metric 9: Quality Assurance	Low	QA/QC techniques were not described but can be implied through the study's methods.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Variability was characterized in different concentrations in boys and girls. Uncertainties and limitations were discussed.

Overall Quality Determination   Medium

Study Citation:	Jornet-Martínez, N., Antón-Soriano, C., Campíns-Falcó, P. (2015). Estimation of the presence of unmetabolized dialkyl phthalates in untreated human urine by an on-line miniaturized reliable method. Science of the Total Environment 532:239-244.		
HERO ID:	2915545		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	High. Key criteria met. Duration of sample storage prior to analysis reported as within 48 hours. All key sampling parameters reported.
Metric 2:	Analytical Methodology	Medium	Medium. Most key criteria met, LOD's and recoveries reported. Lack of info on consideration for creatinine or specific gravity adjustment.
Metric 3:	Biomarker Selection	High	High. Sampling for parent chemical.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	High. Sampling location not reported, publication from university in Spain.
Metric 5:	Currency	Low	Low. Sampling dates not reported, publication date 2015.
Metric 6:	Spatial and Temporal Variability	Low	Low. Single spot urine specimens from 18 male and female volunteers. 12 females and 6 males, paper does not separate the reporting for gender and age groups, results are averaged.
Metric 7:	Exposure Scenario	Low	Low. Participant characteristics reported, no baseline/control samples, occupational information lacking.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Medium. Most key criteria met, frequency of detection reported, lack of raw data.
Metric 9:	Quality Assurance	Medium	Medium. Quality assurance parameters reported, most key criteria met. Missing creatine information and measurements.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Low. Variability summarized within statistical summary measures of reported concentrations, discussion of potential study limitations lacking.

Overall Quality Determination — **Medium**

Study Citation:	Xie, C., Jin, R., Zhao, Y., Lin, L., Li, L., Chen, J., Zhang, Y. (2015). Paraoxonase 2 gene polymorphisms and prenatal phthalates' exposure in Chinese newborns. Environmental Research 140:354-359.		
HERO ID:	2915560		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling equipment and methods are described in sufficient detail, but certain aspects (e.g. duration of storage) were absent that are unlikely to have a substantial impact on results.
Metric 2:	Analytical Methodology	High	Analytical instrumentation and methods are described in sufficient detail and are scientifically sound. LOD is reported in text of Section 2.5.
Metric 3:	Biomarker Selection	Low	MBP is a specific metabolite of DBP.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Study was conducted in Shanghai, China.
Metric 5:	Currency	Medium	Samples were collected in 2011.
Metric 6:	Spatial and Temporal Variability	Medium	Samples of meconium from 185 newborns were collected "from every diaper during the first 48 h after delivery." Collection of replicates is not reported.
Metric 7:	Exposure Scenario	High	The exposure scenario to infants during gestation is highly relevant.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	Raw data are not reported. Summary statistics are limited to median and range or 25th-75th percentiles (based on reporting provided in Table 1).
Metric 9:	Quality Assurance	Medium	QA/QC methods include use of blanks, internal standards, and select replicates; however, results of these methods are not reported and it is unknown if any issues were identified or addressed.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Characterization of variability is reported with range or 25th-75th percentiles of concentration. However, there is very little discussion of limitations or sources of uncertainty in the study.

Overall Quality Determination   Medium

Study Citation:	Dallongeville, A., Costet, N., Zmirou-Navier, D., Le Bot, B., Chevrier, C., Deguen, S., Annesi-Maesano, I., Blanchard, O. (2016). Volatile and semi-volatile organic compounds of respiratory health relevance in French dwellings. Indoor Air 26(3):426-438.		
HERO ID:	2918731		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Supporting Information available in online version of article and in Mercier et al. (2014).
	Metric 2:	Analytical Methodology	High	PLE extraction; GC/MS (Mercier et al. 2014), calibration.
	Metric 3:	Biomarker Selection	N/A	Paper measures concentration of parent compound in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	France, western; Brittany.
	Metric 5:	Currency	Medium	September 2012 to October 2013.
	Metric 6:	Spatial and Temporal Variability	High	150 homes; 81 sampled cold season; 69 sampled hot season. Living room air continuously collected over 5 days for total of 14 m3 per dwelling.
	Metric 7:	Exposure Scenario	High	Indoor air; living room; single family homes with children.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Reported n, LOQ, detection frequency, mean, median, max, min, and 10th and 90th percentiles.
	Metric 9:	Quality Assurance	High	Field blanks, lab blanks, five calibration solutions per compound.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Limitation of one 5-day sampling event per dwelling discussed; influence of other factors evaluated.

Overall Quality Determination   High

Study Citation:		Stelmach, I., Majak, P., Jerzynska, J., Podlecka, D., Stelmach, W., Polańska, K., Ligocka, D., Hanke, W. (2015). The effect of prenatal exposure to phthalates on food allergy and early eczema in inner-city children. Allergy and Asthma Proceedings 36(4):72-78.	
HERO ID:		2919070	

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Spot urine samples were collected into polyethylene cups and stored at-20°C until analysis, which was performed at Nofer Institute of Occupational Medicine, Lodz, Poland. Reference was included for complete reporting on recruitment and follow-up procedures.
	Metric 2: Analytical Methodology	Low	Phthalate metabolites in urine were determined by the use of High Performance Liquid Chromatography with tandem mass spectrometry system. LODs or LOQs were not reported
	Metric 3: Biomarker Selection	High	Urine MnBP and OH-MnBP are specific metabolites of DINP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was performed in Poland.
	Metric 5: Currency	Medium	Samples were collected in 2007.
	Metric 6: Spatial and Temporal Variability	Medium	There were 147 participants, and no replicates were reported.
	Metric 7: Exposure Scenario	High	This is a biomonitoring study that assumes exposure occurred.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual data points were not reported.
	Metric 9: Quality Assurance	Low	QA/QC techniques were not thoroughly discussed. Authors mentioned that they obtained two control urine samples from Consortium to Perform Human Biomonitoring on a European Scale, Work Package 3.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Key limitations reported. Variance reported as percentiles.

Overall Quality Determination   Medium

Study Citation:			Net, S., Dumoulin, D., El-Osmani, R., Rabodonirina, S., Ouddane, B. (2014). Case study of PAHs, Me-PAHs, PCBs, phthalates and pesticides contamination in the Somme river water, France. International Journal of Environmental Research 8(4):1159-1170.
HERO ID:			2932024

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Pertinent sampling procedures were described (e.g., site and matrix characteristics, equipment, storage conditions).
	Metric 2:	Analytical Methodology	Low	There were limited information on instrument calibration and no LOD/LOQs.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in surface water.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in France.
	Metric 5:	Currency	Medium	Samples were collected in 2012.
	Metric 6:	Spatial and Temporal Variability	Medium	There were 11 sampling sites along the river in addition to two nearby ponds. Replicates were not reported.
	Metric 7:	Exposure Scenario	Medium	Data are likely to represent a exposure scenario, but there is limited description of the population or microenvironment of interest.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual data points were provided but most summary statistics were missing.
	Metric 9:	Quality Assurance	Low	There was some discussion about blanks and recoveries, but information on QA/QC is very limited overall.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	There was no discussion of uncertainties and limitations. The main text discussed ranges for the characterization of variance, and the raw data allow for separate computation if necessary.

Overall Quality Determination   **Medium**

Study Citation:	Adeogun, A. O., Ibor, O. R., Omiwole, R. A., Hassan, T., Adegbola, R. A., Adewuyi, G. O., Arukwe, A. (2015). Occurrence, species, and organ differences in bioaccumulation patterns of phthalate esters in municipal domestic water supply lakes in Ibadan, Nigeria. Journal of Toxicology and Environmental Health, Part A: Current Issues 78(12):761-777.		
HERO ID:	2940328		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Maps, coordinates, site characteristics, equipment were described but storage conditions were not thorough.
	Metric 2: Analytical Methodology	High	LOD, instrumentation, and methods included in the SI and main text.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemicals in media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was performed in Nigeria.
	Metric 5: Currency	Medium	Samples were collected in 2011.
	Metric 6: Spatial and Temporal Variability	Medium	Only 3 samples were collected for water and sediment, and 80 were collected from biota. No replicates were reported.
	Metric 7: Exposure Scenario	Medium	The study measured chemical concentrations from biota, ambient water, and sediments in man-made lakes in Nigeria, which are also domestic water sources.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	No raw data were provided and most summary statistics are missing.
	Metric 9: Quality Assurance	Medium	Only some QA/QC techniques were discussed in the supplemental.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	There was little characterization of variance and no discussion of limitations, gaps, or uncertainties.

Overall Quality Determination   Medium

		Domain	Metric	Rating	Comments

Study Citation: Gascon, M., Valvi, D., Forns, J., Casas, M., Martínez, D., Júlvez, J., Monfort, N., Ventura, R., Sunyer, J., Vrijheid, M. (2015). Prenatal exposure to phthalates and neuropsychological development during childhood. International Journal of Hygiene and Environmental Health 218(6):550-558.

HERO ID: 2965922

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1: Sampling Methodology	Medium		Medium. Most key criteria met, project methodology referenced; lack of duration of sample storage data and equipment used.
Metric 2: Analytical Methodology	Medium		Medium. Most key criteria met. The LOD for the different congeners ranged from 0.5 to 1 g/L (further details for methodology referenced in Valvi et al., 2015).
Metric 3: Biomarker Selection	Medium		Sampling for MnBP is measured as sum of four DEHP metabolites.
Domain 2: Representativeness			
Metric 4: Geographic Area	High		High. Samples provided by participants in a hospital in Spain.
Metric 5: Currency	Medium		Low. Samples collected 2004-2006.
Metric 6: Spatial and Temporal Variability	Low		Medium. Two spot urine specimens provided by each participant at 12 and 32 weeks gestation for n=657 participants.
Metric 7: Exposure Scenario	High		Exposure to children.
Domain 3: Accessibility/Clarity			
Metric 8: Reporting of Results	Low		Only provides 95% CI. Lack of raw data and other summary statistics.
Metric 9: Quality Assurance	Low		Low. Quality assurance parameters not reported, however study methods referenced.
Domain 4: Variability and Uncertainty			
Metric 10: Variability and Uncertainty	Medium		Medium. Variability characterized within exposure concentration result summary statistics, robust discussion of potential study limitations and uncertainties.

Overall Quality Determination   **Medium**

Study Citation:			Shapiro, G. D., Dodds, L., Arbuckle, T. E., Ashley-Martin, J., Fraser, W., Fisher, M., Taback, S., Keely, E., Bouchard, M. F., Monnier, P., Dallaire, R., Morisset, A. S., Ettinger, A. S. (2015). Exposure to phthalates, bisphenol A and metals in pregnancy and the association with impaired glucose tolerance and gestational diabetes mellitus: The MIREC study. Environment International 83:63-71.
HERO ID:			3005136

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling methodology only briefly described, cited previously published work (Arbuckle et al., 2014).
	Metric 2:	Analytical Methodology	Medium	Detailed analytical methodology, reported LOD. Some information missing such as calibration, may be mentioned in (Arbuckleet al., 2014; Langlois et al., 2014).
	Metric 3:	Biomarker Selection	High	Biomarker is known to be related with external exposure (MBP, MCPP).
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Canada
	Metric 5:	Currency	Medium	2008-2011
	Metric 6:	Spatial and Temporal Variability	Medium	1274, no replicates (Table 2).
	Metric 7:	Exposure Scenario	High	Exposure to pregnant women.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Only geometric mean reported.
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not discussed but can be implied through the study's techniques.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Characterized variability, discussed uncertainties and limitations.

Overall Quality Determination   Medium

Study Citation:	Takeuchi, S., Tanaka-Kagawa, T., Saito, I., Kojima, H., Jin, K., Satoh, M., Kobayashi, S., Jinno, H. (2015). Differential determination of plasticizers and organophosphorus flame retardants in residential indoor air in Japan. Environmental Science and Pollution Research 25(8):7113-7120.		
HERO ID:	3005686		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	The indoor air and dust sampling methods were described but didn't include details about storage conditions.
	Metric 2: Analytical Methodology	Medium	The analytical methods were described, including LOD. Limited details about recoveries were reported.
	Metric 3: Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The samples were collected in in Japan.
	Metric 5: Currency	Medium	The sampling was performed during October 2013and January 2014.
	Metric 6: Spatial and Temporal Variability	Low	n=19 for dust samples, 21 for indoor air samples. No replicates.
	Metric 7: Exposure Scenario	Medium	The data likely represent relevant exposure scenarios related to indoor air and dust in Japanese dwellings, but the small sample size limits the results' generalizability.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Only summary statistics were reported, without individual sample concentrations.
	Metric 9: Quality Assurance	High	QA/QC techniques were described, including the use of field and laboratory blanks.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability was not characterized. Uncertainties were briefly discussed.

Overall Quality Determination   Medium

Study Citation:	Bi, C., Liang, Y., Xu, Y. (2015). Fate and transport of phthalates in indoor environments and the influence of temperature: A case study in a test house. Environmental Science & Technology 49(16):9674-9681.		
HERO ID:	3009291		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling equipment and methods for air, dust, and surface samples are described in excellent detail, including equipment preparation and sample storage conditions. The methods clear, complete, and scientifically sound.
Metric 2:	Analytical Methodology	Low	Analytical instrumentation and methods are described in good detail, including sample extraction and instrument calibration. However, LOQ, LOD, or MDL are absent.
Metric 3:	Biomarker Selection	N/A	This study is testing for the parent chemical of interest in environmental media (air, dust, and surfaces in a test house).
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	This study took place in a test house located at the University of Texas at Austin in the United States.
Metric 5:	Currency	Medium	While the specific timing of sample collection is not reported, the test house in which the study took place was built in 2008. The study was published in 2015.
Metric 6:	Spatial and Temporal Variability	High	This study took place over four distinct monitoring periods lasting up to six months each where temperature was modulated in a single test house. Air samples were taken during each monitoring period with N ranging from 6 to 16, including duplicates. Sorbed phthalates were measured on different surfaces within the test house once per monitoring period. Dust samples were collected periodically but number of frequency of sampling was not specified.
Metric 7:	Exposure Scenario	High	This experimental study measures phthalate concentrations in a "test house" that is designed to closely resemble real-life residential indoor environments, including building materials, contents, and typical temperature fluctuations.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	Raw data were not reported. The chemical of interest was reported not detected in any samples.
Metric 9:	Quality Assurance	High	QA/QC measures included the use of surrogate chemicals for determination of recoveries for each sample type, all of which were within acceptable ranges (85%-92%). During analysis, variance was reported to be below 10% for all gas chromatography injections. No QC issues were identified.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Variability is not characterized due to no detection of the chemical of interest. Limitations are briefly discussed, including the assumption that indoor air is well mixed, but the majority of this discussion is focused on the fate and transport modeling and not pertinent to exposure monitoring data.

Overall Quality Determination   **Medium**

Study Citation:	Saini, A., Okeme, J. O., Goosey, E., Diamond, M. L. (2015). Calibration of two passive air samplers for monitoring phthalates and brominated flame-retardants in indoor air. Chemosphere 137:166-173.		
HERO ID:	3009392		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Well described methodology
	Metric 2: Analytical Methodology	High	Detailed methodology, included LOD and recoveries
	Metric 3: Biomarker Selection	N/A	QC: env media
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Canada
	Metric 5: Currency	Medium	Sampling started in 2012
	Metric 6: Spatial and Temporal Variability	Medium	batches of 10 samples, limited details on use of replicates
	Metric 7: Exposure Scenario	Medium	limited information on population of interest
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Only summary statistics
	Metric 9: Quality Assurance	High	Well described QA/QC, reported recoveries, analyzed control samples QC: blank correction, surrogate standards.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Limited discussion of limitations and uncertainties QC: does discuss recommended sampling rates for different methods, and how that may affect variability

Overall Quality Determination   High

Study Citation:		Net, S., Rabodonirina, S., Sghaier, R. B., Dumoulin, D., Chbib, C., Tlili, I., Ouddane, B. (2015). Distribution of phthalates, pesticides and drug residues in the dissolved, particulate and sedimentary phases from transboundary rivers (France-Belgium). Science of the Total Environment 521-522:152-159.	
HERO ID:		3012380	

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methodology (e.g., equipment, site/matrix characteristics) were described.
	Metric 2:	Analytical Methodology	Medium	A detailed analytical methodology was provided, but recoveries were missing.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in water and sediment.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected from France and Belgium.
	Metric 5:	Currency	Medium	Samples were collected in 2014.
	Metric 6:	Spatial and Temporal Variability	Medium	Sampled were collected from 15 sites without replicates.
	Metric 7:	Exposure Scenario	Medium	Paper has limited information on the population or microenvironment of interest.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Individual sample concentrations and summary statistics were reported in Table 3S.
	Metric 9:	Quality Assurance	Medium	There was limited information on field controls and recoveries.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	There was a very limited discussion of uncertainties and study limitations.

Overall Quality Determination   Medium

Study Citation:	Zhu, S., Cai, W.,ei, Yoshino, H., Yanagi, U., Hasegawa, K., Kagi, N., Chen, M. (2015). Primary pollutants in schoolchildren's homes in Wuhan, China. Building and Environment 93(P1):41-53.		
HERO ID:	3015515		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling method is detailed.
	Metric 2: Analytical Methodology	Low	No LOD or LOQ mentioned.
	Metric 3: Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Wuhan, China
	Metric 5: Currency	Medium	2013
	Metric 6: Spatial and Temporal Variability	Medium	The amount of samples is not clear. From the figures it seems like there is 5+ for each scenario.
	Metric 7: Exposure Scenario	High	Schoolchildren homes represent an area where children are exposed to pollutants.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual points not reported.
	Metric 9: Quality Assurance	Low	There is no QA section and little mention of QA procedures in the measurements.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	There is little discussion of limitations at the end. There is variation in the schools studied and season.

Overall Quality Determination   Medium

Study Citation:	Ma, T. T., Wu, L., Chen, L., Zhang, H., Teng, Y., Luo, Y. M. (2015). Phthalate esters contamination in soils and vegetables of plastic film greenhouses of suburb Nanjing, China and the potential human health risk. Environmental Science and Pollution Research 22(16):12018-12028.		
HERO ID:	3016266		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported, including site characteristics/matrix, equipment, and storage.
	Metric 2:	Analytical Methodology	High	Analytical methods were performed according to a previously published paper that modified EPA method 8270C.
	Metric 3:	Biomarker Selection	N/A	Study tested for parent chemicals in soil and vegetables.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study was conducted in Nanjing, China.
	Metric 5:	Currency	Medium	Samples were collected in 2011.
	Metric 6:	Spatial and Temporal Variability	Medium	Authors collected 305 samples from 61 greenhouses without replicates.
	Metric 7:	Exposure Scenario	Medium	The exposure source was not well characterized.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data and summary statistics only reported for one of the four suburbs studied (Table 4). Data for all suburbs are presented graphically in Fig 3 with some exact concentrations reported throughout the main text of Results.
	Metric 9:	Quality Assurance	Low	QA/QC can be inferred from the study's use of published literature and methods.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Key gaps and limitations not well characterized, and summary statistics were only partially reported.

Overall Quality Determination   Medium

Study Citation:	Bi, X., Yuan, S., Pan, X., Winstead, C., Wang, Q. (2015). Comparison, association, and risk assessment of phthalates in floor dust at different indoor environments in Delaware, USA. Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances & Environmental Engineering 50(14):1428-1439.		
HERO ID:	3019857		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methods described sites, equipment, care to avoid cross-contamination, storage, and more.
	Metric 2: Analytical Methodology	High	Analytical methodology described sample preparation, extraction, instrumentation, LODs, and more.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemicals in indoor dust.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Dover, Delaware.
	Metric 5: Currency	Medium	Data were collected in 2013.
	Metric 6: Spatial and Temporal Variability	Medium	A total of 44 samples were collected without replicates.
	Metric 7: Exposure Scenario	High	Exposure to dust from different indoor environments is relevant.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	No raw data were provided but summary statistics were complete.
	Metric 9: Quality Assurance	High	There was robust reporting of QA/QC, including triplicate analysis of each sample and acceptable recoveries.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Summary statistics were complete but gaps or limitations were only briefly reported.

Overall Quality Determination   High

Study Citation:	Van Den Eede, N., Heffernan, A., Aylward, L. L., Hobson, P., Neels, H., Mueller, J. F., Covaci, A. (2015). Age as a determinant of phosphate flame retardant exposure of the Australian population and identification of novel urinary PFR metabolites. Environment International 74(Elsevier):1-8.		
HERO ID:	3020426		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Samples were taken from surplus stored urine from specimens collected in routine testing within a Community-based lab. Sampling methodology of original specimens was unknown and not referenced. It was unclear if all of the surplus stored urine specimens were used, or if a sample was selected, and there was insufficient information regarding selection of surplus urine specimens. There was limited detail provided regarding procedures, equipment, sample storage conditions and storage time prior to shipment from community lab to analysis lab. There was insufficient information regarding the initial specimen collection storage conditions and the time for the original "surplus stored urine" samples used for study prior to being selected for use within this study. There was insufficient information regarding storage time of the frozen samples prior to the analysis of pooled frozen samples. Dust sampling was described only as collected as part of a previous referenced study (Toms et al., 2009) from Australian households, with some details also provided within SI.
	Metric 2: Analytical Methodology	Medium	Analytical methods were noted to be further described within Table S1. The text provides a description of the extraction method, analytical instrumentation (MS/MS), MDL's, method recovery, method precision, sensitivity and procedural blanks as detailed within SI Table S3. Authors discuss the urine MDL for DBP (BCEP) as too high for quantitative analysis (> 3ng/mL) resulting in no quantitative data presented. Authors also note the lower MDLs might have been reported using GC-MD/MS rather than MS/MS. The dust sampling analytical methodology was only very briefly described as similar to the method for urine samples, with details provided in SI page 4.
	Metric 3: Biomarker Selection	N/A	Sampling was conducted for parent chemical within urine as well as dust samples.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Urine specimens were collected from surplus stored routine urine collections at a lab in Taringa, QLD, Australia. Dust samples were described as taken from Australian households within South East Queensland as part of a referenced previous study but analyzed within this study.
	Metric 5: Currency	Low	Sampling campaigns 1 and 2 were described as conducted during 2010-2011 and 2012-2013, however it is unclear if these dates refer to the collections of samples from the community lab or refer to the actual dates of original specimen collection for what is referred to as "surplus stored urine" that is used within this study. Dust samples were analyzed within this study but dust sampling information was referenced as from within a previous study.
	Metric 6: Spatial and Temporal Variability	Low	The text notes that 35 individuals contributed to pool 1 and 100 individuals contributed to pool 2 of pooled urine samples. The sampling approach was not described for selection of the samples from the stored surplus urine at the community clinic. No duplicate specimen collection was described. It is assumed that a single specimen was collected per person. Only four dust samples were described as taken from Australian households.
	Metric 7: Exposure Scenario	Medium	The population for urine specimen collection was described in terms of demographic data of age and gender, with no information provided concerning occupation. Authors noted their concerns for TCEP in urine as dependent upon analytical instrumentation. Dust samples were briefly described as from Australian households in South East Queensland.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data for the urine specimens was not reported within the text, but geometric means, ranges, number of individuals, and detection frequencies were listed in Table 1. Dust results were reported within text as a range for four samples without depiction of detection frequencies or measures of central tendency (or raw data).
	Metric 9: Quality Assurance	Critically Deficient	"Recoveries of DBP were low but reproducible (Table S3), and independent of the urinary concentration. A correction factor based on the recovery of QC material was applied to reported results for DBP, yet these concentrations should be considered indicative."

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Study Citation:	Van Den Eede, N., Heffernan, A., Aylward, L. L., Hobson, P., Neels, H., Mueller, J. F., Covaci, A. (2015). Age as a determinant of phosphate flame retardant exposure of the Australian population and identification of novel urinary PFR metabolites. Environment International 74(Elsevier):1-8.		
HERO ID:	3020426		

Domain	Metric	Rating	Comments
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Urine sample variability was described in summary statistics in terms of range of concentrations. Study limitations were detailed in terms of potentially imprecise analytical instrumentation use for BCEP analysis (no quantitative results presented) as well as a lack of accounting for potentially relevant confounding factors of indoor air and diet, the use of a convenience population sample, and the use of pooled samples. Results for four dust samples were presented as a range, with no limitations regarding dust sampling discussed in text.

Overall Quality Determination   Uninformative

| | Study Citation: | Gao, C. J., Liu, L. Y., Ma, W. L., Ren, N. Q., Guo, Y., Zhu, N. Z., Jiang, L., Li, Y. F., Kannan, K. (2016). Phthalate metabolites in urine of Chinese young adults: Concentration, profile, exposure and cumulative risk assessment. Science of the Total Environment 543(Pt A):19-27. |
| | HERO ID: | 3045442 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Medium. Most key criteria met. Duration of sample storage prior to analysis lacking for urine samples. Approaches to avoid contamination in sampling also missing.
	Metric 2:	Analytical Methodology	High	Key criteria met, LOQ's reported as range, recoveries reported. HPLC system electrospray triple quadrupole mass spectrometer (ESI–MS/MS).
	Metric 3:	Biomarker Selection	High	High. Sampling for metabolite specific for parent chemical. See Table S1 (supplemental).
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	High. China.
	Metric 5:	Currency	Medium	Medium. Sampling conducted 2010.
	Metric 6:	Spatial and Temporal Variability	Medium	Sampling in 108 participants across urban, rural areas covering most provinces and municipalities, males and females, first morning urine specimens. No replicates.
	Metric 7:	Exposure Scenario	Medium	Medium. Participant characteristics summarized, potential exposure sources discussed, occupational status unknown, lack of baseline/control samples.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Medium. Most key criteria met. Lack of raw data.
	Metric 9:	Quality Assurance	Medium	Medium. Quality assurance key criteria met. Lack of baseline samples.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Variability represented by statistical summary measures, limitations discussed, uncertainties identified.

Overall Quality Determination   High

Study Citation:	Shi, W., Deng, D., Wang, Y., Hu, G., Guo, J., Zhang, X., Wang, X., Giesy, J. P., Yu, H., Wang, Z. (2015). Causes of endocrine disrupting potencies in surface water in East China. Chemosphere 144:1435-1442.		
HERO ID:	3045459		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Scientifically sound, well described methodology that includes site characteristics, sampling equipment, and storage conditions.
	Metric 2: Analytical Methodology	Medium	LOQs and recoveries were reported, but limited information on instrument calibration.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study conducted in China.
	Metric 5: Currency	Medium	Samples were collected in 2011.
	Metric 6: Spatial and Temporal Variability	Medium	Samples were collected from 12 locations of 20L each without replicates.
	Metric 7: Exposure Scenario	Medium	There was limited information on the population and microenvironment of interest.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual sample concentrations were reported but most summary statistics were missing.
	Metric 9: Quality Assurance	Medium	There was limited reporting of QA/QC techniques.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	There was no characterization of variance (although raw data were provided) and discussion of uncertainties and limitations.

Overall Quality Determination   Medium

Study Citation:	Zhang, Y., Liang, Q., Gao, R., Hou, H., Tan, W., He, X., Zhang, H., Yu, M., Ma, L., Xi, B., Wang, X. (2015). Contamination of Phthalate Esters (PAEs) in Typical Wastewater-Irrigated Agricultural Soils in Hebei, North China. PLoS ONE 10(9):e0137998.		
HERO ID:	3045478		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Soil samples irrigated with river water were collected from 13 sites along the river (Fig 1); topsoil (0-20cm), river water, and sediment (0-5cm) were also collected. Sampling methods and storage were clearly outlined.
Metric 2:	Analytical Methodology	Medium	Recoveries and LOD ranges for water, sediment, and soil were provided on p. 4. Analytical methods were outlined, but it is difficult to determine whether these methods and the sample pretreatment follows an accepted standard.
Metric 3:	Biomarker Selection	N/A	Samples were from environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Wangyang River (WYR) in Shijiazhuang City, Hebei Province, North China
Metric 5:	Currency	Medium	2013
Metric 6:	Spatial and Temporal Variability	High	The paper reports 39 samples were collected from 13 sites. It also states that there were 3 water samples and 4 sediment samples collected from each site. Soil samples were collected from each site in triplicate.
Metric 7:	Exposure Scenario	Medium	River surface water, sediment, and soil came from areas irrigated with wastewater. Industrial effluents from petrochemical, electronic, and pharmaceutical factories are discharged into the river after these effluents are subjected to secondary (biological) treatment; the river water has been used to irrigate farmland soil for 20 years. Data likely represent the exposure scenario in that region, at least in early summer.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Table 1 provides the range, mean, SD, detection frequency, and median levels detected in surface water, sediment, and soil. Raw data are not provided.
Metric 9:	Quality Assurance	High	Recovery was 109.6%; blanks were used.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Results were compared to those of several previous studies (Table 2). The paper addressed variation between soil and sediment samples and the spatial distribution of results. However, there was no discussion of uncertainty or study limitations.

Overall Quality Determination   **Medium**

Study Citation:	Axelsson, J., Rylander, L., Rignell-Hydbom, A., Jönsson, B. A., Lindh, C. H., Giwercman, A. (2015). Phthalate exposure and reproductive parameters in young men from the general Swedish population. Environment International 85:54-60.		
HERO ID:	3045487		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	The sampling methodology of biological fluids was described but did not include storage conditions.
	Metric 2: Analytical Methodology	Medium	The analytical methods were described in detail, including LOD and instrumentation, but the authors did not report recoveries.
	Metric 3: Biomarker Selection	High	The analyzed metabolites are closely related to exposure to the parent chemicals of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was conducted in Sweden.
	Metric 5: Currency	Medium	The samples were collected between 2008 and 2010.
	Metric 6: Spatial and Temporal Variability	Medium	n=314 study participants, no replicates
	Metric 7: Exposure Scenario	High	The data closely represent a relevant exposure scenario related to exposure to phthalates for men in the general population.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	The authors reported summary statistics only (range, median, mean, SD). Raw data not reported.
	Metric 9: Quality Assurance	Medium	The authors mention the use of control samples and report concentrations in the Supplementary Material but details about QA/QC techniques are scarce.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Variability was characterized (range, SD). Uncertainties and limitations were described.

Overall Quality Determination   High

| | Study Citation: | Starling, A. P., Engel, L. S., Calafat, A. M., Koutros, S., Satagopan, J. M., Yang, G., Matthews, C. E., Cai, Q., Buckley, J. P., Ji, B. T., Cai, H., Chow, W. H., Zheng, W., Gao, Y. T., Rothman, N., Xiang, Y. B., Shu, X. O. (2015). Predictors and long-term reproducibility of urinary phthalate metabolites in middle-aged men and women living in urban Shanghai. Environment International 84:94-106. |
| | HERO ID: | 3045503 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Enrollment described, timing of samples, containers and storage described.
	Metric 2:	Analytical Methodology	Low	CDC lab performed analyses; previously published laboratory methods (Kato et al., 2005; Silva et al., 2008), LOD provided.
	Metric 3:	Biomarker Selection	High	Metabolite in urine.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China.
	Metric 5:	Currency	Low	Women samples from 1997-2000 and men from 2006-2007.
	Metric 6:	Spatial and Temporal Variability	Medium	n = 50 men and 50 women, no replicates.
	Metric 7:	Exposure Scenario	High	Biomonitoring.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	GM, 5th, 95th, % below LOD.
	Metric 9:	Quality Assurance	Medium	Ten blinded, pooled quality control samples were also included along with the subject samples.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability discussed, uncertainty included in percentiles.

Overall Quality Determination   Medium

Study Citation:	You, L., Wang, Y., Zeng, Q., Li, M.,in, Huang, Y., Hu, Y.,u, Cao, W., Liu, A., Lu, W. (2015). Semen phthalate metabolites, spermatozoa apoptosis, and dna damage: a cross-sectional study in China. Environmental Science & Technology 49(6):3805-3812.		
HERO ID:	3045587		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	High. Key criteria met, samples analyzed within one hour of collection.
	Metric 2: Analytical Methodology	Medium	Medium. Most key criteria met, LOD's reported. Lack of recovery data.
	Metric 3: Biomarker Selection	Low	Low. Metabolites not specific for parent chemicals.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	High. China.
	Metric 5: Currency	Medium	Medium. Samples collected 2012-2013.
	Metric 6: Spatial and Temporal Variability	Medium	Medium. Single semen sample per participant, n=463 participants, non-statistical sampling methods.
	Metric 7: Exposure Scenario	Medium	Medium. Participant characteristics summarized, lack of baseline/control exposure samples, occupational data within questionnaire not detailed.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Medium. Most key criteria met, detection frequency reported, lack of raw data.
	Metric 9: Quality Assurance	Medium	Medium. Quality assurance procedures in sample collection and analysis reported with most key criteria met. False discoveryrate (FDR) was used. No recovery reported.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Medium. Variability summarized within statistical summary measures, discussion of potential study limitations.

Overall Quality Determination   **Medium**

Study Citation:	Dewalque, L., Pirard, C., Vandepaer, S., Charlier, C. (2015). Temporal variability of urinary concentrations of phthalate metabolites, parabens and benzophenone-3 in a Belgian adult population. Environmental Research 142:414-423.		
HERO ID:	3045602		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Urine samples collection and population described. Participants from previous study (Dewalqueetal.,2014a); limited details about urine sampling were enough to deem it reliable.
Metric 2:	Analytical Methodology	Low	The analytical procedure, consisting an enzymatic hydrolysis and a solid phase extraction followed by liquid chromatography tandem mass spectrometry, has been previously described (Dewalqueetal., 2014c). Missing QA/QC details and LODs
Metric 3:	Biomarker Selection	High	metabolite in urine
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Belgium
Metric 5:	Currency	Medium	2013
Metric 6:	Spatial and Temporal Variability	Medium	32 adults, 351 samples, no replicates
Metric 7:	Exposure Scenario	High	biomonitoring
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Table S2: GM, 95%CI, 50th, 95th min, max
Metric 9:	Quality Assurance	Low	QA not discussed, no obvious concerns
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   **Medium**

| Study Citation: | Wang, L., Xu, X.,ue, Lu, X. (2015). Phthalic acid esters (PAEs) in vegetable soil from the suburbs of Xianyang city, Northwest China. Environmental Earth Sciences 74(2):1487-1496. |
| **HERO ID:** | 3045628 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported (e.g., site characteristics, equipment, storage condition).
	Metric 2:	Analytical Methodology	High	Key analytical methods reported. LOD reported in QC/QA section of main text.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in soil.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study was performed in Xianyang city, Northwest China.
	Metric 5:	Currency	Medium	Samples were collected in 2013.
	Metric 6:	Spatial and Temporal Variability	Medium	Nearly 60 samples were collected from four vegetable production fields without replicates.
	Metric 7:	Exposure Scenario	Medium	Exposure of urban population to phthalates in vegetable soil from modern agricultural practices and deposition was characterized.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not provided.
	Metric 9:	Quality Assurance	High	QA/QC techniques reported, including blank samples, recovery (acceptable), and prevention of cross contamination.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	There is no robust characterization of variance and gaps or limitations.

Overall Quality Determination   High

| Study Citation: | HEW, (2016). Current status and historical variations of phthalate ester (PAE) contamination in the sediments from a large Chinese lake (Lake Chaohu). Environmental Science and Pollution Research 23(11):10393-10405. |
| HERO ID: | 3052884 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported (e.g., site characteristics, location, equipment).
	Metric 2:	Analytical Methodology	Medium	Key analytical methods reported, but LOD were only reported as a range for all but two of the PAEs combined. Paper did note that the supplemental materials provide detailed recoveries and detection limits. However, supplemental materials were not available at the time of QC.
	Metric 3:	Biomarker Selection	N/A	Study measured parent compounds in media (sediment).
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Lake Chaohu, China.
	Metric 5:	Currency	Medium	Samples were collected in 2011.
	Metric 6:	Spatial and Temporal Variability	Medium	More than 20 samples were collected without replicates.
	Metric 7:	Exposure Scenario	High	Authors measured phthalate concentrations in a lake that serves as an important source of drinking water, industry, and agriculture for millions of residents.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not provided.
	Metric 9:	Quality Assurance	High	Key QA/QC reported. Recoveries for all but one non-TSCA phthalate were acceptable.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Key gaps and limitations were not reported. Standard deviations provided in Table 1 for surface sediment, and ranges provided in Table 5 for core sediment.

Overall Quality Determination   High

Study Citation:	Myridakis, A., Chalkiadaki, G., Fotou, M., Kogevinas, M., Chatzi, L., Stephanou, E. G. (2016). Exposure of preschool-age Greek children (RHEA Cohort) to bisphenol A, parabens, phthalates, and organophosphates. Environmental Science & Technology 50(2):932-941.		
HERO ID:	3070749		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Medium. Most key criteria met. Lack of duration of sample storage data.
Metric 2:	Analytical Methodology	Medium	Medium. Most key criteria met, mLOD's reported in Table 1, lack of recovery data.
Metric 3:	Biomarker Selection	Low	Low. Sampling for metabolites not specific for parent chemical of interest
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	High. Samples provided by participants in Heraklion, Crete, Greece.
Metric 5:	Currency	Medium	Medium. Sampling dates for children not provided, but inferred from text as approximately 2008-2012, publication date 2015.
Metric 6:	Spatial and Temporal Variability	Medium	Medium. Spot urine samples obtained from children at 4 years of age, total of n=500 samples collected from 500 children randomly selected from n=800 volunteers.
Metric 7:	Exposure Scenario	High	High. Potential exposure sources explored within principal component analysis, participant characteristics described.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Medium. Most key criteria met; lack of raw data.
Metric 9:	Quality Assurance	Medium	Medium. Quality assurance procedures described, most key criteria met; lack of recovery data.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Medium. Variability characterized within summary statistics, robust discussion of potential reasons for mixed results in comparisons with previous studies.

Overall Quality Determination   Medium

Dibutyl Phthalate | Monitoring | HERO ID: 3070898

Study Citation:	Wang, Y. X., Zeng, Q., Sun, Y., Yang, P., Wang, P., Li, J., Huang, Z., You, L., Huang, Y. H., Wang, C., Li, Y. F., Lu, W. Q. (2016). Semen phthalate metabolites, semen quality parameters and serum reproductive hormones: A cross-sectional study in China. Environmental Pollution 211:173-182.		
HERO ID:	3070898		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	population previously described (Wang et al., 2015; You et al., 2015); sample collection minimal description, missing contamination avoidance approaches.
Metric 2:	Analytical Methodology	Medium	Method previously described (You et al., 2015) and briefly summarized here; LOD range provided. Some analytical QA/QC processes were reported. Analyzed using high-performance liquid chromatograph and finally detected using a triple quad mass spectrometer.
Metric 3:	Biomarker Selection	High	metabolite in semen
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	China
Metric 5:	Currency	Medium	2013
Metric 6:	Spatial and Temporal Variability	Medium	n = 687, no replicates
Metric 7:	Exposure Scenario	High	biomonitoring
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	mean, median, 10th, 25th, 75th, 90th
Metric 9:	Quality Assurance	Medium	blanks and spiked QC samples described
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination　　　　Medium

Study Citation:	Gomez Ramos, M. J., Heffernan, A. L., Toms, L. M., Calafat, A. M., Ye, X., Hobson, P., Broomhall, S., Mueller, J. F. (2016). Concentrations of phthalates and DINCH metabolites in pooled urine from Queensland, Australia. Environment International 88(Elsevier):179-186.		
HERO ID:	3070900		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Surplus stored urine samples, pooled, could have been collected any time of day.
Metric 2:	Analytical Methodology	Medium	Analyses performed by CDC, LOD provided. Analysis was done using solid phase extraction-high performance liquid chromatography isotope dilution tandem mass spectrometry as described previously (Silva et al., 2007a). QA/QC was performed but not reported.
Metric 3:	Biomarker Selection	High	Metabolite in urine.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Australia.
Metric 5:	Currency	Medium	2012-2013.
Metric 6:	Spatial and Temporal Variability	Low	24 pooled samples of 100 urine samples; urine collection varied.
Metric 7:	Exposure Scenario	High	Biomonitoring.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data from pooled samples in Table 2.
Metric 9:	Quality Assurance	Low	QC not discussed, no obvious concerns.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Variability captured from 24 different pools; uncertainty not discussed, no obvious concerns.

Overall Quality Determination   Medium

Dibutyl Phthalate   Monitoring   HERO ID: 3070929

Study Citation:	Sun, J., Pan, L., Zhan, Y., Lu, H., Tsang, D. C., Liu, W., Wang, X., Li, X., Zhu, L. (2015). Contamination of phthalate esters, organochlorine pesticides and polybrominated diphenyl ethers in agricultural soils from the Yangtze River Delta of China. Science of the Total Environment 544:670-676.		
HERO ID:	3070929		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods (e.g., site characteristics, sampling location, equipment) were reported.
	Metric 2:	Analytical Methodology	Medium	Key analytical methods (e.g., instrumentation, extraction) were reported. However, LODs were only reported as a range for all phthalates combined.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in the soil.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study was performed in the Yangtze River Delta, China.
	Metric 5:	Currency	Medium	Samples were collected in 2014.
	Metric 6:	Spatial and Temporal Variability	Medium	A total of 241 topsoil samples were collected without replicates.
	Metric 7:	Exposure Scenario	High	Authors measured the levels of phthalates in farmland soil resulting from rapid urbanization.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not reported.
	Metric 9:	Quality Assurance	High	Key QA/QC were reported, such as duplicate analysis, recoveries, and blank corrections.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Gaps and limitations were not reported, and variance only characterized by min and max.

Overall Quality Determination   **Medium**

Study Citation:	SUNY, (2015). Phthalate exposure in association with serum hormone levels, sperm DNA damage and spermatozoa apoptosis: A cross-sectional study in China. Environmental Research 150:557-565.		
HERO ID:	3070933		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Spot urine shipping, presumably collected and prepared by participants, were described. Storage conditions were also included. Enrollment was only briefly covered, but authors did cite a previously published paper for more details.
Metric 2:	Analytical Methodology	Low	Analytical methods were briefly reported and a previous paper (Wang et al.,2015) was cited for more details. Authors also described equipment and instrumentation, However, LOD was only reported as a range for all metabolites combined.
Metric 3:	Biomarker Selection	High	MBP is specific to DBP.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Study was conducted in China.
Metric 5:	Currency	Medium	Samples were collected in 2013.
Metric 6:	Spatial and Temporal Variability	Medium	Over 1000 participants provided blood and urine samples without replicates. (Two urine samples were collected to capture almost 24 hour variability, which isn't equivalent to replicates).
Metric 7:	Exposure Scenario	High	This is a biomonitoring study.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	No raw data were provided.
Metric 9:	Quality Assurance	Low	Other than a single sentence about preparing control samples, QA/QC techniques were not discussed.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Uncertainty, limitations, and gaps were not discussed. Table S2 provided interquartile range of metabolites in two spot-urine samples.

Overall Quality Determination   Medium

Study Citation:	Asimakopoulos, A. G., Xue, J., De Carvalho, B. P., Iyer, A., Abualnaja, K. O., Yaghmoor, S. S., Kumosani, T. A., Kannan, K. (2016). Urinary biomarkers of exposure to 57 xenobiotics and its association with oxidative stress in a population in Jeddah, Saudi Arabia. Environmental Research 150:573–581.		
HERO ID:	3070934		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Participants and sample collection described, storage described. Missing information such as container used for collection.
	Metric 2:	Analytical Methodology	High	LOD, LOQ, extraction, calibration, recoveries, equipment and detailed methods in SI.
	Metric 3:	Biomarker Selection	High	Metabolites known to be derived from parent compound (MBP, MCPP).
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Saudi Arabia
	Metric 5:	Currency	Medium	2014
	Metric 6:	Spatial and Temporal Variability	Low	n =130, no replicates. Spot urine samples.
	Metric 7:	Exposure Scenario	Medium	Exposure to general population who visited a hospital. No information given on how subjects were chosen.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Min, max, mean, median for detects only; Kaplan-Meier method including non-detects. Individual points not reported.
	Metric 9:	Quality Assurance	High	High recoveries (over 70%), matrix effects, LODs, calibration, blanks, internal and external standards described.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Some discussion of variability, comparison with other studies. Discussion of limitations.

Overall Quality Determination   High

Study Citation:	Wang, X., Song, M., Guo, M., Chi, C., Mo, F., Shen, X. (2015). Pollution levels and characteristics of phthalate esters in indoor air in hospitals. Journal of Environmental Sciences 37:67-74.		
HERO ID:	3070971		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling procedure, equipment, and matrix characteristics were reported.
Metric 2:	Analytical Methodology	High	HPLC with GC was used for analysis; method detection limits were reported for each chemical at the end of QA/QC section.
Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in indoor air.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples were collected from five hospitals in China.
Metric 5:	Currency	Medium	Samples were collected in 2012 and 2013.
Metric 6:	Spatial and Temporal Variability	Medium	Five hospitals and six different rooms were sampled within each hospital. Authors reported that "this study used repeated sampling." However, there was no further elaboration on what that meant to assess if replicates were collected.
Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenario (indoor air/dust in hospitals).
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Mean concentrations with range were reported; no individual data were reported.
Metric 9:	Quality Assurance	High	QA/QC were performed and recovery rate was between 91.75% and 115.1%.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variance was characterized by range. Discussion of limitations, gaps, or uncertainties was mostly absent.

Overall Quality Determination   High

Study Citation:	Chau, H. T., Kadokami, K., Duong, H. T., Kong, L., Nguyen, T. T., Nguyen, T. Q., Ito, Y. (2015). Occurrence of 1153 organic micropollutants in the aquatic environment of Vietnam. Environmental Science and Pollution Research 25(8):7147-7156.		
HERO ID:	3071076		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	The authors report a sampling procedure and the sampling equipment. They report the storage conditions but not the storage duration.
	Metric 2: Analytical Methodology	High	The authors report the analytical methods and equipment used in the study. They also performed recovery studies, and calibration studies. Table 2 lists LODs for commonly detected chemicals, which includes TPP and DnBP.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemical in surface water.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Vietnam
	Metric 5: Currency	Medium	The samples were collected in 2013.
	Metric 6: Spatial and Temporal Variability	Medium	The authors collected 42 samples from different rivers, cities, canals, and urban/rural areas in Vietnam. Per river, the number of samples ranged from 1 to 14. Authors collected one sample in time (no repeat sampling).
	Metric 7: Exposure Scenario	Medium	Exposure to organic contaminants in surface water throughout the country in urban, suburban, and rural areas
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	The authors report the sample size, frequency of detection, median and maximum, but not measures of variation. The authors report the individual sample concentration in the supplemental material.
	Metric 9: Quality Assurance	Low	The authors reported analyzing lab blanks, and performing recovery studies. They did not collect field blanks. Recovery ranges were reported to be between 50-120% but the authors did not say if they adjusted based on low recoveries.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	The authors did not report a standard deviation and did not discuss in detail gaps, limits, or variability within their study.

Overall Quality Determination   Medium

| Study Citation: | Mo, C., Cai, Q. Y., Tang, S., Zeng, Q., Wu, Q.,iT (2009). Polycyclic Aromatic Hydrocarbons and Phthalic Acid Esters in Vegetables from Nine Farms of the Pearl River Delta, South China. Archives of Environmental Contamination and Toxicology 56(2):181-189. |
| HERO ID: | 3112241 |

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Location map in SI; sample prep described, locations and number of samples in Table 1. Approach to avoid contamination provided.
	Metric 2:	Analytical Methodology	Medium	EPA methods for extraction and cleanup; equipment and methods provided. Detected by gas chromatography coupled with mass spectrometry (GC/MS). Calibration, blanks, internal standards, recoveries, QA/QC described and reliable, but not reported.
	Metric 3:	Biomarker Selection	N/A	NA - vegetable samples no biomarker needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	Low	Sample collection and analysis not provided, publication date 2009.
	Metric 6:	Spatial and Temporal Variability	Medium	sample size 2 to 11 for 11 plant species, see Table 1
	Metric 7:	Exposure Scenario	High	Vegetables from farms, could be used for homegrown vegetable scenarios.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Summary tables in main paper min, max, mean is reported in Table 3 and supplement information
	Metric 9:	Quality Assurance	Medium	Calibration, blanks, internal standards, recoveries, QA/QC described and reliable, but not reported. Details of quality assurance/quality control (QA/QC) have been presented elsewhere (Cai et al. 2007a)
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability among vegetables discussed. The occurrences of PAHs and PAEs in this study are compared with those in other studies and their sources are discussed. Sources of the uncertainty, within the samples was not attributed to soil variability or other dynamics within biological samples.

Overall Quality Determination — **Medium**

Study Citation:	Gong, M., Weschler, C. J., Zhang, Y. (2016). Impact of clothing on dermal exposure to phthalates: Observations and insights from sampling both skin and clothing. Environmental Science & Technology 50(8):4350-4357.		
HERO ID:	3229677		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Wipe procedure described and diagramed
Metric 2:	Analytical Methodology	Low	"analyzed using methods similar to those described in previous study (41)" no other details; no LOD
Metric 3:	Biomarker Selection	N/A	parent in dermal wipe
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	China
Metric 5:	Currency	Medium	November 2014 for winter samples (this study) and June-July 2013 for the summer study samples (reported in Gong, M. Y.; Weschler, C. J.; Liu, L. P.; Shen, H. Q.; Huang, L. H.; Sundell, J.; Zhang, Y. P. Phthalate metabolites in urine samples from Beijing children and correlations with phthalate levels in their handwipes. Indoor Air 2015, 25 (6), 572−581.
Metric 6:	Spatial and Temporal Variability	Medium	n = 11, no replicates
Metric 7:	Exposure Scenario	High	Dermal exposure from clothing.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	mean, range, 50th, 75th
Metric 9:	Quality Assurance	Low	QA not discussed, no obvious concerns
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	uncertainty not discussed; variability discussed with respect to clothing versus skin and time of year

Overall Quality Determination   **Medium**

| Study Citation: | Raffy, G., Mercier, F., Blanchard, O., Derbez, M., Dassonville, C., Bonvallot, N., Glorennec, P., Le Bot, B. (2016). Semi-volatile organic compounds in the air and dust of 30 French schools: A pilot study. Indoor Air 27(1):114-127. |
| HERO ID: | 3229681 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Air sampling described; methods for dust sampling described in SI and in Blanchard et al. (2014).
	Metric 2:	Analytical Methodology	High	Details provided in SI, Mercier et al. (2014), and Blanchard et al. (2014). PLE and GC/MS; 5-level calibration; LOQs; field and lab blanks, and QA samples and recoveries.
	Metric 3:	Biomarker Selection	N/A	Air and dust sampling
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Brittany, France
	Metric 5:	Currency	Medium	2009 to 2010
	Metric 6:	Spatial and Temporal Variability	Medium	33 schools, 3 rooms per school, Air: single 4.5-day continuous sample/room, 1 field blank/school; Dust 1 vacuum per room and 3 damp wipes per room.
	Metric 7:	Exposure Scenario	High	School classrooms: air and dust samples.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	5th, 50th, and 95th percentiles (no mean, no variance); N, freq. of detect, LOQ and upper limit of calibration reported.
	Metric 9:	Quality Assurance	High	Well described in text and SI and includes recovery calculation, running blanks and QC samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Discussed analytic issues, uncertainties, possible confounding factors, and excluded data. Variation within and across schools not discussed.

Overall Quality Determination   High

Study Citation:	Braouezec, C., Enriquez, B., Blanchard, M., Chevreuil, M., Teil, M. J. (2016). Cat serum contamination by phthalates, PCBs, and PBDEs versus food and indoor air. Environmental Science and Pollution Research 23(10):9574-9584.		
HERO ID:	3229683		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Air, cat blood serum, cat food. Missing air sampling time intervals, seems the air sample was for 3 periods of 2 weeks each. Unclear if they sample cat serum every 12 hours for the same period they collected air samples. Approaches to avoid contamination not included. Description of sampling space provided but missing key details. Controlled environment was set up to mimic indoor, not completely described to fully assess/characterize sources of the chemicals, such as building materials, consumer products present, and others. This scenario is mainly to assess cat related products and food as sources.
	Metric 2:	Analytical Methodology	High	Extraction, fractionation, purification, analyses, methods quality controls, detection limit range
	Metric 3:	Biomarker Selection	N/A	Measured parent chemical in blood serum.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	France
	Metric 5:	Currency	Low	Sampling date not provided, published 2016.
	Metric 6:	Spatial and Temporal Variability	Low	8 cats; indoor air (missing collection and food sample size not shown)
	Metric 7:	Exposure Scenario	Medium	Indoor air at University Pierre et Marie Curie. Scenario may be used for cat products emissions and cat food background levels. However, is missing a better description of materials present in the control indoor environment.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 1 individual data points available for serum for 8 cats; Figure 1 food and air graphs.
	Metric 9:	Quality Assurance	High	Lab blanks, IDL, LOQ, recoveries.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability and uncertainty not discussed, no obvious concerns. Sources of uncertainty and variability from cross contamination, and materials within the indoor environment missing.

Overall Quality Determination   Medium

Study Citation:	Shoaff, J. R., Romano, M. E., Yolton, K., Lanphear, B. P., Calafat, A. M., Braun, J. M. (2016). Prenatal phthalate exposure and infant size at birth and gestational duration. Environmental Research 150(Elsevier):52-58.		
HERO ID:	3230353		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology included information of participant characteristics, equipment, storage, and more.
	Metric 2:	Analytical Methodology	Low	Authors cited previously published analytical methods without any further details. LODs provided as a range for all metabolites combined.
	Metric 3:	Biomarker Selection	High	MBP is specific to DBP.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study participants were from Cincinnati, Ohio.
	Metric 5:	Currency	Medium	Participant recruitment occurred between 2003 and 2006.
	Metric 6:	Spatial and Temporal Variability	Low	Sample size consisted of 368 infant pairs. Two spot samples were collected at different points in gestation.
	Metric 7:	Exposure Scenario	High	This is a biomonitoring study where mothers were exposed through the prevalence of phthalates and children in-utero.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data were provided.
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not described.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variance was characterized but discussion of uncertainties and limitations was mostly absent.

Overall Quality Determination   Medium

| Study Citation: | Ortiz-Colón, A. I., Piñero-Santiago, L. E., Rivera, N. M., Sosa, M. A. (2016). Assessment of concentrations of heavy metals and phthalates in two urban rivers of the northeast of Puerto Rico. Journal of Environmental & Analytical Toxicology 6(2):1000353. |
| HERO ID: | 3230372 |

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The water sampling methodology was described and cited EPA methods 200.8 and 200.2.
	Metric 2: Analytical Methodology	Medium	The analytical methods were described, including a general LOD but did not include recoveries.
	Metric 3: Biomarker Selection	N/A	The authors analyzed water samples.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was conducted in Puerto Rico.
	Metric 5: Currency	Medium	The sampling campaign was conducted in 2013.
	Metric 6: Spatial and Temporal Variability	Low	Sampling was described as conducted within three sampling sites, the upper, midpoint and lower reaches of the rivers, from two urban rivers, the Rio Piedras and the Rio La Plata, as well as from a non-urban control river, the Mameyes. Sampling was described as conducted in triplicate. Concentrations were reported for only one chemical, with n=3 samples.
	Metric 7: Exposure Scenario	Medium	The data may represent a relevant exposure scenario, but the small sample size limits the results generalizability.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Only three data points were reported in the text for DBP, data for other phthalates were not reported due to instrument unreliability per the authors description.
	Metric 9: Quality Assurance	Medium	QA/QC techniques were briefly described, including the use of control samples.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variability was not characterized. Uncertainties and limitations were briefly discussed.

Overall Quality Determination   Medium

Study Citation:	Zhang, J., Liu, L., Wang, X., Huang, Q., Tian, M., Shen, H. (2016). Low-level environmental phthalate exposure associates with urine metabolome alteration in a Chinese male cohort. Environmental Science & Technology 50(11):5953-5960.		
HERO ID:	3230375		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Some sampling methods were not reported, such as storage duration.
Metric 2:	Analytical Methodology	Medium	Recovery samples were not reported. LODs reported in text under Urinary Phthalate Metabolite Analysis.
Metric 3:	Biomarker Selection	High	MBP is specific to DBP.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples were collected in China.
Metric 5:	Currency	Low	Sample date was not provided. Study was published in 2016.
Metric 6:	Spatial and Temporal Variability	Medium	Spot morning urine samples were collected from 364 mean without replicates.
Metric 7:	Exposure Scenario	High	This is a biomonitoring study where exposure presumably already occurred.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data were not reported.
Metric 9:	Quality Assurance	High	QA/QC reported in the supplemental materials.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	There was only a limited characterization of variance.

Overall Quality Determination   Medium

Study Citation:	Jurewicz, J., Radwan, M., Sobala, W., Radwan, P., Jakubowski, L., Wielgomas, B., Ligocka, D., Brzeźnicki, S., Hanke, W. (2016). Exposure to widespread environmental endocrine disrupting chemicals and human sperm sex ratio. Environmental Pollution 213:732-740.		
HERO ID:	3230399		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Urine, saliva, and semen samples. Most key criteria met, lack of duration of urine sample storage prior to analysis information. Most details are available in Jurewicz et al., 2014, parent study. This study is a subset of the parent study. This study was specifically for Phthalates. May use the parent study descriptions, but the results needed are in this reference.
	Metric 2: Analytical Methodology	Medium	Medium. Most key criteria met, LOD's reported. Lack of recovery sample data.
	Metric 3: Biomarker Selection	Medium	Metabolites measured are for BBP, DBP, DEHP, DINP, although some may apply to other phthalates too
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	High. Samples collected from participants in Poland.
	Metric 5: Currency	Medium	Medium. Samples collected 2008-2011.
	Metric 6: Spatial and Temporal Variability	Medium	Medium. Single urine specimen on one day provided by each of n=194 men, collection of samples 2008-2011, non-statistical sampling method.
	Metric 7: Exposure Scenario	Medium	Medium. Participant characteristics described, potential exposure sources, occupational history not detailed.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Medium. Most key criteria met, text notes metabolites detected in 100% of samples, lack of raw data.
	Metric 9: Quality Assurance	Medium	Medium. Most key criteria met, lack of detail on control/blank samples, however laboratory participated in external quality assurance program.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	High. Variability summarized within statistical summary measures, limitations discussed, uncertainties minimal.

Overall Quality Determination   Medium

Study Citation:	Huen, K., Calafat, A. M., Bradman, A., Yousefi, P., Eskenazi, B., Holland, N. (2016). Maternal phthalate exposure during pregnancy is associated with DNA methylation of LINE-1 and Alu repetitive elements in Mexican-American children. Environmental Research 148:55-62.		
HERO ID:	3230402		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Two urine samples were collected from mothers at the time ofinterview, aliquoted, barcoded and stored at -80 °C.
	Metric 2: Analytical Methodology	High	Measurements were performed using solid phase extraction coupled with isotope dilution high-performance liquid chromatography-electro spray ionization-tandem massspectrometry. The LODs are reported in table 2.
	Metric 3: Biomarker Selection	Medium	MCPP is a metabolite with multiple parents, but with known excretion factor for DBP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Salinas, California.
	Metric 5: Currency	Medium	1999-2000.
	Metric 6: Spatial and Temporal Variability	High	350 mothers at 13 weeks of pregnancy and 339 at 26 weeks of pregnancy.
	Metric 7: Exposure Scenario	High	Maternal phthalate exposure in a Mexican American community in Salinas California.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	No individual sample concentrations. Table 2 reports data as median (IQR) min and max.
	Metric 9: Quality Assurance	High	Quality control procedures included the use of laboratory and field blanks, calibration standards, and controls with high and low concentrations.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Key limitations are reported.

Overall Quality Determination   High

Study Citation:	Arbuckle, T. E., Fisher, M., Macpherson, S., Lang, C., Provencher, G., Leblanc, A., Hauser, R., Feeley, M., Ayotte, P., Neisa, A., Ramsay, T., Tawagi, G. (2016). Maternal and early life exposure to phthalates: The Plastics and Personal-care Products use in Pregnancy (P4) study. Science of the Total Environment 551-552(Elsevier):344-356.		
HERO ID:	3230415		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Key sampling methods reported.
	Metric 2: Analytical Methodology	High	Key analytical methods reported.
	Metric 3: Biomarker Selection	High	Acceptable biomarker.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Ottawa, Canada.
	Metric 5: Currency	Medium	Samples collected between 2009 and 2010.
	Metric 6: Spatial and Temporal Variability	High	>10 samples; replicates.
	Metric 7: Exposure Scenario	Medium	Exposure source characterized.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not provided.
	Metric 9: Quality Assurance	High	Key QA reported.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Limitations reported.

Overall Quality Determination   High

Study Citation:	Mandin, C., Mercier, F., Rarnalho, O., Lucas, J. P., Gilles, E., Blanchard, O., Bonvallot, N., Glorennec, P., Le Bot, B. (2016). Semi-volatile organic compounds in the particulate phase in dwellings: A nationwide survey in France. Atmospheric Environment 136:82-94.		
HERO ID:	3230506		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling is detailed in Section 2.1.
	Metric 2:	Analytical Methodology	Medium	no recovery samples, but analytical method was previously validated
	Metric 3:	Biomarker Selection	N/A	Biomarkers were not assessed nor relevant for this study.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	This study was located in France.
	Metric 5:	Currency	Medium	sampling took place from October 2003 to December 2005
	Metric 6:	Spatial and Temporal Variability	Medium	no replicate samples, but used continuous air sampling methods over a period of one-week
	Metric 7:	Exposure Scenario	Medium	limited characterization of building characteristics and other microenvironmental factors
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	no raw data reported
	Metric 9:	Quality Assurance	Medium	no recovery samples, but used field blank samples; the analytical method was previously validated; no issues were identified
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	no discussion of limitations or data uncertainties

Overall Quality Determination   Medium

Study Citation:		Laborie, S., Moreau-Guigon, E., Alliot, F., Desportes, A., Oziol, L., Chevreuil, M. (2016). A new analytical protocol for the determination of 62 endocrine-disrupting compounds in indoor air. Talanta 147:132-141.	
HERO ID:		3230514	

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling procedure, matrix characterization were described in detail. The study lacked a few details about storage conditions.
	Metric 2:	Analytical Methodology	High	TBBPA was analyzed by LC/MA; the other chemicals were analyzed by GC/MS. LOD was reported in SI.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	4 indoor environments in Paris.
	Metric 5:	Currency	Medium	2013
	Metric 6:	Spatial and Temporal Variability	Low	The samples came from 4 indoor environments.
	Metric 7:	Exposure Scenario	High	Indoor air
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Average concentrations were reported in Table 5.
	Metric 9:	Quality Assurance	Low	Quality assurance was not directly discussed but assumed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The main discussion on limitation and variability were about the analytical method.

Overall Quality Determination **Medium**

| Study Citation: | Gani, K. M., Kazmi, A. A. (2016). Comparative assessment of phthalate removal and risk in biological wastewater treatment systems of developing countries and small communities. Science of the Total Environment 569-570:661-671. |
| HERO ID: | 3350189 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methods for wastewater and sludge from 3 WWTP were described in detail. This included the study site characteristics such as the processes and descriptions of each WWTP. The study also described the sampling equipment, procedures, and storage thoroughly.
	Metric 2:	Analytical Methodology	High	Analytical methods were described thoroughly in text, including the extraction method, analytical instrumentation, instrument calibration, recoveries for wastewater samples, and the LOD and LOQ. Detection limits and recovery were also reported in Table 2.
	Metric 3:	Biomarker Selection	N/A	This study tested for the parent chemical in wastewater and sludge.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study takes place in India.
	Metric 5:	Currency	High	Samples were collected from October 2014 to September 2015.
	Metric 6:	Spatial and Temporal Variability	Medium	Wastewater and sludge samples were collected from October 2014 to September 2015, with a sampling frequency of one month. Sample size for each scenario ranged from 6 to 21. No replicate samples were reported.
	Metric 7:	Exposure Scenario	High	The data represent untreated wastewater influent, sludge, and treated effluent from three wastewater treatment plants. The effluents of these wastewater treatment plants are discharged to rivers which are important drinking water sources for people living nearby.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Detailed summary statistics of the untreated wastewater influent and sludge samples across seasons including the number of samples, range, mean, standard deviation, and detection frequency are reported in Table 3. Mean concentrations and standard deviation of treated effluents by season are reported in Table 4. Individual sample concentrations are not reported.
	Metric 9:	Quality Assurance	High	Quality assurance of the analysis method was done according to the EPA method 606 and recoveries were reported in Table S1. The study also reported that with every analysis, one blank sample of distilled water was analyzed to correct for laboratory contamination.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	The study characterizes variability by reporting the range and standard deviation of concentrations. Limitations were discussed in Section 3.8.

Overall Quality Determination   High

Study Citation:	Lenoir, A., Boulay, R., Dejean, A., Touchard, A., Cuvillier-Hot, V. (2016). Phthalate pollution in an Amazonian rainforest. Environmental Science and Pollution Research 23(16):16865-16872.		
HERO ID:	3350198		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling sites were shown and characterized. Some methods were explained, but missing information about sample storage conditions.
Metric 2:	Analytical Methodology	Low	LOD/LOQs were not reported.
Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in ants.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Study was conducted in French Guiana.
Metric 5:	Currency	Medium	Samples were collected in 2013.
Metric 6:	Spatial and Temporal Variability	Medium	Nearly 300 ants were samples without replicates.
Metric 7:	Exposure Scenario	High	Sources of phthalate exposures to ants in pristine environments were described.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	No raw data were provided.
Metric 9:	Quality Assurance	Medium	Some discussion of QA/QC techniques was provided.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variance not characterized, and uncertainties/limitations were not described.

Overall Quality Determination   Medium

Study Citation:	Watkins, D. J., Milewski, S., Domino, S. E., Meeker, J. D., Padmanabhan, V. (2016). Maternal phthalate exposure during early pregnancy and at delivery in relation to gestational age and size at birth: A preliminary analysis. Reproductive Toxicology 65:59-66.		
HERO ID:	3350206		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Some methods not reported such as sample storage conditions and sampler calibration.
	Metric 2: Analytical Methodology	High	Key analytical methods reported.
	Metric 3: Biomarker Selection	High	Acceptable biomarker.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	USA
	Metric 5: Currency	Medium	Samples collected between 2009 and 2012.
	Metric 6: Spatial and Temporal Variability	High	>10 samples; with replicates.
	Metric 7: Exposure Scenario	Medium	Exposure source not well characterized.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	raw data not reported.
	Metric 9: Quality Assurance	Medium	Limited QA reported.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Gaps and limitations reported.

Overall Quality Determination   High

Study Citation:	Pan, Y., Jing, J., Yeung, L. W., Sheng, N., Zhang, H., Yao, B., Dai, J. (2016). Associations of urinary 5-methyl-2'-deoxycytidine and 5-hydroxymethyl-2'-deoxycytidine with phthalate exposure and semen quality in 562 Chinese adult men. Environment International 94:583-590.		
HERO ID:	3350210		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Key sampling methods reported. Sampling approaches described, materials, and population description described.
	Metric 2: Analytical Methodology	High	key analytical methods reported
	Metric 3: Biomarker Selection	High	Acceptable biomarker
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	China
	Metric 5: Currency	Medium	Samples collected between 2014 and 2015
	Metric 6: Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7: Exposure Scenario	Medium	Exposure scenario not well characterized
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not reported
	Metric 9: Quality Assurance	High	Analytical QA reported, more details in supplemental.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Gaps and limitations reported

Overall Quality Determination   High

Study Citation:	Ferguson, K. K., Meeker, J. D., Cantonwine, D. E., Chen, Y. H., Mukherjee, B., Mcelrath, T. F. (2016). Urinary phthalate metabolite and bisphenol A associations with ultrasound and delivery indices of fetal growth. Environment International 94(Elsevier):531-537.		
HERO ID:	3350218		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported such as sample storage conditions and sampler calibration
Metric 2:	Analytical Methodology	High	Key analytical methods reported
Metric 3:	Biomarker Selection	High	Acceptable biomarker
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Boston, MA
Metric 5:	Currency	Medium	Samples collected from 2006 to 2012
Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not reported
Metric 9:	Quality Assurance	Medium	Limited QA reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Some limitations reported

Overall Quality Determination   Medium

Study Citation:	Gong, Y., Tian, H.,ua, Dong, Y., Zhang, X., Wang, J.,un, Wang, W.,ei, Ru, S. (2016). Thyroid disruption in male goldfish (Carassius auratus) exposed to leachate from a municipal waste treatment plant: Assessment combining chemical analysis and in vivo bioassay. Science of the Total Environment 554:64-72.		
HERO ID:	3350229		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	The sampling methodology was only briefly discussed. Details about volume of samples taken from storage tanks, locations, and storage conditions were provided. Samples of leachate and treated effluent were collected.
	Metric 2: Analytical Methodology	Medium	The analytical methodology was described in detail. The authors reported LODs but did not report recoveries.
	Metric 3: Biomarker Selection	N/A	The authors did not test for biomarkers. They tested for the parent chemicals of interest in aqueous samples and analyzed the samples within a week of collection.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The authors took samples from a municipal solid waste treatment plant in Qingdao, China.
	Metric 5: Currency	Medium	The samples were collected in September, 2014.
	Metric 6: Spatial and Temporal Variability	Critically Deficient	The study did not report the sample size and cannot be inferred.
	Metric 7: Exposure Scenario	High	The data closely represent relevant exposure scenario to phthalates in treated effluents and leachate. The authors also conducted an in vivo bioassay to characterize this exposure in goldfish.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	The authors only provided summary statistics (range and means) in Table 4. The values were provided for leachate and 3 sampling points in the treatment process. They also provided estimates concentrations in exposure media on Table 5.
	Metric 9: Quality Assurance	Low	Details about QA/QC techniques were only briefly described. Supplementary data may include more details but the file was inaccessible during evaluation.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	The authors characterized variability by reporting range of values detected. The uncertainties and limitations were only briefly discussed at the end of the manuscript.

Overall Quality Determination   Uninformative

Study Citation:	Gou, Y., Lin, S., Que, D. E., Tayo, L. L., Lin, D., Chen, K. C., Chen, F., Chiang, P., Wang, G., Hsu, Y.,iC, Chuang, K., Chuang, C. Y.,u, Tsou, T. C., Chao, H. (2016). Estrogenic effects in the influents and effluents of the drinking water treatment plants. Environmental Science and Pollution Research 23(9):8518-8528.		
HERO ID:	3350230		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	water samples collected from DWTP (fig 1); influent and effluent; 2L sample collected using glass bottle with cap; stored at 4C; sampling procedure not discussed further
Metric 2:	Analytical Methodology	Medium	liquid-liquid extraction; GC/MS; MDL=0.61 ug/L; recovery not discussed
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	northern, central, and southern Taiwan (Fig 1)
Metric 5:	Currency	Medium	2011-June
Metric 6:	Spatial and Temporal Variability	Medium	56 samples from 7 DWTPs (28 raw and 28 treated drinking water); 4 per site; sampled between September and June
Metric 7:	Exposure Scenario	High	concentration in influent and effluent to 7 DWTPs in Taiwan
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Table 1 provides arithmetic mean, std, and range for both raw and treated dw per site; raw data may be provided in SI, but not indicated in article
Metric 9:	Quality Assurance	Medium	Based on NIEA 801.52B; blank tests; does not discuss recoveries
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	results compared to recent studies; discussed difference between locations

Overall Quality Determination   Medium

Study Citation:	Li, B., Liu, R., Gao, H., Tan, R., Zeng, P., Song, Y. (2016). Spatial distribution and ecological risk assessment of phthalic acid esters and phenols in surface sediment from urban rivers in Northeast China. Environmental Pollution 219(Elsevier):409-415.		
HERO ID:	3350247		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Some sampling methods not reported such as phthalate free materials for sampling and measures to avoid contamination. Also missing sediment sample collection depth, and thickness or collected layer. Sampling locations and plan was described, Figure 1, upstream and downstream from main sources.
	Metric 2: Analytical Methodology	High	Key analytical methods reported, gas chromatograph (GC) coupled with mass selective detector (MSD). LOD reported along with analytical QA/QC samples, blanks, recoveries, and internal standards.
	Metric 3: Biomarker Selection	N/A	N/A - river sediment samples no biomarker needed.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	China
	Metric 5: Currency	Medium	Samples collected in 2014
	Metric 6: Spatial and Temporal Variability	Medium	Seven and 9 samples in from two rivers at various locations upstream and downstream; no replicates
	Metric 7: Exposure Scenario	Medium	Urban river sediments upstream and downstream from sources.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not reported
	Metric 9: Quality Assurance	High	Analytical QA/QC parameters reported and reliable.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Few gaps and limitations reported. Sources of uncertainty and variability are discussed within the goals of the study, however source attribution and other risk evaluation approaches could have been further explored.

Overall Quality Determination   Medium

Study Citation:	Strømmen, K., Lyche, J. L., Blakstad, E. W., Moltu, S. J., Veierød, M. B., Almaas, A. N., Sakhi, A. K., Thomsen, C., Nakstad, B., Brække, K., Rønnestad, A. E., Drevon, C. A., Iversen, P. O. (2016). Increased levels of phthalates in very low birth weight infants with septicemia and bronchopulmonary dysplasia. Environment International 89-90:228-234.		
HERO ID:	3350320		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The study included description of when samples were collected, how they were stored and how they were analyzed. It also included quality control samples.
	Metric 2:	Analytical Methodology	Medium	The study included internal standards, LOQ, percentages representing accuracy of the method, and, for confirmation of phthalate metabolites, both retention time and qualifier ratio were used. It is not completely clear how "accuracy of the method" was calculated. Analysis was by on-line column switching liquid chromatography coupled to tandem mass spectrometry.
	Metric 3:	Biomarker Selection	Low	Metabolites were described and measured for each chemical. Samples were from urine and were not adjusted for creatinine or specific weight. Multiple metabolites were summed for compounds with multiple metabolites. One metabolite could be a metabolite of either DBP or BBP; no effort was made to apportion it.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Norway
	Metric 5:	Currency	Medium	The study was conducted in 2010.
	Metric 6:	Spatial and Temporal Variability	Low	While there were more than 110 samples, collected in weeks 1, 3, and 5 of life (approx. 35 in each timeframe), they were un-pooled urine spot samples.
	Metric 7:	Exposure Scenario	High	The data closely represent a relevant exposure scenario - no concerns were found.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data were provided, only geometric means, medians, minima, maxima and LOQ.
	Metric 9:	Quality Assurance	Low	QA/QC discussed was limited to a reference to quality control samples; reported ranges of "accuracies of the method," and using both retention time and qualifier ratio to confirm phthalate metabolites).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No discussion of variability or uncertainty was included. Some degree of variability was shown by minimum and maximum detection of urinary phthalate metabolites, but standard deviations are absent.

Overall Quality Determination   Medium

Study Citation:	Eremina, N., Paschke, A., Mazlova, E. A., Schüürmann, G. (2016). Distribution of polychlorinated biphenyls, phthalic acid esters, polycyclic aromatic hydrocarbons and organochlorine substances in the Moscow River, Russia. Environmental Pollution 210:409-418.		
HERO ID:	3350341		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Key sampling methods reported.
Metric 2:	Analytical Methodology	Medium	Recovery samples not reported.
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Moscow River, Russia
Metric 5:	Currency	Medium	Samples collected October 2013.
Metric 6:	Spatial and Temporal Variability	Low	<5 samples; no replicates
Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	Individual sample concentrations and statistics reported.
Metric 9:	Quality Assurance	High	Key QA reported.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Limited gaps and limitations reported.

Overall Quality Determination   Medium

Study Citation:		Liu, B., Li, Y., Ma, J., Huang, L., Chen, L. (2016). Detection of semi-volatile organic compounds (SVOCs) in surface water, soil, and groundwater in a chemical industrial park in Eastern China. Water Science and Technology 73(5):1175-1189.	
HERO ID:		3350971	

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Surface water samples were collected from the outlets of an industrial wastewater treatment plant and a sewage ditch, groundwater samples from irrigation wells at various depths across the site, and soil samples at the surface water sampling locations (Fig 1 and Table 1). Water samples were placed in 1L glass bottles and shipped on ice within 24 hrs to lab. Soil samples of 1kg were collected by foil encasement, sealed in bag, and stored at 4C. Methodology followed China Geological Survey standard sampling procedures.
	Metric 2:	Analytical Methodology	High	Tables 2 and 3 showed the US EPA methods that were followed. Recoveries were acceptable. MDLs were provided in the SI.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected from Eastern China.
	Metric 5:	Currency	Low	Sampling date was not provided, but publication date is 2016. Authors did not that this is a continuation of a paper published in 2014.
	Metric 6:	Spatial and Temporal Variability	Medium	20 samples were collected (7 surface water, 9 groundwater, and 4 soil - Table 1). Replicates and time period of sampling were not reported.
	Metric 7:	Exposure Scenario	High	The analysis of phthalates in surface water, groundwater, and soil within a chemical industrial park is relevant.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Tables 4, 5, and S1-4 provide summary statistics. Raw data were not available.
	Metric 9:	Quality Assurance	High	QA/QC techniques were provided in p. 1778-1779, including blanks and recoveries (all within satisfactory range). Authors followed EPA method 8270D and 8000B.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Limited discussion of uncertainties, limitations, and data gaps

Overall Quality Determination   # High

Study Citation:	Wang, L., Zhang, W., Tao, W., Wang, L., Shi, X., Lu, X. (2016). Investigating into composition, distribution, sources and health risk of phthalic acid esters in street dust of Xi'an City, Northwest China. Environmental Geochemistry and Health 39(4):865-877.
HERO ID:	3355406

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Dust samples. Sampling equipment and methods are described in sufficient detail, but certain aspects (e.g. component materials of sampling equipment) were absent that may have a substantial impact on results.
	Metric 2:	Analytical Methodology	High	Analytical instrumentation and methods are described in sufficient detail and are scientifically sound; LOD is reported for each analyte.
	Metric 3:	Biomarker Selection	N/A	This study is testing for the parent chemical of interest in an environmental medium.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	High	December 2014-January 2015
	Metric 6:	Spatial and Temporal Variability	High	Composite grab samples of street dust from 58 sampling sites
	Metric 7:	Exposure Scenario	High	Each street dust sampling site was categorized under one of six different urban functional categories
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data are not reported; summary statistics include minimum, maximum, mean and standard deviation of concentration at each site.
	Metric 9:	Quality Assurance	High	QA/QC measures included the use of blanks and recovery experiments; recoveries for both surrogate standards and matrix addition standards were within acceptable limits.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Standard deviation is reported to characterize variability. Spatial variability is analyzed, but there is little discussion of limitations or sources of uncertainty.

Overall Quality Determination   High

| | Study Citation: | Gao, L., Shi, Y., Li, W., Liu, J., Cai, Y. (2016). Occurrence and distribution of organophosphate triesters and diesters in sludge from sewage treatment plants of Beijing, China. Science of the Total Environment 544:143-149. |
| | HERO ID: | 3366534 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	The sludge sampling methodology was concisely described, without many details about the sampling procedure.
	Metric 2:	Analytical Methodology	High	The analytical methods were discussed in detail, including recoveries and LOD.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed sludge samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Beijing, China.
	Metric 5:	Currency	Medium	Samples were collected between 2008–2014.
	Metric 6:	Spatial and Temporal Variability	Medium	n=43 samples from 8 sewage treatment plants.
	Metric 7:	Exposure Scenario	Medium	The data likely represent relevant exposure scenarios related to sludge from sewage treatment plants from Beijing, but details about the population of interest were not reported.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics were reported, no individual sample concentrations.
	Metric 9:	Quality Assurance	High	QA/QC techniques were described in detail, including the use of experimental blanks.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability was characterized (range). Uncertainties were briefly discussed.

Overall Quality Determination   **Medium**

Study Citation:	Tian, F., Liu, Y., Liu, C., Gu, H., Liu, H. (2016). Pollution status and multimedia fate simulation of phthalate acid esters (PAEs) in an arid city. Polish Journal of Environmental Studies 25(1):325-331.		
HERO ID:	3367249		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling procedure and study site characters were described in the method. A few information (sample storage, calibration) were missing.
	Metric 2:	Analytical Methodology	Low	Detection limits or reporting limits were not reported.
	Metric 3:	Biomarker Selection	N/A	Environmental media
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Changji-Tianshan region in China
	Metric 5:	Currency	Medium	The samples were collected early each month from Octoberto December, 2014.
	Metric 6:	Spatial and Temporal Variability	High	For air, soil, organic film, plants, and water, every kind of sample was taken 4 times at each sampling point. 5 soil and plantsub-samples were collected from the surroundings of eachsite.
	Metric 7:	Exposure Scenario	High	The sample matrixes covered air, soil, water, terrestrial plants.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Supplementary or raw data were not reported, and therefore summary statistics cannot be reproduced.
	Metric 9:	Quality Assurance	Medium	Limited discussion about quality assurance was provided (field blanks were used).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study has limited discussion of key uncertainties, limitations, and data gaps.

Overall Quality Determination   Medium

Study Citation:	Zhang, H., Xie, J., Yoshino, H., Yanagi, U., Hasegawa, K., Kagi, N., Lian, Z. (2016). Thermal and environmental conditions in Shanghai households: Risk factors for childhood health. Building and Environment 104:35-46.		
HERO ID:	3420616		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods were not reported, such as sample storage conditions and calibration of the sampler.
	Metric 2:	Analytical Methodology	Low	LODs/LOQs were not reported.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in homes.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study was performed in Shanghai, China.
	Metric 5:	Currency	Medium	Data were collected in 2013.
	Metric 6:	Spatial and Temporal Variability	Medium	About 20 homes were sampled without replicates.
	Metric 7:	Exposure Scenario	High	Study examined the association between exposure to indoor air pollutants, home conditions, and children's health.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Raw data were not provided, and most summary statistics were missing.
	Metric 9:	Quality Assurance	Low	Application of QA/QC methods is implied through the use of JIS A 1966 (SVOCs) and JIS A 1962 (formaldehyde) methods.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No characterization of variance or gaps and limitations were presented.

Overall Quality Determination   Medium

Study Citation: Botton, J., Philippat, C., Calafat, A. M., Carles, S., Charles, M. A., Slama, R. (2016). Phthalate pregnancy exposure and male offspring growth from the intra-uterine period to five years of age. Environmental Research 151:601-609.

HERO ID: 3444888

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Participant selection described previously, urine collection described.
	Metric 2:	Analytical Methodology	Medium	LOD provided, analyses performed by CDC.
	Metric 3:	Biomarker Selection	High	Metabolite in urine.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	France
	Metric 5:	Currency	Low	2003-2006
	Metric 6:	Spatial and Temporal Variability	Medium	n = 520, no replicates.
	Metric 7:	Exposure Scenario	High	Biomonitoring
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	5th, 25th, 50th, 75th, 95th standardized and non-standardized concentrations 5th, 50th, and 95th included.
	Metric 9:	Quality Assurance	Low	QA not discussed, no obvious concerns.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty not discussed, no obvious concerns.

Overall Quality Determination   Medium

Study Citation:	Schwarz, S., Rackstraw, A., Behnisch, P. A., Brouwer, A., Koehler, H. R., Kotz, A., Kuballa, T., Malisch, R., Neugebauer, F., Schilling, F., Schmidt, D., von Der Trenck, K. T. (2016). Peregrine falcon egg pollutants Mirror Stockholm POPs list including methylmercury. Toxicological and Environmental Chemistry 98(8):886-923.		
HERO ID:	3449771		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling methods were not described well. Failed wild peregrine falcon eggs were collected by amateur ornithologists, in the process of "caring for" breeding wild peregrine falcon pairs. Storage of eggs is not discussed, and study site characteristics are not described.
	Metric 2:	Analytical Methodology	Medium	GC-EC-MS. For a description of methods, readers are referred to other publications. The LOQ were provided for each chemical, time period, and lab.
	Metric 3:	Biomarker Selection	N/A	Parent substances were measured in the egg contents.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Germany
	Metric 5:	Currency	Medium	2009-2010
	Metric 6:	Spatial and Temporal Variability	Low	Sample size was not reported. No replicates were reported.
	Metric 7:	Exposure Scenario	High	Samples were from peregrine falcon eggs.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Raw data are absent, and summary statistics are not provided. The only reference to results for this chemical are in the text on page 913, where it says the chemicals not found were "phthalic esters ($<$1 mg/g), except for traces of DEHP." We do know from Table 1 which phthalates the samples were analyzed for.
	Metric 9:	Quality Assurance	Low	QA/QC was not discussed at all. Methods were not discussed in detail in this paper, but were laid out in other papers.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty were not discussed, and there were no obvious sources of uncertainty. There is a passing reference to collection of eggs occurring at varying intervals after they were laid.

Overall Quality Determination   **Low**

Study Citation:	Kong, L., Kadokami, K., Duong, H. T., Chau, H. T. (2016). Screening of 1300 organic micro-pollutants in groundwater from Beijing and Tianjin, North China. Chemosphere 165:221-230.		
HERO ID:	3453174		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The sampling methods were explained in detail.
	Metric 2: Analytical Methodology	Low	The analytical methods were described in the supplemental materials. No LOQ or LOD provided.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in domestic wells throughout Beijing and Tianjin, China.
	Metric 5: Currency	High	Samples were collected in April 2015.
	Metric 6: Spatial and Temporal Variability	Medium	There were 10 samples in wells of Beijing and 17 samples in wells of Tianjin. No replicates were reported.
	Metric 7: Exposure Scenario	High	The exposure scenarios were discussed throughout the study.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Table 1 reported raw data. Summary statistics were reported, including median, mean, and range.
	Metric 9: Quality Assurance	Medium	QA/QC techniques not explicitly described. It can be inferred that proper protocols were followed through the study's use of standard methods.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Characterized variability and uncertainties were discussed.

Overall Quality Determination   High

Study Citation:	Jeddi, M. Z., Rastkari, N., Ahmadkhaniha, R., Yunesian, M. (2016). Endocrine disruptor phthalates in bottled water: daily exposure and health risk assessment in pregnant and lactating women. Environmental Monitoring and Assessment 188(9):534.		
HERO ID:	3454705		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Pertinent key aspects of the sampling methods were reported.
Metric 2:	Analytical Methodology	High	Key analytical methods were reported. The paper states the LODs and LOQs for the target analytes ranged from 0.01 to 0.025 and 0.025 to 0.05 ppb, respectively. The paper asserts that the methods were validated by FDA.
Metric 3:	Biomarker Selection	N/A	The study analyzed chemicals in drinking water.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Iran
Metric 5:	Currency	Medium	Samples were collected primarily in 2012.
Metric 6:	Spatial and Temporal Variability	Medium	There were 24 samples of each brand of bottled water exposed to six different conditions (including 5 different temperatures) and left on the roof for four separate periods of time. The only replicates mentioned were in the QC samples, not the bottled water samples.
Metric 7:	Exposure Scenario	High	Exposure represents bottles of water stored at various temperatures.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	The mean and standard deviations are reported for water bottles stored in different conditions (and for different brands of water, in a separate table). Raw data are not reported.
Metric 9:	Quality Assurance	Low	The only quality assurance discussed is QA of the calibration method and some corrections employed.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	A few limitations of the study were reported. Some variability is revealed via reporting of standard deviations. In addition, average concentrations overall across different brands of water were presented. There was limited to no discussion of uncertainties, particularly given the corrections employed, including to "get rid of interference due to residual phthalates."

Overall Quality Determination   Medium

Study Citation:	Sampath, S., Selvaraj, K. K., Shanmugam, G., Krishnamoorthy, V., Chakraborty, P., Ramaswamy, B. R. (2016). Evaluating spatial distribution and seasonal variation of phthalates using passive air sampling in southern India. Environmental Pollution 221:407-417.
HERO ID:	3455107

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Detailed sampling methodology, scientifically sound. Description of sampling region and maps provided.
	Metric 2:	Analytical Methodology	High	Analysis was done using gas chromatography mass spectrometry. Provides extraction details, instrumentation, LOD and LOQ. Analytical QC samples described and reported, blanks, internal standards (recoveries), and blank subtraction for DEHP and DBP.
	Metric 3:	Biomarker Selection	N/A	NA - air samples no biomarker needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	India
	Metric 5:	Currency	Medium	Sampling in 2009-2010
	Metric 6:	Spatial and Temporal Variability	Medium	31 sampling locations, sampled during 3 seasons. The total number of samples is not stated
	Metric 7:	Exposure Scenario	High	Microenvironment and potential sources are described
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual sampling concentrations not reported, only summary statistics
	Metric 9:	Quality Assurance	Medium	Well described QA/QC, missing field blank analysis
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Key uncertainties and limitations are briefly discussed. Temporal and location variability discussed. Source of uncertainty to the measurements from analytical and sampling approaches addressed.

Overall Quality Determination   High

Study Citation:	Giovanoulis, G., Alves, A., Papadopoulou, E., Cousins, A. P., Schütze, A., Koch, H. M., Haug, L. S., Covaci, A., Magnér, J., Voorspoels, S. (2016). Evaluation of exposure to phthalate esters and DINCH in urine and nails from a Norwegian study population. Environmental Research 151:80-90.		
HERO ID:	3455194		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling was only briefly described, but reference to previous study (Papadopoulou et al., 2016) was provided.
	Metric 2: Analytical Methodology	High	Pertinent analytical methods (e.g., extraction, instrumentation, LOQs) were provided in both main paper and SI.
	Metric 3: Biomarker Selection	High	Metabolite is specific to DBP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was conducted in Norway.
	Metric 5: Currency	Medium	Samples were collected during 2013-2014.
	Metric 6: Spatial and Temporal Variability	Low	About 60 samples were collected without replicates, and unpooled spot urine samples were analyzed.
	Metric 7: Exposure Scenario	High	This is a biomonitoring study where exposure is presumed to occur via numerous consumer products.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not provided.
	Metric 9: Quality Assurance	Low	Only some QA (e.g., spike and blank samples) were discussed in SI.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Uncertainties, limitations, and gaps were not discussed.

Overall Quality Determination   **Medium**

Study Citation:	Sun, J., Pan, L., Tsang, D. C., Li, Z., Zhu, L., Li, X. (2016). Phthalate esters and organochlorine pesticides in agricultural soils and vegetables from fast-growing regions: a case study from eastern China. Environmental Science and Pollution Research 25(1):34-42.		
HERO ID:	3455519		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling methods are discussed in moderate detail, but certain aspects (e.g. equipment to collect soil, duration of storage until analysis) are missing. These are unlikely to substantially impact results.
	Metric 2: Analytical Methodology	Low	Analytical instrumentation and methods are described in sufficient detail, but LOD is only reported as a range for all analyzed phthalate esters.
	Metric 3: Biomarker Selection	N/A	This study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was conducted in Eastern China.
	Metric 5: Currency	Medium	Samples were collected in 2014.
	Metric 6: Spatial and Temporal Variability	Medium	Sampling consisted of 26 pairs of topsoil and cabbage evenly distributed across the area of interest with five subsamples for each sample type, as well as three vertical soil profiles. However, it is unclear if those subsamples were replicates or not.
	Metric 7: Exposure Scenario	High	Samples are taken from vegetables collected from agricultural fields and agricultural soil, which are likely representative of general population exposure.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	No individual data points were provided. Summary statistics for concentration include minimum, maximum, mean, SD, and percent of samples above LOD.
	Metric 9: Quality Assurance	High	QA methods included procedural blank, spiked blank, and sample duplicate processing with every batch of ten samples. No major issues were identified; concentrations of all phthalate esters were blank corrected, and spike recovery rates were between 77.6-108.5%.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Standard deviation of concentration was reported, but the value indicates high variability which was not addressed. Other aspects of variability or uncertainty were minimally discussed.

Overall Quality Determination   Medium

Study Citation:	Ouyang, X., Weiss, J. M., de Boer, J., Lamoree, M. H., Leonards, P. E. (2017). Non-target analysis of household dust and laundry dryer lint using comprehensive two-dimensional liquid chromatography coupled with time-of-flight mass spectrometry. Chemosphere 166:431-437.		
HERO ID:	3455857		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Dust sample not fully specified.
	Metric 2: Analytical Methodology	Low	LOD or LOQ not reported
	Metric 3: Biomarker Selection	N/A	The study is testing for the parent chemical
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Uppsala, Sweden and Netherlands
	Metric 5: Currency	Low	The timing of collection is not specified but references available (Ouyang et al., 2015) and (Ouyang et al., 2016).
	Metric 6: Spatial and Temporal Variability	Medium	Five dust samples and six dryer lint samples
	Metric 7: Exposure Scenario	High	Exposure to household dust
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	No raw data reported
	Metric 9: Quality Assurance	Medium	Deviation, recovery and quality control issues discussed. No control samples.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Accuracy of the analytical technique reported but variability and uncertainty not clearly discussed.

Overall Quality Determination   **Medium**

Study Citation:	Polidoro, B. A., Comeros-Raynal, M. T., Cahill, T., Clement, C. (2017). Land-based sources of marine pollution: Pesticides, PAHs and phthalates in coastal stream water, and heavy metals in coastal stream sediments in American Samoa. Marine Pollution Bulletin 116(1-2):501-507.		
HERO ID:	3466558		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Authors provided a detailed description of sampling process, including information on water and sediment collection sites, equipment, and more.
	Metric 2: Analytical Methodology	High	Extraction methods and Gas Chromatography-Mass Spectrometry (GC–MS) were explained. Recoveries and detection limits were reported in main text and supplemental, respectively.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemicals in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in American Samoa.
	Metric 5: Currency	High	Samples were collected in 2015.
	Metric 6: Spatial and Temporal Variability	Medium	Two water samples were collected from 8 different sites, but it is unclear if those two samples were collected at the same time and place as each other. (Note that composite sediment samples were also taken, but sediment wasn't tested for phthalates).
	Metric 7: Exposure Scenario	High	Study measured the presence of heavy metals and contaminants in coastal streams and surface waters by a landfill originating from multiple sources.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Study provided a graph of maximum concentrations per site but not the exact values. There were no summary statistics.
	Metric 9: Quality Assurance	Low	There was little reporting of QA/QC except for recoveries, which was reported as 40-94% for all phthalates combined.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	There was no characterization of variance or discussion of limitations, uncertainties, and gaps.

Overall Quality Determination   Medium

Study Citation:	Huang, H. B., Pan, W. H., Chang, J. W., Chiang, H. C., Guo, Y. L., Jaakkola, J. J., Huang, P. C. (2017). Does exposure to phthalates influence thyroid function and growth hormone homeostasis? The Taiwan Environmental Survey for Toxicants (TEST) 2013. Environmental Research 153(6):63-72.		
HERO ID:	3466596		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampled population, methods, equipment, storage samples all reported.
	Metric 2:	Analytical Methodology	High	Analytical methods, instrument and LOD reported.
	Metric 3:	Biomarker Selection	High	Biomarker is known to have a relationship with external exposure.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study was conducted in Taiwan.
	Metric 5:	Currency	Medium	Samples were taken from 2013.
	Metric 6:	Spatial and Temporal Variability	Medium	358 in total: 279 adults, 79 minors. No replicates.
	Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenarios, including a questionnaire to identify possible exposures.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics reported. Individual points not reported.
	Metric 9:	Quality Assurance	Low	Analyzed control samples, limited description of QA/QC techniques. Recoveries not reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Characterized variability through different participants sampled. Discussed uncertainties and limitations.

Overall Quality Determination   High

Study Citation:	Gyllenhammar, I., Glynn, A., Jönsson, B. A., Lindh, C. H., Darnerud, P. O., Svensson, K., Lignell, S. (2017). Diverging temporal trends of human exposure to bisphenols and plastizisers, such as phthalates, caused by substitution of legacy EDCs?. Environmental Research 153:48-54.		
HERO ID:	3466597		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Recruitment described briefly and refers to Glynn et al., 2007. Sampling described briefly. Morning spot urine samples weresampled by the mothers themselves in a glass bottle three weeks after delivery and the samples were thereafter stored at −20 °C. Missing approaches to avoid contamination, other than glass bottles.
Metric 2:	Analytical Methodology	Medium	Methods described in Bornehag et al., 2015 and briefly described in the paper, LOD provided. Used liquid chromatography tandem mass spectrometry.
Metric 3:	Biomarker Selection	High	metabolite in urine
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Sweden
Metric 5:	Currency	Medium	2009-2014
Metric 6:	Spatial and Temporal Variability	Medium	n = 174, no replicates
Metric 7:	Exposure Scenario	High	biomonitoring
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Summary tables with mean, median, range, no raw data reported.
Metric 9:	Quality Assurance	Medium	Blanks and controls included. LOD approach described.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Temporal trends and discussed, sources of uncertainty and variability within the measurements not discussed. Spot urine samples are not ideal for assessing temporal trends.

Overall Quality Determination   Medium

| Study Citation: | Wu, W., Zhou, F., Wang, Y., Ning, Y., Yang, J. Y., Zhou, Y. K. (2017). Exposure to phthalates in children aged 5-7years: Associations with thyroid function and insulin-like growth factors. Science of the Total Environment 579:950-956. |
| HERO ID: | 3466600 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Study population briefly described, urine sample collection described
	Metric 2:	Analytical Methodology	Medium	Methods described by Specht et al. (2015), LOD provided in Table S1.
	Metric 3:	Biomarker Selection	High	Metabolite in urine
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	Medium	2013
	Metric 6:	Spatial and Temporal Variability	Medium	n = 216, no replicates
	Metric 7:	Exposure Scenario	High	Biomonitoring
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	GM (geometric mean), 5th, 25th, 50th, 75th, 95th reported
	Metric 9:	Quality Assurance	Medium	Recovery in SI, blanks and QC in all batches included
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   Medium

Study Citation:		Wu, W., Zhou, F., Wang, Y., Ning, Y., Yang, J. Y., Zhou, Y. K. (2017). Phthalate levels and related factors in children aged 6-12 years. Environmental Pollution 220(Pt B):990-996.		
HERO ID:		3469193		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling methods, instrument, storage and study population all reported.
	Metric 2:	Analytical Methodology	High	Analytical methods, instrument and LOD reported.
	Metric 3:	Biomarker Selection	High	Biomarker is known to be related with external exposure.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study site is China.
	Metric 5:	Currency	Medium	Sampling was conducted from January 2014 to July 2014.
	Metric 6:	Spatial and Temporal Variability	Medium	336 total samples from children. No replicates reported.
	Metric 7:	Exposure Scenario	Medium	Data was collected from China in 2014 and the exact source of the exposures are unclear.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics reported. Raw data not reported.
	Metric 9:	Quality Assurance	Medium	QA procedures was reported to be used, however, there is no details of it. Recovery was >90%.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Characterized variability, did not discuss uncertainties and limitations.

Overall Quality Determination   Medium

| | Study Citation: | Al-Saleh, I., Elkhatib, R., Al-Rajoudi, T., Al-Qudaihi, G. (2017). Assessing the concentration of phthalate esters (PAEs) and bisphenol A (BPA) and the genotoxic potential of treated wastewater (final effluent) in Saudi Arabia. Science of the Total Environment 578:440-451. | | |
| | HERO ID: | 3469247 | | |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported
	Metric 2:	Analytical Methodology	High	Key analytical methods reported
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Saudi Arabia
	Metric 5:	Currency	Low	Study published in 2017
	Metric 6:	Spatial and Temporal Variability	High	>10 samples; no replicates
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not provided
	Metric 9:	Quality Assurance	Medium	Limited QA/QC reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Limited gaps and limitations

Overall Quality Determination   Medium

Study Citation:	Choi, W., Kim, S., Baek, Y. W., Choi, K., Lee, K., Kim, S., Yu, S. D., Choi, K. (2016). Exposure to environmental chemicals among Korean adults-updates from the second Korean National Environmental Health Survey (2012-2014). International Journal of Hygiene and Environmental Health 220(2 Pt A):29-35.		
HERO ID:	3469260		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling procedure was described in details, including equipment, storage, and population characteristics.
	Metric 2:	Analytical Methodology	High	Analytical procedure was described. HPLC–MS/MS was used. LODs were reported for individual metabolite: MEHHP, MEOHP, MECPP, MBzP, and MnBP were determined at 0.28, 0.26, 0.34, 0.27, and 0.44 μg/L, respectively (reported in same cohort study with HERO: 3515110).
	Metric 3:	Biomarker Selection	High	Biomarker (metabolite) is derived from exposure to the chemical of interest.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study was conducted in Korea.
	Metric 5:	Currency	Medium	The sampling was conducted from 2012 to 2014.
	Metric 6:	Spatial and Temporal Variability	Medium	In total 6478 samples were collected without replicates. Note that replicates may not be relevant in this study though.
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenario. The sample information included the products used.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Supplementary or raw data are not reported, and therefore summary statistics cannot be reproduced.
	Metric 9:	Quality Assurance	Medium	QA/QC measures were not explicitly discussed, but authors noted the procedures they followed which was published by authoritative sources in Korea and Germany.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	There was some discussion of key uncertainties, limitations, and data gaps have been identified.

Overall Quality Determination   High

Study Citation:	Dereumeaux, C., Saoudi, A., Pecheux, M., Berat, B., de Crouy-Chanel, P., Zaros, C., Brunel, S., Delamaire, C., le Tertre, A., Lefranc, A., Vandentorren, S., Guldner, L. (2016). Biomarkers of exposure to environmental contaminants in French pregnant women from the Elfe cohort in 2011. Environment International 97:56-67.		
HERO ID:	3469298		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Samples were collected according to the protocols defined and validated by a pilot study in 2007, including materials and storage conditions.
Metric 2:	Analytical Methodology	High	Analytical method, LOD, LOQ and Intra day precision are reported in Table 2. Instrument provided also. Analytical performances of biomarker measurements realized in the perinatal component of the French HBM program.
Metric 3:	Biomarker Selection	High	The biomarkers were selected owing to the biomonitoring feasibility, the exposure relevance, the existing regulations for the compounds, and the priorities in terms of health effects.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	National scale monitoring in France.
Metric 5:	Currency	Medium	2011
Metric 6:	Spatial and Temporal Variability	Medium	Large sample size, sampling from June to November. No sample replicates. Spot urine samples taken.
Metric 7:	Exposure Scenario	High	The primary aim of the perinatal component of the French HBM program was to describe internal concentrations of environmental contaminants among pregnant women having given birth in continental France in 2011.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Individual sample concentrations are not reported. Descriptive statistical analyses for each biomarker included: the geometric mean, median, 25th, 75th and 95th percentiles in Table 4.
Metric 9:	Quality Assurance	Low	Laboratory blanks and QC samples (spiked samples) were introduced into each batch of samples (every 10 samples) to verify the accuracy and precision of the measurements at, at least, three concentration levels within the measurement range. No field control samples. Recoveries not reported.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	The study characterizes variability in the community sampled and reports weakness and limitations of the study.

Overall Quality Determination — High

Study Citation:	Müllerová, D., Bouchalová, V., Matějková, D., Kovářová, K., Svačina, Š., Vrbík, K., Pavloušková, J., Dvořáková, J., Müller, L. (2016). Phthalates exposure indicators determined by urinary phthalate metabolites in healthy non-obese Czech adults: FANTOM study. Food Additives & Contaminants: Part A, Chemistry, Analysis, Control, Exposure & Risk Assessment 33(12):1817-1825.		
HERO ID:	3469309		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods (e.g., participant characteristics, urine collection schedule, storage conditions) were reported.
	Metric 2:	Analytical Methodology	Low	LODs/LOQs were not reported.
	Metric 3:	Biomarker Selection	High	Metabolite is specific to DBP.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study was conducted in Czech Republic.
	Metric 5:	Currency	Medium	Samples were collected in 2013.
	Metric 6:	Spatial and Temporal Variability	Medium	Samples were collected from 201 adults without replicates.
	Metric 7:	Exposure Scenario	High	This is a biomonitoring study that aimed to characterize associations between various consumer products, fruits, and meats and urine metabolite levels.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not reported.
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not reported but can be implied through its use of an accredited laboratory that participated in previous quality assessments. References were provided.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations were reported.

Overall Quality Determination   **Medium**

Domain	Metric		Rating	Comments
Study Citation:	James-Todd, T. M., Meeker, J. D., Huang, T., Hauser, R., Ferguson, K. K., Rich-Edwards, J. W., Mcelrath, T. F., Seely, E. W. (2016). Pregnancy urinary phthalate metabolite concentrations and gestational diabetes risk factors. Environment International 96:118-126.			
HERO ID:	3469326			
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	enrollment described, urine collection described
	Metric 2:	Analytical Methodology	Low	All phthalate metabolites were analyzed by National Science Foundation International, Inc. (Ann Arbor, MI) using protocol from the Centers for Disease Control and Prevention described elsewhere (Ferguson et al., 2014a; CDC. (Centers for Disease Control and Prevention), 2005). LOD not provided.
	Metric 3:	Biomarker Selection	High	metabolite in urine
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Boston, U.S.
	Metric 5:	Currency	Medium	2006-2008
	Metric 6:	Spatial and Temporal Variability	High	N = 350
	Metric 7:	Exposure Scenario	High	biomonitoring
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	GM, 25th, 75th
	Metric 9:	Quality Assurance	Low	QA not discussed, no obvious concerns
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	variability captured by different demographic groups; uncertainty not discussed, no obvious concerns

Overall Quality Determination — Medium

Study Citation:	Doherty, B. T., Engel, S. M., Buckley, J. P., Silva, M. J., Calafat, A. M., Wolff, M. S. (2017). Prenatal phthalate biomarker concentrations and performance on the Bayley Scales of Infant Development-II in a population of young urban children. Environmental Research 152(Elsevier):51-58.		
HERO ID:	3469358		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Enrollment and sample collection were described, but missing details such as equipment and collection regimen.
	Metric 2: Analytical Methodology	Medium	Analytical methods were not described but referenced publications where it was: Silva et al., 2008; Kato et al., 2005. LODs were provided.
	Metric 3: Biomarker Selection	High	Metabolite is specific to DBP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study conducted in U.S. (New York).
	Metric 5: Currency	Low	Samples were collected during 1998-2002.
	Metric 6: Spatial and Temporal Variability	Low	Samples were collected from 258 participants without replicates. Spot unpooled urine samples were analyzed from mothers.
	Metric 7: Exposure Scenario	High	This is a biomonitoring study that explained possible sources of exposure, as well as population of interest.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Geometric mean, standard error, and 50th and 95th percentiles were provided but not raw data.
	Metric 9: Quality Assurance	Low	QA/QC was not discussed.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Uncertainties, limitations, and gaps were not discussed.

Overall Quality Determination   **Medium**

Study Citation:	Saini, A., Okeme, J. O., Mark Parnis, J., Mcqueen, R. H., Diamond, M. L. (2016). From air to clothing: characterizing the accumulation of semi-volatile organic compounds to fabrics in indoor environments. Indoor Air 27(3):631-641.		
HERO ID:	3469466		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Study was missing some information such as sample matrix. Equipment for air sampling and collection intervals were described. A previously published paper was cited for further details on air sampling methods.
Metric 2:	Analytical Methodology	Low	LOD/LOQs were not provided.
Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in air and fabric.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Study was performed in Canada.
Metric 5:	Currency	Medium	Samples were collected in 2013.
Metric 6:	Spatial and Temporal Variability	Low	Fabrics were deployed in 20 homes and 5 offices. Air samples were collected weekly for up to 56 days (or 28 - unclear). The study size was unclear, but enough information was provided to infer that there more than 10 samples. Replicates were occasionally collected over the study period.
Metric 7:	Exposure Scenario	High	Exposure to phthalates via dermal contact with clothing and via inhalation of particles that partition to indoor air is relevant.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	Some concentration values and ranges were provided in text. Otherwise, most summary statistics and raw data were missing.
Metric 9:	Quality Assurance	Medium	Blanks, recoveries, and references to other analytical methods for reproducibility were provided. However, recoveries were not reported for most phthalates of interest.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variance and limitations were not presented.

Overall Quality Determination   **Medium**

Study Citation:	Tsai, H. J., Wu, C. F., Tsai, Y. C., Huang, P. C., Chen, M. L., Wang, S. L., Chen, B. H., Chen, C. C., Wu, W. C., Hsu, P. S., Hsiung, C. A., Wu, M. T. (2016). Intake of phthalate-tainted foods and serum thyroid hormones in Taiwanese children and adolescents. Scientific Reports 6:30589.		
HERO ID:	3469519		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Participants in this study provided one-spot urine samples which were aliquoted and stored in a freezer until measurement. No further details on methodology or equipment for sample collection were reported, which may have an impact on results.
	Metric 2: Analytical Methodology	Medium	The study reported following analytical methodology that has been described in detail in other cited studies. Instrumentation was reported, but other details of the method were not described. Method detection limit was reported.
	Metric 3: Biomarker Selection	High	The monoester phthalate metabolite of the parent chemical of interest is measured in urine, which is considered a highly reliable measure of current phthalate exposure. Concentration is further corrected for urine creatinine.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	This study was conducted with participants in Taiwan.
	Metric 5: Currency	Medium	Study participants were collected between August 2012 and January 2013.
	Metric 6: Spatial and Temporal Variability	Low	Single spot urine samples were collected from 240 study participants. Use of replicates was not reported.
	Metric 7: Exposure Scenario	High	This is a biomonitoring study where exposure is presumed to occur through a deliberate addition of certain phthalates to foodstuffs, after which specific event, participants sought medical consultation and responded to a questionnaire designed to estimate exposure from this event.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not reported. Summary statistics include minimum, median, maximum, and other percentiles of concentration of phthalate biomarker.
	Metric 9: Quality Assurance	Low	QA/QC methods were not described but can be inferred from the use of standard laboratory protocols published in other studies.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Quantitative characterization of variability was reported by various percentiles of measured exposure. There is some discussion of limitations, including a time lag that may have resulted in recall bias when completing the exposure questionnaire. Further detail on exposure-specific limitations could have improved the score in this metric.

Overall Quality Determination   Medium

Study Citation:	Moreau-Guigon, E., Alliot, F., Gasperi, J., Blanchard, M., Teil, M. J., Mandin, C., Chevreuil, M. (2016). Seasonal fate and gas/particle partitioning of semi-volatile organic compounds in indoor and outdoor air. Atmospheric Environment 147(Elsevier):423-433.		
HERO ID:	3470397		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Key sampling methods were reported.
Metric 2:	Analytical Methodology	High	Acceptable analytical methods were reported
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	France
Metric 5:	Currency	Medium	Samples collected in 2011 and 2012
Metric 6:	Spatial and Temporal Variability	High	6 samples per indoor environment
Metric 7:	Exposure Scenario	Medium	Exposure source was not well characterized
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data were not reported
Metric 9:	Quality Assurance	High	QA was reported.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Few gaps and limitations were reported.

Overall Quality Determination　　　　　　　High

Study Citation:	Selvaraj, K. K., Mubarakali, H., Rathinam, M., Harikumar, L., Sampath, S., Shanmugam, G., Ramaswamy, B. R. (2016). Cumulative exposure and dietary risk assessment of phthalates in bottled water and bovine milk samples: A preliminary case study in Tamil Nadu, India. Human and Ecological Risk Assessment 22(5):1166-1182.		
HERO ID:	3479504		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	sampling described
	Metric 2:	Analytical Methodology	High	method described by Selvaraj et al. (2015). Equipment described. MDL and LOQ provided.
	Metric 3:	Biomarker Selection	N/A	environmental
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	India
	Metric 5:	Currency	High	Collected in 2015
	Metric 6:	Spatial and Temporal Variability	Medium	n = 21, no replicates
	Metric 7:	Exposure Scenario	Medium	water bottles and cow milk
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	maximum concentrations in Table 2, averages in Figure 1 and 2. No raw data.
	Metric 9:	Quality Assurance	High	Spike recovery, method blanks, calibration, MDL, and LOQ described.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	variability and uncertainty discussed using statistical analysis and PCA, unclear if the selected samples represent the general population or just specific locations. No obvious concerns

Overall Quality Determination   High

Study Citation:	Hu, X., Gu, Y., Huang, W., Yin, D. (2016). Phthalate monoesters as markers of phthalate contamination in wild marine organisms. Environmental Pollution 218:410-418.		
HERO ID:	3479523		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	"Random" collection of marine animals. How the fish, mollusks and prawn were grabs was not described; handling and lab storage described; muscle (and liver, kidney, gills, and bile from fish) homogenized for analysis. Fish characteristics reported in Supplemental Information. Each fish was a sample except for yellow croakers, was a pool of 5-20 fish, range is too large and should have been accounted. Mollusks and prawns samples were pooled from 5-10 g, unclear how many singulars mollusks and prawns is that.
Metric 2:	Analytical Methodology	High	Analytic standards obtained (purities >98%); spiked matrix blanks; ultra-clean techniques. Ultrasonic liquid extraction (USE) followed by LC-MS/MS and GC-MS/MS. Previous reference (HERO 2713581) described methods development.
Metric 3:	Biomarker Selection	High	Both parent compound and primary metabolite (monoalkyl phthalate) measured in marine animals.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	China, Yangtze River Delta - coastal areas East China Sea
Metric 5:	Currency	Medium	2013, June to December
Metric 6:	Spatial and Temporal Variability	High	8 locations; 69 fish from 18 species (with individual fish analyzed separately except for 1 species).
Metric 7:	Exposure Scenario	High	Exposure of marine fish and shellfish near industrialized city.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	A total of 19 single data points reported; remaining samples reported for two or more individuals per species per location with concentration mean, SD, n, % detection, and range (ng/g ww) reported.
Metric 9:	Quality Assurance	High	HERO 2713581: Method validated by assessment of linearity, MDLs, matrix effects, accuracy, and precision with replicates of calibration samples and reagent blanks. Phthalate-free matrices not available, so QC performed using low, medium, and high reagent blanks (5, 25, and 50 ng/g of compound); intra and inter-day variation evaluated.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Discussion different sources of variation and uncertainty (e.g., trophic level, feeding habits, possible metabolism, analytic method) for results. Spatial variation covered by sampling design.

Overall Quality Determination   **High**

Study Citation:	Yang, J. F., Yang, L. M., Zheng, L. Y., Ying, G. G., Liu, C. B., Luo, S. L. (2017). Phthalates in plastic bottled non-alcoholic beverages from China and estimated dietary exposure in adults. Food Additives and Contaminants: Part B: Surveillance 10(1):44-50.		
HERO ID:	3515163		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling methods were explained in some detail, but a few aspects of the sampling methods were not reported, such as sampler calibration.
	Metric 2: Analytical Methodology	High	Key aspects of the analytical methods were reported, including limits of detection, instrumentation, recovery percentages, etc.
	Metric 3: Biomarker Selection	N/A	Samples were of parent chemicals in liquids within plastic bottles.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	China
	Metric 5: Currency	High	Samples were collected in 2015.
	Metric 6: Spatial and Temporal Variability	High	There were 69 samples and two duplicates from each brand of beverage.
	Metric 7: Exposure Scenario	High	The authors estimated the daily intake of six phthalates by the Chinese population from drinking bottled beverages, based on the data they collected.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not reported, but ranges, means, and medians were reported.
	Metric 9: Quality Assurance	High	Key aspects of the QA/QC were reported, including recoveries, blanks, and duplicates.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Although a few limitations of the study were identified, key aspects of variability and uncertainty were not well characterized.

Overall Quality Determination   High

Study Citation:	Chang, W. H., Wu, M. H., Pan, H. A., Guo, P. L., Lee, C. C. (2017). Semen quality and insulin-like factor 3: Associations with urinary and seminal levels of phthalate metabolites in adult males. Chemosphere 173:594-602.		
HERO ID:	3519878		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Urine, blood, and semen samples were collected from the malepartners of subfertile (n = 253) and fertile (n = 37) couples in a reproductive center in southern Taiwan. Sample collection described
	Metric 2:	Analytical Methodology	Medium	Analytical methodology used was LC-MS/MS and quality controls were driven as previously described (Chang et al., 2015), but briefly and adequately described. LOD in SI. Missing analytical QA/QC mention or brief description.
	Metric 3:	Biomarker Selection	High	metabolite in urine and semen
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Taiwan
	Metric 5:	Currency	Medium	2010-2014
	Metric 6:	Spatial and Temporal Variability	Medium	n = 37, 124, and 129, no replicates; urine samples morning void
	Metric 7:	Exposure Scenario	High	biomonitoring
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	geometric mean and geometric mean SD
	Metric 9:	Quality Assurance	Low	QA not discussed, no obvious concerns
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   Medium

Study Citation:	Rocha, B. A., Asimakopoulos, A. G., Barbosa, F., Kannan, K. (2017). Urinary concentrations of 25 phthalate metabolites in Brazilian children and their association with oxidative DNA damage. Science of the Total Environment 586:152-162.		
HERO ID:	3531624		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Limited description of sampling methodology.
Metric 2:	Analytical Methodology	High	Well described analytical methods, reported LOD.
Metric 3:	Biomarker Selection	High	Biomarkers are known to be related with external exposure.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Brazil
Metric 5:	Currency	Medium	Samples from 2012-2013.
Metric 6:	Spatial and Temporal Variability	Low	300 samples, no replicates.
Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenario.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Summary statistics only.
Metric 9:	Quality Assurance	High	Detailed QA/QC techniques.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Characterized variability, did not discuss uncertainties and limitations.

Overall Quality Determination   High

Study Citation:	Chen, C. F., Chen, C. W., Ju, Y. R., Dong, C. D. (2016). Determination and assessment of phthalate esters content in sediments from Kaohsiung Harbor, Taiwan. Marine Pollution Bulletin 124(2):767-774.		
HERO ID:	3540854		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Details of the sampling procedures, locations, and sample storage have been reported elsewhere (Dong et al., 2015a). Brief description: Surface sediment (0–15 cm) samples were collected at 20 sampling points. Missing mention of sampling efforts to avoid phthalate contamination from materials and person collecting sample. Description of sampling location and sites provided, and shown in Figure 1.
	Metric 2:	Analytical Methodology	High	Use gas chromatography mass spectrometry was used for the analysis of the samples. Five-point calibration curve (2 to 10 ng), procedural blank, check standard, sample duplicates, and certified reference materials were carried out for all samples. Detection limits reported.
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Kaohsiung Harbor, Taiwan.
	Metric 5:	Currency	Medium	Samples collected in 2013.
	Metric 6:	Spatial and Temporal Variability	Medium	80 samples; no replicates.
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not provided.
	Metric 9:	Quality Assurance	High	Key QA reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Key gaps and limitations not well characterized.

Overall Quality Determination   **Medium**

Study Citation:	Tordjman, K., Grinshpan, L., Novack, L., Göen, T., Segev, D., Beacher, L., Stern, N., Berman, T. (2016). Exposure to endocrine disrupting chemicals among residents of a rural vegetarian/vegan community. Environment International 97(Elsevier):68-75.		
HERO ID:	3540861		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Subjects then provided a spot urine sample. All collection and storage equipment was BPA and phthalate-free. Each subject filled in a detailed 61-item health, lifestyle and eating practice questionnaire, see supplemental. Key sampling methods reported, storage and contamination avoidance reported.
	Metric 2: Analytical Methodology	Medium	The analytical procedure consisted of a multidimensional liquidchromatography tandem mass spectrometry method (LC-MS/MS). Some analytical methods not reported, such as recovery samples. LOD reported in supplemental information.
	Metric 3: Biomarker Selection	Medium	Acceptable biomarker
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Israel
	Metric 5: Currency	Medium	Samples collected in 2013 and 2014
	Metric 6: Spatial and Temporal Variability	Medium	42 Amirim residents (29 vegetarians/13 vegans; 24 women/18men; no replicates
	Metric 7: Exposure Scenario	Medium	Exposure to phthalates from diet, although other sources not well characterized
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	raw data not reported
	Metric 9: Quality Assurance	Low	Limited QA reported. Some reported in the text and supplemental information, but missing calibration, recoveries, blanks.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Key limitations reported

Overall Quality Determination   Medium

Study Citation:	Fan, G., Xie, J., Yoshino, H., Yanagi, U., Hasegawa, K., Kagi, N., Liu, J. (2017). Environmental conditions in homes with healthy and unhealthy schoolchildren in Beijing, China. Building and Environment 112:270-284.		
HERO ID:	3841179		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling approaches described, samplers reported.
Metric 2:	Analytical Methodology	Low	no information on instrument calibration, recovery samples, or limits of detection/quantification; field measurements
Metric 3:	Biomarker Selection	N/A	NA - biomarker not needed for air, dust and particulate samples
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Beijing, China
Metric 5:	Currency	Medium	sampling took place in 2013
Metric 6:	Spatial and Temporal Variability	Medium	lack of temporal variability since authors did not use continuous sampling methods for chemicals of interest; however, did take samples from multiple parts of the home
Metric 7:	Exposure Scenario	Medium	authors told study participants not to clean or cook during the time of sampling, which may have influenced field measurement values
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	lack of monitoring data tables; results scattered across the text; did not report standard deviation or variance for summary statistics; did not report detection frequency
Metric 9:	Quality Assurance	Low	QA process not directly discussed; did not test or report sample recoveries
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	limited discussion on uncertainty from potential issues with the analytical method or exposure scenario; no standard deviation or variance reported

Overall Quality Determination   Medium

| **Study Citation:** | Hu, J., Li, N., Yoshino, H., Yanagi, U., Hasegawa, K., Kagi, N., He, Y., Wei, X. (2017). Field study on indoor health risk factors in households with schoolchildren in south-central China. Building and Environment 117:260-273. |
| **HERO ID:** | 3841180 |

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methods and approaches were described in detail in Table 2.
	Metric 2: Analytical Methodology	Low	Analytical methods were mentioned, but the process was minimally described.
	Metric 3: Biomarker Selection	N/A	They did not test for biomarkers, as they were not needed.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Changsha, China
	Metric 5: Currency	Medium	Samples were collected in 2013
	Metric 6: Spatial and Temporal Variability	Medium	Samples were collected in 10 households, from various rooms within households. No replicates were reported
	Metric 7: Exposure Scenario	High	Samples were collected from indoor environments.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Summary statistics were reported in figures and within text, including ranges, minimum, maximum, and averages in Table 3. Raw data were not reported.
	Metric 9: Quality Assurance	Low	No information on QA/QC techniques, analytical blanks, nor recoveries.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Characterized variability between seasons and the uncertainty sources were discussed.

Overall Quality Determination   Medium

		Study Citation:	Chepchirchir, B. S., Paschke, A., Schüürmann, G. (2017). Passive sampling for spatial and temporal monitoring of organic pollutants in surface water of a rural-urban river in Kenya. Science of the Total Environment 601-602:453-460.

HERO ID: 3841181

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Limited information on sample storage conditions to avoid contamination
	Metric 2: Analytical Methodology	High	well described methods, reported detection limits and further details in supplementary material
	Metric 3: Biomarker Selection	N/A	NA - surface water no biomarker needed
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Kenya
	Metric 5: Currency	Medium	January - February 2014
	Metric 6: Spatial and Temporal Variability	Medium	7 sampling sites, sampled in two campaigns, no replicates.
	Metric 7: Exposure Scenario	Low	Limited exposure relevant data e.g. population of interest and microenvironment
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	individual concentrations and summary statistics reported
	Metric 9: Quality Assurance	High	Reported recoveries, analyzed field and laboratory controls
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Study provided a good level of characterization of variability, uncertainties and limitations

Overall Quality Determination — High

Study Citation: Albar, H., Ali, N., Shahzad, K., Ismail, I. M. I., Rashid, M. I., Wang, W.,ei, Ali, L. N., Eqani, S. (2017). Phthalate esters in settled dust of different indoor microenvironments; Source of non-dietary human exposure. Microchemical Journal 132:227-232.

HERO ID: 3859024

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Dust samples collected from three different microenvironments (cars, air conditioner (AC) filters and house-hold floor dust) of Saudi Arabia (KSA) and Kuwait. Used vacuum cleaner to collect dust samples. Approaches to avoid contamination reported. More details in supplemental information.
Metric 2:	Analytical Methodology	Medium	Some analytical methods not reported, such as recovery samples
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Saudi Arabia (KSA) and Kuwait
Metric 5:	Currency	Medium	Data collected between 2011-12 (Saudi Arabia) and 2014-15 (Kuwait)
Metric 6:	Spatial and Temporal Variability	Medium	Although replicates were not collected, samples were extracted in triplicate.
Metric 7:	Exposure Scenario	High	Indoor dust environments cars, air conditioners, and household floor dust.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	raw data not reported
Metric 9:	Quality Assurance	Medium	Analytical QA/QC was described, but not all reported, missing recoveries.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Uncertainty and variability sources discussed.

Overall Quality Determination   High

Study Citation:	Ipapo, K. N., Factor-Litvak, P., Whyatt, R. M., Calafat, A. M., Diaz, D., Perera, F., Rauh, V., Herbstman, J. B. (2017). Maternal prenatal urinary phthalate metabolite concentrations and visual recognition memory among infants at 27 weeks. Environmental Research 155:7-14.		
HERO ID:	3859030		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	participants and sampling described briefly, spot urine samples from mothers
Metric 2:	Analytical Methodology	Medium	methods previously described (Kato et al., 2005); LOD provided.
Metric 3:	Biomarker Selection	High	metabolite in urine
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	U.S.
Metric 5:	Currency	Low	1998-2006
Metric 6:	Spatial and Temporal Variability	Medium	n = 168, no replicates, urine spot samples
Metric 7:	Exposure Scenario	High	biomonitoring
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	geometric mean, 95%CI, range, %<LOD, 25%, median, 75%
Metric 9:	Quality Assurance	Low	QA not discussed, no obvious concerns
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   Medium

Study Citation:	Lee, K. M., Kho, Y., Kim, P. G., Park, S. H., Lee, J. H. (2017). Urinary levels of phthalate metabolites and associations with demographic characteristics in Korean adults. Environmental Science and Pollution Research 24(17):14669-14681.		
HERO ID:	3859032		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Most key criteria met. Duration of sample storage data lacking.
	Metric 2: Analytical Methodology	Medium	Most key criteria met, chemical-specific LOD's reported.
	Metric 3: Biomarker Selection	Low	Sampling for metabolites not specific for parent chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples provided by participants in South Korea.
	Metric 5: Currency	High	Samples collected in 2009.
	Metric 6: Spatial and Temporal Variability	Medium	Sampling strategy based upon random sample of national census data, single spot urine samples collected, distributions across rural and urban, age group, gender and other demographics provided.
	Metric 7: Exposure Scenario	Medium	Participant characteristics summarized, potential for occupational exposure described, lack of information on pre-exposure or control samples.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Most key criteria met; lack of raw data.
	Metric 9: Quality Assurance	Medium	Quality assurance procedures minimally described with some key criteria met; lack of recovery data.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability characterized within summary statistics, potential study limitations, including occupational exposure, discussed.

Overall Quality Determination   **Medium**

Study Citation:	Chen, Q., Yang, H., Zhou, N., Sun, L., Bao, H., Tan, L., Chen, H., Ling, X., Zhang, G., Huang, L., Li, L., Ma, M., Yang, H., Wang, X., Zou, P., Peng, K., Liu, T., Shi, X., Feng, D., Zhou, Z., Ao, L., Cui, Z., Cao, J. (2017). Phthalate exposure, even below US EPA reference doses, was associated with semen quality and reproductive hormones: Prospective MARHCS study in general population. Environment International 104(Elsevier):58-68.		
HERO ID:	3859041		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampled participants, equipment and storage described. However, sampling methods are only briefly discussed, and missing detail may have a substantial impact on results.
	Metric 2: Analytical Methodology	High	Analytical instrumentation and methods are discussed in detail and are scientifically sound. LOD is reported.
	Metric 3: Biomarker Selection	Medium	The monoester phthalate analyte is a metabolite of multiple parent chemicals, not just the chemical of interest, and there is not a stated method to apportion the estimate to only the chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was conducted in China.
	Metric 5: Currency	Medium	The study was conducted in June 2013 and June 2014.
	Metric 6: Spatial and Temporal Variability	Medium	One urine spot sample was collected at one timepoint from 796 participants without the use of replicates. 656 participants provided second samples one year later.
	Metric 7: Exposure Scenario	Medium	The study is measuring phthalates in men with demographics given. However, the source of exposure is unclear.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual data points are not reported; summary statistics include percentage of samples above LOD, mean, minimum, maximum, and percentiles (5, 25, 50, 75, 95) of concentration.
	Metric 9: Quality Assurance	Medium	QA/QC techniques are not directly discussed except for reporting of recovery for each metabolite (between 81.6% and 105.5%).
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	The relative standard deviation for each metabolite was reported to be below 10%, indicating low variability. Limitation/sources of uncertainty are also briefly discussed.

Overall Quality Determination   Medium

Study Citation:	Yang, T. C., Peterson, K. E., Meeker, J. D., Sánchez, B. N., Zhang, Z., Cantoral, A., Solano, M., Tellez-Rojo, M. M. (2017). Bisphenol A and phthalates in utero and in childhood: association with child BMI z-score and adiposity. Environmental Research 156:326-333.		
HERO ID:	3859043		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Participant characteristics and urine sampling were described.
	Metric 2: Analytical Methodology	Medium	Method details were mostly described elsewhere (Lewis et al., 2013; Calafat et al., 2008; Silva et al., 2007). The methods were modified based on an unspecified validated CDC method.
	Metric 3: Biomarker Selection	High	MBP is specific to DBP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was conducted in Mexico.
	Metric 5: Currency	Medium	Samples were collected in 2012.
	Metric 6: Spatial and Temporal Variability	Low	Authors collected 223 prenatal urine samples and 242 urine samples from children. Only a spot (second morning void) was collected.
	Metric 7: Exposure Scenario	High	This is a biomonitoring study were exposure to children occurred in-utero.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Summary statistics included geometric mean, SD, min, max, 25th, 50th, 75th percentiles. No raw data were provided.
	Metric 9: Quality Assurance	Low	Specific-gravity was accounted for, but QA/QC techniques were mostly not discussed.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Some limitations were reported toward the end of Discussion.

Overall Quality Determination   Medium

| | Study Citation: | Sobolewski, M., Weiss, B., Martin, M., Gurven, M., Barrett, E. (2017). Toxicoanthropology: Phthalate exposure in relation to market access in a remote forager-horticulturalist population. International Journal of Hygiene and Environmental Health 220(5):799-809. |
| | HERO ID: | 3859047 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Participants and sampling described, not much detail about urine sampling timing.
	Metric 2:	Analytical Methodology	Medium	Method briefly described with further details cited in Silva et al., 2007. LOD reported in Table 1.
	Metric 3:	Biomarker Selection	High	Metabolite in urine.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Bolivia
	Metric 5:	Currency	Medium	2008-2009
	Metric 6:	Spatial and Temporal Variability	Medium	n = 59, no replicates, limited details about urine sampling timing.
	Metric 7:	Exposure Scenario	High	Biomonitoring
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	25th, median, 75th.
	Metric 9:	Quality Assurance	Low	QA not discussed, no obvious concerns.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Variability and uncertainty including factors leading to metabolite variation and study limitations discussed.

Overall Quality Determination   Medium

Study Citation:	Sakhi, A. K., Sabaredzovic, A., Cequier, E., Thomsen, C. (2017). Phthalate metabolites in Norwegian mothers and children: Levels, diurnal variation and use of personal care products. Science of the Total Environment 599-600:1984-1992.		
HERO ID:	3859057		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Participants and sampling described. Approaches to avoid contamination reported. Urine samples from mother and child. Morning void urine sample and evening samples. A subset provided daily spot urine samples.
Metric 2:	Analytical Methodology	Medium	Methods described else where (Sabaredzovic et al., 2015) and briefly described in text. LOD provided in S1. Reported using QA/QC, some is shown, nothing about calibration.
Metric 3:	Biomarker Selection	High	metabolite in urine
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Norway
Metric 5:	Currency	Medium	2012
Metric 6:	Spatial and Temporal Variability	Medium	n = 23 to 48 depending on timepoint, no replicates
Metric 7:	Exposure Scenario	High	biomonitoring
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	median, min, max
Metric 9:	Quality Assurance	Low	QA not discussed, no obvious concerns
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination　　　　　Medium

Study Citation:	Šidlovská, M., Petrovičová, I., Kolena, B., Pilka, T., Šovčíková, E., Trnovec, T. (2017). Exposure of children to phthalates and the impact of consumer practices in Slovakia. Reviews on Environmental Health 32(1-2):211-214.		
HERO ID:	3859080		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Participants and sampling described only briefly. Some information such as urine collection equipment and storage duration was missing.
Metric 2:	Analytical Methodology	Low	Authors cited previously reported method by Pilka et al. LODs/LOQs were not provided.
Metric 3:	Biomarker Selection	High	MiBP is specific to DiBP.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples were collected in Slovakia.
Metric 5:	Currency	Low	Only a publication year of 2017 was provided.
Metric 6:	Spatial and Temporal Variability	Low	The study consisted of 107 children. No sample replicates were collected, and authors reported only urine spot samples.
Metric 7:	Exposure Scenario	High	This is a biomonitoring where exposure occurs through the widespread use of phthalates.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	No raw data were provided.
Metric 9:	Quality Assurance	Low	Authors did not discuss their QA/QC protocol.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Standard deviation was provided in Table 1. There was no discussion of limitations, gaps, or uncertainties.

Overall Quality Determination   Medium

Study Citation:	González-Mariño, I., Rodil, R., Barrio, I., Cela, R., Quintana, J. B. (2017). Wastewater-based epidemiology as a new tool for estimating population exposure to phthalate plasticizers. Environmental Science & Technology 51(7):3902-3910.		
HERO ID:	3859087		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Key sampling methods reported. Wastewater from various plants, collected by automatic samplers operating in time proportional mode
	Metric 2: Analytical Methodology	High	Key analytical methods reported. Used liquid chromatography-tandem mass spectrometry (LC−MS/MS) for analysis of samples. Limits of quantification reported in text.
	Metric 3: Biomarker Selection	High	Metabolites in wastewater, see table 1 for matching of metabolites to parent chemical.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Spain
	Metric 5: Currency	High	Samples collected in 2015 and 2016
	Metric 6: Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7: Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	Raw data reported
	Metric 9: Quality Assurance	High	Analytical QA/QC reported
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Few gaps and limitations reported

Overall Quality Determination   High

Study Citation:	Saeed, T., Al-Jandal, N., Abusam, A., Taqi, H., Al-Khabbaz, A., Zafar, J. (2017). Sources and levels of endocrine disrupting compounds (EDCs) in Kuwait's coastal areas. Marine Pollution Bulletin 118(1-2):407-412.		
HERO ID:	3859095		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Authors provided a detailed description of sampling sites, methodology (e.g., equipment, storage), and processing methods (mostly relevant to sediments).
	Metric 2: Analytical Methodology	Low	Detection limits were not reported.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemicals in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Kuwait.
	Metric 5: Currency	High	Samples were collected during 2015-2016.
	Metric 6: Spatial and Temporal Variability	Medium	A total of 41 samples (14, 12, 15) were collected without replicates from the inflow and outflow of three water treatment plants. Sediment and seawater were collected once from each of five different locations. No replicates were reported.
	Metric 7: Exposure Scenario	High	Phthalates in seawater/coastal areas near sewage treatment is relevant
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data provided for phthalates levels at the 3 treatment plants in Tables S2-S4. Tables 3-4 show raw data for seawater and marine samples. Summary statistics were missing though.
	Metric 9: Quality Assurance	Medium	Authors reported that about 10% of samples were duplicated, and recovery standards were incorporated. Recoveries were reported in Table S1 and acceptable.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	No measures of variance were provided, but raw data were available. There was no discussion about limitations.

Overall Quality Determination   Medium

Study Citation:	Chi, C., Xia, M., Zhou, C., Wang, X., Weng, M., Shen, X. (2017). Determination of 15 phthalate esters in air by gas-phase and particle-phase simultaneous sampling. Journal of Environmental Sciences 55:137-145.		
HERO ID:	3859102		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling method, equipment, and conditions were described.
	Metric 2:	Analytical Methodology	High	GCMS was used to perform the analysis. MDL and IDL were reported for each chemical for 2 phases - gas and particle.
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study only reported that 4 different kinds of microenvironments were collected, but no specific locations were reported.
	Metric 5:	Currency	Low	No sampling date or publication date is provided - 2016.
	Metric 6:	Spatial and Temporal Variability	High	The number of air samples collected from busses, subways, taxis and private cars was 105, 40, 30, 60, respectively.
	Metric 7:	Exposure Scenario	High	Exposure matrix was relevant - indoor air from different kinds of traffic microenvironments.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Mean concentrations were reported with range, no individual data were reported.
	Metric 9:	Quality Assurance	High	QA/QC was performed, recovery rate were all above 90%.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	The study had a robust discussion of variability and the sampling methods.

Overall Quality Determination   High

Study Citation:		Mailler, R., Gasperi, J., Patureau, D., Vulliet, E., Delgenes, N., Danel, A., Deshayes, S., Eudes, V., Guerin, S., Moilleron, R., Chebbo, G., Rocher, V. (2017). Fate of emerging and priority micropollutants during the sewage sludge treatment: Case study of Paris conurbation. Part 1: Contamination of the different types of sewage sludge. Waste Management 59:379-393.	
HERO ID:		3859167	

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	sludge from three sludge treatment plants; characteristics of each plant and waste/treatment type provided in Table S1 and S2; each sludge type (raw sludge (RS), centrifuged sludge (CS), digested sludge (DS), thermally dried sludge (TS) and sludge cake (SC), centrifuged (CW) and condensed water (TDW)) sampled 6 times at inlet and outlet; sampling equipment, strategy, and storage not discussed
	Metric 2:	Analytical Methodology	High	Tables S3, S4, and 1 provide extraction, analytical standard, recoveries; LOQ
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Paris, France
	Metric 5:	Currency	Medium	April 2014
	Metric 6:	Spatial and Temporal Variability	Medium	n=3-7 campaigns; 3 plants; only monitored in April 2014
	Metric 7:	Exposure Scenario	High	concentration in different kinds of sludge (raw, centrifuged, digested, thermally dried sludge and sludge cake); untreated and treated; also concentration in sludge liquors
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	discussed Section 3.2.5, Fig 3, Table 4; Table S7 provides mean, std, and range per sludge type
	Metric 9:	Quality Assurance	Medium	Table S3 provides recoveries (75%); no further discussion of QA/QC
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	compares concentration between sludge type and between the different compounds; also compares to previously published papers

Overall Quality Determination   **Medium**

Study Citation:	Li, R., Liang, J., Duan, H., Gong, Z. (2017). Spatial distribution and seasonal variation of phthalate esters in the Jiulong River estuary, Southeast China. Marine Pollution Bulletin 122(1-2):38-46.		
HERO ID:	3859571		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Samples were collected from 15 sites along the salinity gradient in the river estuary during Aug, April, and January (Fig 1). Water samples were collected from the top layer (0-20cm) in 10L stainless steel barrel and filtered to separate SPM from water and stored at 4C. SPM was free-dried. The top 0-10cm of sediment was collected with grab sampler, stored in glass jar at 4C, freeze-dried at -20C for 72 hours, ground, and sieved. Plastic equipment was avoided to minimize contamination.
	Metric 2:	Analytical Methodology	Medium	Methods used included SPE and GC-MS. Recoveries were reported, but only ranges were provided (pg 40) for LOQs.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in various environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected from the Jiulong River estuary, Fujian, Southeast China.
	Metric 5:	Currency	High	Samples were collected in April and August (2014) and January (2015).
	Metric 6:	Spatial and Temporal Variability	Medium	15 sites were sampled in normal (April), wet (August), and dry (January) seasons. Each site was sampled once person season without replicates.
	Metric 7:	Exposure Scenario	High	Study measured phthalate concentrations in river water, suspended particulate matter, and sediment of an estuary affected by river runoff, sewage discharge, agriculture, tourist industry and shipping. The spatial distribution and seasonal variations were also evaluated. This scenario is relevant to local communities who use the estuary.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Tables 1-3 provide range, mean, median, n, and DF for each media in wet, medium, and dry season. No raw data were available.
	Metric 9:	Quality Assurance	High	The range of recoveries was provided on p. 40 (section 2.4) were acceptable. Authors also reported analyzing sample duplicate, procedural blank, and spiked blank.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variance was characterized with range but only minimal discussion of limitations and uncertainties.

Overall Quality Determination   High

| | Study Citation: | Subedi, B., Sullivan, K. D., Dhungana, B. (2017). Phthalate and non-phthalate plasticizers in indoor dust from childcare facilities, salons, and homes across the USA. Environmental Pollution 230:701-708. |
| | HERO ID: | 3860935 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methods, materials, location, time and storage conditions reported.
	Metric 2:	Analytical Methodology	Medium	Analytical methods, instrument and LOD reported as a range.
	Metric 3:	Biomarker Selection	N/A	Concentrations reported in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples taken from South Dakota, Ohio, Indiana, Kentucky, Texas, Maryland, California and Massachusetts.
	Metric 5:	Currency	High	Samples taken in 2016.
	Metric 6:	Spatial and Temporal Variability	Medium	12 childcare facility samples, 5 salon samples, 11 home samples taken. No replicates were taken.
	Metric 7:	Exposure Scenario	High	The study represents indoor air exposure for the general population.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual points reported. Summary stats not reported.
	Metric 9:	Quality Assurance	High	QA/QC reported in detail. Recoveries over 100% reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	No gaps nor limitations reported. Variability accounted for in different settings sampled.

Overall Quality Determination — High

Study Citation:	Le Coadou, L., Le Ménach, K., Labadie, P., Dévier, M. H., Pardon, P., Augagneur, S., Budzinski, H. (2017). Quality survey of natural mineral water and spring water sold in France: Monitoring of hormones, pharmaceuticals, pesticides, perfluoroalkyl substances, phthalates, and alkylphenols at the ultra-trace level. Science of the Total Environment 603-604:651-662.		
HERO ID:	3864659		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling equipment and methods are described in sufficient detail, but certain aspects (e.g. duration of storage) were absent that are unlikely to have a substantial impact on results.
Metric 2:	Analytical Methodology	High	Analytical instrumentation and methods are described in sufficient detail and are scientifically sound. LOQ is reported for each analyte in Table S1.
Metric 3:	Biomarker Selection	N/A	This study is testing for the parent chemical of interest in an environmental medium.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples were collected for bottled water sold in France, but the actual source of the water were located in France, New Caledonia, Reunion Island, Luxembourg, and Italy.
Metric 5:	Currency	Medium	Samples were collected in 2013.
Metric 6:	Spatial and Temporal Variability	Medium	40 brands of bottled water were sampled without replicates.
Metric 7:	Exposure Scenario	High	Samples were collected directly after the bottling process and are a good representation of exposure to the consumer.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	N/A	All results for phthalates were below the limit of quantification. Therefore, there were no data to report or summarize statistically.
Metric 9:	Quality Assurance	High	QA/QC measures included the use of blanks, control samples, internal standards, and external calibration (in order to prevent internal phthalates contamination) in procedures documented by other references.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Because all samples were below LOQ, no characterization of variability could be reported. A robust discussion demonstrated minimal uncertainties from the analytical process.

Overall Quality Determination   High

Study Citation:	Messerlian, C., Bellinger, D., Mínguez-Alarcón, L., Romano, M. E., Ford, J. B., Williams, P. L., Calafat, A. M., Hauser, R., Braun, J. M. (2017). Paternal and maternal preconception urinary phthalate metabolite concentrations and child behavior. Environmental Research 158:720-728.		
HERO ID:	3972244		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Pertinent sampling methods (e.g., participants characteristics, sampling periods, equipment, and storage) were described.
	Metric 2: Analytical Methodology	Medium	Analytical method identified as solid phase extraction-high performance liquid chromatography-isotope dilution tandem mass spectrometry with a reference to Silva et al., 2007. No further details were provided. LOD provided in SI.
	Metric 3: Biomarker Selection	High	MnBP is specific to DnBP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Participants were from the US.
	Metric 5: Currency	Low	It is unclear when urine samples were taken from mothers and fathers, but could have started as early as 2004 and lasted through 2015. Scoring low because of the uncertainty and wide time period for sample collection.
	Metric 6: Spatial and Temporal Variability	Low	More than 100 samples were collected at different points in preconception among women and men. There was no report of replicates. Multiple spot urine samples were collected, and it is unclear if they were pooled or not (likely not).
	Metric 7: Exposure Scenario	High	This is a biomonitoring study.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Table 1A of SI provides detection frequency, GM, GSD, median, and IQR. Raw data were not provided.
	Metric 9: Quality Assurance	Medium	Urine dilution was accounted with specific gravity. However, little else QA/QC methods were described.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Variance characterized with geometric standard deviation and IQR. Limitations described in Discussion.

Overall Quality Determination   **Medium**

Study Citation:	Huang, Y. F., Pan, W. C., Tsai, Y. A., Chang, C. H., Chen, P. J., Shao, Y. S., Tsai, M. S., Hou, J. W., Lu, C. A., Chen, M. L. (2017). Concurrent exposures to nonylphenol, bisphenol A, phthalates, and organophosphate pesticides on birth outcomes: A cohort study in Taipei, Taiwan. Science of the Total Environment 607-608:1126-1135.		
HERO ID:	3972262		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods (e.g., participant characteristics, equipment, storage) were reported.
	Metric 2:	Analytical Methodology	Medium	Extraction and analytical methods were reported, as well as LODs and recoveries. However, analytical methods were brief as only a reference was provided.
	Metric 3:	Biomarker Selection	High	MnBP is specific to DnBP.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Participants were in Taiwan.
	Metric 5:	Currency	Medium	Samples collected in 2010.
	Metric 6:	Spatial and Temporal Variability	Medium	162 women provided three spot urine samples with no replicates, but only 112 of them were analyzed for phthalates due to small sample volume. Urine samples were pooled.
	Metric 7:	Exposure Scenario	High	This is a biomonitoring study where widespread exposure occurs through use of a variety of products, etc
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not reported.
	Metric 9:	Quality Assurance	High	QA/QC methods were reported (e.g., blank and spiked samples, recoveries which were acceptable, creatinine analysis).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Some gaps and limitations were reported at the end of Discussion. Variance characterized with range.

Overall Quality Determination   High

Study Citation:	Watkins, D. J., Sánchez, B. N., Téllez-Rojo, M. M., Lee, J. M., Mercado-García, A., Blank-Goldenberg, C., Peterson, K. E., Meeker, J. D. (2017). Impact of phthalate and BPA exposure during in utero windows of susceptibility on reproductive hormones and sexual maturation in peripubertal males. Environmental Health 16(1):69.		
HERO ID:	3972348		

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	participant information and sampling summary provided. Measures to avoid sampling phthalate contamination missing
	Metric 2:	Analytical Methodology	Medium	LOD provided; analysis conducted at NSF International. Missing QA/QC.
	Metric 3:	Biomarker Selection	High	metabolite in urine
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Mexico
	Metric 5:	Currency	Low	1997 to 2004
	Metric 6:	Spatial and Temporal Variability	Medium	n = 199 to 229 depending on visit, no replicates, urine morning void
	Metric 7:	Exposure Scenario	High	Biomonitoring
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	GM, GSD, max provided
	Metric 9:	Quality Assurance	Low	QA not discussed, no obvious concerns
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   Medium

Study Citation:	Kim, J. I., Hong, Y. C., Shin, C. H., Lee, Y. A., Lim, Y. H., Kim, B. N. (2017). The effects of maternal and children phthalate exposure on the neurocognitive function of 6-year-old children. Environmental Research 156:519-525.		
HERO ID:	3974172		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Participants were described, and sampling methods provided under "Measurement of phthalate metabolites."
	Metric 2: Analytical Methodology	High	"Measurement of phthalate metabolites" sections summarizes extraction, equipment, LODs, and other analytical methods.
	Metric 3: Biomarker Selection	High	MBP is specific to DBP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was performed in South Korea.
	Metric 5: Currency	High	Study was performed in 2015.
	Metric 6: Spatial and Temporal Variability	Low	Spot urine samples (n = 175) were collected without replicates.
	Metric 7: Exposure Scenario	High	This is a biomonitoring study where exposure presumably occurred already.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Only geometric means are provided on the first paragraph of page 523. Other summary statistics were missing.
	Metric 9: Quality Assurance	Medium	QA/QC techniques, including blanks, spikes, and LODs were reported.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variance was not characterized, and uncertainties were not described.

Overall Quality Determination   Medium

| | Study Citation: | USGS, (2006). Water-quality conditions of Chester Creek, Anchorage, Alaska, 1998-2001. (2006-5229 (0):32.. |
| | HERO ID: | 3975042 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	three streambed sediment and 2 lakebed sediment sites (Figs 1 and 3, Table 1); collected at least once, top 2 cm; performed by USGS National Water-Quality Assessment Program
	Metric 2:	Analytical Methodology	Low	analytical methodology not discussed, but implied because performed by USGS
	Metric 3:	Biomarker Selection	N/A	NA - sediment samples
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Anchorage, AK
	Metric 5:	Currency	Low	October 1998 - September 2001
	Metric 6:	Spatial and Temporal Variability	Low	3 streambed sites (1 sample each for two sites and 3 samples for third site) from Chester Creek watershed from 1998-2001
	Metric 7:	Exposure Scenario	High	concentration in streambed and lakebed sediment from urban sites along a streambed
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Table 4 provides concentration/range; no raw data
	Metric 9:	Quality Assurance	Low	QA/QC no discussed but implied because performed by USGS
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	no discussion in regards to this particular chemical

Overall Quality Determination   Low

Study Citation:		Gaspéri, J., Ayrault, S., Moreau-Guigon, E., Alliot, F., Labadie, P., Budzinski, H., Blanchard, M., Muresan, B., Caupos, E., Cladière, M., Gateuille, D., Tassin, B., Bordier, L., Teil, M. J., Bourges, C., Desportes, A., Chevreuil, M., Moilleron, R. (2016). Contamination of soils by metals and organic micropollutants: case study of the Parisian conurbation. Environmental Science and Pollution Research 25(24):23559-23573.	
HERO ID:		3985396	

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	32 soil samples (fig 1) using a auger to collect first 10cm; each sample pooled three different cores collected 5 m from one another; homogenized and bagged; stored in dark; freeze-dried, ground, and stored at 4C
	Metric 2:	Analytical Methodology	Medium	extraction method not discussed; GC-MS; LOQ provided in Table S2; recovery samples not discussed
	Metric 3:	Biomarker Selection	N/A	soil samples
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Greater Paris, France
	Metric 5:	Currency	Medium	2009-2010
	Metric 6:	Spatial and Temporal Variability	Medium	32 samples (rural = 12; urban=20) sampled over a year; no replicates
	Metric 7:	Exposure Scenario	High	levels in soil from rural and densely urbanized areas
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	briefly discussed in text (range) p.23565 also depicted in Fig 4 (mean and SD); no indication results in SI
	Metric 9:	Quality Assurance	Low	states "analyzed according to validated methods"
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	compares results to previous studies and around the world

Overall Quality Determination   Medium

Study Citation:	Muenhor, D., Moon, H. B., Lee, S., Goosey, E. (2018). Organophosphorus flame retardants (PFRs) and phthalates in floor and road dust from a manual e-waste dismantling facility and adjacent communities in Thailand. Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances & Environmental Engineering 53(1):79-90.		
HERO ID:	4164912		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Referenced a previously described standardized protocol for their sampling methodology and included a summary of pertinent information.
	Metric 2:	Analytical Methodology	Medium	Analytical method discussed and LOQ provided. However, instrument calibration not discussed.
	Metric 3:	Biomarker Selection	N/A	Study tested the parent chemicals in floor and road dust.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples collected in Thailand.
	Metric 5:	Currency	Medium	Data collected in May 2014.
	Metric 6:	Spatial and Temporal Variability	Medium	5-10 samples collected per microenvironment and no replicate data.
	Metric 7:	Exposure Scenario	High	Study examined exposure to floor and road dust from a manual e-waste dismantling facility and impact to nearby communities.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Summary statistics presented such as mean and range. However, raw data not provided.
	Metric 9:	Quality Assurance	High	Pertinent QA/QC info provided, including recoveries and references to previously established protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No discussion of limitations, data gaps, or uncertainties.

Overall Quality Determination   High

Study Citation:	Azuma, K., Ikeda, K., Kagi, N., Yanagi, U., Osawa, H. (2017). Physicochemical risk factors for building-related symptoms in air-conditioned office buildings: Ambient particles and combined exposure to indoor air pollutants. Science of the Total Environment 616-617:1649-1655.		
HERO ID:	4165387		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Some sample conditions not reported, such as sample storage conditions. Missing DBP approaches to avoid sampling contamination.
	Metric 2: Analytical Methodology	Low	Some analytical methods not reported, such as recovery samples. DBP specific analysis and needs required approaches to avoid contamination during analysis, this information is missing. Calibration for phthalates missing.
	Metric 3: Biomarker Selection	N/A	NA - air samples
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Tokyo, Japan
	Metric 5: Currency	Medium	Data collected in 2013
	Metric 6: Spatial and Temporal Variability	High	11 offices in winter, 13 offices in summer in 17 buildings. One day of the week for two weeks during working hours.
	Metric 7: Exposure Scenario	High	Indoor office air, this seems like occupational, but it may inform baseline calculations, and scenarios for multiple use buildings.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	No raw data reported
	Metric 9: Quality Assurance	Low	No QA/QC reported
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Some limitations provided

Overall Quality Determination   Medium

Study Citation:	Hu, J., Li, N., Lv, Y., Liu, J., Xie, J., Zhang, H. (2017). Investigation on Indoor Air Pollution and Childhood Allergies in Households in Six Chinese Cities by Subjective Survey and Field Measurements. International Journal of Environmental Research and Public Health 14(9):979.		
HERO ID:	4166808		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods were not reported, such as sample storage conditions and performance of the sampler.
	Metric 2:	Analytical Methodology	Low	LODs/LOQs were not reported.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in indoor air.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected from six cities in China.
	Metric 5:	Currency	Medium	Data were collected during 2012 - 2013.
	Metric 6:	Spatial and Temporal Variability	Low	Indoor air samples collected from 60 homes without replicates.
	Metric 7:	Exposure Scenario	High	Exposure to phthalates and formaldehyde via indoor air is relevant.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	No raw data were provided, and most summary statistics are missing.
	Metric 9:	Quality Assurance	Low	Limited QA/QC information was provided.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variance was not characterized for phthalates and only graphically presented for formaldehyde. There was some discussion of gaps and limitations.

Overall Quality Determination   Low

Study Citation:	Celeiro, M., Dagnac, T., Llompart, M. (2017). Determination of priority and other hazardous substances in football fields of synthetic turf by gas chromatography-mass spectrometry: A health and environmental concern. Chemosphere 195:201-211.		
HERO ID:	4166969		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Detailed and clear sampling methodology
Metric 2:	Analytical Methodology	Medium	Limited details about recoveries, reported LOD
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Spain
Metric 5:	Currency	Medium	published in 2018, but sites were built after 2009 and replenished in the sampled materials periodically.
Metric 6:	Spatial and Temporal Variability	Medium	15 samples, no replicates
Metric 7:	Exposure Scenario	High	Data are likely to represent a relevant exposure scenario
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	individual sample concentrations and summary statistics reported
Metric 9:	Quality Assurance	Medium	Limited information on recoveries, field and laboratory controls were analyzed
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Key uncertainties and limitations are not discussed

Overall Quality Determination   Medium

Study Citation: Quintana-Belmares, R. O., Krais, A. M., Esfahani, B. K., Rosas-Pérez, I., Mucs, D., López-Marure, R., Bergman, Å., Alfaro-Moreno, E. (2018). Phthalate esters on urban airborne particles: Levels in PM10 and PM2.5 from Mexico City and theoretical assessment of lung exposure. Environmental Research 161:439-445.

HERO ID: 4167514

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Detailed sampling methodology description, scientifically sound.
	Metric 2: Analytical Methodology	Medium	Analytical methodology is briefly discussed, recovery samples or calibrations are not mentioned. LOD is discussed but not reported.
	Metric 3: Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Mexico City.
	Metric 5: Currency	Medium	Samples from 2013.
	Metric 6: Spatial and Temporal Variability	High	Paper reports weekly sampling for 7 months, but number of samples is not reported explicitly. They "recovered 30 filters"
	Metric 7: Exposure Scenario	High	Data closely represents a relevant exposure scenario for the population of Mexico City described in the manuscript.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual sample concentrations are not reported, only summary statistics.
	Metric 9: Quality Assurance	Low	Field and laboratory blanks were not analyzed, recoveries were not reported. and QA/QC was not discussed.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Key uncertainties and limitations are nor discussed, potentially having a substantial impact on the exposure assessment.

Overall Quality Determination   Medium

Study Citation:	Lin, L. Y.,u, Tsai, M. S., Chen, M., Ng, S., Hsieh, C. J., Lin, C. C., Lu, F. L., Hsieh, W.,uS, Chen, P. (2018). Childhood exposure to phthalates and pulmonary function. Science of the Total Environment 615:1282-1289.		
HERO ID:	4170166		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Details of the sample process were reported in our previous studies (Wang et al., 2014; Weng et al., 2017) and not explained in this one.
	Metric 2: Analytical Methodology	Medium	Citation to detailed methods was provided (Silva et al., 2004) and briefly described. LODs were provided in text.
	Metric 3: Biomarker Selection	High	MBP is specific to DBP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Taiwan.
	Metric 5: Currency	Medium	Samples were collected between 2004 and 2005.
	Metric 6: Spatial and Temporal Variability	Low	The total number of samples ranged from 132-191 depending on age group. No replicates were reported. The urine sample type (e.g., pooled, spot) was not described.
	Metric 7: Exposure Scenario	High	This is a biomonitoring study.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Figure 1 has geometric mean and error bars that would need to be digitized. No raw data were provided.
	Metric 9: Quality Assurance	Medium	Some QA/QC was not discussed, such as recoveries (acceptable), creatinine measurements, and analysis in duplicate and triplicate.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variance only visually shown with error bars. Uncertainty/limitations was not discussed.

Overall Quality Determination   Medium

Study Citation:	Wang, H., Liang, H., Gao, D. W. (2017). Occurrence and distribution of phthalate esters (PAEs) in wetland sediments. Journal of Forestry Research 28(6):1241-1248.		
HERO ID:	4172527		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling of sediments, materials used, and sample storage described.
	Metric 2: Analytical Methodology	High	Sample extraction and analysis provided, used GC/MS. Analysis parameters and conditions reported. QA/QC described and adequate. Detection limits in text.
	Metric 3: Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	China
	Metric 5: Currency	Medium	Samples collected in 2014
	Metric 6: Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7: Exposure Scenario	Medium	Exposure scenario not well characterized
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	raw data not reported
	Metric 9: Quality Assurance	High	Key QA reported
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Variability among sites discussed. Sources of uncertainty were discussed and appropriate.

Overall Quality Determination   High

Study Citation:	Wang, L., Gong, M., Xu, Y., Zhang, Y. (2017). Phthalates in dust collected from various indoor environments in Beijing, China and resulting non-dietary human exposure. Building and Environment 124(Elsevier):315-322.		
HERO ID:	4176702		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methodology is thoroughly described and scientifically sound. No key details are omitted.
	Metric 2: Analytical Methodology	Low	The analytical methodology is described; however, the limit of detection is mentioned but the value of the limit is not provided.
	Metric 3: Biomarker Selection	N/A	Study is testing for parent chemical in house dust.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Beijing.
	Metric 5: Currency	Medium	Samples were collected from 2010 to 2011.
	Metric 6: Spatial and Temporal Variability	Medium	No replicate samples collected
	Metric 7: Exposure Scenario	High	Exposure scenario is concentration in dust in houses, which is a scenario of interest.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data is not provided, but summary statistics are provided.
	Metric 9: Quality Assurance	High	QA/QC methods are provided and no issues were identified.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Variability and uncertainty are characterized and discussed. Ranges are given for measurements.

Overall Quality Determination   High

Study Citation:	Kim, H., Tanabe, S. I. (2017). Measuring Degree of Contamination by Semi-volatile Organic Compounds (SVOC) in Interiors of Korean Homes and Kindergartens. Journal of Asian Architecture and Building Engineering 16(3):661-668.		
HERO ID:	4178500		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	The paper's sampling procedures and equipment are clearly detailed.
Metric 2:	Analytical Methodology	High	The authors list the limit of detection, matching the criteria.
Metric 3:	Biomarker Selection	N/A	It is stated that the parent chemical was measured in the environment.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	This study was conducted in South Korea.
Metric 5:	Currency	Medium	The dates reported were from 2013 to 2014.
Metric 6:	Spatial and Temporal Variability	Medium	It is reported that samples were collected over multiple days, but it is unclear how many samples were taken. Individual data is not reported.
Metric 7:	Exposure Scenario	High	The source of exposure, floors, is relevant to study, particularly for children.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Individual data was not reported.
Metric 9:	Quality Assurance	Medium	There is no specific section but quality assurance but can be implied.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	There was variability in media (air and dust), setting (house and kindergarten), and floor material (pvc and wood). There was also no mention of limitations.

Overall Quality Determination   High

Study Citation:	Olofsson, U., Brorström-Lundén, E., Kylin, H., Haglund, P. (2013). Comprehensive mass flow analysis of Swedish sludge contaminants. Chemosphere 90(1):28-35.		
HERO ID:	4182871		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	The sampling methodology is discussed in the supplement. The discussion contains most information (site characters, sampling procedure, storage).
	Metric 2: Analytical Methodology	Medium	Analytical procedure was performed by other labs. LOD was mentioned to be calculated but not reported in the document.
	Metric 3: Biomarker Selection	N/A	The study tested in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was conducted in Sweden.
	Metric 5: Currency	Low	The study took place in Autumn of 2004.
	Metric 6: Spatial and Temporal Variability	Medium	Sludge samples were collected at seven STPs.
	Metric 7: Exposure Scenario	Medium	Sludge was reported as the exposure medium.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	The supplement contained the individual data points but still lacked a few important information including standard deviation.
	Metric 9: Quality Assurance	High	Quality assurance and quality checks was discussed in the supplement. No issues were identified.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	The study has limited discussion of key uncertainties, limitations, and data gaps.

Overall Quality Determination   Medium

Study Citation: Olesen, T. S., Bleses, D., Andersen, H. R., Grandjean, P., Frederiksen, H., Trecca, F., Bilenberg, N., Kyhl, H. B., Dalsager, L., Jensen, I. K., Andersson, A. M., Jensen, T. K. (2017). Prenatal phthalate exposure and language development in toddlers from the Odense Child Cohort. Neurotoxicology and Teratology 65:34-41.

HERO ID: 4198566

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Most pertinent sampling information is provided in the data source or companion source, including sample storage condition and population characteristics, but lacking sampling equipment and specific sampling procedures/regime, performance/calibration of sampler.
	Metric 2:	Analytical Methodology	High	Analytical techniques were reported (LC-MS/MS) and LOD were reported for each metabolite (see supplemental table S1).
	Metric 3:	Biomarker Selection	High	Biomarker (parent chemical or metabolite) is derived from exposure to the chemical of interest.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Odense, Denmark
	Metric 5:	Currency	Medium	2010-2012
	Metric 6:	Spatial and Temporal Variability	High	Urinary samples from 518 pregnant women were reported.
	Metric 7:	Exposure Scenario	Medium	The data likely represent the relevant exposure scenario of children. Study does not have detailed information on source of exposure.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Summary statistics reported. Raw data not given.
	Metric 9:	Quality Assurance	Medium	The study applied and documented quality assurance/quality control measures and described the completeness of samples including measuring osmolality; however, one piece of QA/QC information, recoveries, is not described. Missing information is unlikely to have a substantial impact on results.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Key uncertainties, limitations, and data gaps have been identified. Study also compared with other studies (see supplemental).

Overall Quality Determination   High

Study Citation: D'Appolonia Consulting Eng, (1987). Phase II - Hydrogeological impact assessment - Waste disposal facilities.
HERO ID: 4213879

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The sampling methodology is described at the methods of investigation section
	Metric 2:	Analytical Methodology	Medium	Table 1, ground water quality parameter and analytical methods. LOD not reported
	Metric 3:	Biomarker Selection	N/A	Parent chemical in groundwater
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Barberton plant at Ohio
	Metric 5:	Currency	Low	1983
	Metric 6:	Spatial and Temporal Variability	Low	Single sample collected per site. A total of 15 samples collected
	Metric 7:	Exposure Scenario	High	waste disposal facility groundwater contamination
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Table 12 reports individual data points. No statistics
	Metric 9:	Quality Assurance	Medium	Sample duplicates collected for QA
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	variability across wells, no uncertainty reported

Overall Quality Determination   Medium

| Study Citation: | ERM-Northeast, (1992). ECRA sampling and analysis plan report - AlliedSignal Aerospace Company Bendix Electric Power Division with cover letter dated 111693. |
| **HERO ID:** | 4213973 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Critically Deficient	Sampling methodology was not described
	Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology was not discussed
	Metric 3:	Biomarker Selection	N/A	Not applicable
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	NJ, USA
	Metric 5:	Currency	Low	Published in 1992
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size was not reported
	Metric 7:	Exposure Scenario	Medium	Did not describe the population of interest
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	High	Analyzed control samples, described QA/QC techniques
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Limited description of uncertainties, no characterization of variability

Overall Quality Determination   **Uninformative**

| | Study Citation: | DERS, (1991). Environmental site assessment report for Vista Chemical Company Facility Aberdeen, Mississippi with cover letter. |
| | HERO ID: | 4214058 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Critically Deficient	Sampling methodology not described
	Metric 2:	Analytical Methodology	Low	Analytical methods not described, cited EPA methods
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Mississippi, USA
	Metric 5:	Currency	Low	Sampling in 1991
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Sample size not reported
	Metric 7:	Exposure Scenario	Medium	Missing methodological details, sample size, population of interest and exposure characteristics
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	Low	Analyzed control samples, did not describe QA/QC
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Did not characterize variability or discussed uncertainties and limitations

Overall Quality Determination   **Uninformative**

Study Citation:	Liang, J., Ning, X. A., Kong, M., Liu, D., Wang, G., Cai, H., Sun, J., Zhang, Y., Lu, X., Yuan, Y. (2017). Elimination and ecotoxicity evaluation of phthalic acid esters from textile-dyeing wastewater. Environmental Pollution 231(Pt 1):115-122.		
HERO ID:	4259743		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Methods, location, equipment and storage condition reported.
Metric 2:	Analytical Methodology	Medium	Key analytical methods and instrument reported. Limit of detection reported as a range.
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	The study was conducted in China.
Metric 5:	Currency	High	Sampling campaign conducted in 2017.
Metric 6:	Spatial and Temporal Variability	Low	4 plants sampled with no replicates.
Metric 7:	Exposure Scenario	Medium	The samples are taken from wastewater effluent which is an applicable exposure scenario.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Summary statistics reported. Raw data not reported.
Metric 9:	Quality Assurance	High	QA procedures followed and all recoveries >70%.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	No gaps and limitations reported. Variability accounted for different plants sampled.

Overall Quality Determination   Medium

Study Citation:	Liao, C., Liu, W., Zhang, J., Shi, W., Wang, X., Cai, J., Zou, Z., Lu, R., Sun, C., Wang, H., Huang, C., Zhao, Z. (2018). Associations of urinary phthalate metabolites with residential characteristics, lifestyles, and dietary habits among young children in Shanghai, China. Science of the Total Environment 616-617:1288-1297.		
HERO ID:	4285933		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Method selecting children presented in Huang et al. (2016) and Wang et al. (2016). First morning urine collected in polyethylene containers; stored -40 C. Questionnaires on residential characteristics, lifestyle (cleaning habits), foods, etc. (see Supplemental Table A.1).
	Metric 2:	Analytical Methodology	High	SPE; isotope dilution-HPLC-heated electrospray ionization source (HESI) with triple quadrupole MS. Sample preparation and measurement conditions thoroughly described. All urine metabolite analyses performed during 3 wk in September, 2016.
	Metric 3:	Biomarker Selection	High	MnBP in first morning urine.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China, Shanghai, six districts
	Metric 5:	Currency	Medium	March 2013 to December 2014
	Metric 6:	Spatial and Temporal Variability	Medium	Children aged 5-10 years, n = 434. Comparison groups of 213 girls and 221 boys; suburban vs urban; low and high frequencies of cleaning/dusting/changing bedclothes; some food types. Minimum group size for comparison >10. However, only one urine sample per child.
	Metric 7:	Exposure Scenario	Medium	Evaluated many in-home possible exposure characteristics via questionnaire or in-home visit. Highest phthalate metabolites in urine during summer; five other associations identified.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Reported n, % detect, mean (and SD), geometric mean, 5th, 25th, 50th, 75th, and 95th percentiles.
	Metric 9:	Quality Assurance	High	Low and high-concentration QC (n=3 each) samples and 3 blanks per batch of 48 (or 96) samples; 7 internal standard concentration calibration levels; Supplemental Table A.4 reports QC details by metabolite.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Children sampled across all 4 seasons; however, only one first morning urine sample per child. Study limitations noted; compared results with those from 9 other countries (Figure 1).

Overall Quality Determination   High

Study Citation:	He, M. J., Lu, J. F., Ma, J. Y., Wang, H., Du, X. F. (2018). Organophosphate esters and phthalate esters in human hair from rural and urban areas, Chongqing, China: Concentrations, composition profiles and sources in comparison to street dust. Environmental Pollution 237(Elsevier):143-153.		
HERO ID:	4574307		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling methodology was detailed in terms of equipment, procedures, sample storage conditions, study site characteristics for hair and dust. Insufficient information was provided on sample storage duration prior to analysis.
Metric 2:	Analytical Methodology	High	Analytical methodology was described in terms of extraction and recovery range and referenced in terms of analytical instrumentation details within previous study and SI. LOD/LOQ information was presented within SI.
Metric 3:	Biomarker Selection	N/A	The analyte measured is the TSCA chemical.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples were collected in Chongqing, China.
Metric 5:	Currency	Medium	Sampling was conducted in 2014 for hair and dust.
Metric 6:	Spatial and Temporal Variability	Medium	There was a large sample size for rural (n=154) and urban (n=43) hair samples, but single sampling for each participant and non-statistical sampling methods. There was a moderate sample size for rural (n=6) and urban (n=6) dust samples and authors note replicate (three sub-samples) sampling, but location of dust sampling within the residence was not described within text and non-statistical sampling methodology.
Metric 7:	Exposure Scenario	High	Participant occupations noted as including government officers, salesmen, students and retired people in urban areas, with agricultural work as the primary occupation of rural participants.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Summary statistics reported in terms of range, mean (SD), median, number of samples, urban/rural location and detection frequencies. Insufficient information was provided on raw data for individual participants.
Metric 9:	Quality Assurance	High	Study QA/QC details within text included laboratory control/blanks, recoveries, and blank-correction of lab results with further information within SI.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Range of chemical-specific concentrations was reported, and results were compared with previous work. Potential sources of exposure for sampling media, and limitations in terms of the exogenous and endogenous source exposures for hair analysis due to unwashed hair sampling and limited sample size for dust sampling was discussed. Authors acknowledge lack of gender analysis due to limited number of female participants, but do not discuss this in relation to concentrations related to personal care products in this study, or other potential study limitations (e.g., possible data gaps).

Overall Quality Determination   **High**

Study Citation:	Okeme, J. O., Yang, C., Abdollahi, A., Dhal, S., Harris, S. A., Jantunen, L. M., Tsirlin, D., Diamond, M. L. (2018). Passive air sampling of flame retardants and plasticizers in Canadian homes using PDMS, XAD-coated PDMS and PUF samplers. Environmental Pollution 239:109-117.		
HERO ID:	4659643		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	The study reports home air sampling and sample storage.
Metric 2:	Analytical Methodology	Low	The analytical procedures were outlined. Section 2.5 discusses how LOD and LOQ are calculated but no values provided.
Metric 3:	Biomarker Selection	N/A	The parent chemical was measured in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples were collected in greater Toronto area and Ottawa, Canada.
Metric 5:	Currency	High	Samples were collected in February and August 2015.
Metric 6:	Spatial and Temporal Variability	High	Samples were collected in 32 homes in the Toronto area and 19 in Ottawa (homes included apartments, detached homes, semi-detached homes, townhouses, and condos); sampled for 3 weeks; duplicate and field blanks were collected.
Metric 7:	Exposure Scenario	Medium	The study focused on home sampling; 5 apartments, 34 detached homes, 7 semi-detached; 3 townhouses and 2 condos; number of residents ranged from 1 to 7.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data is not reported. Section 3.3 reported concentrations (min, max, median, mean, SD) and DF provided in Table S3d.
Metric 9:	Quality Assurance	Medium	QA/QC reported in Section 2.5; recovery was corrected for individual compounds.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Limitations are not reported, variability reported as SD, and comparison between other studies.

Overall Quality Determination   **Medium**

Study Citation:	Zhu, Z. Y., Ji, Y. Q., Zhang, S. J., Zhao, J. B., Zhao, J. (2016). Phthalate Ester Concentrations, Sources, and Risks in the Ambient Air of Tianjin, China. Aerosol and Air Quality Research 16(9):2294-2301.		
HERO ID:	4727284		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling equipment and methods are described in sufficient detail, but certain aspects (e.g. duration of storage) were absent that are unlikely to have a substantial impact on results.
	Metric 2:	Analytical Methodology	High	Analytical instrumentation and methods are described in good detail and are scientifically sound. LOD is reported for each analyte.
	Metric 3:	Biomarker Selection	N/A	This study is testing for the parent chemical in an environmental medium.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Tianjin, China
	Metric 5:	Currency	Medium	2014
	Metric 6:	Spatial and Temporal Variability	Medium	24h particulate matter samples from four sites for eight days each, but no replicates.
	Metric 7:	Exposure Scenario	Medium	Sampling sites are only characterized by geographical location and by an "urban" label.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data are not reported; summary statistics include mean, standard deviation, median, minimum, and maximum concentration for each particulate filtrate size in each season.
	Metric 9:	Quality Assurance	High	QA/QC measures included the use of internal standard and spiked blanks to determine calibration linearity and recovery, which were both reported to be in acceptable ranges.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Characterization of variability is reported, but discussion of pertinent study limitations or sources of uncertainty is absent.

Overall Quality Determination   **Medium**

| Study Citation: | Salaudeen, T., Okoh, O., Agunbiade, F., Okoh, A. (2018). Fate and impact of phthalates in activated sludge treated municipal wastewater on the water bodies in the Eastern Cape, South Africa. Chemosphere 203(Elsevier):336-344. |
| HERO ID: | 4728386 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Detailed and scientifically sound sampling methodology
	Metric 2:	Analytical Methodology	High	Detailed analytical methodology, included LODs, LOQ, calibrations, recoveries
	Metric 3:	Biomarker Selection	N/A	Sludge sampling
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	South Africa
	Metric 5:	Currency	High	2016
	Metric 6:	Spatial and Temporal Variability	Medium	Daily sampling for 6 months at 3 sampling points. No replicate samples.
	Metric 7:	Exposure Scenario	Medium	Data are likely to represent a relevant exposure scenario
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual concentration data not provided, only summary statistics
	Metric 9:	Quality Assurance	High	Analyzed control samples, reported recoveries, detailed QA/QC section
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Limited discussion of variability, uncertainties and study limitations

Overall Quality Determination   High

Study Citation:	Minatoya, M., Araki, A., Miyashita, C., Ait Bamai, Y., Itoh, S., Yamamoto, J., Onoda, Y., Ogasawara, K., Matsumura, T., Kishi, R. (2018). Association between prenatal bisphenol A and phthalate exposures and fetal metabolic related biomarkers: The Hokkaido study on Environment and Children's Health. Environmental Research 161:505-511.		
HERO ID:	4728391		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling methods, participant information and sample storage all reported.
Metric 2:	Analytical Methodology	High	Analytical methods, instrument, calibration and LOD reported.
Metric 3:	Biomarker Selection	High	Biomarker is known to be related with external exposure.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	The study was conducted in Japan.
Metric 5:	Currency	Low	Sampling from 2003-2012.
Metric 6:	Spatial and Temporal Variability	Low	365 samples with no replicates.
Metric 7:	Exposure Scenario	High	Data represents exposure scenarios of pregnant women.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Only summary statistics reported. No raw data reported.
Metric 9:	Quality Assurance	High	QA/QC techniques discussed in supplemental, including recoveries >70%. Limitations also reported.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Characterized variability and discussed uncertainties and limitations

Overall Quality Determination   **High**

Study Citation:	Polinski, K. J., Dabelea, D., Hamman, R. F., Adgate, J. L., Calafat, A. M., Ye, X., Starling, A. P. (2018). Distribution and predictors of urinary concentrations of phthalate metabolites and phenols among pregnant women in the Healthy Start Study. Environmental Research 162:308-317.		
HERO ID:	4728411		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Most key criteria met. Duration of sample storage data lacking.
	Metric 2:	Analytical Methodology	Medium	Most key criteria met, chemical-specific LOD's reported within supplemental material, lack of recovery sample data.
	Metric 3:	Biomarker Selection	High	Supplemental Table 1 contains specific metabolite concentrations.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples provided by participants in the state of Colorado.
	Metric 5:	Currency	High	Samples collected 2009-2014.
	Metric 6:	Spatial and Temporal Variability	Medium	Total of n=446 participants in convenience (non-statistical sampling approach) sample, providing single spot urines at 24-32 weeks gestation. Additional sub-sample of women (n=24) had three spot urine samples collected at two-week intervals.
	Metric 7:	Exposure Scenario	Medium	Participant characteristics summarized, lack of information on pre-exposure or control samples.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Most key criteria met; lack of raw data.
	Metric 9:	Quality Assurance	Low	Quality assurance procedures not described, however laboratory methods referenced.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability characterized within summary statistics, potential study limitations discussed.

Overall Quality Determination   Medium

Study Citation:	Lesser, L. E., Mora, A., Moreau, C., Mahlknecht, J., Hernández-Antonio, A., Ramírez, A. I., Barrios-Piña, H. (2018). Survey of 218 organic contaminants in groundwater derived from the world's largest untreated wastewater irrigation system: Mezquital Valley, Mexico. Chemosphere 198:510-521.		
HERO ID:	4728420		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	samples from groundwater and spring water in valley and wastewater in several irrigation canals (Fig 1) in dry season last week of February; wells were shallow (7-8m); others were up to 260m deep; further details on sampling site included in Table S1; 3 grab water samples at each site in glass bottles; stored at 4C; max storage time before analysis was 7 days.
	Metric 2: Analytical Methodology	Medium	extraction methods and analytical method discussed; following EPA methods; MDL provided in SI tables; recoveries not discussed in main paper
	Metric 3: Biomarker Selection	N/A	Parent chemicals measured in groundwater
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Mezquital Valley, Central Mexico
	Metric 5: Currency	Medium	2013
	Metric 6: Spatial and Temporal Variability	Medium	17 groundwater wells, 4 springs, and 9 irrigation canals sampled during dry season in a single sampling campaign, no replicates
	Metric 7: Exposure Scenario	High	oldest and largest example of urban wastewater reuse (after conventional treatment) for agricultural irrigation; wastewater infiltration and excess irrigation has promoted artificial recharge of three aquifers in the area which in turn supply water to the industrial park and 500,000 inhabitants; this study measures concentration in wastewater used for irrigation, springs, and groundwater
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	Table 1 provides concentration at each site; Fig 2 provides the max concentration and DF in the wastewater canals
	Metric 9: Quality Assurance	Low	QA/QC not directly discussed but implied through EPA methods followed
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	minimal discussion on study limitations; aim of study was to find highest concentration so measured in late dry season; discussed spatial distribution and differences in concentrations between the three media; limited characterization of variance

Overall Quality Determination   Medium

| | Study Citation: | Li, X., Sun, H., Yao, Y., Zhao, Z., Qin, X., Duan, Y., Wang, L. (2018). Distribution of phthalate metabolites between paired maternal-fetal samples. Environmental Science & Technology 52(11):6626-6635. |
| | HERO ID: | 4728430 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Participants described. Sample collection not described.
	Metric 2:	Analytical Methodology	Medium	Sample preparation described in SI. Mass spec described. Method detection limit in SI
	Metric 3:	Biomarker Selection	High	metabolite in urine
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	High	2015
	Metric 6:	Spatial and Temporal Variability	Medium	n = 80 to 83 depending on sample type, no replicates, no details about urine sample collection
	Metric 7:	Exposure Scenario	High	biomonitoring
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	detection rate, mean, median, GM, and range provided. No raw data.
	Metric 9:	Quality Assurance	High	Blanks, spikes, and calibration described.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed, no obvious concerns

Overall Quality Determination   Medium

| Study Citation: | Li, Y., Wang, J., Ren, B., Wang, H., Qiao, L., Zhu, J., Li, L. (2018). The characteristics of atmospheric phthalates in Shanghai: A haze case study and human exposure assessment. Atmospheric Environment 178:80-86. |
| HERO ID: | 4728440 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling equipment and methods are described. Sampling time and handling of tubes after sample collection are not evident.
	Metric 2:	Analytical Methodology	High	Analytical instrumentation and methods are described in sufficient detail and are scientifically sound. Instrument detection limit is reported for each analyte.
	Metric 3:	Biomarker Selection	N/A	This study is testing for the parent chemical of interest in an environmental medium.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	High	2016
	Metric 6:	Spatial and Temporal Variability	Medium	Air samples were collected from one site over the course of 10 days. No replicates.
	Metric 7:	Exposure Scenario	High	The air sampling site is well characterized by its building types, traffic routes, and possible nearby pollution sources (none).
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Raw data are not reported and there are some inconsistencies in the results resulting in low confidence. The number of samples or their relative size (duration of air sampling) are unclear based on the reporting of results, and individual phthalate concentrations are only reported numerically as a mean and range over all meteorological conditions; stratified analyses are only reported graphically.
	Metric 9:	Quality Assurance	High	QA/QC methods included the use of spiked replicates and blanks for determination of instrument detection limits, relative standard deviation, background contamination, desorption recovery, and linear range calibration. All results were in acceptable limits and corrections were made for minor issues when warranted (background contamination).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Characterization of variability is absent and key uncertainties and limitations are not discussed.

Overall Quality Determination   **Medium**

Study Citation:	Machtinger, R., Zhong, J., Mansur, A., Adir, M., Racowsky, C., Hauser, R., Brennan, K., Karlsson, O., Baccarelli, A. A. (2018). Placental lncRNA Expression Is Associated With Prenatal Phthalate Exposure. Toxicological Sciences 163(1):116-122.		
HERO ID:	4728442		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Participants and sampling described.
Metric 2:	Analytical Methodology	Medium	LOD provided, CDC performed analyses.
Metric 3:	Biomarker Selection	Low	MBP is metabolite in urine for both DBP and BBP.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Israel
Metric 5:	Currency	High	2015
Metric 6:	Spatial and Temporal Variability	Low	n = 10, no replicates, urine samples not pooled.
Metric 7:	Exposure Scenario	High	Biomonitoring
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	% below LOD, mean, median, max provided.
Metric 9:	Quality Assurance	Medium	Standard quality assurance/quality control procedures discussed in detail before (Silva et al., 2013, 2017).
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty not discussed, no obvious concerns.

Overall Quality Determination   Medium

Study Citation:	Machtinger, R., Berman, T., Adir, M., Mansur, A., Baccarelli, A. A., Racowsky, C., Calafat, A. M., Hauser, R., Nahum, R. (2018). Urinary concentrations of phthalate metabolites, bisphenols and personal care product chemical biomarkers in pregnant women in Israel. Environment International 116(Elsevier):319-325.		
HERO ID:	4728447		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported.
	Metric 2:	Analytical Methodology	Medium	Some analytical methods not reported such as recovery samples.
	Metric 3:	Biomarker Selection	High	Acceptable biomarker.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Israel
	Metric 5:	Currency	High	Samples collected in 2015 and 2016.
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates.
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported.
	Metric 9:	Quality Assurance	Medium	QC referenced.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Some limitations reported.

Overall Quality Determination   High

Study Citation:	Kishi, R., Ketema, R. M., Bamai, Y. A., Araki, A., Kawai, T., Tsuboi, T., Saito, I., Yoshioka, E., Saito, T. (2018). Indoor environmental pollutants and their association with sick house syndrome among adults and children in elementary school. Building and Environment 136:293-301.		
HERO ID:	4728476		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The sampling methodology is discussed, scientifically sound and consistent with widely accepted methods/approaches for the chemical and media being analyzed. The references for the full sampling description are provided.
	Metric 2: Analytical Methodology	High	Analytical methodology is described, including analytical instrumentation and scientifically appropriate for the chemical and media analyzed. LOD is reported. The previous studies are referred for analysis method.
	Metric 3: Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was conducted in Sapporo, Japan.
	Metric 5: Currency	Medium	The samples were collected in October and November of 2009 and 2010.
	Metric 6: Spatial and Temporal Variability	High	There were 128 samples and no replicates.
	Metric 7: Exposure Scenario	High	Indoor air exposures were measured in the residential house.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Full Raw data are not reported. Only summary statistics were reported.
	Metric 9: Quality Assurance	High	Quality assurance procedures in sample collection and analysis were reported with most key criteria met.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Limitations are well described but variability and uncertainty are not well discussed.

Overall Quality Determination   High

Study Citation:	Huffman, A. M., Wu, H., Rosati, A., Rahil, T., Sites, C. K., Whitcomb, B. W., Richard Pilsner, J. (2018). Associations of urinary phthalate metabolites and lipid peroxidation with sperm mitochondrial DNA copy number and deletions. Environmental Research 163:10-15.		
HERO ID:	4728509		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Participants and sampling described briefly.
	Metric 2:	Analytical Methodology	Low	LOD range provided, CDC analyzed samples.
	Metric 3:	Biomarker Selection	High	Metabolite in urine.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	U.S.
	Metric 5:	Currency	High	2014 and 2017
	Metric 6:	Spatial and Temporal Variability	Low	n = 99, no replicates, spot urine samples.
	Metric 7:	Exposure Scenario	High	Biomonitoring
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	GM, 95%CI, % below LOD, percentiles: 25%, 50%, 75%, 95%
	Metric 9:	Quality Assurance	Medium	Standards, spikes, blanks, and LOD approach described. Recovery not included.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty not discussed, no obvious concerns.

Overall Quality Determination   Medium

Domain	Metric	Rating	Comments
Study Citation:	Liao, K. W., Kuo, P. L., Huang, H. B., Chang, J. W., Chiang, H. C., Huang, P. C. (2018). Increased risk of phthalates exposure for recurrent pregnancy loss in reproductive-aged women. Environmental Pollution 241:969-977.		
HERO ID:	4728516		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Participant information, sampling methods and storage conditions reported.
	Metric 2: Analytical Methodology	Medium	LOD provided in text. method described previously (Huang et al.,2015; Huang et al., 2016).
	Metric 3: Biomarker Selection	High	Metabolite is known to be from parent in urine.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was conducted in Taiwan.
	Metric 5: Currency	High	Study was conducted between 2013 and 2017.
	Metric 6: Spatial and Temporal Variability	Medium	n = 76 (control group), n = 103 (recurrent pregnancy loss group), no replicates, urine sample details not provided.
	Metric 7: Exposure Scenario	High	The study is measuring phthalates in pregnant women urine.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	The study reports detection rate %, median and range. Raw data not reported.
	Metric 9: Quality Assurance	Medium	Blanks, spikes, repeated samples, and recovery included. However, the exact recovery percent is not reported.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variability account for different ages sampled. Limitations discussed.

Overall Quality Determination   High

Study Citation:	Hartle, J. C., Cohen, R. S., Sakamoto, P., Barr, D. B., Carmichael, S. L. (2018). Chemical contaminants in raw and pasteurized human milk. Journal of Human Lactation 34(2):340-349.		
HERO ID:	4728555		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Included only milk from women who passed screen for risk factors, medications, and serology. Milk collected in BPA-free bags and stored at CA state milk bank at -20 C. Method of milk collection by women not specified.
Metric 2:	Analytical Methodology	High	Samples deglucuronidized; analyzed by isotope dilution, SPE, HPLC- negative ion electrospray-MS/MS; LODs in SI. Lipid content measured. Reviewed analytic details provided in previous publication (Calafat et al. 2004, HERO 673259). The study reported the LOD in the SI
Metric 3:	Biomarker Selection	High	Analyzed breast milk, pre- and post-pasteurization, for MnBP.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples were from across California
Metric 5:	Currency	High	Samples were collected in 2015.
Metric 6:	Spatial and Temporal Variability	High	Analyzed milk donated by 21 women from across California to CA milk bank (sample bags selected randomly from storage). Some categories of ethnicity, parity, age, CA region, and baby's age were represented by few individuals.
Metric 7:	Exposure Scenario	Medium	The study evaluated the presence and co-occurrence of contaminants in human milk and the effects of pasteurization.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	Raw data provided in Excel in SI, along with LOD and summary statistics (mean, SD, percentiles, range).
Metric 9:	Quality Assurance	High	Used blanks, duplicate samples, and spiked QC materials (approximately 15% of samples tested); accuracy 93%-102%; RSD 7%-13%. Previous method validation was reported in HERO 673259.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Discussed possible reasons for increased phthalate concentrations after pasteurization; recognized limitations for "self-selected" nature of women donating milk and relatively small sample size.

Overall Quality Determination   High

Study Citation:		Wen, Z. D., Huang, X. L., Gao, D. W., Liu, G., Fang, C., Shang, Y. X., Du, J., Zhao, Y., Lv, L. L., Song, K. S. (2018). Phthalate esters in surface water of Songhua River watershed associated with land use types, Northeast China. Environmental Science and Pollution Research 25(8):7688-7698.	
HERO ID:		4728576	

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	28 surface water samples (12 in mainstream and 16 in tributaries - Fig 1); collected in glass bottles at a depth of 0.5-1m; stored in refrigerator; extraction performed immediately or within 48 h.
	Metric 2:	Analytical Methodology	High	Liquid phase extraction following EPA method; GC-MS; recoveries; LOD ranged 0.001 to 0.057 μg/L.
	Metric 3:	Biomarker Selection	N/A	Environmental media
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Songhua River, Northeast China.
	Metric 5:	Currency	High	2016
	Metric 6:	Spatial and Temporal Variability	Medium	28 river water stations sampled in July. No replicates.
	Metric 7:	Exposure Scenario	High	Concentration in river in China used for both domestic water supply and irrigation.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 1 provides concentration range, mean, median, and DF; n not reported; Fig 4 presents concentration per site along the direction of the river flow.
	Metric 9:	Quality Assurance	High	Followed strict QC procedures; blanks; recoveries ranged from 89-110%.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Discusses spatial variation along the river; compares concentrations to those of previous studies.

Overall Quality Determination   High

Study Citation:		Torres, N. I., Yu, X., Padilla, I. Y., Macchiavelli, R. E., Ghasemizadeh, R., Kaeli, D., Cordero, J. F., Meeker, J. D., Alshawabkeh, A. N. (2018). The influence of hydrogeological and anthropogenic variables on phthalate contamination in eogenetic karst groundwater systems. Environmental Pollution 237:298-307.	
HERO ID:		4728606	

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The sampling methodology was described for both historical database and current study field sampling within the supplemental materials (Table S1) and included details for field sampling such as brief sampling methodology, sampling equipment, storage conditions, and duration of sample storage prior to analysis.
	Metric 2:	Analytical Methodology	High	The sample analysis for field samples was described in terms of analytic methodology (U.S. EPA methods 3501C and 827OD), extraction, analytical instrumentation, instrument calibration, limits of detection set at instrument detection limit of 1 microgram per Liter, and recoveries, as described within Table S1.
	Metric 3:	Biomarker Selection	N/A	Sampling was conducted within environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Sampling was conducted within the karst region of northern Puerto Rico (KRNPR).
	Metric 5:	Currency	Medium	Sampling results from the historical databases (USGS, USEPA and PRDOH) was conducted 1981-2013. Sampling results from the current study field sampling was conducted 2011-2013.
	Metric 6:	Spatial and Temporal Variability	High	A total of n=2,004 samples were analyzed from historical databases (n=1,803 samples from 197 well sites and 4 springs) and current study field sampling (n=201 samples from 17 wells and 4 springs), with n=1,995, n=295, and only n=89 samples analyzed for DEHP, DBP, and BBP, respectively. Authors note that duplicate samples were collected at each site for Spring and Fall samples of each year from 2011 - 2013 for field samples. Field sampling sites were selected based on proximity to potential Superfund, RCRA and landfill site contamination sources, accessibility, and spatial representation. This study specifically examined principal factors which affect phthalate concentration distributions.
	Metric 7:	Exposure Scenario	High	This study assessed the concentration of phthalates in groundwater of aquifers of the karst region of northern Puerto Rico (KRNPR) near contaminated sources, explored the spatial distribution patterns, and evaluated factors affecting the spatial variability of phthalate detections and concentrations. There was a high density of RCRA and Superfund sites in the region.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Summary statistics of central tendency and variation were reported for DEHP and DBP concentrations, but not BBP (all samples were less than the limit of detection) within the text. The number of samples and frequency of detection was also reported for DEHP, DBP and BBP. Raw data was not presented.
	Metric 9:	Quality Assurance	Medium	Quality assurance/control parameters for the current study field sampling included laboratory recoveries, quality control samples analyzed every 10 samples, instrument calibration and system performance verification were detailed. Field, shipment and laboratory blanks were collected for each sampling day of the current study field sampling. Baseline, pre-exposure sampling was not conducted. Specific details of QA/QC parameters for historical databases from USGS, U.S. EPA and PRDOH were not detailed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The characterization of variability within statistical summary measures was limited to SD/SE for DEHP and DBP (BBP was not characterized, all BBP samples within historical database were less than LOD, and BBP was not analyzed within the current study field sampling). Study limitations were outlined in detail within Table S2, and noted differences in sampling frequencies driven by regulatory requirements over the years of sampling within the historical databases as well as high variability in extraction recoveries.

Overall Quality Determination   **High**

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Study Citation:	Torres, N. I., Yu, X., Padilla, I. Y., Macchiavelli, R. E., Ghasemizadeh, R., Kaeli, D., Cordero, J. F., Meeker, J. D., Alshawabkeh, A. N. (2018). The influence of hydrogeological and anthropogenic variables on phthalate contamination in eogenetic karst groundwater systems. Environmental Pollution 237:298-307.
HERO ID:	4728606

Domain	Metric	Rating	Comments

Study Citation:	Watkins, D. J., Sánchez, B. N., Téllez-Rojo, M. M., Lee, J. M., Mercado-García, A., Blank-Goldenberg, C., Peterson, K. E., Meeker, J. D. (2017). Phthalate and bisphenol A exposure during in utero windows of susceptibility in relation to reproductive hormones and pubertal development in girls. Environmental Research 159:143-151.		
HERO ID:	4728621		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Well described sampling methods.
Metric 2:	Analytical Methodology	High	Detailed analytical methods, reported LOD.
Metric 3:	Biomarker Selection	High	Biomarker is known to be related to external exposure.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Mexico
Metric 5:	Currency	Low	Sampling began in 1997.
Metric 6:	Spatial and Temporal Variability	Low	n=97, with replicates.
Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenarios.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Only summary statistics.
Metric 9:	Quality Assurance	Medium	Limited description about QA/QC techniques.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Characterized variability, discussed uncertainties and limitations.

Overall Quality Determination   High

Study Citation:	Duan, Y., Wang, L., Han, L., Wang, B., Sun, H., Chen, L., Zhu, L., Luo, Y. (2017). Exposure to phthalates in patients with diabetes and its association with oxidative stress, adiponectin, and inflammatory cytokines. Environment International 109(Elsevier):53-63.		
HERO ID:	4728629		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Sampling equipment and methods are only briefly discussed, therefore certain aspects (e.g. material components of sampling vessel) are absent that may have a substantial impact on results.
	Metric 2: Analytical Methodology	High	Analytical instrumentation and methods are reported in sufficient detail, are referenced to other published studies, and are scientifically sound. LOD and LOQ are reported.
	Metric 3: Biomarker Selection	Medium	The monoester phthalate biomarker is a metabolite of multiple parent chemicals, not just the chemical of interest, and there is not a stated method to apportion the estimate to just the chemical of interest. A secondary metabolite is also assessed with lower accuracy.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Tianjin, China
	Metric 5: Currency	High	May-July 2016
	Metric 6: Spatial and Temporal Variability	Low	Unpooled spot urine samples from 343 participants collected between 9:00 and 11:00 a.m.
	Metric 7: Exposure Scenario	Medium	Exposure scenarios for sampled population not well characterized.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data are not reported; summary statistics include geometric mean, median, minimum, and maximum concentrations, as well as medians by various population stratifications.
	Metric 9: Quality Assurance	High	QA/QC methods included the use of procedural blanks, spiked samples, and surrogate standards to determine background contamination, spiked matrix recovery, and relative standard deviation. All values were within acceptable ranges or adjustments were made to correct (in the case of background contamination).
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Characterization of variability is reported, and variability across certain population stratifications is analyzed. Methodological limitations and sources of uncertainty are briefly discussed, including the limit of study population only being diabetic patients and only using one spot sample per participant.

Overall Quality Determination   Medium

Study Citation:	Dales, R. E., Kauri, L. M., Cakmak, S. (2018). The associations between phthalate exposure and insulin resistance, {\ensuremath{\beta}}-cell function and blood glucose control in a population-based sample. Science of the Total Environment 612:1287-1292.		
HERO ID:	4728651		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sample methodology was not the most comprehensive. It explained a nationally representative population from Canadian Health Measures Survey (CHMS), Cycle 2, their enrollment criteria, and one "midstream" urine sample collected per person (blood collected same day).
	Metric 2: Analytical Methodology	Low	SPE UPLC-MS-MS analyses conducted by Centre de Toxicologie du Quebec as described in Saravanabhavan et al. (2013), which refers back to another study. Only the analytical method (UPLC-MS-MS) and LODs were provided.
	Metric 3: Biomarker Selection	High	MnBP and MCPP are urinary metabolites of DnBP. MnBP is specific to DnBP while can also be a metabolite of DNP/DiNP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Participants were from Canada.
	Metric 5: Currency	Medium	Participants were recruited during 2009-2011.
	Metric 6: Spatial and Temporal Variability	Low	Sampling is representative of 96% of Canada. It included 2,119 individuals between 12 and 29 years of age from 18 sites across 5 regions. Only spot samples (i.e., single mid-stream) were collected per person.
	Metric 7: Exposure Scenario	Medium	Questionnaire covered lifestyle factors including alcohol consumption, cigarette smoking, and physical activity. Questions related to possible sources of phthalate exposure were not included, but this is a biomonitoring study where exposure sources are difficult to pinpoint.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Data reported geometric mean, GM standard error, and interquartile range across entire sample population. Creatinine was adjusted for. No raw data were provided.
	Metric 9: Quality Assurance	Low	QA/QC methods mostly missing. Authors referred to previous publications - HERO 1597648 and 1325357 - that may explain QA/QC protocols.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	There is some discussion of limitations in Discussion.

Overall Quality Determination   Medium

Study Citation:	Bu, Z., Wang, J., Yu, W.,ei, Li, B. (2018). Dermal exposure to phthalates in home environment: Handwipes, influencing factors and implications. Building and Environment 133:1-7.		
HERO ID:	4728663		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling by wipes described. Four swipes in the same part of the hand with the same wipe to achieve max removal. Sampled air and dust as well. Process was mentioned and described elsewhere.
	Metric 2:	Analytical Methodology	Medium	Analytical method described, MDL estimate approach provided, but MDL values were not reported.
	Metric 3:	Biomarker Selection	N/A	Not a biomonitoring study.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Southwestern China, Chongqing
	Metric 5:	Currency	Medium	Data collected 2014 to 2015
	Metric 6:	Spatial and Temporal Variability	Medium	No replicate samples collected
	Metric 7:	Exposure Scenario	High	Dermal, but not product or activity specific.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data reported
	Metric 9:	Quality Assurance	Medium	QA/QC not directly mentioned in the study - this study referenced a different study
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Statistical uncertainties discussed in Section 3.5 Limitations.

Overall Quality Determination   High

Study Citation:	Buckley, J. P., Quirós-Alcalá, L., Teitelbaum, S. L., Calafat, A. M., Wolff, M. S., Engel, S. M. (2018). Associations of prenatal environmental phenol and phthalate biomarkers with respiratory and allergic diseases among children aged 6 and 7years. Environment International 115:79-88.		
HERO ID:	4728666		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Methodology (e.g., participant characteristics, collection methods, and storage conditions) was adequately described.
	Metric 2: Analytical Methodology	High	LODs given in Table 2. Analytical methods described as solid phase extraction coupled with HPLC-isotope dilution tandem spectrometry. CDC performed the analysis, and references were also provided.
	Metric 3: Biomarker Selection	High	MnBP has a strong relationship with DnBP
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in New York.
	Metric 5: Currency	Low	Samples were collected from 1998 to2002.
	Metric 6: Spatial and Temporal Variability	Medium	No replicates were reported. Over 100 samples were analyzed.
	Metric 7: Exposure Scenario	High	This is a biomonitoring study.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Summary statistics only and no raw data were provided.
	Metric 9: Quality Assurance	Medium	Samples were adjusted for creatinine. However, no other QA/QC methods were reported but can be inferred through use of CDC laboratory for testing.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Table 2 characterizes variance. Uncertainties and limitations were discussed.

Overall Quality Determination   High

Study Citation:	Albert, O., Huang, J. Y., Aleksa, K., Hales, B. F., Goodyer, C. G., Robaire, B., Chevrier, J., Chan, P. (2018). Exposure to polybrominated diphenyl ethers and phthalates in healthy men living in the greater Montreal area: A study of hormonal balance and semen quality. Environment International 116:165-175.	
HERO ID:	4728683	

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The sampling methods, demographics, materials and storage were reported in this biomonitoring study.
	Metric 2: Analytical Methodology	Medium	The analytical methods, instrument, LOD and LOQ were reported for hair and urine. Recovery samples were not reported by study authors.
	Metric 3: Biomarker Selection	High	The study reported acceptable biomarkers.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was conducted in Montreal, Canada.
	Metric 5: Currency	Medium	Data were collected between 2009 and 2012.
	Metric 6: Spatial and Temporal Variability	Medium	Samples were collected from 153 men but there were no replicate samples collected.
	Metric 7: Exposure Scenario	Medium	It is unclear where the sources of exposure come from.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Summary statistics reported in Table 2. Raw data were not reported by the study authors.
	Metric 9: Quality Assurance	Medium	Some QA was implied but some important QC components were not reported such as recovery samples.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Some gaps and limitations were reported. Variability captured through different demographics of participants studied.

Overall Quality Determination   Medium

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling methodology is only briefly discussed but study participants are described in another study. Storage conditions are reported. However, equipment to collect the samples are not reported.
	Metric 2:	Analytical Methodology	Low	Analytical methodology is reported to have followed a modified version of LC-MS/MS method developed by the CDC and is referenced to another study. However, detection limits are not reported.
	Metric 3:	Biomarker Selection	Low	The monoester phthalate biomarker is a metabolite of multiple parent chemicals, not just the chemical of interest, and there is not a stated method to apportion the estimate to just the chemical of interest.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Boston, United States.
	Metric 5:	Currency	Medium	Samples were collected 2006-2008.
	Metric 6:	Spatial and Temporal Variability	Low	Unpooled spot urine samples from 134 participants at one timepoint.
	Metric 7:	Exposure Scenario	High	The study is measuring phthalate concentrations in pregnant women.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data are not reported; summary statistics include geometric mean, maximum, and percentiles (25, 50, 75, 95) of biomarker concentration.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Characterization of variability is reported, and limitations of the study are discussed (i.e., acknowledgement of the limited statistical power of the exploratory study with small sample size).

Study Citation: Bedrosian, L. D., Ferguson, K. K., Cantonwine, D. E., Mcelrath, T. F., Meeker, J. D. (2018). Urinary phthalate metabolite concentrations in relation to levels of circulating matrix metalloproteinases in pregnant women. Science of the Total Environment 613-614:1349-1352.

HERO ID: 4728685

Overall Quality Determination   Medium

| Study Citation: | Savoca, D., Arculeo, M., Barreca, S., Buscemi, S., Caracappa, S., Gentile, A., Persichetti, M. F., Pace, A. (2018). Chasing phthalates in tissues of marine turtles from the Mediterranean sea. Marine Pollution Bulletin 127:165-169. |
| **HERO ID:** | 4728695 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	sample collection details limited "13 turtles found dead stranded in 2016 along the Sicilian coasts"
	Metric 2:	Analytical Methodology	High	extraction described; HPLC method described; LOD and LOQ range provided
	Metric 3:	Biomarker Selection	N/A	sampling of sea turtles
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Sicily
	Metric 5:	Currency	High	2016
	Metric 6:	Spatial and Temporal Variability	High	n = 13 turtles.
	Metric 7:	Exposure Scenario	Low	Sampling of turtles does not directly tie with exposures of interest.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Figure 1-4 - unclear what summary statistic the bar graphs represent.
	Metric 9:	Quality Assurance	Medium	quality not discussed; no obvious concerns
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	variability and uncertainty not discussed; no obvious concerns

Overall Quality Determination   Medium

Study Citation:	Shu, H., Wikstrom, S., Jönsson, B. A. G., Lindh, C. H., Svensson, Å., Nånberg, E., Bornehag, C. G. (2018). Prenatal phthalate exposure was associated with croup in Swedish infants. Acta Paediatrica 107(6):1011-1019.		
HERO ID:	4728698		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Medium. Most key criteria sampling methodology briefly described; lack of sample storage duration prior to analysis, however sample collection methods referenced.
	Metric 2:	Analytical Methodology	Medium	Medium. Analytical methodology briefly described, chemical-specific limits of detection reported; lack of calibration data, however analytic methods referenced.
	Metric 3:	Biomarker Selection	Low	Low. Sampling for metabolites not specific for parent chemicals of interest.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	High. Samples provided by participants in Varmland, Sweden.
	Metric 5:	Currency	Medium	Medium. Samples collected 2007-2010.
	Metric 6:	Spatial and Temporal Variability	Medium	Medium. Participants recruited from Varmland, Sweden county with urban, suburban and rural areas (Bornehag, 2012 reference) during 2007-2010; single first-morning urines at median gestational week 10 time period provided by all (n=1,062) participants; non-statistical sampling methodology
	Metric 7:	Exposure Scenario	Medium	Medium. Participant characteristics described, occupational exposure, exposure sources not described.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Medium. Most key criteria met; lack of raw data.
	Metric 9:	Quality Assurance	Medium	Medium. Quality assurance procedures not described, lack of pre-exposure/baseline samples, however sampling and analytic methods referenced (Bornehag, 2012) with QC procedures briefly described.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Medium. Variability described within statistical summary measures, potential study limitations minimally described and comparisons with previous literature presented.

Overall Quality Determination   Medium

Study Citation:	Soomro, M. H., Baiz, N., Philippat, C., Vernet, C., Siroux, V., Nichole Maesano, C., Sanyal, S., Slama, R., Bornehag, C. G., Annesi-Maesano, I. (2018). Prenatal exposure to phthalates and the development of eczema phenotypes in male children: results from the EDEN mother-child cohort study. Environmental Health Perspectives 126(2):027002.		
HERO ID:	4728712		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Concise but scientifically sound methods.
Metric 2:	Analytical Methodology	Medium	Limited description, reported LOD.
Metric 3:	Biomarker Selection	High	Biomarker known to be related to external exposure.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	France
Metric 5:	Currency	High	Published in 2018.
Metric 6:	Spatial and Temporal Variability	Low	n=604, no replicates.
Metric 7:	Exposure Scenario	Medium	Data likely represent relevant exposure scenarios, missing details about the source and exposure characteristics.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Only summary statistics.
Metric 9:	Quality Assurance	Low	QA/QC techniques were not discussed.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Characterized variability, discussed uncertainties and limitations.

Overall Quality Determination   Medium

Study Citation:	Smarr, M. M., Kannan, K., Sun, L., Honda, M., Wang, W., Karthikraj, R., Chen, Z., Weck, J., Buck Louis, G. M. (2018). Preconception seminal plasma concentrations of endocrine disrupting chemicals in relation to semen quality parameters among male partners planning for pregnancy. Environmental Research 167:78-86.		
HERO ID:	4728828		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Detailed sampling methods.
	Metric 2:	Analytical Methodology	Medium	Well described analytical methods, did not report LOD.
	Metric 3:	Biomarker Selection	High	Biomarker is known to be related with external exposure.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Medium	Sampling began in 2005.
	Metric 6:	Spatial and Temporal Variability	Low	n=501 study participants, with duplicate samples.
	Metric 7:	Exposure Scenario	Medium	Limited information about the source and microenvironment.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics.
	Metric 9:	Quality Assurance	Low	QA/QC techniques only briefly discussed, cited previously published work.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Characterized variability and discussed study limitations.

Overall Quality Determination   Medium

Study Citation:	Gupta, S., Gadi, R. (2018). Temporal variation of phthalic acid esters (PAEs) in ambient atmosphere of Delhi. Bulletin of Environmental Contamination and Toxicology 101(2):153-159.		
HERO ID:	4728875		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling equipment and methods are described in sufficient detail, but certain aspects (e.g. duration of storage) were absent that are unlikely to have a substantial impact on results.
	Metric 2:	Analytical Methodology	High	Analytical instrumentation and methods are described in sufficient detail and are scientifically sound. LOD and LOQ are reported for each analyte.
	Metric 3:	Biomarker Selection	N/A	This study is testing for the parent chemical of interest in an environmental medium.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Delhi, India
	Metric 5:	Currency	High	2015
	Metric 6:	Spatial and Temporal Variability	Medium	24h particulate matter samples from one site collected 2-3 times per week for one year (for a total of 69 samples), but no replicates.
	Metric 7:	Exposure Scenario	High	The sampling site is well characterized based on surrounding area, traffic, population, pollution, and weather patterns.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Raw data are not reported; one unspecified summary statistic for concentration is provided, which is inferred to be the mean value.
	Metric 9:	Quality Assurance	High	QA/QC measures included the use of external standards, field blank samples, spiked blanks, and triplicate analyses to determine calibration, recoveries, reproducibility, LOD and LOQ; all were reported within acceptable ranges.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Characterization of variability is absent, as is any discussion of limitations or sources of uncertainty.

Overall Quality Determination   Medium

Study Citation:	Chen, Y., Lv, D., Li, X., Zhu, T. (2018). PM2.5-bound phthalates in indoor and outdoor air in Beijing: Seasonal distributions and human exposure via inhalation. Environmental Pollution 241:369-377.		
HERO ID:	4728877		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methods, site, equipment, calibration and storage reported.
	Metric 2: Analytical Methodology	Low	Analytical methods, instrument and blanks reported. LOD nor LOQ reported
	Metric 3: Biomarker Selection	N/A	Study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was conducted in Beijing, China.
	Metric 5: Currency	Medium	Data collected from 2014 to 2016.
	Metric 6: Spatial and Temporal Variability	High	114-226 samples taken with no replicates.
	Metric 7: Exposure Scenario	Medium	Source of exposure is from indoor environments, but the exact source is unknown.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Summary statistics are reported. Raw data not provided.
	Metric 9: Quality Assurance	High	QA was reported with high recovery rates for all the phthalates (>70%).
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability characterized through different settings sampled. Gaps and limitations not characterized.

Overall Quality Determination   Medium

Study Citation:	Weiss, J. M., Gustafsson, Å., Gerde, P., Bergman, Å., Lindh, C. H., Krais, A. M. (2018). Daily intake of phthalates, MEHP, and DINCH by ingestion and inhalation. Chemosphere 208:40-49.		
HERO ID:	4728899		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Some sampling methods not reported, such as sample storage conditions. Pooled school dust sampling was not explained to people collecting samples and hence potential differences in collection.
	Metric 2: Analytical Methodology	Medium	Some analytical methods not reported, such as recovery samples.
	Metric 3: Biomarker Selection	N/A	Not biomonitoring samples.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Sweden
	Metric 5: Currency	Medium	Not reported. FORMAS project is dated to 2012, but sampling could have occurred at various times. Sampling time can range from 2012 to 2018.
	Metric 6: Spatial and Temporal Variability	Medium	No replicates.
	Metric 7: Exposure Scenario	Medium	Household dust collected from children's sleeping roomsand from living rooms and in schools at three locations inSweden.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not provided.
	Metric 9: Quality Assurance	Medium	LOD reported, recovery samples not reported. Blanks and other QC samples were used to discuss results.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Few gaps and limitations reported.

Overall Quality Determination   **Medium**

Study Citation:	Wenzel, A. G., Bloom, M. S., Butts, C. D., Wineland, R. J., Brock, J. W., Cruze, L., Unal, E. R., Kucklick, J. R., Somerville, S. E., Newman, R. B. (2018). Influence of race on prenatal phthalate exposure and anogenital measurements among boys and girls. Environment International 110:61-70.		
HERO ID:	4728953		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Medium. Most key criteria met, lack of duration of sample storage prior to analysis.
	Metric 2: Analytical Methodology	Medium	Medium. Most key criteria met, LOD's reported, specific gravity considerations for matrix adjustment, lack of recovery data.
	Metric 3: Biomarker Selection	Low	Low. Metabolites not specific for parent chemicals.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	High. Samples collected from participants in Charleston, SC.
	Metric 5: Currency	Medium	Medium. Samples collected from pregnant women recruited 2011-2014.
	Metric 6: Spatial and Temporal Variability	Medium	Medium. Single spot urine specimens collected from main study, subsample gave a second sample, total participating = 380 women, non-statistical sampling method.
	Metric 7: Exposure Scenario	Medium	Medium. Participant characteristics reported in Table 1, some discussion of potential exposure sources, lack of control samples.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Medium. Most key criteria met, lack of raw data.
	Metric 9: Quality Assurance	Medium	Medium. Standard QC methods reported, most key criteria met, recoveries reported, lack of pre-exposure samples.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Medium. Variability described in terms of statistical summary measures, limitations of sampling during gestational weeks (GW) 18-20 rather than earlier, etiologically relevant GW 7-13 noted.

Overall Quality Determination   Medium

| Study Citation: | Baurès, E., Blanchard, O., Mercier, F., Surget, E., le Cann, P., Rivier, A., Gangneux, J. P., Florentin, A. (2018). Indoor air quality in two French hospitals: Measurement of chemical and microbiological contaminants. Science of the Total Environment 642:168-179. |
| HERO ID: | 4729972 |

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The air sampling methodology was described in detail.
	Metric 2:	Analytical Methodology	Medium	The analytical methods were described and included LOD/LOQ but not recoveries.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed air samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study was conducted in France.
	Metric 5:	Currency	Medium	The samples were collected between June 2014 and February 2015
	Metric 6:	Spatial and Temporal Variability	High	n>10 air samples, with replicates.
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenarios related indoor airborne pollutants in French Hospitals.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	The authors reported summary statistics and raw data.
	Metric 9:	Quality Assurance	High	The authors described QA/QC techniques in detail.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability was characterized (SD, range). Little information was reported on limitations and gaps.

Overall Quality Determination   High

Study Citation:	Ait Bamai, Y., Araki, A., Nomura, T., Kawai, T., Tsuboi, T., Kobayashi, S., Miyashita, C., Takeda, M., Shimizu, H., Kishi, R. (2018). Association of filaggrin gene mutations and childhood eczema and wheeze with phthalates and phosphorus flame retardants in house dust: The Hokkaido study on Environment and Children's Health. Environment International 121(Pt 1):102-110.		
HERO ID:	4829235		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The authors report the microenvironment of the dust collection (living room floor), and the sampling equipment. They also reported the storage conditions but not the storage duration.
	Metric 2: Analytical Methodology	Medium	The authors referred to another paper regarding the methods, but they reported the analytical method used and instrumentation. The authors reported LOQ.
	Metric 3: Biomarker Selection	N/A	NA - Dust sample no biomarker needed.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Hokkaido Japan.
	Metric 5: Currency	Medium	Samples were collected in 2013.
	Metric 6: Spatial and Temporal Variability	Medium	The study collected 888 house dust samples, however they did not collect replicate samples.
	Metric 7: Exposure Scenario	Medium	The exposure scenario is relevant.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	The authors report the detection frequency, min, max, 25 and 75%. They also reported the number of samples in the data set. No standard deviation was reported, nor individual concentrations.
	Metric 9: Quality Assurance	Medium	The authors refer to another paper regarding their quality control and assurance methods.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	The authors address limitations of the study, variance was reported in terms of percentiles.

Overall Quality Determination   Medium

Study Citation:	Malits, J., Attina, T. M., Karthikraj, R., Kannan, K., Naidu, M., Furth, S., Warady, B. A., Vento, S., Trachtman, H., Trasande, L. (2018). Renal function and exposure to bisphenol A and phthalates in children with chronic kidney disease. Environmental Research 167:575-582.		
HERO ID:	4829246		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sample storage duration is unclear.
Metric 2:	Analytical Methodology	Low	The main study does not include information on analytical methods, but states that detailed methods can be found in the supplementary materials for the article.
Metric 3:	Biomarker Selection	Medium	The biomarker (urine) is acceptable.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	The study was performed in the USA.
Metric 5:	Currency	Medium	The majority of samples were collected from 2005 to 2008, and some were collected between 2009 and 2014.
Metric 6:	Spatial and Temporal Variability	Medium	There were 538 study participants. Samples were fresh void samples, not 24-hr samples.
Metric 7:	Exposure Scenario	Medium	The data likely represent the exposure scenario.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Results we're adjusted for urinary creatine. Mean values with 95% confidence intervals were reported. Raw data were not included in the main study (it is unclear whether these data are contained in the supplementary materials).
Metric 9:	Quality Assurance	Low	The study reports that no QC/QC measures were in place during sampling.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	The study included a brief discussion of the limitations of its cross-sectional design.

Overall Quality Determination   **Medium**

Study Citation:	Fan, G., Xie, J., Yoshino, H., Zhang, H., Li, Z., Li, N., Liu, J., Lv, Y., Zhu, S., Yanagi, U., Hasegawa, K., Kagi, N., Zhang, X., Liu, J. (2018). Common SVOCs in house dust from urban dwellings with schoolchildren in six typical cities of China and associated non-dietary exposure and health risk assessment. Environment International 120:431-442.		
HERO ID:	4829253		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology described in detail.
	Metric 2:	Analytical Methodology	Medium	Analytical methods were described in detail. Detection limits reported. Missing some information such as calibration.
	Metric 3:	Biomarker Selection	N/A	Parent chemical measured in dust.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples collected from 6 Chinese cities - Shanghai, Beijing, Changsha, Wuhan, Dalian and Harbin.
	Metric 5:	Currency	Medium	Phase 2 (field measurements of indoor environment) conducted during 2013-2014.
	Metric 6:	Spatial and Temporal Variability	Medium	68 dwellings sampled in winter and 59 in summer. No replicates were reported.
	Metric 7:	Exposure Scenario	High	Dust sampled from apartment houses in urban area that include children.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 2 provides summary statistics including detection rate, max, average, min of chemical by winter and by summer. Concentration statistics by city provided in SI. Individual points not reported.
	Metric 9:	Quality Assurance	Medium	QA/QC discussed in Section 2.5. Lab-introduced contamination was negligible. Does not discuss recovery.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Paper compared findings to previous studies and discusses variation in different seasons and cities as well as limitations.

Overall Quality Determination   High

Study Citation:	Amin, M. M., Ebrahimpour, K., Parastar, S., Shoshtari-Yeganeh, B., Hashemi, M., Mansourian, M., Poursafa, P., Fallah, Z., Rafiei, N., Kelishadi, R. (2018). Association of urinary concentrations of phthalate metabolites with cardiometabolic risk factors and obesity in children and adolescents. Chemosphere 211:547-556.		
HERO ID:	4829277		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Some aspects of sampling methods not reported, most notably whether the urine samples were first voids, 24-hour samples, or another type (as well as how they were collected and stored).
	Metric 2: Analytical Methodology	Low	Limits of detection were not identified. Some aspects of analytical methods were not reported, such as recovery samples and instrument calibration.
	Metric 3: Biomarker Selection	Low	Metabolites were measured in urine. However, one metabolite could be derived from multiple parents (including this chemical), and no effort was made to apportion it.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Isfahan, Iran
	Metric 5: Currency	High	Samples collected in 2016
	Metric 6: Spatial and Temporal Variability	Low	There were >10 samples, but no replicates. It is unclear whether the urine samples were 24-hour samples, first morning voids, or another type. Since they were likely spot samples collected when the children also provided blood samples, I rated this as low.
	Metric 7: Exposure Scenario	Medium	Exposure source not well characterized, but surveys were used to assess use of certain products that may have been sources of phthalates, such as bottled beverages, cosmetics, etc.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not reported, but means, medians, standard deviations, and number of detections reported.
	Metric 9: Quality Assurance	Low	QA was not discussed.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	There was little discussion of uncertainty, but some limitations (e.g., just one snapshot in time, correlation does not demonstrate causation) were discussed. The sources of variability included whether children had entered puberty, which was not assessed, and use of products that may have increased exposure to phthalates, which was assessed.

Overall Quality Determination   **Medium**

Study Citation:	Ramzi, A., Gireeshkumar, T. R., Habeeb Rahman, K., Manu, M., Balachandran, K. K., Chacko, J., Chandramohanakumar, N. (2018). Distribution and contamination status of phthalic acid esters in the sediments of a tropical monsoonal estuary, Cochin - India. Chemosphere 210(Elsevier):232-238.		
HERO ID:	4829338		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Key sampling methods (e.g., location, site characteristics, equipment, collection regimen) were reported.
	Metric 2: Analytical Methodology	High	Key analytical methods (e.g., instrumentation, extraction, LODs/LOQs, recoveries) were reported.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemicals in sediment.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Cochin, India.
	Metric 5: Currency	Medium	Samples were collected in 2013.
	Metric 6: Spatial and Temporal Variability	Medium	Samples were collected from 15 locations. Authors reported that several deployments were made to obtain a well-preserved samples, but it is unclear if that means replicates were collected.
	Metric 7: Exposure Scenario	High	The introduction describes sources of phthalates to the estuary and how it can pose an ecological hazard.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not reported.
	Metric 9: Quality Assurance	High	Key QA/QC were reported. Recoveries were acceptable.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variance characterized with ranges. Gaps and limitations were only briefly reported.

Overall Quality Determination   **High**

Study Citation:	Paluselli, A., Fauvelle, V., Schmidt, N., Galgani, F., Net, S., Sempéré, R. (2018). Distribution of phthalates in Marseille Bay (NW Mediterranean Sea). Science of the Total Environment 621:578-587.		
HERO ID:	4829461		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The sampling method is clear and appropriate, and includes details such as sample storage, sample storage duration and sampler calibration.
	Metric 2:	Analytical Methodology	High	The analytical methodology is clear and appropriate. A range of LODs is provided for the chemicals.
	Metric 3:	Biomarker Selection	N/A	Study is testing for the parent chemical in an environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Marseille Bay, France.
	Metric 5:	Currency	Medium	Samples were collected from Dec 2013 to Nov 2014.
	Metric 6:	Spatial and Temporal Variability	High	A total of 72 water samples were collected monthly at multiple seawater depths of 0.5, 5, 15 and 30 meters for surface and bottom seawater level sampling over a period of one year. Duplicate samples were reported.
	Metric 7:	Exposure Scenario	High	The exposure scenario is surface water in a bay in France at various depths. The scenario is well characterized with details such as the microclimate and potential sources provided.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Concentrations of chemical were provided in Table 1, including range, average, and standard deviation. No raw data was provided.
	Metric 9:	Quality Assurance	Medium	QA/QC measures are reported, including the use of a method blank and a spike blank. No major issues were identified. It was noted that occasionally DiBP, DBP and DEHP were detected in blanks but in concentrations that were below the limits of detection.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Standard deviations are provided in Table 1 and there is discussion of variability and uncertainty in the results and discussion section.

Overall Quality Determination   High

Study Citation:	Zhang, H., Zhou, Q., Xie, Z., Zhou, Y., Tu, C., Fu, C., Mi, W., Ebinghaus, R., Christie, P., Luo, Y. (2018). Occurrences of organophosphorus esters and phthalates in the microplastics from the coastal beaches in north China. Science of the Total Environment 616-617:1505-1512.		
HERO ID:	4829473		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Some methods not reported such as sample storage conditions. More information provided in other references stated.
Metric 2:	Analytical Methodology	High	Key analytical methods reported, including extraction methods, analytical instrument, LOD provided in supplementary file.
Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples collected in China.
Metric 5:	Currency	High	Samples collected in 2015.
Metric 6:	Spatial and Temporal Variability	Medium	28 samples collected. No replicates mentioned.
Metric 7:	Exposure Scenario	High	Samples collected from the sand near the sea.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not reported. Summary statistics such as mean, median, range reported.
Metric 9:	Quality Assurance	High	Key QA reported. Procedural blanks and high recoveries reported.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Gaps and limitations not reported. Variation, such as SD, comparison to other studies, and spatial analysis reported.

Overall Quality Determination   High

Study Citation:	Kuzukiran, O., Yurdakok-Dikmen, B., Sevin, S., Sireli, U. T., Iplikcioglu-Cil, G., Filazi, A. (2018). Determination of selected endocrine disruptors in organic, free-range, and battery-produced hen eggs and risk assessment. Environmental Science and Pollution Research 25(35):35376-35386.		
HERO ID:	4938680		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sample collection was described. Site matrix and characteristics were provided. And storage condition was described.
	Metric 2: Analytical Methodology	High	GC-MS was used to analyze the chemicals. LOD and LOQ were reported.
	Metric 3: Biomarker Selection	N/A	Environmental media
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Ankara, Turkey
	Metric 5: Currency	High	March to May 2017
	Metric 6: Spatial and Temporal Variability	Medium	50 battery-hen eggs were collected from ten cages
	Metric 7: Exposure Scenario	High	The data closely represent relevant exposure scenario.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Supplementary or raw data (i.e., individual data points) are not reported, and therefore summary statistics cannot be reproduced.
	Metric 9: Quality Assurance	High	The study applied quality assurance/quality control measures and all pertinent quality assurance information is provided. (Table 3)
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	The study has limited discussion of key uncertainties, limitations, and data gaps.

Overall Quality Determination   High

Study Citation:	Okeme, J. O., Nguyen, L. V., Lorenzo, M., Dhal, S., Pico, Y., Arrandale, V. H., Diamond, M. L. (2018). Polydimethylsiloxane (silicone rubber) brooch as a personal passive air sampler for semi-volatile organic compounds. Chemosphere 208:1002-1007.		
HERO ID:	5017615		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Personal air sampling methodology described within text as incorporating passive polydimethylsiloxane brooch samplers worn within breathing zone of participants, samples stored in air tight glass jars and frozen pending analysis, extensive calibration study of passive samplers compared with active sampling pumps conducted prior to field study described with field study conducted on participants instructed to stay indoors unless going to/from work. Insufficient information on sample storage time prior to analysis. Sampling methodology within field study unclear as to distribution/collection times of passive samplers—it is unclear if passive sampling brooches were collected daily or if single brooches were worn for seven consecutive days.
	Metric 2:	Analytical Methodology	Medium	Extraction methods and analytical instrumentation as GC-MS/ENCI described with data on detection limits and recovery samples described within SI and noted to have met criteria from previous references (Saini et al., 2015; Okeme et al., 2016b). Insufficient information on instrument calibration, although this information may be provided within SI.
	Metric 3:	Biomarker Selection	N/A	Personal passive air sampling results with brooch and active sampling pump for parent chemicals of interest.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Canada.
	Metric 5:	Currency	High	Sampling conducted in winter of 2016.
	Metric 6:	Spatial and Temporal Variability	Low	Field study consisted of three volunteers wearing badges for seven days with unclear methodology description of when/if passive sampling brooches were retrieved and replaced daily or if a single brooch was worn for 24 hours during seven day period. No duplicate/replicate sampling conducted, however 24-hour sampling conducted.
	Metric 7:	Exposure Scenario	Medium	Participants are office workers who were instructed to remain indoors (work/home) for the period of study other than transportation to/from work.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Raw data in terms of passive personal brooch sampling results for each participant reported within Table 1, with additional data from calibration in SI. Insufficient information on exact sampling dates, although sampling reported as conducted during "winter of 2016". Insufficient information on summary statistics as only single brooch concentrations, without range, number of brooches, etc. provided. Frequency of detection information described as detailed within SI.
	Metric 9:	Quality Assurance	Medium	Recovery and QC data described as detailed within SI (S3). Results described as blank and recovery corrected as appropriate. Pre-exposure sampling not conducted.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Insufficient information on variability characterization as no range or SD information provided for sampling results. Limitations of small sample size (n=3 participants for field study) as well as lack of individual activity data noted. Some uncertainty with effects of humidity on passive sampling brooch while left within bathroom during shower/bathing activities not noted by authors.

Overall Quality Determination   Medium

Study Citation:	Balalian, A. A., Whyatt, R. M., Liu, X., Insel, B. J., Rauh, V. A., Herbstman, J., Factor-Litvak, P. (2019). Prenatal and childhood exposure to phthalates and motor skills at age 11 years. Environmental Research 171:416-427.		
HERO ID:	5039985		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Most key criteria not described. Sampling equipment, sample storage conditions, duration of sample storage, lacking.
	Metric 2: Analytical Methodology	Medium	Some key criteria briefly described, samples analyzed by CDC with methodology referenced, chemical-specific LOD's reported.
	Metric 3: Biomarker Selection	Low	Sampling for metabolites not specific for parent chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples provided by participants in Harlem and New York, New York hospitals.
	Metric 5: Currency	Medium	Prenatal spot urine samples collected 1998-2006; age three urines collected 2002-2008; age 5 urines collected 2004-2009; age 7 urines collected 2005-2009.
	Metric 6: Spatial and Temporal Variability	Medium	Single prenatal 3rd trimester spot urine specimens obtained from n=300 participants 1998-2006; repeated urines collected across ages 3, 5 and 7 for children of mother participants 2002-2009.
	Metric 7: Exposure Scenario	Medium	Participant characteristics summarized, lack of information on pre-exposure or control samples.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Most key criteria met; lack of raw data.
	Metric 9: Quality Assurance	Medium	Quality assurance procedures not described however analytic methods referenced and samples noted as analyzed at CDC labs.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability characterized within summary statistics, potential study limitations discussed.

Overall Quality Determination   Medium

| Study Citation: | Chen, Y., Jiang, L., Lu, S., Kang, L., Luo, X., Liu, G., Cui, X., Yu, Y. (2019). Organophosphate ester and phthalate ester metabolites in urine from primiparas in Shenzhen, China: Implications for health risks. Environmental Pollution 247:944-952. |
| HERO ID: | 5039996 |

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology is adequately described.
	Metric 2:	Analytical Methodology	Medium	LOQ is not stated in the main article, but is reportedly provided in the supplemental materials for this article.
	Metric 3:	Biomarker Selection	High	The biomarker (metabolite in urine samples) is appropriate.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Participants were recruited in Shenzhen Maternal and Child Health Hospital (China).
	Metric 5:	Currency	High	Samples were collected between September 2013 and June 2015.
	Metric 6:	Spatial and Temporal Variability	Medium	Samples collected from 84 Primiparas but no replicates. First-morning voids were collected as opposed to 24-hr sampling.
	Metric 7:	Exposure Scenario	High	The data represent the population of interest.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Summary statistics were detailed and complete but individual data points and measures of variance were not reported.
	Metric 9:	Quality Assurance	Medium	Recoveries were measured, and blanks were analyzed. Glassware was cleaned and heated to minimize background contamination. The study reported that trace levels of mBP were detected in the procedural blanks, and were subtracted to determine the final concentrations in urine samples. Results were normalized by specific gravity.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No measure of variance is reported. The study briefly discussed its primary limitation (small sample size).

Overall Quality Determination   High

Study Citation:	Zhu, Q., Jia, J., Zhang, K., Zhang, H., Liao, C., Jiang, G. (2019). Phthalate esters in indoor dust from several regions, China and their implications for human exposure. Science of the Total Environment 652:1187-1194.		
HERO ID:	5041236		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methodology is thoroughly described and scientifically sound. No key details are omitted.
	Metric 2: Analytical Methodology	High	Analytical method is thoroughly described and sound. LOD and LOQ is provided in the text.
	Metric 3: Biomarker Selection	N/A	Study is testing for parent chemical in dust.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples collected in China.
	Metric 5: Currency	High	Samples collected from 2017-2018.
	Metric 6: Spatial and Temporal Variability	Medium	No replicates provided.
	Metric 7: Exposure Scenario	High	The source of exposure was well characterized and this is an exposure scenario of interest.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data is not provided, but summary statistics are given.
	Metric 9: Quality Assurance	High	QA/QC methods are provided and no issues were identified.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Limited gaps and limitations are reported. Characterization of variability is limited but the range is provided.

Overall Quality Determination   High

Study Citation:	Martinez, R. M., Hauser, R., Liang, L., Mansur, A., Adir, M., Dioni, L., Racowsky, C., Bollati, V., Baccarelli, A. A., Machtinger, R. (2019). Urinary concentrations of phenols and phthalate metabolites reflect extracellular vesicle microRNA expression in follicular fluid. Environment International 123:20-28.		
HERO ID:	5041241		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The urine sampling methodology was described in detail and is scientifically sound.
	Metric 2: Analytical Methodology	Medium	The analytical methods were described and included LODs but did not include recoveries.
	Metric 3: Biomarker Selection	High	The metabolites closely represent exposure to phthalates.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The samples were collected in Israel
	Metric 5: Currency	High	The samples were collected between 2014 and 2016.
	Metric 6: Spatial and Temporal Variability	Low	n=130, some study participants provided duplicate samples.
	Metric 7: Exposure Scenario	High	The data closely represent relevant scenarios related to phthalate exposure
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Only summary statistics were reported (median, IQR, max)
	Metric 9: Quality Assurance	Medium	QA/QC techniques were mentioned but not described in detail.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Variability was characterized (IQR, max). Uncertainties and study limitations were discussed.

Overall Quality Determination   High

Study Citation:	Nassan, F. L., Williams, P. L., Gaskins, A. J., Braun, J. M., Ford, J. B., Calafat, A. M., Hauser, R. (2019). Correlation and temporal variability of urinary biomarkers of chemicals among couples: Implications for reproductive epidemiological studies. Environment International 123:181-188.		
HERO ID:	5041439		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Well described
Metric 2:	Analytical Methodology	High	LOD reported. Standard methods.
Metric 3:	Biomarker Selection	High	Strong relationship with parent.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Boston
Metric 5:	Currency	Medium	2004 to 2017
Metric 6:	Spatial and Temporal Variability	Medium	Hundreds of samples and hundreds of participants. Replicate samples (men and women on same day). Un-pooled spot urine samples. Multiple samples per person, so treat as if pooled.
Metric 7:	Exposure Scenario	Low	Matches exposure scenario for couples seeking fertility treatments, so may not be representative of US population.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	Summary statistics only. Downgraded to Low because I cannot tell if the summary statistics are per person (best) or per sample.
Metric 9:	Quality Assurance	Low	QA/QC not discussed. SG adjustment.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Uncertainties and limitations discussed.

Overall Quality Determination   **Medium**

Study Citation: Velázquez-Gómez, M., Hurtado-Fernández, E., Lacorte, S. (2019). Differential occurrence, profiles and uptake of dust contaminants in the Barcelona urban area. Science of the Total Environment 648:1354-1370.

HERO ID: 5043338

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Dust sampling methods were included and described (Velázquez-Gómez et al., 2018). Sample collection was performed by gently collecting the accumulation of the settled dust. In houses, cars and in the public places where we had access, the samples were collected by scientific staff with a Bosch BKS4 (14.4 V) vacuum cleaner.
	Metric 2:	Analytical Methodology	Medium	GC-EI-MS/MS analysis. All QA/QC measures reported except reporting limits were not reported in the text.
	Metric 3:	Biomarker Selection	N/A	They did not test for biomarkers; tested for parent chemicals in dust samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples collected in Spain.
	Metric 5:	Currency	Low	Sampling date was not reported, but publication date is available, 2019.
	Metric 6:	Spatial and Temporal Variability	Medium	Authors did not collect replicate samples.
	Metric 7:	Exposure Scenario	Medium	Table 1 presents sample site characteristics, but does not include indoor characteristics such as air flow.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Authors did not calculate standard deviation or other measure of variation (besides IQR).
	Metric 9:	Quality Assurance	Medium	QA/QC techniques were discussed, but authors did not report sample recoveries.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Authors provided limited discussion on key data uncertainties.

Overall Quality Determination   **Medium**

Study Citation:	Bi, C., Maestre, J. P., Li, H., Zhang, G., Givehchi, R., Mahdavi, A., Kinney, K. A., Siegel, J., Horner, S. D., Xu, Y. (2018). Phthalates and organophosphates in settled dust and HVAC filter dust of U.S. low-income homes: Association with season, building characteristics, and childhood asthma. Environment International 121(Pt 1):916-930.		
HERO ID:	5043341		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling methodology described, sample storage provided, comparison between two settled dust sampling methods
Metric 2:	Analytical Methodology	Medium	LOD or LOQ not provided but MDLs are reported. Instrumentation and analytical was briefly described and is acceptable.
Metric 3:	Biomarker Selection	N/A	NA - dust samples biomarker not needed.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Texas, USA
Metric 5:	Currency	Medium	Data collected 2014 to 2015. winter (December 2014–February 2015 and summer (June 2014–September 2014) seasons
Metric 6:	Spatial and Temporal Variability	High	54 homes, multiple types of samples (91 for HVAC and 92 for settled dust). Two small replicate cuts per filter
Metric 7:	Exposure Scenario	High	Indoor dust low income homes rural/semi rural areas. Collection of HVAC particulate is more representative of breathable and inhalable particles then from settled dust
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	No raw data reported. Summary stats and figures available
Metric 9:	Quality Assurance	High	Blanks, recovery spikes and standards are used correctly
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Statistical analysis appropriate and discussion of limitations was adequate

Overall Quality Determination   High

Study Citation:	Reeves, K. W., Santana, M. D., Manson, J. E., Hankinson, S. E., Zoeller, R. T., Bigelow, C., Hou, L., Wactawski-Wende, J., Liu, S., Tinker, L., Calafat, A. M. (2019). Predictors of urinary phthalate biomarker concentrations in postmenopausal women. Environmental Research 169:122-130.		
HERO ID:	5043403		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported such as sampler calibration
Metric 2:	Analytical Methodology	Medium	Recovery samples not reported
Metric 3:	Biomarker Selection	High	Acceptable biomarker
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	United States
Metric 5:	Currency	Low	Samples collected between 1993 and 1998
Metric 6:	Spatial and Temporal Variability	High	>10 samples; replicates
Metric 7:	Exposure Scenario	High	Exposure sources characterized
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not reported
Metric 9:	Quality Assurance	Medium	Key QA reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Some limitations reported

Overall Quality Determination   Medium

Study Citation:	Rodríguez-Carmona, Y., Cantoral, A., Trejo-Valdivia, B., Téllez-Rojo, M. M., Svensson, K., Peterson, K. E., Meeker, J. D., Schnaas, L., Solano, M., Watkins, D. J. (2019). Phthalate exposure during pregnancy and long-term weight gain in women. Environmental Research 169:26-32.		
HERO ID:	5043451		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Only briefly described.
Metric 2:	Analytical Methodology	High	Well described analytical methods, reported LOD in supplemental material.
Metric 3:	Biomarker Selection	High	Biomarker is known to be related to external exposure.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Mexico
Metric 5:	Currency	Low	Sampling began in 1997.
Metric 6:	Spatial and Temporal Variability	Low	n=178, with 4 replicates.
Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenarios.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Only summary statistics.
Metric 9:	Quality Assurance	Medium	Limited description about QA/QC techniques.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Characterized variability, discussed uncertainties and limitations.

Overall Quality Determination   Medium

Study Citation:	Shaffer, R. M., Ferguson, K. K., Sheppard, L., James-Todd, T., Butts, S., Chandrasekaran, S., Swan, S. H., Barrett, E. S., Nguyen, R., Bush, N., Mcelrath, T. F., Sathyanarayana, S. (2019). Maternal urinary phthalate metabolites in relation to gestational diabetes and glucose intolerance during pregnancy. Environment International 123:588-596.		
HERO ID:	5043458		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Most key criteria met, sampling methodology briefly described; lack of sample storage duration prior to analysis.
	Metric 2: Analytical Methodology	Medium	Analytical methodology briefly described, limits of detection reported as range, however analytic methods referenced.
	Metric 3: Biomarker Selection	Low	Sampling for metabolites not specific for parent chemicals of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples provided by participants in California, Minnesota, New York, and Washington State.
	Metric 5: Currency	Medium	Samples collected 2010-2012.
	Metric 6: Spatial and Temporal Variability	Medium	Participants in their first trimester recruited from California, Minnesota, New York, and Washington State during 2010-2012; single spot urines during first (70-100 samples per chemical) and third trimester period (n=679 samples); non-statistical sampling methodology.
	Metric 7: Exposure Scenario	Medium	Participant characteristics described.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Most key criteria met; lack of raw data.
	Metric 9: Quality Assurance	Medium	Quality assurance procedures briefly described, lack of pre-exposure/baseline samples, however analytic methodology referenced.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability described within statistical summary measures, potential study limitations described and comparisons with previous literature presented.

Overall Quality Determination   Medium

Dibutyl Phthalate   Monitoring   HERO ID: 5043463

Study Citation:	Shin, H. M., Bennett, D. H., Barkoski, J., Ye, X., Calafat, A. M., Tancredi, D., Hertz-Picciotto, I. (2019). Variability of urinary concentrations of phthalate metabolites during pregnancy in first morning voids and pooled samples. Environment International 122:222-230.		
HERO ID:	5043463		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Sampling methodology does not represent best protocols. Participants were instructed to collect urine "in a clean plastic container," transfer into a study-provided bottle, then stored in their home refrigerator "or other cool place" for an unspecified amount of time. Additionally, many participants did not include all four requested samples (three first morning voids and one 24-hour) and the selection of samples to analyze from the provided number is unclear.
Metric 2:	Analytical Methodology	High	Samples were analyzed at a CDC laboratory following methodology that is well-established and reliable. Analyte LOD is provided.
Metric 3:	Biomarker Selection	Low	Monoester phthalate is a biomarker for multiple parent molecules, and there is no stated method to quantify exposure for the molecule of interest.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	California
Metric 5:	Currency	Medium	2007-2014
Metric 6:	Spatial and Temporal Variability	Medium	178 mothers (188 pregnancies) were instructed to provided four urine samples each: first morning void urine samples once per week for three weeks, and one 24-hour urine sample on the fourth week. However, many participants did not provide all requested samples; the selection of samples to analyze from the provided number favored first-morning voids and is otherwise unclear.
Metric 7:	Exposure Scenario	Medium	Biomonitoring
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Summary statistics for analyte concentration include 5th, 25th, 50th, 75th, and 95th percentile, as well as maximum and geometric mean. Individual concentration values are not reported.
Metric 9:	Quality Assurance	High	Samples were analyzed at a CDC laboratory following protocols that are well-established to be precise and reproducible, including in-study assurances.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Variability between sample types (pooled vs. individual) and across trimesters is thoroughly discussed and analyzed.

Overall Quality Determination   **Medium**

Study Citation:	Al Qasmi, N. N., Al-Thaiban, H., Helaleh, M. I. H. (2019). Indoor phthalates from household dust in Qatar: Implications for non-dietary human exposure. Environmental Science and Pollution Research 26(1):421-430.		
HERO ID:	5043469		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling methodology described.
Metric 2:	Analytical Methodology	High	Analytical methodology described, LOD reported.
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Qatar
Metric 5:	Currency	Medium	Data collected in 2014 and 2015.
Metric 6:	Spatial and Temporal Variability	Medium	Replicate samples not collected.
Metric 7:	Exposure Scenario	Medium	Indoor dust samples in 11 homes.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not reported.
Metric 9:	Quality Assurance	High	Reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Some gaps and limitations provided.

Overall Quality Determination   **High**

Study Citation:	Kang, H., Kim, S., Lee, G., Lee, I., Lee, J. P., Lee, J., Park, H., Moon, H. B., Park, J., Kim, S., Choi, G., Choi, K. (2019). Urinary metabolites of dibutyl phthalate and benzophenone-3 are potential chemical risk factors of chronic kidney function markers among healthy women. Environment International 124:354-360.		
HERO ID:	5043489		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported
	Metric 2:	Analytical Methodology	Medium	Recovery samples not reported
	Metric 3:	Biomarker Selection	High	Acceptable biomarker
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Korea
	Metric 5:	Currency	High	Samples collected in 2015 to 2016
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported
	Metric 9:	Quality Assurance	Medium	Limited QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported

Overall Quality Determination   **High**

Study Citation: Assens, M., Frederiksen, H., Petersen, J. H., Larsen, T., Skakkebæk, N. E., Juul, A., Andersson, A. M., Main, K. M. (2019). Variations in repeated serum concentrations of UV filters, phthalates, phenols and parabens during pregnancy. Environment International 123:318-324.

HERO ID: 5043499

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling methodology is only briefly discussed, therefore, most sampling information is missing and likely to have a substantial impact on results.
	Metric 2:	Analytical Methodology	High	Analytical instrumentation and methods are described in sufficient detail and are referenced to other published studies. LOD is reported for each analyte.
	Metric 3:	Biomarker Selection	Medium	The monoester phthalate biomarker is a metabolite of multiple parent chemicals, not just the chemical of interest, and there is not a stated method to apportion the estimate to just the chemical of interest. A secondary metabolite is also reported which may be unique to the parent chemical of interest, but is reported in very low concentration.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Copenhagen, Denmark
	Metric 5:	Currency	Low	1999-2001
	Metric 6:	Spatial and Temporal Variability	Medium	Blood serum samples from 128 pregnant women taken at various stages of pregnancy; 119 had samples from 4 timepoints.
	Metric 7:	Exposure Scenario	Medium	Phthalate metabolites were measured from prenatal serum of pregnant women. However, it is uncertain what the exposure sources are.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data are not reported; summary statistics include the detection rate, maximum, and percentiles (10, 25, 50, 75, 90) of concentration of metabolite.
	Metric 9:	Quality Assurance	Medium	QA/QC measures were briefly described and referenced to other published studies, but the results of these measures are not explicitly reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Characterization of variability is reported, and within-person and across-person variation are thoroughly investigated. However, discussion of methodological limitations or sources of uncertainty is absent.

Overall Quality Determination   **Medium**

Study Citation:	Sulentic, R. O., Dumitrascu, I., Deziel, N. C., Gurzau, A. E. (2018). Phthalate Exposure from Drinking Water in Romanian Adolescents. International Journal of Environmental Research and Public Health 15(10):2109.		
HERO ID:	5043505		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methods described, including sample procedures, storage, and equipment for tap water, representative bottled water, and first morning urine samples.
	Metric 2: Analytical Methodology	Medium	Analytic methodology described, including detection limits, analytical instrumentation, and extraction. Tap and bottled water samples analyzed according to ISO 18856, 2006 method. Urine specimens analyzed according to modified (unclear what was modified) Kim (2014) referenced study methods, along with creatinine analyses.
	Metric 3: Biomarker Selection	High	Sampling for metabolites specific for parent chemical of interest in urine and measured the parent chemical in water.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples provided by participants in Cluj-Napoca, Romania.
	Metric 5: Currency	High	Samples collected during the summer months of June and July of 2017.
	Metric 6: Spatial and Temporal Variability	Medium	Single first morning urine samples (not 24-hour samples) collected for 40 participants during a single season (summer) of a single year (2017). Only 10 tap water samples collected for 40 participants, and 16 bottled water concentrations reported. No replicates reported.
	Metric 7: Exposure Scenario	High	This is a biomonitoring (urine) study where exposure was assessed through sampling of tap and bottled water.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Summary statistics included median, 25th and 75th percentiles. Raw data not provided.
	Metric 9: Quality Assurance	Medium	Quality assurance procedures described, including blank and a laboratory control. No discussion of recoveries.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Characterized variability through tap and bottled water concentrations. Urinary concentrations reported across water consumption behaviors, consumer product use and demographics, as well as sample storage conditions. Potential study limitations and variability in results compared with previously reported studies presented.

Overall Quality Determination   High

Study Citation: Sun, J., Pan, L., Li, Z., Zeng, Q., Wang, L., Zhu, L. (2018). Comparison of greenhouse and open field cultivations across China: Soil characteristics, contamination and microbial diversity. Environmental Pollution 243(Pt B):1509-1516.

HERO ID: 5043507

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology discussed, including study site characteristics, storage conditions, and sampling equipment.
	Metric 2:	Analytical Methodology	Low	Analytical methods reported, including extraction method, instrumentation, and recovery samples. Detection limits not provided.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in soil.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples collected from 20 provinces in China (figure 1).
	Metric 5:	Currency	High	Samples collected from 2014 to 2015.
	Metric 6:	Spatial and Temporal Variability	Medium	51 pairs (greenhouses and nearby open vegetable fields) of surface soils samples collected from 20 areas. 2 or 3 sites for each province. Replicate samples not indicated.
	Metric 7:	Exposure Scenario	Medium	Samples collected from greenhouse and surrounding open fields. Type of fertilizer used identified. No further information provided.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Critically Deficient	No stats provided specific for this chemical. Raw data not provided.
	Metric 9:	Quality Assurance	High	QC discussed including blanks, controls, and recoveries (Text S2).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Few gaps and limitations reported. Compared results to previous studies.

Overall Quality Determination   **Uninformative**

Study Citation:	Cheng, Z., Liu, J. B., Gao, M., Shi, G. Z., Fu, X. J., Cai, P., Lv, Y. F., Guo, Z. B., Shan, C. Q., Yang, Z. B., Xu, X. X., Xian, J. R., Yang, Y. X., Li, K. B., Nie, X. P. (2019). Occurrence and distribution of phthalate esters in freshwater aquaculture fish ponds in Pearl River Delta, China. Environmental Pollution 245:883-888.		
HERO ID:	5043518		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The study reported most necessary sampling methods including sample collection and storage methods.
	Metric 2: Analytical Methodology	High	Methodology described in detail and includes extraction method, analytical instrumentation, recoveries, and LOD & LOQ.
	Metric 3: Biomarker Selection	N/A	This metric is not applicable to the data source.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	This study was conducted in the Pearl River Delta, China.
	Metric 5: Currency	High	The samples were collected between July 2016 and September 2017.
	Metric 6: Spatial and Temporal Variability	High	At least 5 replicate samples were collected at each of 22 aquaculture fish ponds.
	Metric 7: Exposure Scenario	Medium	The study is not able to make explicit links between sources of exposure and chemical concentrations.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not reported. Mean concentrations were reported.
	Metric 9: Quality Assurance	High	The study authors reported all key QA.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	The study authors reported few gaps, limitations, and uncertainties.

Overall Quality Determination   High

Study Citation:	Kweon, D., Kim, M. K., Zoh, K. (2018). Distribution of brominated flame retardants and phthalate esters in house dust in Korea. Environmental Engineering Research 23(4):354-363.		
HERO ID:	5043550		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	QC: sampling methodology well described table 1
	Metric 2: Analytical Methodology	Medium	Some analytical methods not reported, such as recovery samples
	Metric 3: Biomarker Selection	N/A	QC: indoor dust media
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	QC: Korea
	Metric 5: Currency	Medium	Data collected in 2011
	Metric 6: Spatial and Temporal Variability	Medium	No replicates collected
	Metric 7: Exposure Scenario	High	QC: indoor dust is relevant scenario for phthalates/frs
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	No raw data reported
	Metric 9: Quality Assurance	High	QC: detailed QA/QC provided for calibration and recoveries in supplementary materials
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	No gaps nor limitations reported

Overall Quality Determination   High

Study Citation: Lee, Y. M., Lee, J. E., Choe, W., Kim, T., Lee, J. Y., Kho, Y., Choi, K., Zoh, K. D. (2019). Distribution of phthalate esters in air, water, sediments, and fish in the Asan Lake of Korea. Environment International 126:635-643.

HERO ID: 5043593

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling methodology discussed including study area, sampling procedures and equipment, as well as storage conditions.
Metric 2:	Analytical Methodology	High	Analytical methodology discussed, including extraction methods, instrumentation, and LOD and LOQ provided in SI.
Metric 3:	Biomarker Selection	N/A	Measured parent chemical in air, water, sediment and fish.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples collected from Asan Lake, Korea.
Metric 5:	Currency	High	Samples collected in 2016 and 2017.
Metric 6:	Spatial and Temporal Variability	Medium	Air samples collected from site A1 (n=4), water samples from sites WS1–WS12 (n=47), sediment from sites WS1–WS12 (n=47), and fish samples near sites WS11 and W12 (n=30) at different seasons and spatial variation. No indication of replicate samples.
Metric 7:	Exposure Scenario	High	Air, water, sediment, and fish collected from the largest artificial lake in Korea that is surrounded and likely affected by pollution from an industrial complex.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not reported. Statistics provided in Tables 1 and 2, including the mean, median, range, and detection frequency.
Metric 9:	Quality Assurance	High	QA/QC described, including blanks and control samples as well as recoveries.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Seasonal and spatial variation discussed. Uncertainty only minimally discussed, no obvious concerns.

Overall Quality Determination   High

Study Citation:		van't Erve, T. J., Rosen, E. M., Barrett, E. S., Nguyen, R. H. N., Sathyanarayana, S., Milne, G. L., Calafat, A. M., Swan, S. H., Ferguson, K. K. (2019). Phthalates and phthalate alternatives have diverse associations with oxidative stress and inflammation in pregnant women. Environmental Science & Technology 53(6):3258-3267.	
HERO ID:		5043603	

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling methodology was briefly described, except sample storage duration prior to analysis. Most key elements were outlined herein, with a more thorough discussion referenced in a separate paper.
	Metric 2:	Analytical Methodology	Medium	The analytical methodology was briefly described. Specific limits of detection appear in Table 3. There was no calibration or recovery data, but analytic methods were referenced, and there was a reference to quality control samples.
	Metric 3:	Biomarker Selection	Low	Sampling was for metabolites of phthalates. However, two metabolites could be derived from multiple parents (including this chemical), and no effort was made to apportion them.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were provided by participants in California, Minnesota, New York, and Washington State.
	Metric 5:	Currency	Medium	Samples were collected in 2010-2012.
	Metric 6:	Spatial and Temporal Variability	Low	Participants in their first trimester recruited from California, Minnesota, New York, and Washington State during 2010-2012; single spot urines during third trimester period provided by n=762 participants. They used a non-statistical sampling methodology. There was no mention of replicates or duplicates. Rated low because they appeared to use un-pooled spot samples.
	Metric 7:	Exposure Scenario	Medium	Some participant characteristics were described, but they did not use a detailed questionnaire with information about potential sources of exposures.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not provided, but the mean, SD, and 25th/50th/765th/90th percentile result were included. This study measured certain biomarkers of oxidative stress alongside concentrations of phthalates.
	Metric 9:	Quality Assurance	Medium	The authors noted: "Quality control samples were analyzed with each batch with coefficients of variation within the expected range (CV = 3−7%)." Also, they corrected for urinary specific gravity. Other discussion of quality assurance procedures was missing, such as recoveries. No pre-exposure samples were available.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability was described using statistical data. Potential study limitations, including sources of uncertainty, were briefly described.

Overall Quality Determination   Medium

Study Citation:	Berardi, C., Fibbi, D., Coppini, E., Renai, L., Caprini, C., Scordo, C. V. A., Checchini, L., Orlandini, S., Bruzzoniti, M. C., Del Bubba, M. (2019). Removal efficiency and mass balance of polycyclic aromatic hydrocarbons, phthalates, ethoxylated alkylphenols and alkylphenols in a mixed textile-domestic wastewater treatment plant. Science of the Total Environment 674(Elsevier):36-48.		
HERO ID:	5119787		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling and sampling equipment was described in detail with WWTP sampled during two weeks in summer using bottles and 24-h composite sampling using autosamplers. Samples were stored at 4C and analyzed within 48 hours and filtered.
	Metric 2:	Analytical Methodology	Low	Analytical methodology was described as utilizing EPA 3535A SPE method with GC-MS with recoveries noted and described within SI. Detection limits were not reported for this chemical in the main text, but may be within the SI.
	Metric 3:	Biomarker Selection	N/A	Sampling was conducted in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Sampling was conducted in Prato, Italy.
	Metric 5:	Currency	Medium	Sampling was conducted in 2011.
	Metric 6:	Spatial and Temporal Variability	High	Seven samples were collected from one WWTP for each of two series for a total of n=14 samples during a 2 week period in summer.
	Metric 7:	Exposure Scenario	High	Concentrations in influent and effluent were sampled from a well-described WWTP area of an industrial textile district in Italy.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Influent and effluent mean relative percentages with standard deviations were depicted in Fig2b, however raw data is not reported.
	Metric 9:	Quality Assurance	Medium	Recovery range was provided in Section 2.4; Quality control was also implied via use of the EPA methods.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Standard deviations were reported in Figure 2B, and ranges were reported within Table 4 for DEHP, however study limitations were not discussed in detail.

Overall Quality Determination   Medium

Dibutyl Phthalate   Monitoring   HERO ID: 5154880

Study Citation:	Li, Q., Xu, X., Fang, Y., Xiao, R., Wang, D., Zhong, W. (2018). The temporal changes of the concentration level of typical toxic organics in the river sediments around Beijing. Frontiers of Environmental Science & Engineering 12(6):8.		
HERO ID:	5154880		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methods were adequately reported. Sampler calibration is not applicable because of grab sampling.
	Metric 2:	Analytical Methodology	High	Key analytical methods (e.g., extraction, instrumentation, detection limits in Table S5) were reported.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in river sediment.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Beijing, China.
	Metric 5:	Currency	High	Samples collected in October 2016
	Metric 6:	Spatial and Temporal Variability	Medium	There were 5 sampling sites, but it is unclear how many samples were collected from each site. No replicates were reported.
	Metric 7:	Exposure Scenario	High	Samples were collected from rivers that are used for either drinking or irrigation, which is relevant to human exposure.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not provided.
	Metric 9:	Quality Assurance	High	QA/QC protocols included blanks and recoveries, which were acceptable.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Gaps and limitations were not reported. There was only a minimal characterization of variance.

Overall Quality Determination   **High**

| | Study Citation: | He, R., Li, Y., Xiang, P., Li, C., Zhou, C., Zhang, S., Cui, X., Ma, L. Q. (2016). Organophosphorus flame retardants and phthalate esters in indoor dust from different microenvironments: Bioaccessibility and risk assessment. Chemosphere 150:528-535. |
| | HERO ID: | 5163600 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling procedure, equipment, and sample storage details were reported. No calibration method was mentioned.
	Metric 2:	Analytical Methodology	High	The analytical methods were described. LOD was reported for each analyte. Recovery samples was used.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Nanjing, China.
	Metric 5:	Currency	High	Sampling was conducted between January 2014 and March 2015.
	Metric 6:	Spatial and Temporal Variability	Low	n=33 samples in total. No replicate samples were mentioned.
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenario related to flame retardants and phthalate esters in indoor dust from indoor spaces in Nanjing, China.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics were reported. Individual data points were not reported in the main article or in the SI.
	Metric 9:	Quality Assurance	Medium	QA/QC techniques were described but only mentioned procedural blanks, not field blanks.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability was characterized (range). Uncertainties were briefly described.

Overall Quality Determination   Medium

| | Study Citation: | Sun, H., An, T., Li, G., Qiao, M., Wei, D. (2014). Distribution, possible sources, and health risk assessment of SVOC pollution in small streams in Pearl River Delta, China. Environmental Science and Pollution Research 21(17):10083-10095. |
| | HERO ID: | 5188487 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	clear and detailed sampling methodssample storage details were provided
	Metric 2:	Analytical Methodology	High	detailed methods, reported recoveries and LODs in supp. information
	Metric 3:	Biomarker Selection	N/A	Not a biomonitoring study
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	Medium	Sampling began in 2008, ended in 2009
	Metric 6:	Spatial and Temporal Variability	High	2 samples per site, 6 sites, 2 seasons
	Metric 7:	Exposure Scenario	Medium	Data may represent a relevant exposure scenario. Authors acknowledge that residents wouldn't drink the water directly
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics, no raw data
	Metric 9:	Quality Assurance	High	detailed QA/QC, analyzed control samples, reported recoveries
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	limited characterization of uncertainties, study limitations and data gaps

Overall Quality Determination   High

| Study Citation: | Miloradov, M. V., Mihajlovic, I., Vyviurska, O., Cacho, F., Radonic, J., Milic, N., Spanik, I. (2014). Impact of wastewater discharges to Danube surface water pollution by emerging and priority pollutants in the vicinity of Novi Sad, Serbia. Fresenius Environmental Bulletin 23(9):2137-2145. |
| HERO ID: | 5197471 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	4 sampling sites in municipal wastewater collectors, 5 in the river, and 1 raw water entering drinking water production facility (Table 1 and Fig 1); all samples collected in plastic and glass bottles and stored at 4C; samples filtered; no other information on sampling procedures/details
	Metric 2:	Analytical Methodology	Low	extracted with dichloromethane; GC-MS; recoveries not discussed; LOD not provided
	Metric 3:	Biomarker Selection	N/A	Environmental media
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Danube River in vicinity of Novi Sad, Serbia
	Metric 5:	Currency	Medium	2012
	Metric 6:	Spatial and Temporal Variability	Medium	10 sampling points (4 wastewater, 5 surface water, and 1 influent); sampled during summer (July) and autumn (September)
	Metric 7:	Exposure Scenario	Medium	sampling of river polluted by direct and indirect discharge of urban and industrial waters and run-off; also sampling wastewater from sewage discharges
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Table 5 provides concentration at each sampling site in 1st campaign and then second campaign
	Metric 9:	Quality Assurance	Low	QA/QC no directly discussed
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	compared results between the two sampling times (campaigns); also compared between media (surface water, wastewater, and raw water)

Overall Quality Determination   Medium

Domain		Metric	Rating	Comments
Study Citation:		Purtymun, W. D., Ferenbaugh, R. W., Maes, M. (1988). Quality of surface and ground water at and adjacent to the Los Alamos National Laboratory: Reference organic compounds.		
HERO ID:		5255865		

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling methodology not described, but followed the USEPA guidelines USEPA 1983 and USEPA 1985.
	Metric 2:	Analytical Methodology	High	Analytical methods described in Appendix B. DL reported
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in an environmental media (water).
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Geographic location is reported; Alamos National Laboratory, USA.
	Metric 5:	Currency	Low	Timing of sample collection for monitoring data is not consistent with current or recent exposures may be expected (> 15years). The water samples were collected in late September and early October of 1986.
	Metric 6:	Spatial and Temporal Variability	High	Sampling approach accurately captures variability. The study used a large sample size (43 surface and ground water stations and a total of 5,676 individual analytical results), and sampling occurred over a sufficient period of time (fall of one year). Replicate samples are used.
	Metric 7:	Exposure Scenario	High	Surface and ground water samples adjacent to the Los Alamos National Laboratory.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data (i.e., individual data points) are not reported , and therefore summary statistics cannot be reproduced.
	Metric 9:	Quality Assurance	Low	QA/QC describes in page 9 in QA/QC section. Recoveries are on the low side (<70%) and it is unclear if they correct for recovery.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability or uncertainty not reported.

Overall Quality Determination   **Medium**

Study Citation:	Lee, S., Ahn, R. M., Kim, J. H., Han, Y. D., Lee, J. H., Son, B. S., Lee, K. (2019). Study design, rationale and procedures for human biomonitoring of hazardous chemicals from foods and cooking in Korea. International Journal of Environmental Research and Public Health 16(14):2583.		
HERO ID:	5386084		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Key sampling methods reported.
Metric 2:	Analytical Methodology	High	Key analytical methods reported.
Metric 3:	Biomarker Selection	High	Acceptable biomarker.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Korea
Metric 5:	Currency	Low	Study conducted in 2009-2011.
Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates.
Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not reported.
Metric 9:	Quality Assurance	High	Key QA reported.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Few limitations reported.

Overall Quality Determination   Medium

Study Citation:	Giovanoulis, G., Nguyen, M. A., Arwidsson, M., Langer, S., Vestergren, R., Lagerqvist, A. (2019). Reduction of hazardous chemicals in Swedish preschool dust through article substitution actions. Environment International 130:104921.		
HERO ID:	5412073		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Reported key sampling details and cited sampling method previously were described in Papadopoulou et al., 2016 (reference not obtained).
	Metric 2: Analytical Methodology	High	Extraction and analytical methods were well-described; collected replicate samples from each preschool; reported detection limits in Table 1; analyzed the standard reference material (SRM) 2585 (NIST, USA) each time in replicate (n=4) to evaluate accuracy of the analytical method.
	Metric 3: Biomarker Selection	N/A	The analytes were collected as dust samples; biomarker samples were not collected.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The samples were collected in Stockholm area, Sweden.
	Metric 5: Currency	High	Dust sampling took place from January to February 2018.
	Metric 6: Spatial and Temporal Variability	High	The study had a sample size of n=20 and replicate samples from each pre-school. The study collected dust at one point in time (2018), but compared current dust contaminant concentrations to prior concentrations to examine the impact of implementation of "chemical smart" actions.
	Metric 7: Exposure Scenario	High	The study collected questionnaire data during sampling to capture information on indoor materials, daily cleaning routines and ventilation function. It also examined association between dust and indoor parameters to understand product sources of exposure.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not reported in main text (does not seem to be reported in SI either, but SI file was not obtained). The standard deviation of summary statistics was not reported in main text.
	Metric 9: Quality Assurance	High	The study analyzed solvent and field blanks. It reported adequate (>70%) sample recoveries; results were in good agreement with previously reported values in the literature.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	The study accounted for variability between chemicals and floor materials (boxplot distributions presented in Fig 1). It discussed key limitations and uncertainties, which likely underestimated risk to children specifically.

Overall Quality Determination   **High**

Study Citation:	Wang, L., Li, Y., Zhang, P., Zhang, S., Li, P., Wang, P., Wang, C. (2019). Sorption removal of phthalate esters and bisphenols to biofilms from urban river: From macroscopic to microcosmic investigation. Water Research 150:261-270.		
HERO ID:	5432773		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Limited information on sample storage conditions and durations.
	Metric 2: Analytical Methodology	Low	LOQ, LOD, detection limits, and/or reporting limits not reported.
	Metric 3: Biomarker Selection	N/A	Study tested for the parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	China
	Metric 5: Currency	High	Sampling began in 2017
	Metric 6: Spatial and Temporal Variability	Medium	8-12 samples from Table 2. Sample size not explicitly stated or easy to find. Table S3 calculates the average concentration of two different sites using three samples each.
	Metric 7: Exposure Scenario	Medium	May represent a relevant scenario, limited information on population of interest.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual sample concentrations not provided, only summary statistics.
	Metric 9: Quality Assurance	Low	Quality assurance/controls were not directly discussed.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Limited discussion on variability, uncertainties and study limitations.

Overall Quality Determination   Medium

Study Citation:	Dodson, R. E., Bessonneau, V., Udesky, J. O., Nishioka, M., McCauley, M., Rudel, R. A. (2019). Passive indoor air sampling for consumer product chemicals: A field evaluation study. Journal of Exposure Science & Environmental Epidemiology 29(1):95-108.
HERO ID:	5432871

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	The air sampling methodology was well described and is scientifically sound
Metric 2:	Analytical Methodology	High	The analytical methods were described, including LOD and recoveries.
Metric 3:	Biomarker Selection	N/A	The authors analyzed air samples.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Data was collected in Boston, USA.
Metric 5:	Currency	High	The samples were collected in Oct. 2013-July 2015.
Metric 6:	Spatial and Temporal Variability	Low	n=37 samples, without replicates.
Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenarios related to consumer product chemicals in indoor air in Boston.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Only summary statistics were reported. Individual sample concentrations were not reported.
Metric 9:	Quality Assurance	High	QA/QC techniques were described in detail, including the use of control samples.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Variability was characterized (range, 95th percentile). Uncertainties and study limitations were discussed in detail.

Overall Quality Determination   High

Study Citation:	Dankova, R., Jarosova, A., Polakova, S. (2013). Monitoring of phthalates in moravian agricultural soils in 2011 and in 2012. 2013:563-567.		
HERO ID:	5432954		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	soil taken from 17 areas (p.564) using zig-zag pattern from topsoil (arable soil 0-25 cm; permanent grassland 0-10cm); 0.5kg soil homogenized, put in plastic bag, stored at -18C; sampling equipment not discussed
	Metric 2: Analytical Methodology	Low	extraction using sonication and mixture of hexan/acetone (1/1; HPLC with UV detection; recovery samples not discussed; detection limits not provided
	Metric 3: Biomarker Selection	N/A	environmental media
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	five Moravian regions of the Czech Republic
	Metric 5: Currency	Medium	2001 and 2012
	Metric 6: Spatial and Temporal Variability	Medium	17 areas sampled twice (2011 and then again in 2012); not replicate samples
	Metric 7: Exposure Scenario	High	concentration in agricultural soil in 2011 and again in 2012
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	raw data in Table I and II (2011 and 2012 respectively); comparison between two years depicted in Fig 1
	Metric 9: Quality Assurance	Low	QA/QC not discussed; implied as analyzed by Dept of Food Technology of Mendel Univ
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	compares concentration by year and localities

Overall Quality Determination   **Medium**

Study Citation:	Lee, I., Kim, S., Park, S., Mok, S., Jeong, Y., Moon, H., Lee, J., Kim, S., Kim, H., Choi, G., Choi, S., Kim, S.,uY, Lee, A., Park, J., Choi, K. (2019). Association of urinary phthalate metabolites and phenolics with adipokines and insulin resistance related markers among women of reproductive age. Science of the Total Environment 688(Elsevier):1319-1326.		
HERO ID:	5433031		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Sample storage conditions described, however duration of sample storage and most key sampling criteria not described.
	Metric 2: Analytical Methodology	Medium	Most key criteria described, LOQ's reported as range; analytic methods referenced.
	Metric 3: Biomarker Selection	Low	Sampling for metabolites not specific for parent chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples provided by participants in Seoul, Gyeonggi, Imcheon and Jeju, Republic of Korea.
	Metric 5: Currency	High	Sample collection dates not reported, although can be inferred as recruitment 2015-2016 and publication date 2019.
	Metric 6: Spatial and Temporal Variability	Medium	Urine samples collected from n=459 participants selected for analytic sample after exclusions for study objectives and missing data from original n=516 women visiting health centers for regular checks and n=70 randomly chosen women participating in the CHECK study. Years of sample collection not reported. Non-statistical sampling methods.
	Metric 7: Exposure Scenario	Medium	Participant characteristics summarized with respect to outcomes of interest.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Most key criteria met; lack of raw data.
	Metric 9: Quality Assurance	Medium	Quality assurance procedures detailed, most key criteria met; lack of baseline pre-exposure sampling.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability characterized within summary statistics, potential study limitations discussed.

Overall Quality Determination   **Medium**

Study Citation:			Chakraborty, P., Sampath, S., Mukhopadhyay, M., Selvaraj, S., Bharat, G. K., Nizzetto, L. (2019). Baseline investigation on plasticizers, bisphenol A, polycyclic aromatic hydrocarbons and heavy metals in the surface soil of the informal electronic waste recycling workshops and nearby open dumpsites in Indian metropolitan cities. Environmental Pollution 248(Elsevier):1036-1045.
HERO ID:			5433039

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Surface soil samples (0-20cm) were collected from 4 cities (Table S1 for site details) in India–Chennai, Kolkata, Mumbai and New Delhi. At each location, duplicate composite samples were collected. Samples were packed in aluminum foil and kept at -20C until extraction, however duration of sample storage was not detailed. Each sample was grinded and sieved. Soil sample collection details were provided in previous study (Chakraborty et al. 2018).
	Metric 2:	Analytical Methodology	High	The analytical methodology was described in terms of extraction, instrumentation (GC-MS), recoveries, calibration and limits of detection (Table S2).
	Metric 3:	Biomarker Selection	N/A	Chemicals were measured within environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Surface soil sampling was conducted within 4 cities in India–New Delhi (north), Kolkata (east), Mumbai (west) and Chennai (south).
	Metric 5:	Currency	Medium	Sampling was conducted in 2014.
	Metric 6:	Spatial and Temporal Variability	Medium	Duplicate composite surface (0-20 cm) soil samples were obtained from each sampling location during 2014. A total of 28 composite soil samples were obtained from informal e-waste recycling sites (3 subsites), dumpsites and control sites within each city (e-waste dismantling (EWD, n = 5), shredding (EWS, n = 4), precious metal recovery (EWR, n = 5), nearby open municipal dumpsites (DS, n = 11) and control sites (CS, n =3).
	Metric 7:	Exposure Scenario	High	This study measured the concentration in surface soil of informal e-waste recycling workshops and nearby open dumpsites and a control site in four metropolitan cities of India.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 1 provides the range, mean, and SD by e-waste site type and dumpsite. Raw data and detection frequencies were not provided.
	Metric 9:	Quality Assurance	Medium	QA/QC details were noted. Recovery rates ranged from 81-105%, and blank samples showed no sign of contamination. Pre-exposure control sampling was not conducted.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability in terms of standard deviation and range was detailed. Limitations were discussed within comparisons of results by site type/city and to results from previous studies, although a robust discussion of study limitations was lacking.

Overall Quality Determination   Medium

Study Citation:		Ko, N. Y., Lo, Y. C., Huang, P. C., Huang, Y. C., Chang, J. L., Huang, H. B. (2019). Changes in insulin resistance mediate the associations between phthalate exposure and metabolic syndrome. Environmental Research 175:434-441.	
HERO ID:		5433079	

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling methodology is described in sufficient detail and in reference to a previous study, but certain aspects (e.g. duration of storage) are absent that are unlikely to have a substantial impact on results.
	Metric 2: Analytical Methodology	Low	Analytical instrumentation and methods are described in sufficient detail and are scientifically sound. LOD is reported in reference to a previous study and not provided here.
	Metric 3: Biomarker Selection	High	The monoester phthalate biomarker is a metabolite of just the chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was conducted in Taiwan.
	Metric 5: Currency	High	Participants were recruited in June-August 2017.
	Metric 6: Spatial and Temporal Variability	Low	Participants provided only a spot urine sample in the morning.
	Metric 7: Exposure Scenario	High	This is a biomonitoring study.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not reported. Summary statistics include detection rate, maximum, and percentiles (25, 50, 95) of concentration across all participants and stratified by sex.
	Metric 9: Quality Assurance	High	QA/QC measures included the use of blanks, replicates, and spiked samples; relative percent difference for replicates and spike recovery rates were within acceptable ranges.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Characterization of variability is reported by way of different percentiles of concentration. Limitations and sources of uncertainty are discussed, including only analyzing one sample per participant, possible lack of generalizability of results.

Overall Quality Determination   High

Study Citation:	Zhang, Z. M., Zhang, H. H., Zou, Y. W., Yang, G. P. (2018). Distribution and ecotoxicological state of phthalate esters in the sea-surface microlayer, seawater and sediment of the Bohai Sea and the Yellow Sea. Environmental Pollution 240:235-247.		
HERO ID:	5433212		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The water and sediment sampling methodology is well described.
	Metric 2:	Analytical Methodology	High	The analytical methods were described, including LOD and recoveries.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Bohai Sea and Yellow Sea. Specific sampling locations given.
	Metric 5:	Currency	Medium	The samples were collected in 2014.
	Metric 6:	Spatial and Temporal Variability	High	n=110 water samples, n=38 sediment samples.
	Metric 7:	Exposure Scenario	Medium	The data likely represent a relevant exposure scenario related to phthalate contamination of seawater and sediment in the Bohai and Yellow Seas. Population data or descriptions were not reported.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only raw data was reported.
	Metric 9:	Quality Assurance	High	QA/QC methods were described in detail.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability was not characterized. Uncertainties were briefly discussed.

Overall Quality Determination   **High**

Study Citation: Zhang, Z., Zhang, C., Huang, Z., Yi, X., Zeng, H., Zhang, M., Huang, M. (2019). Residue levels and spatial distribution of phthalate acid esters in water and sediment from urban lakes of Guangzhou, China. Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances & Environmental Engineering 54(2):127-135.

HERO ID: 5433252

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Samples were collected from 8 urban lakes at 23 sites (Fig 1). Water was collected from surface to a depth of 50cm with a portable water sampler and stored in glass bottles at 4C. Sediment was collected below water interfaces within 10cm with stainless-steel grab sampler and PP bags to store at -80C and processed through freeze-drying.
	Metric 2:	Analytical Methodology	Medium	Authors reported using liquid-liquid extraction for water and ultrasonic extraction for sediments, followed by GC-MS for analysis. Recoveries were reported. LOQ only reported as a range for all phthalates combined (0.60-0.80 ng/L for water and 0.05-0.08 ng/g for sediment).
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in surface water and sediment.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples collected from Guangzhou, Southern China.
	Metric 5:	Currency	High	Samples were collected in 2016.
	Metric 6:	Spatial and Temporal Variability	High	Samples were collected from 8 urban lakes (23 water and 16 sediment samples from 23 sampling sites) during the dry season in October. No replicates were reported.
	Metric 7:	Exposure Scenario	High	Possible exposure to phthalates from surface water and sediments of eight lakes in an area of industrial activity is relevant.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 1 provides mean, range and DF in water and sediment samples; Fig 2 depicts the distribution (concentrations) in water and sediment at each sampling site. No raw data were available.
	Metric 9:	Quality Assurance	High	Average recovery in water and sediments ranged from 76.9-110.3% and 77.6-107.8%, respectively. Blanks, spiked samples, and other QA/QC protocols were reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	There was no discussion of limitations, gaps, and uncertainties. Variance was characterized by min and max values.

Overall Quality Determination   High

Study Citation:			Zhang, Z. M., Zhang, H. H., Zhang, J., Wang, Q. W., Yang, G. P. (2018). Occurrence, distribution, and ecological risks of phthalate esters in the seawater and sediment of Changjiang River Estuary and its adjacent area. Science of the Total Environment 619-620:93-102.
HERO ID:			5433253

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology is detailed and complete with information on components such as site characteristics, collection regimen, and equipment.
	Metric 2:	Analytical Methodology	Medium	Extraction and analytical methods were reported, including references to previously published protocols for additional details. Recoveries and MDLs were also reported, but the latter only provided a range for all phthalates combined.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in water and sediment.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study was conducted in China.
	Metric 5:	Currency	High	Samples were collected in 2015.
	Metric 6:	Spatial and Temporal Variability	Medium	A total of 133 water samples (79 surface water and 54 seawater) and 17 sediment samples were collected without replicates.
	Metric 7:	Exposure Scenario	Medium	Data are likely to represent a relevant exposure scenario with the study area being part of a large economic center. However, details on the population of interest were missing.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual sample concentrations are provided in Tables S3 and S5. Most summary statistics are missing.
	Metric 9:	Quality Assurance	Medium	Authors analyzed control samples and referenced another study for more details. Recoveries were reported as a range, but the lower bound is <70%.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	A discussion of key uncertainties and limitations was absent. The first paragraph of Results provides some limited characterization of variance, but raw data are available.

Overall Quality Determination   Medium

Study Citation:	Li, X., Ra, K., Nuruddin, M., Teimouri Sendesi, S. M., Howarter, J. A., Youngblood, J. P., Zyaykina, N., Jafvert, C. T., Whelton, A. J. (2019). Outdoor manufacture of UV-Cured plastic linings for storm water culvert repair: Chemical emissions and residual. Environmental Pollution 245:1031-1040.		
HERO ID:	5433348		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling methodology discussed, including site locations, sampling equipment, procedures, and storage. Water sampling described in section 2.2.2. Air monitoring performed by photoionization detector.
Metric 2:	Analytical Methodology	Low	Analytical methodology discussed, including instrumentation, calibration, and recovery samples. LOD are not reported.
Metric 3:	Biomarker Selection	N/A	Study measures parent chemical in water.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples collected from New York and Fairfax, Virginia.
Metric 5:	Currency	High	Samples collected in 2017.
Metric 6:	Spatial and Temporal Variability	Low	Number of samples not reported, but at least 4 sites with replicates.
Metric 7:	Exposure Scenario	High	Sampled water after installation of UV-cured plastic lining for storm water culvert were repaired.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	Raw data not reported. Table 3 reports medium and SD in waters.
Metric 9:	Quality Assurance	High	QA/QC discussed, including recoveries, blanks, and controls.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Variability represented as SD and limitations reported across the study.

Overall Quality Determination   Medium

Study Citation:	Wu, Y., Sun, J., Zheng, C., Zhang, X., Zhang, A., Qi, H. (2019). Phthalate pollution driven by the industrial plastics market: a case study of the plastic market in Yuyao City, China. Environmental Science and Pollution Research 26(11):11224-11233.		
HERO ID:	5433502		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling methodology discussed, including location of sites, sampling equipment, number of samples per media, and storage conditions.
Metric 2:	Analytical Methodology	High	Key analytical methodology discussed, including extraction method, analytical instrumentation, recovery samples, and detection limits (Table S2) per media.
Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in soil, vegetables, and sediment.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples collected from sites downwind of the plastic market in Yuyao City, China.
Metric 5:	Currency	High	Samples collected in 2017.
Metric 6:	Spatial and Temporal Variability	High	Twenty-one soil samples, 21 vegetable samples, and 16 sedimentsamples were collected downwind of the market.
Metric 7:	Exposure Scenario	High	Soil, vegetable, and sediment samples collected downwind of a plastic market in China.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data were not reported. Several summary statistics were reported, including geometric mean, median, and range.
Metric 9:	Quality Assurance	High	Key QA reported, including the use of blanks and recoveries.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	There is discussion of variability from the different sampling sites and distance from the market. Gaps and limitations not well characterized

Overall Quality Determination   High

Study Citation:	Heck, B. A., Myers, N. C., Hargadine, D. A. (1992). Hydrogeology and ground-water quality conditions at the Reno County Landfill, South-Central Kansas, 1990-91.		
HERO ID:	5438509		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Some sampling methods not reported such as sampler calibration
	Metric 2: Analytical Methodology	Low	LOD nor LOQ reported
	Metric 3: Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Reno County, Kansas
	Metric 5: Currency	Low	Data collected in 1991
	Metric 6: Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7: Exposure Scenario	Medium	Exposure source not well characterized. Further investigation needed to determine usefulness of information.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	Raw data reported. Most summary statistics provided.
	Metric 9: Quality Assurance	Low	Limited QA reported
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Few gaps and limitations reported

Overall Quality Determination   Medium

Study Citation:	Wu, J., Ma, T., Zhou, Z., Yu, N.,a, He, Z., Li, B., Shi, Y., Ma, D. (2019). Occurrence and fate of phthalate esters in wastewater treatment plants in Qingdao, China. Human and Ecological Risk Assessment 25(6):1547-1563.		
HERO ID:	5442818		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Sampling methodology only briefly described, including sampling equipment, storage conditions, and study site characteristics. However, sampling procedure not discussed, especially for influent and effluent.
Metric 2:	Analytical Methodology	Low	Analytical methodology discussed including extraction methodology, analytical equipment, and recovery samples. Detection limits not provided.
Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in WWTP influent, effluent, and sludge.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples collected from WWTPs in Qingdao, China.
Metric 5:	Currency	Medium	Samples collected in April 2014.
Metric 6:	Spatial and Temporal Variability	Medium	A total of 57 sewage and 9 sludge samples collected from 3 WWTPs. Number of influent, effluent, and samples within the each WWTPs not provided.
Metric 7:	Exposure Scenario	High	Type of sewage each WWTP treats is described as well as each treatment process.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	Raw data not reported. Table 1 provides summary statistics for influent from the three WWTPs. Table 2 provides mean of influent and effluent per WWTP and Table 3 statistics for sludge per WWTP. Number of samples per data set not clearly defined.
Metric 9:	Quality Assurance	High	Key QA reported including use of blanks and recoveries (ranging from 78.5% to 109%).
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Gaps and limitations were not reported. There was only a minimal characterization of variance.

Overall Quality Determination   Medium

Study Citation: Bigsby, P. R., Myers, N. C. (1989). Hydrogeology and ground-water-quality conditions at the Geary County landfill, northeast Kansas, 1988.
HERO ID: 5449639

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	USGS conducted study; 7 monitoring wells sampled (MW- to MW-2); samples retrieved with a Teflon-bottom check-valve bailer and immediately put on ice; samples filtered; also samples of Smoky Hill River collected by dipping bottles into the stream and allowing to fill
	Metric 2:	Analytical Methodology	Low	Performed by Kansas Department of Health and Environment laboratory, no discussion of analytical methodology. Although missing analytical description and other QA and uncertainties in this report they have references in which this information can be found. Most of the used methodology are accepted methods performed by accredited labs.
	Metric 3:	Biomarker Selection	N/A	NA - water samples no biomarker needed.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Geary County, northeast Kansas
	Metric 5:	Currency	Low	Sept 20-22, 1988
	Metric 6:	Spatial and Temporal Variability	Medium	7 wells sampled Sept 20-22; also 3 samples from the river; no replicate samples indicated
	Metric 7:	Exposure Scenario	High	groundwater quality conditions at a county landfill
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Table 8 provides concentration per site
	Metric 9:	Quality Assurance	Low	QA/QC not reported but implied as it is a USGS investigation
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	no discussion of variability or uncertainty

Overall Quality Determination   Medium

Study Citation:	Westinghouse Savannah River Company, (1993). Mixed Waste Management Facility (MWMF) groundwater monitoring report (U): Fourth quarter 1992 and 1992 summary.		
HERO ID:	5452031		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Sampling methodology is only briefly discussed. Described sampling locations and study site characteristics. Did not report sample storage conditions/duration or sampling equipment and procedure.
Metric 2:	Analytical Methodology	Critically Deficient	Analytical methodology is not described, including analytical instrumentation.
Metric 3:	Biomarker Selection	N/A	Study tested for the parent chemical in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Savannah River Site, Aiken, SC
Metric 5:	Currency	Low	Samples collected throughout second quarter 1992.
Metric 6:	Spatial and Temporal Variability	Medium	>10 samples were collected but there no replicate samples collected. Several wells sampled, but only one sample per well.
Metric 7:	Exposure Scenario	Medium	The report provides extensive background information about the sites and wells. The data likely represent the relevant exposure scenario. Routes of exposure and populations of interest not described.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	Raw data were reported.
Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not discussed.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	The characterization of variability is absent and key uncertainties, limitations, and data gaps are not discussed.

Overall Quality Determination　　　　　　**Uninformative**

Study Citation: Tahboub, Y. R., Zaater, M. F., Khater, D. F. (2017). Semi-volatile organic pollutants in Jordanian surface water. Arabian Journal of Chemistry 10:S3318-S3323.

HERO ID: 5469387

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling was performed according to USEPA (1982) handbook for sampling and sample preservation of water and wastewater. details of the sampling method, sample storage, analytical method, and site characteristics were provided.
	Metric 2:	Analytical Methodology	Low	Thee analytical method, extraction and instrument were described in detail. LODs were not provided.
	Metric 3:	Biomarker Selection	N/A	Study tests chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The sampling locations in Jordan were described in detail.
	Metric 5:	Currency	Medium	The samples were collected in 2010.
	Metric 6:	Spatial and Temporal Variability	Medium	Monthly samples from April to August 2010 were collected from 4 sites between April and August.
	Metric 7:	Exposure Scenario	High	The purpose of the study was to monitor reservoir water which is the main water source.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	The mean concentration and SD wre provided. Raw data were not provided.
	Metric 9:	Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Means and SDs were provided and there was limited discussion of uncertainty.

Overall Quality Determination   Medium

Study Citation:	Yasuhara, A. (1995). Chemical components in leachates from hazardous wastes landfills in Japan. *Toxicological and Environmental Chemistry* 51(1-4):113-120.		
HERO ID:	5469470		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Only the purchasing of sampling samples and study site characteristics (i.e., 4 controlled landfills in central Japan and one open landfill in northeastern Japan) were discussed. Nothing else about the sampling methodology, such as equipment, procedure, storage conditions, was available.
	Metric 2:	Analytical Methodology	Low	The analytical methodology were discussed in detail, limit of detection was only provided as an approximate range.
	Metric 3:	Biomarker Selection	N/A	Parent chemical was measured in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected from landfills in northeastern and central Japan.
	Metric 5:	Currency	Low	No sampling date was provided, but the publication year is 1995.
	Metric 6:	Spatial and Temporal Variability	Low	Five samples from 5 locations (one from each location) were collected with no replicates.
	Metric 7:	Exposure Scenario	Medium	The exposure scenario was briefly described.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	The individual and raw data were provided without any summary statistics.
	Metric 9:	Quality Assurance	Low	QA/QC was not directly discussed but implied.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	There was no discussion on variability/uncertainty but variability is seen in media studied.

Overall Quality Determination   Low

Study Citation:	Luongo, G., Oestman, C. (2016). Organophosphate and phthalate esters in settled dust from apartment buildings in Stockholm. Indoor Air 26(3):414-425.		
HERO ID:	5469670		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling of indoor dust on tops of shelves and furniture as well as indoor air was described. Some criteria were not mentioned like sample storage conditions (may be listed in a referenced study, Bergh et al. (2010, 2011a,b, 2012)).
Metric 2:	Analytical Methodology	Medium	Some analytic methodology criteria details were not mentioned, such as instrument calibration (but may be described in a referenced study). LOD's were reported.
Metric 3:	Biomarker Selection	N/A	Sampling was conducted for parent chemicals of interest in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Sampling was conducted in Stockholm, Sweden.
Metric 5:	Currency	Medium	Data was collected in 2008.
Metric 6:	Spatial and Temporal Variability	High	Indoor dust samples were collected in 2008 from 62 apartments in 19 different buildings in the Stockholm city area at a height of 0.8 meters from surfaces of furniture and frames of windows and doors. Indoor air sampling was conducted for 24-hours with duplicate active air samples positioned within a central location in each apartment on the same day as dust sampling.
Metric 7:	Exposure Scenario	Medium	Source of exposure and population exposed were detailed. There were no exposure controls used.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	Raw data was reported in Table S1. Some summary statistics included 25th percentile, median, 75th percentile, and range. Detection frequencies were reported.
Metric 9:	Quality Assurance	High	QC details were described and included laboratory blanks. Standard reference materials were utilized for quality control samples. Baseline, pre-exposure sampling was not conducted.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	No limitations were described. Variations in toddler and adult exposure was studied.

Overall Quality Determination   High

Study Citation:		Schneider, B. J., Oaksford, E. T. (1986). Design, operation, and monitoring capability of an experimental artificial-recharge facility at East Meadow, Long Island, New York.		
HERO ID:		5477444		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	The "inclined gravity lysimeters" described in the report only measured pH, dissolved oxygen, and suspended solids. Regarding the monitoring wells samples, we know they were obtained "by submersible pump" and "sent to the U.S. Geological Survey." Screen depth is provided in a table, and certain location information is provided. Sampling procedures, sample volume, and sample storage conditions/duration are missing. Soil samples mentioned were not analyzed for volatile organic compounds.
	Metric 2:	Analytical Methodology	Low	Analytical processes were not directly mentioned but publicly available methods that are scientifically sound can be inferred to have been used because water samples were analyzed by the U.S. Geological Survey. Detection limits were shown in Table 7 for all samples for which there were non-detects among the samples reported (including 1,1-DCE, 1,2-EDC, 1,1,1-TCA, and 1,2-DCE [total], but not DBP). Page 31 also says Table 7 shows chemicals detected at 1 ppb or more, suggesting that was typically the detection limit, which is consistent with the data shown in Table 7 in almost all cases.
	Metric 3:	Biomarker Selection	N/A	They analyzed for parent chemicals in water.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Artificial recharge facility at East Meadow, Long Island, New York.
	Metric 5:	Currency	Low	Samples are from 1978-1983, according to the text of the report.
	Metric 6:	Spatial and Temporal Variability	Medium	Samples analyzed for chemicals of interest are shown on the last page. There is no indication that replicate samples were ever collected. The number of samples varied by analyte and by location. All chemicals of interest were sampled in 3 wells post-recharge. In addition, there were 2 (DBP), 6 (1,2-DCE [total]) or 7 (1,1,1-TCA; 1,1-DCE; 1,2-EDC) samples from a storage tank. There were also 1 (DBP), 3 (1,2-EDC and 1,2-DCE [total]), 5 (1,1-DCE), or more background samples (e.g., 27 were analyzed for 1,1,1-TCA), collected pre-recharge.
	Metric 7:	Exposure Scenario	Medium	The exposure scenario was relevant - the groundwater aquifer was identified the source of drinking water for the local residents. The post-recharge samples would have been affected by tertiary treated sewage. Sources of chemicals in pre-recharge samples were not discussed.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	For each chemical, they reported mean, median, min, max and number of samples. Raw data were provided for the three post-recharge samples, but not for the background and storage tank samples (except for DNP, because there was only one background sample from a well and two from a storage tank, with the range shown by the min and max reported).
	Metric 9:	Quality Assurance	Medium	Quality assurance/quality control techniques and results were not directly discussed but were implied because the study was conducted by the U.S. Geological Survey, which likely had standard field and laboratory protocols that needed to be followed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	There was no discussion of variability, uncertainty, and study limitations. However, the inclusion of samples collected over time and, at one location that was sampled both before and after recharge began, provides some information about variability. Also, there is a comment that "the mechanisms of mixing, dilution, and dispersion are causing concentrations of some chemical constituents in the water-table aquifer to fluctuate. This fluctuation is directly related to the introduction of reclaimed water to the aquifer and its subsequent interaction with native ground water." However, this reviewer would note that levels of some chemicals also fluctuated prior to the introduction of reclaimed water into the aquifer, which began in late 1982.

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Study Citation:	Schneider, B. J., Oaksford, E. T. (1986). Design, operation, and monitoring capability of an experimental artificial-recharge facility at East Meadow, Long Island, New York.
HERO ID:	5477444

Domain	Metric	Rating	Comments

Overall Quality Determination   Low

Study Citation:	Li, X., Liu, L., Wang, H., Zhang, X., Xiao, T., Shen, H. (2019). Phthalate exposure and cumulative risk in a Chinese newborn population. Environmental Science and Pollution Research 26(8):7763-7771.		
HERO ID:	5488911		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Key sampling methods (e.g., participant characteristics, study matrix, collection regimen, storage conditions) were reported.
	Metric 2: Analytical Methodology	High	Extraction, analytical methods, and LODs were reported.
	Metric 3: Biomarker Selection	High	MBP is specific to DBP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Participants were from Xiamen, China.
	Metric 5: Currency	Medium	Samples were collected in 2012.
	Metric 6: Spatial and Temporal Variability	Medium	Urine samples were collected from 748 newborns without replicates.
	Metric 7: Exposure Scenario	High	This is a biomonitoring study of newborns that were presumed to be exposed in utero.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not reported.
	Metric 9: Quality Assurance	High	QA/QC included replicate analysis, blanks, and compliance to the German External Quality Assessment Scheme for Biological Monitoring.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variance was characterized with SD. There was some but not a robust discussion of limitations.

Overall Quality Determination   High

Study Citation: Campbell, T. R. (1997). Soil, water, and streambed quality at a demolished asphalt plant, Fort Bragg, North Carolina, 1992-94.
HERO ID: 5489294

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	samples were collected and handled according to procedures outlined in the work plan for Ft. Bragg SWMU's and approved by local government and EPA (p.17)
	Metric 2:	Analytical Methodology	High	samples were analyzed in accordance with the USEPA methods or ASTM standards; Table 4 provides LODs
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Ft. Bragg, Fayetteville, NC
	Metric 5:	Currency	Low	December 1992-April 1994
	Metric 6:	Spatial and Temporal Variability	Medium	7 wells for groundwater sampling; 22 soil samples at various depths; several sub-samples of streambed sediment at various locations; soil samples collected at 7 locations across the site;
	Metric 7:	Exposure Scenario	Medium	soil, ground water, surface water, and sediments in the area of a demolished asphalt plant at Ft. Bragg; aim to determine if site should added to list of solid-waste management units under the RCRA permit; p. 12-16 contains information on the area of contamination
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 7 provides concentrations in soil samples; no results specific to this chemical; only data is for LOD
	Metric 9:	Quality Assurance	Low	QA/QC not directly discussed but implied through standard methods and lab protocols
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	characterization of variability and uncertainties are absent

Overall Quality Determination   Medium

Study Citation:	Al-Saleh, I., Elkhatib, R. (2014). Analysis of phthalates residues in apple juices produced in Saudi Arabia. Journal of Food Measurement and Characterization 8(4):373-380.		
HERO ID:	5489874		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling methods were not thoroughly reported. Authors noted that they purchased seven brands of apple juice in local supermarkets, and no information was provided on selection criteria for these brands and super-markets.
	Metric 2: Analytical Methodology	High	Key analytical methods, including extraction, instrumentation, and LOQs were reported.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemicals in apple juice.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was performed in Saudi Arabia.
	Metric 5: Currency	Low	Study was published in 2014. Sample collection date was not reported.
	Metric 6: Spatial and Temporal Variability	Medium	Seventy samples (7 brands, 10 batches per brand) were collected without replicates.
	Metric 7: Exposure Scenario	High	Exposure to phthalates explained as the packaging, with both adults and child consumers as the population of interest.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not reported.
	Metric 9: Quality Assurance	High	QA/QC techniques was reported, including blank sampling, replicate analysis, spiking, and recoveries (within acceptable range).
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Gaps and limitations were not characterized.

Overall Quality Determination   Medium

| Study Citation: | Chatonnet, P., Boutou, S., Plana, A. (2014). Contamination of wines and spirits by phthalates: Types of contaminants present, contamination sources and means of prevention. Food Additives & Contaminants: Part A, Chemistry, Analysis, Control, Exposure & Risk Assessment 31(9):1605-1615. |
| **HERO ID:** | 5490367 |

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported.
	Metric 2:	Analytical Methodology	High	Key analytical methods reported.
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	France
	Metric 5:	Currency	Medium	Study published in 2014.
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates.
	Metric 7:	Exposure Scenario	Medium	Exposure source characterized.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported.
	Metric 9:	Quality Assurance	Low	Limited QA reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported.

Overall Quality Determination   Medium

Study Citation:	Shan, X. M., Wang, B. S., Lu, B. B., Shen, D. H. (2016). [Investigation of pollution of phthalate esters and bisphenols in source water and drinking water in Hefei City, China]. Huanjing yu Zhiye Yixue / Chinese Journal of Environmental & Occupational Medicine 33(4):350-355.
HERO ID:	5491666

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling methods were described but barely.
	Metric 2:	Analytical Methodology	Low	The only description of analytical methods is as follows: sample preparation was solid phase extraction and determination by GS-MS. Detection limits were reported though.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in source and drinking water.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Hefei (China).
	Metric 5:	Currency	Medium	Samples were collected in 2012.
	Metric 6:	Spatial and Temporal Variability	High	There were 10 sampling sites where parallel samples were taken from each.
	Metric 7:	Exposure Scenario	High	The measurement of phthalates in source and drinking water is relevant.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Mean concentrations and raw data are available in Table 1.
	Metric 9:	Quality Assurance	Low	Other than reporting recoveries (all >84%), no other QA/QC methods were discussed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Characterization of variance is missing, but raw data area available. There was no discussion of limitations, gaps, and uncertainties either.

Overall Quality Determination   **Medium**

Study Citation:	Zimmermann, S., Gruber, L., Schlummer, M., Smolic, S., Fromme, H. (2012). Determination of phthalic acid diesters in human milk at low ppb levels. Food Additives & Contaminants: Part A, Chemistry, Analysis, Control, Exposure & Risk Assessment 29(11):1780.		
HERO ID:	5492285		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methodology briefly discussed. Authors cite previously published peer-review publication for more details.
	Metric 2: Analytical Methodology	High	Key analytical methods reported, including extraction method, instrumentation, and detection limits.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemical in human milk.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples collected from southern Germany.
	Metric 5: Currency	Low	Study published in 2012. No date for research study provided.
	Metric 6: Spatial and Temporal Variability	Medium	30 milk samples collected from 30 individuals. No replicate samples indicated.
	Metric 7: Exposure Scenario	Medium	Sources of exposure not characterized, but the data represent a relevant general exposure scenario.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Summary statistics provided, including number of samples below LOQ, max, median, and 95th percentile. Raw data reported
	Metric 9: Quality Assurance	High	Key QA reported, including method blanks, standards, and recoveries.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability and uncertainty discussed, including discrepancies with other published studies and limitations with sample size.

Overall Quality Determination   Medium

Study Citation:		Chen, C. F., Chen, C. W., Chen, T. M., Ju, Y. R., Chang, Y. K., Dong, C. D. (2017). Phthalate ester distributions and its potential-biodegradation microbes in the sediments of Kaohsiung Ocean Dredged Material Disposal Site, Taiwan. International Biodeterioration & Biodegradation 124:233-242.	
HERO ID:		5494792	

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported, such as sampler calibration.
	Metric 2:	Analytical Methodology	High	Key analytical methods reported.
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Taiwan
	Metric 5:	Currency	Medium	Samples collected in 2014.
	Metric 6:	Spatial and Temporal Variability	High	>10 samples collected; replicates.
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported.
	Metric 9:	Quality Assurance	Medium	QA conducted but reported in a different study.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported.

Overall Quality Determination   Medium

| Study Citation: | Müller, J., Kördel, W. (1993). Occurrence and fate of phthalates in soil and plants. Science of the Total Environment 134(Suppl. 1):431-437. |
| HERO ID: | 5494794 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported such as sampler calibration and storage conditions
	Metric 2:	Analytical Methodology	High	Key analytical methods reported
	Metric 3:	Biomarker Selection	N/A	N/A - testing for parent chemical in environmental media
Domain 2: Representativeness				
	Metric 4:	Geographic Area	Critically Deficient	Geographic location is not referenced or reported
	Metric 5:	Currency	Low	Data collected from 1986 to 1989
	Metric 6:	Spatial and Temporal Variability	Medium	Three fields per phthalate emitting plant, 4 replicate samples at each field.
	Metric 7:	Exposure Scenario	Medium	Exposure scenario not well characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	few raw data points given
	Metric 9:	Quality Assurance	Low	No QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps or limitations reported

Overall Quality Determination   Uninformative

Study Citation:	Shao, X. L., Zou, Y. M., Wang, F. X., Zhang, Z., Wang, S. M., Han, S. L., Wang, S. S., Chen, Y., Wu, X. Y., Chen, Z. L. (2013). Determination of phthalate acid esters in water and sediment samples by GC-MS. Advanced Materials Research 610-613:157-162.		
HERO ID:	5495649		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Surface water (3 from Yangtze River, 1 from Tongji River), sediment (2 from Yangtze), and tap water (from laboratory) were sampled in autumn. Water samples were filtered. Sediment were freeze-dried and extracted overnight. Sampling equipment and storage were not specified.
Metric 2:	Analytical Methodology	Medium	Solid phase extraction was used for water samples, and ultrasonic-associated solvent extraction for soil. Samples were analyzed with GC-MS. Recoveries were reported. LODs for all analytes were only reported as a range (0.103-0.373 ug/L for water and .232-0.572 mg/kg for sediment).
Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in water and sediment.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples were collected from the Zhenjiang section of the lower reach of Yangtze River as well as Jiangsu Province for Tongji River, China.
Metric 5:	Currency	Medium	Samples were collected in 2011.
Metric 6:	Spatial and Temporal Variability	Low	Sample size is small for each scenario. Water was samples from only 3 sites in Yangtze River (upstream, midstream, downstream) and 1 site in Tongji river. There was only one tap water sample from the laboratory. Sediment samples were collected from 2. Surface water and sediment were sampled in autumn only.
Metric 7:	Exposure Scenario	High	Water and sediment were sampled from rivers in China that are located in highly developed industry and agriculture areas.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Table 4 provides concentrations in water from each sampling location (100% DF); Table 5 provides concentration in sediments by sample site. Most summary statistics are missing.
Metric 9:	Quality Assurance	High	QA/QC was reported, including blanks, triple samples, and recoveries. Recoveries were provided in Table 3, and are acceptable for the phthalates of interest.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variance was not reported, and neither were limitations, data gaps, or uncertainties.

Overall Quality Determination   **Medium**

Study Citation: Wang, X. K., Guo, W. L., Meng, P. R., Gan, J. A. (2002). Analysis of phthalate esters in air, soil and plants in plastic film greenhouse. Chinese Chemical Letters 13(6):557-560.

HERO ID: 5518156

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Sampling equipment and methods are briefly discussed but missing some details (e.g. storage conditions/duration, details on the portions of the plant samples collected) that may have an impact on results.
Metric 2:	Analytical Methodology	Low	Analytical instrumentation and methods are discussed with sufficient detail, including QA, but LOD is not reported. It is unclear whether the analytical methods were modeled after any widely-accepted standards; the paper suggests a special method had to be developed for this analysis.
Metric 3:	Biomarker Selection	N/A	This study is testing for the parent chemical in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	While the location of the plastic film greenhouse is not specified, contrast air samples were sampled in urban area of Jinan, and the location of the greenhouse can be inferred to be in China.
Metric 5:	Currency	Low	Collected in 2000
Metric 6:	Spatial and Temporal Variability	Medium	Samples collected included air inside and outside of the plastic film greenhouse, soil at four specific depths inside and outside of the greenhouse, and plants grown inside the greenhouse. Six independent samples were taken for each metric, providing replicates. The paper does not say the distance from the greenhouse the control soil samples from outside the greenhouse and the control plant samples were collected.
Metric 7:	Exposure Scenario	High	Sampling for this study compares exposure inside of a plastic film greenhouse to exposure outside of the greenhouse for each type of sample collected and therefore highlights the effects of the exposure scenario of interest. The size of the greenhouse is not discussed, which could be relevant. The age of the greenhouse is mentioned.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Critically Deficient	No raw data points are reported. One type of summary statistic is provided for each chemical in each medium, with a plus/or minus value. The type of statistics provided are not explicitly named (i.e., the numbers presented are likely means and standard deviations, but could be means or medians plus or minus a value to represent the full range of results, an interquartile range, etc.).
Metric 9:	Quality Assurance	Medium	Average spike recoveries of standards were measured to be 86-98%. It is unclear whether blanks were used.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Critically Deficient	There is no discussion of uncertainty and little to no discussion of variability in the paper. Some variability in the data is referenced in the data tables, but it cannot be determined whether the plus or minus values in the tables are standard deviation or ranges. Limitations do not appear to be discussed in the text.

Overall Quality Determination   Uninformative

Study Citation: Růžičková, J., Raclavská, H., Raclavský, K., Juchelková, D. (2016). Phthalates in PM2.5 airborne particles in the Moravian-Silesian Region, Czech Republic. Perspectives in Science 7:178-183.

HERO ID: 5525088

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sampling methodology is very briefly discussed, and many details are missing (e.g., equipment, sampling duration).
	Metric 2:	Analytical Methodology	Low	Analytical instrumentation and methods are described in sufficient detail, but certain aspects (e.g. sample extraction) were absent that are unlikely to have a substantial impact on results. However, LOD is not reported.
	Metric 3:	Biomarker Selection	N/A	This study is testing for the parent chemical of interest in an environmental medium.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Moravian-Silesian Region, Czech Republic.
	Metric 5:	Currency	Medium	Samples were collected during 2013-2014.
	Metric 6:	Spatial and Temporal Variability	Medium	Seasonal particulate matter was collected from ten sites, for a total of 40 samples, with no replicates.
	Metric 7:	Exposure Scenario	High	The region of samples sites is characterized as industrial and highly polluted.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw data are reported alongside mean and standard deviation for each sampling season across all ten sites.
	Metric 9:	Quality Assurance	Low	QA/QC techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Characterization of variability is reported and spatiotemporal variability is investigated. However, discussion of methodological limitations or sources of uncertainty is absent.

Overall Quality Determination   Medium

| | Study Citation: | Guo, Y., Weck, J., Sundaram, R., Goldstone, A. E., Louis, G. B., Kannan, K. (2014). Urinary Concentrations of Phthalates in Couples Planning Pregnancy and Its Association with 8-Hydroxy-2'-deoxyguanosine, a Biomarker of Oxidative Stress: Longitudinal Investigation of Fertility and the Environment Study. Environmental Science & Technology 48(16):9804-9811. |
| | HERO ID: | 5529569 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Some sampling methods were described, but reference to a previously published study was provided for more details. There was no information on when urine samples were collected by participants.
	Metric 2:	Analytical Methodology	Medium	Analytical methods were described, but LOQs was only reported as a range for all phthalates.
	Metric 3:	Biomarker Selection	High	MBP is specific to DBP.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples collected in Michigan and Texas.
	Metric 5:	Currency	Medium	Samples collected during 2005-2009.
	Metric 6:	Spatial and Temporal Variability	Medium	No replicates were reported among the 849 urine samples. It is also unclear if the urine samples were spot or pooled.
	Metric 7:	Exposure Scenario	High	This is a biomonitoring study where exposure is presumed to occur through phthalates' ubiquity commercial and personal care products.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data were available.
	Metric 9:	Quality Assurance	High	QA/QC techniques were described, and samples were creatinine adjusted.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability was characterized. Uncertainties and limitations were not discussed

Overall Quality Determination   **High**

Study Citation:		Giam, C. S., Atlas, E., Chan, H., Neff, G. (1977). Estimation of fluxes of organic pollutants to the marine environment; Phthalate plasticizer concentration and fluxes. Revue Internationale d'Océanographie Médicale 47(1):79-84.	
HERO ID:		5529661	

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Discussion of sampling methods was very limited.
	Metric 2: Analytical Methodology	Low	Methods were only very broadly described with references to other publications. No detection limits were reported.
	Metric 3: Biomarker Selection	High	Study measured parent chemicals in biota and environment.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected from the Gulf of Mexico, USA.
	Metric 5: Currency	Low	Sampling date was not provided. Study was published in 1977.
	Metric 6: Spatial and Temporal Variability	Medium	3-22 samples were collected from each location without replicates.
	Metric 7: Exposure Scenario	Medium	Study of the marine environment is relevant to ecological hazards and biota for exposure if consumed.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	No raw data were provided and most summary statistics are missing.
	Metric 9: Quality Assurance	Low	Authors did not discuss QA/QC.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variability and uncertainty were not discussed.

Overall Quality Determination   Low

Study Citation:	Promtes, K., Kaewboonchoo, O., Kawai, T., Miyashita, K., Panyapinyopol, B., Kwonpongsagoon, S., Takemura, S. (2019). Human exposure to phthalates from house dust in Bangkok, Thailand. Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances & Environmental Engineering 11(13):1-7.		
HERO ID:	5532759		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sample methodology was succinctly summarized including a reference to previously published protocol for more details.
	Metric 2:	Analytical Methodology	High	Extract method, GC/MS, LOD, and recoveries were all reported.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in household dust.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected from homes in Bangkok, Thailand.
	Metric 5:	Currency	High	Samples were collected in 2017.
	Metric 6:	Spatial and Temporal Variability	Medium	No replicate samples were collected.
	Metric 7:	Exposure Scenario	High	Exposure to phthalates via household dust is relevant.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	No raw data were reported.
	Metric 9:	Quality Assurance	Medium	There is some discussion of QA/QC with spiked samples, triplicate measurements, and recoveries (acceptable).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variance was characterized with a range. Discussion of limitations was very brief.

Overall Quality Determination   High

Study Citation:	Hammel, S. C., Levasseur, J. L., Hoffman, K., Phillips, A. L., Lorenzo, A. M., Calafat, A. M., Webster, T. F., Stapleton, H. M. (2019). Children's exposure to phthalates and non-phthalate plasticizers in the home: The TESIE study. Environment International 132:105061.		
HERO ID:	5532853		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methodology is described for all sample media
	Metric 2: Analytical Methodology	High	Analytical methodology is described and MDL reported per metabolite in table 2
	Metric 3: Biomarker Selection	High	MBP urine, DBP in dust and handwipes
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	USA NC
	Metric 5: Currency	High	2014-2016
	Metric 6: Spatial and Temporal Variability	Medium	No sample replicates, 203 children from 190 families
	Metric 7: Exposure Scenario	High	Biomonitoring children exposure to phthalates
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	No raw data. Table 2 Descriptive statistics for phthalates and non-phthalate plasticizers with their urinary metabolites
	Metric 9: Quality Assurance	High	Recovery, field blanks, NIST samples for accuracy
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	No standard difference reported. Section 3.5 limitations

Overall Quality Determination   High

Study Citation:	Garí, M., Koch, H. M., Pälmke, C., Jankowska, A., Wesołowska, E., Hanke, W., Nowak, D., Bose-O'Reilly, S., Polańska, K. (2019). Determinants of phthalate exposure and risk assessment in children from Poland. Environment International 127:742-753.		
HERO ID:	5540505		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	The cohort methodology have been published previously (Polańska et al., 2009, 2011, 2016a).
	Metric 2: Analytical Methodology	High	LOD reported in table 2. Samples were analyzed in the spot urine samples using high performance liquid chromatography coupled with tandem mass spectrometry (HPLC-MS/MS) method.
	Metric 3: Biomarker Selection	High	Urine MnBP and OH-MnBP
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Poland
	Metric 5: Currency	High	2014-2015
	Metric 6: Spatial and Temporal Variability	Medium	No sample replicates, n=250 samples.
	Metric 7: Exposure Scenario	High	Biomonitoring
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	No individual data points. Table 2 Concentrations of phthalate metabolites in urine of seven year-old children (in μg/l) in the REPRO_PL cohort (n=250).
	Metric 9: Quality Assurance	Medium	QC is mentioned but not reported.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Key limitation described, variability reported in table 2.

Overall Quality Determination   High

| | Study Citation: | Ishida, M., Suyama, K., Adachi, S. (1981). Occurrence of dibutyl and di(2-ethylhexyl) phthalate in chicken eggs. Journal of Agricultural and Food Chemistry 29(1):72-74. |
| | **HERO ID:** | 5540676 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported such as sample storage conditions, calibration of sampler
	Metric 2:	Analytical Methodology	High	Key analytical methods reported
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Japan
	Metric 5:	Currency	Low	Samples collected in 1977
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7:	Exposure Scenario	Medium	Exposure source characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	raw data not reported
	Metric 9:	Quality Assurance	Low	QA implied
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Gaps and limitations not well characterized

Overall Quality Determination   Medium

Study Citation:	Li, K., Ma, D., Wu, J., Chai, C., Shi, Y. (2016). Distribution of phthalate esters in agricultural soil with plastic film mulching in Shandong Peninsula, East China. Chemosphere 164:314-321.		
HERO ID:	5540829		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methodology discussed, including sampling procedure, sample information, and storage conditions.
	Metric 2: Analytical Methodology	Medium	Analytical methodology discussed, including extraction method, analytical instrumentation, and recovery samples. However, MDL not reported for this chemical. Only a range is provided for PAEs.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemical in soil.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples collected from four areas (Qingdao, Weihai, Weifang, and Yantai) in Shandong Peninsula, East China.
	Metric 5: Currency	Medium	Samples collected in 2012.
	Metric 6: Spatial and Temporal Variability	High	A total of 108 samples collected from 36 vegetable fields, in 4 areas (Qingdao samples: 30, Yantai samples: 30, Weifang samples: 24, and Weihai samples: 24).
	Metric 7: Exposure Scenario	High	Samples collected from soils with plastic film mulching in vegetable fields in China.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Table 2 provides summary statistics for all the agricultural soils, including range, mean, std, and detection frequency. Raw data not reported.
	Metric 9: Quality Assurance	High	Key QA reported, including use of blanks, standards, and recoveries.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability between the four study areas as well as depth of soil discussed and presented in Figs 2 and 3. Gaps and limitations not well characterized.

Overall Quality Determination   High

Study Citation:		Schecter, A., Lorber, M., Guo, Y., Wu, Q., Yun, S. H., Kannan, K., Hommel, M., Imran, N., Hynan, L. S., Cheng, D., Colacino, J. A., Birnbaum, L. S. (2013). Phthalate concentrations and dietary exposure from food purchased in New York State. Environmental Health Perspectives 121(4):473-494.	
HERO ID:		5540861	

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Description of sampling methodology is limited, but most criteria are not applicable given it mostly involved purchasing food samples.
	Metric 2:	Analytical Methodology	High	Extraction and analytical methods described in detail for the various food types.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in food.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Food samples were purchased in New York.
	Metric 5:	Currency	Medium	Samples were collected in 2011.
	Metric 6:	Spatial and Temporal Variability	Medium	72 commonly consumed food samples were purchased without replicates.
	Metric 7:	Exposure Scenario	High	The potential exposure to phthalates via food is relevant.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data may be reported in the supplementary materials, but cannot access them.
	Metric 9:	Quality Assurance	Medium	QA conducted (e.g., spiked blank, matrix, duplicate analysis), but reference to methods was provided and not described fully.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Limited characterization of variance. Some gaps and limitations were reported.

Overall Quality Determination   Medium

Study Citation:	Wang, X., Lou, X., Zhang, N., Ding, G., Chen, Z., Xu, P., Wu, L., Cai, J., Han, J., Qiu, X. (2015). Phthalate esters in main source water and drinking water of Zhejiang Province (China): Distribution and health risks. Environmental Toxicology and Chemistry 34(10):2205-2212.		
HERO ID:	5540969		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Site description, collection timing, equipment, storage, and more were all reported.
	Metric 2:	Analytical Methodology	High	Key analytical methods were reported. LODs/LOQs are in Table S2.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in source and drinking water.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected from Zhejiang, China.
	Metric 5:	Currency	Medium	Samples were collected in 2013.
	Metric 6:	Spatial and Temporal Variability	Medium	Water was collected from 19 different sources without replicates.
	Metric 7:	Exposure Scenario	High	Exposure to phthalates via drinking water is relevant.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not reported.
	Metric 9:	Quality Assurance	High	Key QA/QC methods were reported, including recoveries which were acceptable. (Note that main text has a typo on reported recoveries. Refer to Table S2 for exact numbers).
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Gaps and limitations were not described.

Overall Quality Determination   **High**

Study Citation:	Mouritsen, A., Frederiksen, H., Sørensen, K., Aksglaede, L., Hagen, C., Skakkebaek, N. E., Main, K. M., Andersson, A. M., Juul, A. (2013). Urinary phthalates from 168 girls and boys measured twice a year during a 5-year period: Associations with adrenal androgen levels and puberty. Journal of Clinical Endocrinology and Metabolism 98(9):3755-3764.		
HERO ID:	5541110		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Population characteristics, sampling collection for first morning urine samples, storage condition, and sample preparation were described.
	Metric 2: Analytical Methodology	High	LC-MS/MS was used for analysis. LOD was provided.
	Metric 3: Biomarker Selection	Low	While MBP is specific to DBP, authors noted that they combined MiBP and MnBP and expressed it as the sum of MBP isomers. It is therefore unclear what percentage is derived from exposure to DiBP vs DnBP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was conducted in the Copenhagen area of Denmark.
	Metric 5: Currency	Medium	The study was conducted during 2006-2010.
	Metric 6: Spatial and Temporal Variability	Medium	A total number of 792 (boys and girls) urinary samples were presented in the supplementary table 1 without replicates.
	Metric 7: Exposure Scenario	Medium	This is a biomonitoring study but there was no discussion about suspected sources of exposure, not even speaking generally from phathlates' ubiquity.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual data were not reported. Mean concentrations and coefficient of variance were reported for each analyte in Table S1.
	Metric 9: Quality Assurance	Medium	Quality assurance was reported to be conducted, though description was referred to elsewhere. Recoveries were all above 89%.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Limitations were described in the study, which were mainly on the variations in the volume, and time of collection of urinary samples. Variance characterized by range in Table S1.

Overall Quality Determination   Medium

Study Citation:	Yuan, S. Y., Liu, C., Liao, C. S., Chang, B. V. (2002). Occurrence and microbial degradation of phthalate esters in Taiwan river sediments. Chemosphere 49(10):1295-1299.		
HERO ID:	5541359		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Methodology was succinct but complete.
	Metric 2: Analytical Methodology	High	Extraction and analysis was performed according to USEPA SW-846 method 8270.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemicals in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Taiwan.
	Metric 5: Currency	Low	Sampling was conducted in 2000.
	Metric 6: Spatial and Temporal Variability	Medium	14 river water and 6 sediment samples were collected without replicates.
	Metric 7: Exposure Scenario	High	Samples collected from some of the most heavily contaminated in Taiwan where aquatic environments may be affected.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	No raw data were provided.
	Metric 9: Quality Assurance	Low	Recoveries are acceptable but little reporting of QA/QC otherwise. It can be inferred that proper protocols were followed through the study's use of a standard method.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Key uncertainties, limitations, and data gaps were not discussed.

Overall Quality Determination   Medium

Study Citation:	Zhang, S. H., Guo, A. J., Fan, T. T., Zhang, R., Niu, Y. J. (2019). Phthalates in residential and agricultural soils from an electronic waste-polluted region in South China: distribution, compositional profile and sources. Environmental Science and Pollution Research 26(12):12227-12236.		
HERO ID:	5541389		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Key sampling methods reported
Metric 2:	Analytical Methodology	Medium	Key analytical methods reported
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Residential and agricultural soils from Guiyu, Shantou, China. Maps were provided.
Metric 5:	Currency	Medium	Samples collected in 2012
Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
Metric 7:	Exposure Scenario	Medium	Exposure scenario not well characterized
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not reported
Metric 9:	Quality Assurance	High	Key QA reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Gaps and limitations not well characterized

Overall Quality Determination   Medium

Study Citation:	Weiss, J. M., Gustafsson, Å., Gerde, P., Bergman, Å., Lindh, C. H., Krais, A. M. (2018). Daily intake of phthalates, MEHP, and DINCH by ingestion and inhalation. Chemosphere 208:40-49.		
HERO ID:	5550408		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	The study authors reported some sampling methods. Some methods were not reported such as sample storage conditions.
Metric 2:	Analytical Methodology	Medium	The study authors reported the LOD. Recovery samples were not reported.
Metric 3:	Biomarker Selection	N/A	Study looked at chemical in an environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	The study was conducted in Sweden.
Metric 5:	Currency	Low	The date of sample collection was not reported for pooled samples. Individual dust samples were part of 2012 MiSSE project.
Metric 6:	Spatial and Temporal Variability	Medium	For pooled samples there were 61 samples collected in total but pooled across three locations. For individual samples there were 10 samples for living rooms and 5 samples for children's rooms.
Metric 7:	Exposure Scenario	Medium	This was a monitoring study and did not examine specific sources of exposure.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	Raw data were reported in the supplementary materials.
Metric 9:	Quality Assurance	High	The study authors reported key QA.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	The study authors reported few gaps, limitations, and uncertainties.

Overall Quality Determination   **Medium**

Study Citation:	Molbert, N., Alliot, F., Santos, R., Chevreuil, M., Mouchel, J. M., Goutte, A. (2019). Multiresidue Methods for the Determination of Organic Micropollutants and Their Metabolites in Fish Matrices. Environmental Toxicology and Chemistry 38(9):1866-1878.		
HERO ID:	5555943		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Key sampling methods reported
Metric 2:	Analytical Methodology	High	Key analytical methods reported
Metric 3:	Biomarker Selection	Medium	Acceptable biomarker
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	France
Metric 5:	Currency	High	Samples collected in 2016
Metric 6:	Spatial and Temporal Variability	High	>5-10 samples; replicates of chub muscle and liver
Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not reported
Metric 9:	Quality Assurance	High	QA reported
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported

Overall Quality Determination   High

Study Citation:	Lee, K. S., Lim, Y. H., Kim, K. N., Choi, Y. H., Hong, Y. C., Lee, N. (2018). Urinary phthalate metabolites concentrations and symptoms of depression in an elderly population. Science of the Total Environment 625:1191-1197.		
HERO ID:	5556125		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Recruitment details, including participant characteristics, were described. However, urine sample collection regimen was mostly absent.
	Metric 2:	Analytical Methodology	Low	LODs and creatinine-adjusted levels were provided. No other information regarding analytical methods were described except for a reference (Kim et al. 2009).
	Metric 3:	Biomarker Selection	Medium	MnBP specific to DnBP.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study was conducted in South Korea.
	Metric 5:	Currency	Medium	Samples were collected in 2012.
	Metric 6:	Spatial and Temporal Variability	Low	535 participants provided a urine sample. No replicates were reported. No details about urine samples (e.g., pooled, first morning voids, spot) were provided.
	Metric 7:	Exposure Scenario	High	This is a biomonitoring study were exposure is presumed to occur through phthalates' ubiquity in the environment.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not reported
	Metric 9:	Quality Assurance	Low	QA/QC methods were mostly absent, except for adjusting for creatinine.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Some limitations reported in last paragraph of Discussion.

Overall Quality Determination   Medium

Study Citation:	Fromme, H., Lahrz, T., Piloty, M., Gebhart, H., Oddoy, A., Rüden, H. (2004). Occurrence of phthalates and musk fragrances in indoor air and dust from apartments and kindergartens in Berlin (Germany). Indoor Air 14(3):188-195.		
HERO ID:	5556411		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Unclear how the sampled buildings were selected
Metric 2:	Analytical Methodology	High	LODs provided (called "determination limits") Standard analytic methods. Blanks and recoveries meaured.
Metric 3:	Biomarker Selection	N/A	NA since testing for parent chemical in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Berlin, Germany
Metric 5:	Currency	Low	2000 to 2001
Metric 6:	Spatial and Temporal Variability	Medium	No replicates used. n = 59, 74, or 30
Metric 7:	Exposure Scenario	Medium	No info on chemical use inside building.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Summary statistics but no raw data
Metric 9:	Quality Assurance	Medium	Recovery rates and blanks were used. No detailed discussion of QA/QC
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Good discussion of uncertainty and variability in the estimated phthalate intake. No discussion of limitations of the concentration data.

Overall Quality Determination   Medium

Study Citation:	Han, S. W., Lee, H., Han, S. Y., Lim, D. S., Jung, K. K., Kwack, S. J., Kim, K. B., Lee, B. M. (2009). An exposure assessment of di-(2-ethylhexyl) phthalate (DEHP) and di-n-butyl phthalate (DBP) in human semen. Journal of Toxicology and Environmental Health, Part A: Current Issues 72(21-22):1463-1469.		
HERO ID:	5557779		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Not much information was provided for semen collection. The source and storage condition was provided.
	Metric 2: Analytical Methodology	High	Chromatographic analysis was performed using UPLC-MS/MS. LOD was provided.
	Metric 3: Biomarker Selection	High	Biomarker (parent chemical or metabolite) is derived from exposure to the chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were from Yonsei University, Korea
	Metric 5: Currency	Medium	May and September in 2007
	Metric 6: Spatial and Temporal Variability	High	Samples were from 99 healthy volunteers
	Metric 7: Exposure Scenario	Medium	The data likely represent the relevant exposure scenario, unclear about the source of chemical.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual data were not reported. Mean and range were reported in Table 3.
	Metric 9: Quality Assurance	Medium	The study applied and documented quality assurance/quality control measures. Recovery values were above 90%.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	The study provided standard deviation for the data, and identified some uncertainties, as well as compared to other publications.

Overall Quality Determination   High

Study Citation:	Polyakova, O. V., Artaev, V. B., Lebedev, D. T. (2018). Priority and emerging pollutants in the Moscow rain. Science of the Total Environment 645:1126-1134.		
HERO ID:	5576453		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methods were described in detail. Sample preparation was carried out according to the US EPA 8270D Method.
	Metric 2:	Analytical Methodology	Low	Analytical methods were sufficiently described. LOD not reported.
	Metric 3:	Biomarker Selection	N/A	Parent chemical measured in rainwater.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples collected in Moscow.
	Metric 5:	Currency	High	The samples were collected in the period between April 7 and May 15, 2017.
	Metric 6:	Spatial and Temporal Variability	Medium	8 rain samples collected. No replicates mentioned.
	Metric 7:	Exposure Scenario	High	Ambient samples of rainwater collected in 2 locations in Moscow.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw data reported.
	Metric 9:	Quality Assurance	High	Key QA reported including use of blanks and recoveries.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No limitations or variability mentioned.

Overall Quality Determination　　　　　　　　　**High**

Study Citation:	Lin, L., Dong, L., Meng, X., Li, Q., Huang, Z., Li, C., Li, R., Yang, W., Crittenden, J. (2018). Distribution and sources of polycyclic aromatic hydrocarbons and phthalic acid esters in water and surface sediment from the Three Gorges Reservoir. Journal of Environmental Sciences 69:271-280.		
HERO ID:	5576760		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	include map of sampling sites and describe overview of sampling procedure. Transport details missing.
Metric 2:	Analytical Methodology	High	detailed description of analytical methods and provide detection limits.
Metric 3:	Biomarker Selection	N/A	environmental media
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Three Gorges reservoir/Yangtze River
Metric 5:	Currency	High	2015
Metric 6:	Spatial and Temporal Variability	Medium	20 sample sites. No replicates collected.
Metric 7:	Exposure Scenario	Medium	investigating plastics and pollutants in water sources
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Low	provide bar graph with error bars but all chemical concentrations are on the same graph/axis which is misleading; no raw data or detailed summary stats
Metric 9:	Quality Assurance	Medium	included standards; all recoveries for water samples were >85%; sediment samples recoveries all >60%
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	no discussion of uncertainties and limited measures of variance

Overall Quality Determination   Medium

Study Citation:	Rodríguez-Ramos, R., Socas-Rodríguez, B., Santana-Mayor, Á., Rodríguez-Delgado, M. Á. (2019). Nanomaterials as alternative dispersants for the multiresidue analysis of phthalates in soil samples using matrix solid phase dispersion prior to ultra-high performance liquid chromatography tandem mass spectrometry. Chemosphere 236:124377.	
HERO ID:	5617923	

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Soil and sand samples were collected following the guidelines established by the Joint Research Centre of the European commission, which is a publicly available and scientifically sound SOP.
Metric 2:	Analytical Methodology	High	Development of improved analytical methodology was the focus of this study. All important details are included and the methods are scientifically sound. LOQ were reported.
Metric 3:	Biomarker Selection	N/A	This study was testing for the parent chemical of interest in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	This study used soil and sand samples collected in Tenerife (Canary Islands, Spain).
Metric 5:	Currency	Low	Timing of sample collection was not reported, but a publication date is available.
Metric 6:	Spatial and Temporal Variability	Medium	Five soil samples and four sand samples were analyzed. One sample of each type was not a "real" sample collected during the study. Use of replicates was not reported.
Metric 7:	Exposure Scenario	High	Soil samples were collected from agricultural crop areas related to cereals and potatoes, and sand samples were from beaches. Both sample sets were well characterized and represent relevant exposure sources.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data are reported; results obtained as an average of two analyses for each sample. Summary statistics are not reported but not warranted for the size of the data set and contents of the data (i.e., most data points are not detected or below LOQ).
Metric 9:	Quality Assurance	High	Development of improved analytical methodology was the focus of this study. An exhaustive validation of the whole methodology was carried out, obtaining good linearity as well as recovery values between 70 and 120% with RSDs below 20% for all analytes in the selected matrices.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Quantitative characterization of variability is not reported, but there is some qualitative discussion around variability and uncertainty.

Overall Quality Determination   High

Study Citation:	Huang, C. N., Yee, H., Cho, H. B., Lee, C. W. (2019). Children's exposure to phthalates in dust and soil in Southern Taiwan: A study following the phthalate incident in 2011. Science of the Total Environment 696:133685.		
HERO ID:	5618703		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The dust and soil sampling methodologies were well described.
	Metric 2:	Analytical Methodology	High	The analytical methods were described in detail, including LODs and recoveries.
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Taiwan.
	Metric 5:	Currency	Medium	Samples were collected between 2012 and 2014.
	Metric 6:	Spatial and Temporal Variability	High	n>10 indoor and n>10 outdoor samples.
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenarios related to phthalates in dust and soil in Taiwan.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics were reported.
	Metric 9:	Quality Assurance	Medium	QA/QC techniques were briefly described.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Variability was characterized (SD, range). Uncertainties were discussed.

Overall Quality Determination   High

Study Citation: Pereira, J., Selbourne, M. D., Pocas, F. (2019). Determination of phthalates in olive oil from European market. Food Control 98:54-60.
HERO ID: 5619803

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported.
	Metric 2:	Analytical Methodology	High	Key analytical methods reported.
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples collected from markets from several European countries (Sweden, Spain, Portugal, Ireland, Italy, Luxemburg, Portugal).
	Metric 5:	Currency	Medium	Samples collected in 2014.
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates.
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw data reported in Figure 2.
	Metric 9:	Quality Assurance	Low	Limited QA reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported.

Overall Quality Determination   Medium

Study Citation:	Jarosová, A., Puskárová, L., Stancová, V. (2012). Di-2-ethylhexyl phthalate and di-n-butyl phthalate in tissues of common carp (cyprinus carpio l.) after harvest and after storage in fish storage tanks. Journal of Microbiology, Biotechnology and Food Sciences 1(3):277-286.		
HERO ID:	5627801		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Some sampling details were described, such as general location of fish ponds and tissue collection. However, details were missing on how fish were caught, equipment, gutting procedures, etc.
Metric 2:	Analytical Methodology	Low	Extraction and equipment were described, including reference to an established method. LODs/LOQs were not reported.
Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in fish.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Study was conducted in South Moravia, Czech Republic.
Metric 5:	Currency	Medium	Samples were collected in 2007 and 2010.
Metric 6:	Spatial and Temporal Variability	Medium	Ten samples each were collected from two ponds during the autumn harvest and after storage in a fish tank. No replicates were reported.
Metric 7:	Exposure Scenario	High	The fish sampled were meant for human consumption.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Median, SD, min, max were provided (Table 1 and 2) but not raw data.
Metric 9:	Quality Assurance	Low	QA/QC was not discussed, but can be inferred through use of established methods.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Uncertainties, limitations, and gaps were not discussed.

Overall Quality Determination　　　　　Medium

Study Citation:	Kunikane, S., Ando, M., Aizawa, T., Kanegaki, Y. (2004). A nationwide survey of endocrine disrupting chemicals in source and drinking waters in Japan. Journal of Water and Environment Technology 2(1):17-22.		
HERO ID:	5628092		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Authors discussed little beyond site characteristics.
	Metric 2: Analytical Methodology	Medium	Detection limits provided in Table 2. Authors cited the analytical methods that were prepared by the Environment Agency but little details beyond that.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemicals in ground and surface water.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Japan.
	Metric 5: Currency	Low	Samples were collected in 1999.
	Metric 6: Spatial and Temporal Variability	Medium	45 samples were collected without replicates.
	Metric 7: Exposure Scenario	Low	Most details are missing (e.g., exposure source, details, population of interest, microenvironment).
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Raw data were not reported, and only detection frequency and range were reported.
	Metric 9: Quality Assurance	Low	Authors did attempt to reduce analytical variations between samples by using the same laboratory. However, all other QA/QC protocols were missing.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variance was characterized by range. There was no discussion of uncertainty and study limitations.

Overall Quality Determination   **Low**

Study Citation:	Wang, X. T., Ma, L. L., Sun, Y. Z., Xu, X. B. (2006). Phthalate esters in sediments from Guanting Reservoir and the Yongding River, Beijing, People's Republic of China. Bulletin of Environmental Contamination and Toxicology 76(5):799-806.
HERO ID:	5629322

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some methods not reported, such as sample storage conditions, equipment, and regimen.
	Metric 2:	Analytical Methodology	Medium	Extraction and analytical methods followed EPA's SW-846 and 8061A with modifications reported. MDLs were only reported as a range for all phthalates combined.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in surface water.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected from the Guanting Reservoir and Yongding River in China.
	Metric 5:	Currency	Low	Samples were collected in 2003.
	Metric 6:	Spatial and Temporal Variability	Medium	Samples were collected from 12 sites with no report of replicates.
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not provided.
	Metric 9:	Quality Assurance	Low	QA/QC can be implied through its use of EPA protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variance was characterized with range and SD, but there was no discussion of gaps and limitations.

Overall Quality Determination   Medium

Study Citation:	Puklová, V., Janoš, T., Sochorová, L., Vavrouš, A., Vrbík, K., Fialová, A., Hanzlíková, L., Černá, M. (2019). Exposure to mixed phthalates in Czech preschool and school children. Archives of Environmental Contamination and Toxicology 77(4):1-9.		
HERO ID:	5630466		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Authors described study population, collection procedure, equipment, and storage. Note that some components of sampling methodology are not relevant to urine collection (e.g., sampler calibration).
	Metric 2: Analytical Methodology	Medium	Some analytical methods were not reported such as recovery samples.
	Metric 3: Biomarker Selection	High	MnBP is specific to DnBP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Czech Republic.
	Metric 5: Currency	High	Samples were collected between 2016 and 2017.
	Metric 6: Spatial and Temporal Variability	Medium	A total of 370 samples were collected without replicates and only first morning void.
	Metric 7: Exposure Scenario	High	Children's exposure to the countless products containing phthalates, as measured in this biomonitoring study, is relevant.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not reported.
	Metric 9: Quality Assurance	Low	QA/QC protocol was not reported but implied through its use of the National Institute of Public Health Laboratory in Prague.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variance characterized by range. Some gaps and limitations were reported.

Overall Quality Determination   High

Domain		Metric	Rating	Comments
Study Citation:		Coiner, R. L., Pope, L. M., Mehl, H. E. (2010). Assessment of energetic compounds, semi-volatile organic compounds, and trace elements in streambed sediment and stream water from streams draining munitions firing points and impact areas, Fort Riley, Kansas, 2007-08. :55.		
HERO ID:		5676787		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	sediment and surface water sampling performed by USGS in cooperation with the US Army; sediment samples collected from top 2.0cm using stainless steel or plastic scoop and sieved onsite; freeze dried and placed in storage; water samples manually collected equal-width increment method and stored in glass jar; water processed unfiltered
	Metric 2:	Analytical Methodology	High	conducted by USACE contract laboratory according to USEPA Method 8330 for nitroaromatic and nitramine compounds, USEPA Method 8332 for nitroglycerin, USEPA Method 8321 (modified) for perchlorate, and USEPA Method 8270C/8270D for SVOCs (table 4)
	Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Fort Riley, northeast Kansas
	Metric 5:	Currency	Medium	June 2007-June 2008
	Metric 6:	Spatial and Temporal Variability	High	16 streambed sediment sampling sites and 5 stream-water sampling sites (17 samples collected during run-off); 3 streams water samples collected during base-flow conditions; replicate samples collected
	Metric 7:	Exposure Scenario	Medium	streambed sediment and stream water from streams draining munitions firing points and impact areas
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Table 15 and 16 provide raw data
	Metric 9:	Quality Assurance	High	QA discussed on p.13-16; QA measures part of lab analytical protocols
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	discussed variability (p.17 and 22) and uncertainty

Overall Quality Determination　　　High

Study Citation:	Juhler, R. K., Felding, G. (2003). Monitoring methyl tertiary butyl ether (MTBE) and other organic micropollutants in groundwater: Results from the Danish national monitoring program. Water, Air, and Soil Pollution 149(1):145.		
HERO ID:	5679227		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Sampled under the Danish National Groundwater Monitoring program. Few sampling details provided.
	Metric 2: Analytical Methodology	Low	Little info provided beside GC, although more info may be in the companion source (Apfalter 1999).
	Metric 3: Biomarker Selection	N/A	NA - water samples no biomarker needed.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Denmark
	Metric 5: Currency	Low	Data from 1993 to 2001.
	Metric 6: Spatial and Temporal Variability	Medium	1115 locations, but not sure if replicates. Samples collected over multiple years.
	Metric 7: Exposure Scenario	Medium	Specifies that samples are from water supply wells, detailed description of locations and well info not provided.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Only median and max provided.
	Metric 9: Quality Assurance	Low	Not mentioned, but assumed since used govt protocols.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	No standard deviation.

Overall Quality Determination   Low

Study Citation:	Saliu, F., Montano, S., Leoni, B., Lasagni, M., Galli, P. (2019). Microplastics as a threat to coral reef environments: Detection of phthalate esters in neuston and scleractinian corals from the Faafu Atoll, Maldives. Marine Pollution Bulletin 142(Elsevier):234-241.		
HERO ID:	5683148		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	A study area map was provided; sampling equipment, methods, storage, and containers were described in detail.
	Metric 2: Analytical Methodology	Medium	LOD range provided; sample prep, extraction, LC-MS instrumentation, calibration, and methods described in detail. Analytical method for extracting chemicals from coral seems somewhat novel, but was described in a prior paper, as well. Method validation is not described herein.
	Metric 3: Biomarker Selection	High	Parent and metabolite measured in coral and plankton.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Republic of Maldives
	Metric 5: Currency	High	2018
	Metric 6: Spatial and Temporal Variability	Medium	The narrative indicates there were 12 sampling sites, and 10 coral samples were collected per location, then homogenized for each location. 9 neuston-plankton samples were collected. Sampling characteristics are described in more detail in a separate paper. Table 4 shows 8 coral samples, not 12, for reasons that are not explained. Also, there were no replicates reported.
	Metric 7: Exposure Scenario	Medium	Coral and neuston-plankton were analyzed for phthalates, and the amounts of microplastics in the neustonic water were also assessed. The total amount or nature of sources of microplastics is not discussed.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Tables 3 and 4 provide individual data points. Most summary statistics are absent.
	Metric 9: Quality Assurance	High	QA was discussed, including matrix spikes, calibration verification, method blanks, spiked blanks, and recoveries (which were $93 \pm 24\%$). No QA/QC issues identified.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability was discussed, and there was minimal discussion of sources of uncertainty.

Overall Quality Determination   High

Study Citation:	Li, J., Xia, W., Wu, C., Zhao, H., Zhou, Y., Wei, J., Ji, F., Luan, H., Xu, S., Cai, Z. (2019). Variations of phthalate exposure and metabolism over three trimesters. Environmental Pollution 251(Elsevier):137-145.		
HERO ID:	5692137		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Most key criteria were met. Specifics on equipment and duration of sample storage prior to analysis were lacking.
Metric 2:	Analytical Methodology	Medium	Most key criteria met, including reference to previously published protocols. However, LODs were reported as a range.
Metric 3:	Biomarker Selection	High	MnBP is specific to DnBP.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples provided by participants in Wuhan City, China.
Metric 5:	Currency	Medium	Samples collected 2014-2015.
Metric 6:	Spatial and Temporal Variability	Medium	Multiple samples provided by 946 participants over three trimesters of pregnancy for a total of n=2838 samples. Samples provided only by participants in one city.
Metric 7:	Exposure Scenario	Medium	Participant characteristics reported in Table 1.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	No raw data were provided.
Metric 9:	Quality Assurance	Medium	Some quality assurance procedures were reported, such as recovery which were acceptable and adjustments for urine dilution.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	There was no discussion of limitations, uncertainties. and gaps.

Overall Quality Determination   Medium

Study Citation:	Buckley, J. P., Engel, S. M., Mendez, M. A., Richardson, D. B., Daniels, J. L., Calafat, A. M., Wolff, M. S., Herring, A. H. (2016). Prenatal phthalate exposures and childhood fat mass in a New York City cohort. Environmental Health Perspectives 124(4):507-513.		
HERO ID:	5699787		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Limited description of sampling methods
Metric 2:	Analytical Methodology	Medium	Authors did not described laboratory methods aside from citing previously reported methods. LODs reported in Table 2.
Metric 3:	Biomarker Selection	High	Biomarker (MnBP) is known to be related with external exposure to DnBP.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples collected from a cohort in New York City.
Metric 5:	Currency	Low	Sampling began in 1998 until 2002.
Metric 6:	Spatial and Temporal Variability	Low	Maternal urine samples (spot only) totaled 404, and 180 children were evaluated. There was no report of replicates.
Metric 7:	Exposure Scenario	High	Data closely represents relevant exposure scenarios (e.g., biomonitoring study).
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Only summary statistics were provided and not raw data.
Metric 9:	Quality Assurance	Low	Limited description of QA/QC techniques besides citing another paper that explained their methods.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variability was characterized, but uncertainties and limitations were not discussed.

Overall Quality Determination   Medium

Study Citation:	Wilk, B. K., Fudala-Ksiazek, S., Szopińska, M., Luczkiewicz, A. (2019). Landfill leachates and wastewater of maritime origin as possible sources of endocrine disruptors in municipal wastewater. Environmental Science and Pollution Research 26(25):1-12.		
HERO ID:	5709835		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling methodology for samples of landfill leachate, raw/pre-treated cruise ship wastewater, and municipal wastewater entering the wastewater treatment plant (WWTP) was detailed in terms of sampling equipment, procedures, instrumental calibration and study site characteristics however some sampling methods were not reported, such as sample storage conditions and duration of sample storage.
	Metric 2: Analytical Methodology	High	Key analytical methods such as extraction, instrumentation, instrumental calibration, limits of detection and recoveries were detailed.
	Metric 3: Biomarker Selection	N/A	Samples of environmental media were collected.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Poland.
	Metric 5: Currency	High	Samples were collected in 2015 and 2016.
	Metric 6: Spatial and Temporal Variability	Medium	Sampling of landfill leachate (n=20), raw (n=10) and pre-treated (n=15) cruise ship wastewater and municipal wastewater (n=48) were described as collected 2015-2016 monthly and/or during the tourist season. Replicate sampling was not conducted.
	Metric 7: Exposure Scenario	Medium	In this study in Poland, the exposure scenario was described as wastewater from landfill leachate, raw and pre-treated wastewater from cruise ships/ferries, and municipal wastewater entering a wastewater treatment plant, were tested for the presence of the suspected endocrine-disrupting compounds phthalates (PAEs) and bisphenol A (BPA). Use of exposure controls was not detailed.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data was not reported. Summary statistics of maximum and range were reported.
	Metric 9: Quality Assurance	Medium	Recoveries were reported, but additional key QC parameters, such as pre-exposure control sampling, was not detailed. Recoveries for DEHP (55%) were low.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Measured concentration variability summarized within reported ranges. Few gaps and limitations were reported.

Overall Quality Determination — **Medium**

Study Citation:	Hurford, N., Law, R. J., Payne, Fileman, T. W. (1989). Concentrations of chemicals in the North Sea arising from discharges from chemical tankers. Oil and Chemical Pollution 5(6):391-410.		
HERO ID:	5739457		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	sampling details of position and location Table 3 and Fig 1; 3 water samples (2x2.7 L and 1x1L) at each 32 location from windward side at 5m by glass bottles; storage conditions/duration not discussed
Metric 2:	Analytical Methodology	Medium	extracted with dichlormetane; GC/MS; Table 5 provides LOD; recoveries not discussed
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	North Sea
Metric 5:	Currency	Low	1986
Metric 6:	Spatial and Temporal Variability	High	3 water samples taken from each 32 sampling stations between 21 and 27 of April
Metric 7:	Exposure Scenario	High	sampling concentrations of chemicals in the North Sea to which operational discharges from chemical tankers would be expected to contribute
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Table 7 provides concentration of at each sampling location
Metric 9:	Quality Assurance	Medium	Section 6.3; procedural blanks; no discussion of recoveries
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	discusses limitation in data to make possible explanation of differences between locations

Overall Quality Determination   Medium

Study Citation:	Loraine, G. A., Pettigrov, M. E. (2006). Seasonal Variations in Concentrations of Pharmaceuticals and Personal Care Products in Drinking Water and Reclaimed Wastewater in Southern California. Environmental Science & Technology 40(3):687-695.		
HERO ID:	5743010		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Detailed sampling methodology is discussed.
Metric 2:	Analytical Methodology	Medium	The LODs are mentioned but not reported. The recoveries are not reported and the MDLs are reported.
Metric 3:	Biomarker Selection	N/A	Water was sampled for biomarkers of exposure.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples were collected in California, USA.
Metric 5:	Currency	Low	Sampling was conducted in 2001-2002.
Metric 6:	Spatial and Temporal Variability	Medium	Sampling was conducted with 4-5 samples per plant from 4 plants and no replicates.
Metric 7:	Exposure Scenario	Medium	Data may represent a relevant exposure scenario. The methods provide limited details on exposure assessment and population of interest.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	The reporting of results included only the summary statistics.
Metric 9:	Quality Assurance	Low	QC/QC issues is only briefly discussed.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Key uncertainties, study limitations and data gaps are not discussed.

Overall Quality Determination   Medium

Study Citation:	Machtinger, R., Mansur, A., Baccarelli, A. A., Calafat, A. M., Gaskins, A. J., Racowsky, C., Adir, M., Hauser, R. (2018). Urinary concentrations of biomarkers of phthalates and phthalate alternatives and IVF outcomes. Environment International 111:23-31.		
HERO ID:	5743382		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Well described sampling methods.
	Metric 2:	Analytical Methodology	Medium	Limited description, cited previously published work, reported LOD.
	Metric 3:	Biomarker Selection	High	Known metabolites resulting from external exposure.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Israel
	Metric 5:	Currency	High	Sampling began in 2014, finished in 2016.
	Metric 6:	Spatial and Temporal Variability	Low	136 samples, no replicates.
	Metric 7:	Exposure Scenario	Medium	Did not discuss relation to exposure sources.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics.
	Metric 9:	Quality Assurance	Low	QA/QC not directly discussed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Did not characterize variability. Discussed uncertainties and study limitations.

Overall Quality Determination   Medium

Study Citation:	SUNY, (2018). The effect of air change rate and temperature on phthalate concentration in house dust. Science of the Total Environment 639:760-768.		
HERO ID:	5744397		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The sampling methodology is thoroughly described and scientifically sound.
	Metric 2: Analytical Methodology	Low	The analytical methodology is thoroughly described and scientifically appropriate. The LOD is not provided.
	Metric 3: Biomarker Selection	N/A	Study is testing for concentration in house dust.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in China.
	Metric 5: Currency	High	Samples were collected from 2016 to 2017.
	Metric 6: Spatial and Temporal Variability	High	20 samples were collected from each location.
	Metric 7: Exposure Scenario	High	The exposure scenario of indoor dust in residential apartments is a scenario of interest and is well characterized.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data is not provided. Summary statistics are provided.
	Metric 9: Quality Assurance	High	QA/QC methods are provided.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Few limitations and gaps are provided. Variability is not characterized.

Overall Quality Determination   High

Study Citation:			Lee, I., Alakeel, R., Kim, S., Al-Sheikh, Y. A., Al-Mandeel, H., Alyousef, A. A., Kho, Y., Choi, K. (2019). Urinary phthalate metabolites among children in Saudi Arabia: Occurrences, risks, and their association with oxidative stress markers. Science of the Total Environment 654:1350-1357.
HERO ID:			5750962

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Concise but clear sampling methods.
	Metric 2:	Analytical Methodology	High	Detailed analytical methods, reported LOD in Supporting Information.
	Metric 3:	Biomarker Selection	High	Biomarker is known to represent external exposure.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Saudi Arabia
	Metric 5:	Currency	High	Sampling in 2017.
	Metric 6:	Spatial and Temporal Variability	Low	109 samples, no replicates.
	Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenarios.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics.
	Metric 9:	Quality Assurance	Low	QA/QC not discussed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Study limitations only briefly discussed.

Overall Quality Determination　　　　　　High

Study Citation:	Dodson, R. E., Udesky, J. O., Colton, M. D., Mccauley, M., Camann, D. E., Yau, A. Y., Adamkiewicz, G., Rudel, R. A. (2017). Chemical exposures in recently renovated low-income housing: Influence of building materials and occupant activities. Environment International 109:114-127.		
HERO ID:	5755270		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methods are standard SOPs and are detailed in the paper and the SI.
	Metric 2: Analytical Methodology	High	MRLs are tabulated. The paper and SI adequately discuss methodology.
	Metric 3: Biomarker Selection	N/A	Testing for the parent chemical in an environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Boston, MA.
	Metric 5: Currency	Medium	Samples were collected from 2013-2014.
	Metric 6: Spatial and Temporal Variability	High	10 pre-occupancy and >= 25 post-occupancy samples were collected. Duplicates were collected.
	Metric 7: Exposure Scenario	Medium	Information on potential chemical use not discussed beyond describing the measured concentrations.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Summary statistics were reported, but no raw data were reported (unless provided in the SI).
	Metric 9: Quality Assurance	High	The QAQC discussion was adequate.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	There was sufficient discussion on variability and uncertainty.

Overall Quality Determination   High

Study Citation:	Huang, Y., Li, J., Garcia, J. M., Lin, H., Wang, Y., Yan, P., Wang, L., Tan, Y., Luo, J., Qiu, Z., Ji-An, C., Shu, W. (2014). Phthalate levels in cord blood are associated with preterm delivery and fetal growth parameters in chinese women. PLoS ONE 9(2):e87430.		
HERO ID:	5755647		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	The sampling methodology was described in detail and is scientifically sound.
	Metric 2:	Analytical Methodology	High	The analytical methods were described, including recoveries and LOD.
	Metric 3:	Biomarker Selection	High	The study tested for parent chemicals in cord blood.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study was conducted in China.
	Metric 5:	Currency	Medium	The samples were collected between 2011 and 2012.
	Metric 6:	Spatial and Temporal Variability	High	n=207 volunteers.
	Metric 7:	Exposure Scenario	High	The data closely represent relevant exposure scenarios related phthalates.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics were reported (mean and percentiles).
	Metric 9:	Quality Assurance	High	QA/QC techniques were described in detail.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Variability was characterized (percentiles). Uncertainties were discussed.

Overall Quality Determination　　　　　　High

Domain	Metric	Rating	Comments
Study Citation:	Han, H., Park, B., Park, B., Ha, E. H., Hye Ah, L., Park, H., Young Sun, H. (2019). Associations of phthalate exposure with lipid levels and insulin sensitivity index in children: A prospective cohort study. Science of the Total Environment 662:714-721.		
HERO ID:	5772241		

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Medium. Most key criteria met. Duration of sample storage data lacking.
	Metric 2:	Analytical Methodology	Medium	Medium. Most key criteria met, chemical-specific LOD's reported.
	Metric 3:	Biomarker Selection	Low	Low. Sampling for metabolites not specific for parent chemical of interest.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	High. Samples provided by participants in Seoul, South Korea.
	Metric 5:	Currency	High	High. Samples collected 2005-2010 for participants at ages 3-5 follow-up, unspecified dates of sampling for additional follow-up urine specimen collection.
	Metric 6:	Spatial and Temporal Variability	Low	Low. Urine specimens provided by a total of n=164 children at ages 3-5 years and 7-9 years, but for subjects with two or more follow-ups, data was only analyzed for that obtained at the youngest ages, non-statistical sampling methods.
	Metric 7:	Exposure Scenario	Medium	Medium. Participant characteristics summarized, lack of information on pre-exposure or control samples.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Medium. Most key criteria met; lack of raw data.
	Metric 9:	Quality Assurance	Medium	Medium. Quality assurance procedures described with most key criteria met; lack of recovery data.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Medium. Variability characterized within summary statistics, minimal potential study limitations of residual confounding and potential storage container contamination reported.

Overall Quality Determination — **Medium**

Study Citation:	Buckley, J. P., Palmieri, R. T., Matuszewski, J. M., Herring, A. H., Baird, D. D., Hartmann, K. E., Hoppin, J. A. (2012). Consumer product exposures associated with urinary phthalate levels in pregnant women. Journal of Exposure Science & Environmental Epidemiology 22(5):468-475.		
HERO ID:	5772514		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported such as sampler calibration
	Metric 2:	Analytical Methodology	Medium	Recovery samples not reported
	Metric 3:	Biomarker Selection	Medium	Acceptable biomarker
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	USA
	Metric 5:	Currency	Low	Samples collected in 2002 and 2003
	Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported
	Metric 9:	Quality Assurance	High	Key QA reported
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported

Overall Quality Determination   Medium

Study Citation:	Hart, R. J., Taylor, H. E., Antweiler, R. C., Fisk, G. G., Anderson, G. M., Roth, D. A., Flynn, M. E., Peart, D. B., Truini, M., Barber, L. B. (2005). Physical and chemical characteristics of Knowles, Forgotten, and Moqui Canyons, and effects of recreational use on water quality, Lake Powell, Arizona and Utah. U.S. Geological Survey :116.		
HERO ID:	5821282		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	USGS report; bed-material samples from selected beach areas (fig 1); all samples were collected below the water line (p. 9); 300 g wet sediment collected by inserting an HNO3-cleaned 3-cm diameter by 30-cm long polystyrene tube into the sediment; chilled at less than 5C
	Metric 2:	Analytical Methodology	Medium	Continuous liquid-liquid extraction with methylene chloride; GC/MS; p. 11; calibration curves for instrumental determinations were established; based on Table 12 seems LDL is 0.5 ug/L.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples collected in Knowles, Forgotten, and Moqui Canyons of Lake Powell in Arizona and Utah.
	Metric 5:	Currency	Low	Samples collected in summers of 2001 and 2002.
	Metric 6:	Spatial and Temporal Variability	High	More than 10 samples over 4 sampling trips (May 15-17, 2001; September 5-7, 2001; May 20-22, 2002; September 9-12, 2002); refer to Fig 1 and Table 12.
	Metric 7:	Exposure Scenario	High	2 and 3 million people visit Glen Canyon National Recreation Area each year; high usage; sites selected to represent camping or other recreational activity use.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	Raw data reported in Table 12 (p.1 and 2); no other summary statistics provided.
	Metric 9:	Quality Assurance	Medium	Accuracy established by analysis of standard reference materials (primary sediment reference material used was NIST Standard Reference Material (SRM) 2704 Buffalo River Sediment) (p. 14)
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Limited reference to level of contaminants in other studies; nothing chemical specific.

Overall Quality Determination   Medium

Study Citation:	Zhang, G., Wang, N., Cheng, X., Sun, Y., Yan, H., Chen, C. (2017). Distribution of persistent organic pollutants (POPs) in atmospheric particles during district heating period (DHP) and non-district heating period (N-DHP) in Shandong province, China. Air Quality, Atmosphere and Health 10(10):1247-1257.		
HERO ID:	5883076		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling equipment and methods are described in sufficient detail, but certain aspects (e.g. duration of storage) were absent that are unlikely to have a substantial impact on results.
	Metric 2: Analytical Methodology	Low	Analytical instrumentation and methods are described in sufficient detail and are scientifically sound. However, method detection limit is only reported as a range for all phthalates.
	Metric 3: Biomarker Selection	N/A	This study is testing for the parent chemical in an environmental medium.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was performed in Shandong province, China.
	Metric 5: Currency	Medium	Samples were collected in 2009.
	Metric 6: Spatial and Temporal Variability	High	23h total suspended particulate samples were collected from seven sites for eight days during winter and spring, including quadruple replicates (except for a few instrument malfunctions).
	Metric 7: Exposure Scenario	High	Sampling sites were well characterized based on urban/rural conditions and surrounding geography. All samples were taken at a height inferred to be sufficient to isolate from ground-level point sources.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Raw data were not reported; summary results are presented graphically for each sampling site and season, but summary statistics (i.e. mean or median) were not provided.
	Metric 9: Quality Assurance	High	QA/QC measures included the use of triplicate analysis of standard solutions, laboratory control samples, and matrix spikes. Relative standard deviation, control sample recovery, and spike recovery were all within acceptable ranges.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Characterization of variability was absent except for spatiotemporal variability. Discussion of limitations or sources of uncertainty was also missing.

Overall Quality Determination   Medium

Study Citation:	LTI Limno-Tech, (1993). Preliminary evaluation of Dow Corning Carrollton, Kentucky environmental effects to surface waters with cover letter dated 04/20/94.		
HERO ID:	5885319		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Limited description of sampling methods
	Metric 2:	Analytical Methodology	Medium	Limited description of analytical methods
	Metric 3:	Biomarker Selection	N/A	The authors analyzed environmental samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Ohio, USA
	Metric 5:	Currency	Low	Sampling in 1992
	Metric 6:	Spatial and Temporal Variability	Low	Sample size is reported in Appendix B - Laboratory Data Report (page 74 of the 134 pages of the .PDF file). There are 4 water and 4 soil samples.
	Metric 7:	Exposure Scenario	Medium	Missing information about the population of interest, limited description of microenvironment
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual sample concentrations, no summary statistics
	Metric 9:	Quality Assurance	High	Described QA/QC techniques, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Did not characterize variability, or discussed uncertainties and limitations

Overall Quality Determination   Medium

Study Citation:	Lee, G., Kim, S., Kho, Y., Kim, S., Lee, S., Choi, G., Park, J., Worakhunpiset, S., Moon, H. B., Okanurak, K., Geounuppakul, M., Tangtitawong, J., Wetsutthanon, K., Trisurat, D., Choi, K. (2019). Urinary levels of phthalates and DINCH metabolites in Korean and Thai pregnant women across three trimesters. Science of the Total Environment 711:134822.		
HERO ID:	5932874		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Most appropriate sampling methods for a biomonitoring study were included. Some sampling methods were not reported such as sampler calibration.
	Metric 2:	Analytical Methodology	Medium	The LOD was reported. Some analytical methods were not reported, such as recovery samples.
	Metric 3:	Biomarker Selection	High	The study reported an acceptable biomarker.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	This study was conducted in Korea and Thailand.
	Metric 5:	Currency	High	Samples were collected in 2016.
	Metric 6:	Spatial and Temporal Variability	High	There were >10 samples collected and replicates collected.
	Metric 7:	Exposure Scenario	Medium	The exposure source was not well characterized.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not reported.
	Metric 9:	Quality Assurance	High	Key QA was reported in this study.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Some gaps and limitations were reported.

Overall Quality Determination   High

Study Citation: Gao, C. J., Wang, F., Shen, H. M., Kannan, K., Guo, Y. (2020). Feminine hygiene products-a neglected source of phthalate exposure in women. Environmental Science & Technology 54(2):930-937.

HERO ID: 5932884

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported. Sample location and details of material and products reported.
	Metric 2:	Analytical Methodology	Medium	Key analytical methods reported. Extraction and analytical equipment described (centrifuge and GC) but calibration not described. LOQ reported as a range and not individual chemicals. Instrumental analysis described in another study (ref 28).
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples from China
	Metric 5:	Currency	High	Samples collected in 2017 and 2018
	Metric 6:	Spatial and Temporal Variability	Medium	56 Feminine Care Products. 64 Sanitary Napkins. There is mention of duplicates.
	Metric 7:	Exposure Scenario	High	Exposure source characterized- feminine care products.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported. Summary statistics (mean, range, median) reported.
	Metric 9:	Quality Assurance	High	Key QA reported. Two method blanks, two matrix-spiked samples,and duplicates were analyzed. High recoveries.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Limitations characterized. Comparison to other feminine products. SD not reported.

Overall Quality Determination   High

Study Citation:	Fisher, M., Arbuckle, T. E., Macpherson, S., Braun, J. M., Feeley, M., Gaudreau, É. (2019). Phthalate and BPA exposure in women and newborns through personal care product use and food packaging. Environmental Science & Technology 53(18):10813-10826.		
HERO ID:	5932899		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Key criteria met, sample storage duration prior to analysis not reported, sampling methods detailed within text and referenced.
	Metric 2: Analytical Methodology	Medium	Most key criteria described, chemical-specific detection limits reported, analytic methods referenced, recovery data lacking.
	Metric 3: Biomarker Selection	Low	Sampling for metabolites not specific for parent chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples provided by participants of P4 study at clinics within Ottawa, Canada.
	Metric 5: Currency	Medium	Enrollment during pregnancy prior to 20 weeks gestation 2009-2010.
	Metric 6: Spatial and Temporal Variability	Medium	Non-statistical sampling methods; multiple maternal spot urine samples (<= 10 samples) within one 24-hour weekday period, within one 24-hour weekend period, and a single spot urine specimen collected during second trimester (T2), T3 and 2-3 months post-partum for mothers; infant spot urines collected at delivery (n=45) and 2-3 months post-partum (n=55). Total number of maternal urines varied by chemical (n=513-1,260).
	Metric 7: Exposure Scenario	Medium	Participant characteristics summarized.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Most key criteria met; lack of raw data.
	Metric 9: Quality Assurance	Low	Most key criteria met, analytic methods referenced; authors note potential for contamination with maternal MnBP and infant MnBP, MEHP, MEOHP samples.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variability characterized within summary statistics, potential study limitations reported; authors note potential for contamination with maternal MnBP and infant MnBP, MEHP, MEOHP samples.

Overall Quality Determination   **Medium**

Study Citation:	Malem, F., Soonthondecha, P., Khawmodjod, P., Chunhakorn, V., Whitlow, H. J., Chienthavorn, O. (2019). Occurrence of phthalate esters in the eastern coast of Thailand. Environmental Monitoring and Assessment 191(10):627.		
HERO ID:	5933394		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	provide info about sampling site, equipment, procedure
	Metric 2:	Analytical Methodology	High	describe analytical methods and provide LOD
	Metric 3:	Biomarker Selection	N/A	environmental media
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Pradu Bay and Chakmak Canal, Thailand
	Metric 5:	Currency	Medium	2014
	Metric 6:	Spatial and Temporal Variability	High	56 seawater and 43 sediment samples
	Metric 7:	Exposure Scenario	Medium	phthalates in seawater near economic/industrial hub
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	provide average standard deviation but not individual concentrations or table of raw data
	Metric 9:	Quality Assurance	High	% recovery >75%, used procedural blanks
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	provide measures of variance but don't identify key uncertainties or limitations

Overall Quality Determination   High

Study Citation:		Quynh, T. X., Toan, V. D. (2019). Endocrine disrupting compounds (EDCs) in surface waters of the Kimnguu River, Vietnam. Bulletin of Environmental Contamination and Toxicology 103(5):734-738.	
HERO ID:		5933601	

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Equipment used for sample collection, transportation, and preparation mentioned but not detailed. Surface water collected from 6 sites (Fig 1); at each site, one sample collected in dry season (April) and six samples in wet season (October). 500 mL of water sample filtered.
	Metric 2:	Analytical Methodology	Medium	Extraction method discussed (p.735). Analytical equipment (GC-MS-MS-SRM), recoveries, methods described more in Kadokami et al. (2009). MDLs reported as a rang from 0.01-0.05 ng/L.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	KimNguu River, Hanoi, Vietnam
	Metric 5:	Currency	High	2018
	Metric 6:	Spatial and Temporal Variability	Medium	1 sample in dry season and 6 samples taken in wet season from six sites (no replicates for dry season).
	Metric 7:	Exposure Scenario	Medium	River in Vietnam that everyday receives large quantities of industrial, medial, and domestic wastewater; assuming untreated.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Concentration range, mean and std in dry season and wet season reported. Percentages of each chemical at each site provided. No raw data provided.
	Metric 9:	Quality Assurance	Medium	Recoveries ranged from 75%-98%; duplicative samples performed. Blanks not taken.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	SD provided in Table 1. discussed variance among seasons and among world studies. No limitations reported.

Overall Quality Determination   Medium

Study Citation: Karthikraj, R., Lee, S., Kannan, K. (2019). Urinary concentrations and distribution profiles of 21 phthalate metabolites in pet cats and dogs. Science of the Total Environment 690:70-75.

HERO ID: 5933622

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Some information, such as sampling storage not described.
Metric 2:	Analytical Methodology	High	SI includes LOQ, matrix spike recoveries and recoveries for NIST certified standard reference materials (SRM). Extraction methods, calibration, and equipment also included.
Metric 3:	Biomarker Selection	High	Metabolites in cats and dogs. Biomarker is derived from exposure to the chemical of interest (MBP, MCPP).
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	New York
Metric 5:	Currency	High	2017
Metric 6:	Spatial and Temporal Variability	Medium	50 cats and 50 dogs, no replicates.
Metric 7:	Exposure Scenario	Medium	Exposure to pets (dogs and cats).
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Table 1 has mean, median, SD, min, max, and detection frequency. Individual points not reported.
Metric 9:	Quality Assurance	High	QA/QC discussed in detail. Procedural blanks analyzed. Recoveries over 70%.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Variation in dogs and cats, gender, age, habitat analyzed. Comparison to human exposure also analyzed.

Overall Quality Determination   High

Study Citation:	Zhang, Z. M., Yang, G. P., Zhang, H. H., Shi, X. Z., Zou, Y. W., Zhang, J. (2019). Phthalic acid esters in the sea-surface microlayer, seawater and sediments of the East China Sea: Spatiotemporal variation and ecological risk assessment. Environmental Pollution 259:113802.		
HERO ID:	5933853		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Clear and detailed methods
	Metric 2:	Analytical Methodology	High	Included detection limits and recoveries
	Metric 3:	Biomarker Selection	N/A	environmental data
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	East China Sea
	Metric 5:	Currency	Medium	Began in 2014
	Metric 6:	Spatial and Temporal Variability	Medium	56 and 98 seawater samples (including surface water samples and the samples at different sampling depths) collected in autumn and spring, respectively. Additionally, 12 SML and 19 sediment samples were obtained in spring. no replicates
	Metric 7:	Exposure Scenario	High	Data represent a relevant exposure scenario, included ecological risk assessment
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	includes raw data in supplementary information
	Metric 9:	Quality Assurance	High	Detailed QA/QC section, included recoveries, analyzed control samples
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Limited characterization of uncertainties, study limitations and data gaps

Overall Quality Determination   High

Study Citation:	Bechtel Environmental, (1988). Final site investigation report for the Rohm and Haas Redwood City Facility.
HERO ID:	6307465

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology is discussed and is generally appropriate (i.e., scientifically sound) for the chemical and media of interest. Details regarding soil sampling page 18-23, 28; groundwater sampling page 37-38, 41-47; monitoring well sampling page 48-58; concrete and asphalt sampling page 60-64.
	Metric 2:	Analytical Methodology	High	Samples were analyzed according to EPA Methods. Table 2-2 reports EPA methods followed for each contaminant.
	Metric 3:	Biomarker Selection	N/A	Study tested for the parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in California, USA.
	Metric 5:	Currency	Low	Samples were collected in 1986-1987.
	Metric 6:	Spatial and Temporal Variability	High	Duplicate samples were collected for all media types; 95 soil samples, 53 groundwater samples, 26 monitoring well samples, and 55 concrete and asphalt samples.
	Metric 7:	Exposure Scenario	Medium	The data likely represent relevant/realistic exposure scenario, but the use of expose controls was not described.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data reported in Tables 4-2, A-2, A-3. No summary statistics reported.
	Metric 9:	Quality Assurance	Medium	The use of QA/QC techniques were described such as the use of standards, blanks, laboratory duplicates, field duplicates, and spikes. However, recovery values and baseline samples were not reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	The study has limited characterization of variability and no measure of variance is provided. Key uncertainties, limitations, and data gaps are not discussed.

Overall Quality Determination   Medium

Study Citation:	Hargis & Montgomery Inc, (1984). Phase I Investigation of Groundwater Quality and Hydrogeological Conditions Summa Corporation Facility Culver City, California.		
HERO ID:	6311565		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Sampling methods were only briefly described.
Metric 2:	Analytical Methodology	Low	The authors cited analytical methods from EPA with brief descriptions.
Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	The study was conducted in the USA.
Metric 5:	Currency	Low	Samples were collected in 1983.
Metric 6:	Spatial and Temporal Variability	High	14 monitoring wells, with replicates.
Metric 7:	Exposure Scenario	Medium	The data may represent a relevant exposure scenario, but it's missing details about the population of interest.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Only individual sample concentrations were reported.
Metric 9:	Quality Assurance	High	The authors described QA/QC techniques and analyzed control samples.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	The authors did not characterize variability or uncertainties.

Overall Quality Determination   Medium

Study Citation:	Mercier, F., Gilles, E., Soulard, P., Mandin, C., Dassonville, C., Le Bot, B. (2020). On-line coupling of thermal extraction with gas chromatography / tandem mass spectrometry for the analysis of semivolatile organic compounds in a few milligrams of indoor dust. Journal of Chromatography A 1615:460768.		
HERO ID:	6393969		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Random subsample of 5 dust samples collected in French schools. The locations (within each school) of the dust samples are not reported.
	Metric 2: Analytical Methodology	High	LOD and LOQ reported. Results show that the new method performs as well as the conventional method for standard reference materials.
	Metric 3: Biomarker Selection	N/A	N/A since testing for parent chemical in an environmental medium.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	France
	Metric 5: Currency	Medium	2013 to 2017
	Metric 6: Spatial and Temporal Variability	Medium	5 samples. Replicate samples were used to compare the two methods. Replicates were also used for the 5 school dust samples.
	Metric 7: Exposure Scenario	High	School data is from a large school survey.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	High	SI lists summary statistics for the 5 replicates of all 5 samples.
	Metric 9: Quality Assurance	High	Thorough QA/QC discussion.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Good discussion of uncertainties/variability in main paper.

Overall Quality Determination   High

Study Citation:	McKesson Environmental Services, (1984). Priority pollutant analysis.		
HERO ID:	6574972		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Critically Deficient	The groundwater sampling methodology was not described.
Metric 2:	Analytical Methodology	Critically Deficient	The analytical methodology was not described.
Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in groundwater.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	The study was conducted in California, USA.
Metric 5:	Currency	Low	The analysis is from 1984.
Metric 6:	Spatial and Temporal Variability	Critically Deficient	The sample size is not reported.
Metric 7:	Exposure Scenario	Low	The data may represent a relevant exposure scenario, but the document lacks sufficient details about sampling and analytical methods, population of interest and microenvironment characteristics.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	The authors only reported individual sample concentrations, without summary statistics.
Metric 9:	Quality Assurance	Low	QA/QC techniques were not described, control samples were not analyzed.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	Variability was not characterized. Uncertainties and limitations were not described.

Overall Quality Determination   Uninformative

Study Citation:	Başaran, B., Soylu, G. N., Yılmaz Civan, M. (2020). Concentration of phthalate esters in indoor and outdoor dust in Kocaeli, Turkey: implications for human exposure and risk. Environmental Science and Pollution Research International 27(2):1808-1824.		
HERO ID:	6813710		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling methodology for samples of indoor and outdoor dust were described in terms of sampling equipment, procedures, and sample storage conditions, but were lacking storage duration details.
Metric 2:	Analytical Methodology	High	Limits of quantification were reported. Analytical methodology was detailed in terms of extraction, analytical instrumentation, calibration, and recoveries. Extraction was described as conducted according to modified U.S. EPA methods.
Metric 3:	Biomarker Selection	N/A	Sampling was conducted within environmental media.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Sampling was conducted in Kocaeli, Turkey.
Metric 5:	Currency	High	Sampling was conducted in 2016.
Metric 6:	Spatial and Temporal Variability	Medium	No replicate samples were collected, however a total of n=90 samples were collected for indoor dust and n=90 samples were collected for outdoor dust.
Metric 7:	Exposure Scenario	High	Indoor and outdoor dust sampling was conducted within an industrialized area of Turkey between February and April of 2016.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	No raw data was provided. Statistical summary measures included median, mean, standard deviation and range. Frequencies of detection were noted.
Metric 9:	Quality Assurance	Medium	Quality assurance procedures were detailed and included analytical instrument calibration and recoveries, but no pre-exposure sampling was conducted.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	The study characterizes variability but overall study limitations were not detailed.

Overall Quality Determination   Medium

Study Citation: Chen, J., Shi, X., Zhou, X., Dong, R., Yuan, Y., Wu, M., Chen, W., Liu, X., Jia, F., Li, S., Yang, Q., Chen, B. (2020). Renal function and the exposure to melamine and phthalates in Shanghai adults. Chemosphere 246:125820.

HERO ID: 6813754

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Limited description of sampling methodology.
	Metric 2:	Analytical Methodology	High	Detailed analytical methods, reported LOD.
	Metric 3:	Biomarker Selection	High	Biomarker is known to be related to external exposure.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Shanghai, China
	Metric 5:	Currency	Medium	Samples from 2012.
	Metric 6:	Spatial and Temporal Variability	Low	n = 1663, no replicates.
	Metric 7:	Exposure Scenario	High	Data closely represent relevant exposure scenarios.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Concentration data was not provided in manuscript or in SI.
	Metric 9:	Quality Assurance	High	Described QA/QC techniques, analyzed control samples.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability was not characterized, uncertainties and limitations were discussed.

Overall Quality Determination   Medium

Study Citation:	Chin, H. B., Jukic, A. M., Wilcox, A. J., Weinberg, C. R., Ferguson, K. K., Calafat, A. M., Mcconnaughey, D. R., Baird, D. D. (2019). Association of urinary concentrations of early pregnancy phthalate metabolites and bisphenol A with length of gestation. Environmental Health 18(1):80.		
HERO ID:	6813785		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	All pertinent sampling methods were described. This paper continued the North Carolina Early Pregnancy Study (EPS), a prospective cohort study. In the early 1980s, daily first-morning urine samples were collected in polypropylene jars, and women were monitored for pregnancy for EPS. In this study, during 2010-2011, women were re-contacted to determine outcome of pregnancy. Those available had urine tested for phthalate metabolites. Investigators pooled three pre-conception and three post-conception urine samples for each woman.
Metric 2:	Analytical Methodology	Low	U.S. CDC analyzed urine samples using SPE isotope dilution HPLC-MS/MS, as described in Silva et al. (2007), HERO 807138. Possible effects of long-term frozen storage on phthalate metabolite concentrations evaluated by Baird et al. (2010), HERO 673435. LODs/LOQs were not reported.
Metric 3:	Biomarker Selection	High	MBP is a specific metabolite of DBP. All concentrations were standardized to creatinine mass measured in pooled urine samples.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Study was conducted in North Carolina.
Metric 5:	Currency	Low	Urine samples collected in 1982 through 1986 and analyzed after 2007. Thus, samples were frozen for at least two decades before analysis.
Metric 6:	Spatial and Temporal Variability	Medium	First morning urine samples were collected daily. Three preconception samples from the same woman were pooled to minimize episodic spikes in phthalate metabolites in urine (n=125 women). Similarly, three post-conception samples were pooled for each woman (n=121). Primarily Monday samples, collected one week apart, were pooled.
Metric 7:	Exposure Scenario	Medium	No exposure scenarios were specified because exposure is presumed to be widespread.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Table 1 presented median and IQR for metabolite concentrations and the same statistics for the molar sum of all four DEHP metabolites. Raw data were not provided.
Metric 9:	Quality Assurance	Low	No explicit discussion of QA/QC techniques, but can be implied through its use of CDC laboratory for analysis. QA/QC was also discussed in HERO 673435, although MECPP was not included in that report.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Variance was characterized with IQR in Table 1. Limitations were described in Discussion. HERO 673435 described variation in metabolite concentrations among first morning urine samples within and between women and over time; it also compared variation in first morning urine to spot samples from other studies.

Overall Quality Determination   **Medium**

Study Citation:	Ferguson, K. K., Rosen, E. M., Barrett, E. S., Nguyen, R. H. N., Bush, N., Mcelrath, T. F., Swan, S. H., Sathyanarayana, S. (2019). Joint impact of phthalate exposure and stressful life events in pregnancy on preterm birth. Environment International 133(Pt B):105254.		
HERO ID:	6813951		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	The sampling methodology was briefly described, citing previously published work.
	Metric 2: Analytical Methodology	Medium	The analytical methods were well-described but did not include LODs or recoveries.
	Metric 3: Biomarker Selection	High	The urine metabolites are closely associated with exposure to the parent chemicals.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	USA
	Metric 5: Currency	Medium	The sampling campaign occurred between 2010 and 2012.
	Metric 6: Spatial and Temporal Variability	High	The study included n=783 study participants that provided urine samples at three routine visits.
	Metric 7: Exposure Scenario	High	The data closely represent scenarios of phthalate exposure in pregnant women in the U.S.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Only summary statistics were reported (median, IQR).
	Metric 9: Quality Assurance	Low	QA/QC techniques were not described by the authors.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Variability was characterized (IQR). The authors discussed uncertainties and study limitations.

Overall Quality Determination   High

Study Citation:	Urbancova, K., Lankova, D., Sram, R. J., Hajslova, J., Pulkrabova, J. (2019). Urinary metabolites of phthalates and di-iso-nonyl cyclohexane-1,2-dicarboxylate (DINCH)-Czech mothers' and newborns' exposure biomarkers. Environmental Research 173:342-348.		
HERO ID:	6814511		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Key sampling methods reported. Sampling methods, equipment, storage described.
	Metric 2: Analytical Methodology	High	Key analytical methods reported. Extraction methods, analytical instrument, LOQ reported, calibration standards used.
	Metric 3: Biomarker Selection	High	Metabolite is derived from parent chemical (MBP).
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Czech Republic
	Metric 5: Currency	Medium	Samples collected in 2013 and 2014
	Metric 6: Spatial and Temporal Variability	Medium	204 samples. No replicates.
	Metric 7: Exposure Scenario	High	Measuring metabolites in pregnant women and newborns.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data not reported. Mean, median, min and max reported.
	Metric 9: Quality Assurance	High	Key QA reported. Recoveries of 70–126%. A procedural blank sample, which contained deionised water instead of urine, was prepared with each set of samples.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	No limitations discussed. Comparison of results with other studies.

Overall Quality Determination   **High**

Study Citation:	van Drooge, B. L., Rivas, I., Querol, X., Sunyer, J., Grimalt, J. O. (2020). Organic air quality markers of indoor and outdoor PM2.5 aerosols in primary schools from Barcelona. International Journal of Environmental Research and Public Health 17(10):3685.		
HERO ID:	6814514		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Duplicate sampling to consider seasonality, sampling period provided.
Metric 2:	Analytical Methodology	Medium	Missing sampling information including LOD or LOQ not described but used.
Metric 3:	Biomarker Selection	N/A	Biomarkers were not assessed nor relevant to this study.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Primary Schools from Barcelona
Metric 5:	Currency	Medium	Year of data collection is unclear; however, it is likely 2012-2013.
Metric 6:	Spatial and Temporal Variability	High	Over 10 samples, replicates collected to account for seasonality.
Metric 7:	Exposure Scenario	High	The exposure scenario assessed is relevant to indoor and ambient air pathways analyses for TSCA risk evaluation.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Multiple pieces of information not presented.
Metric 9:	Quality Assurance	Medium	Though recoveries were discussed, replicates were not evident.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	While standard deviations were discussed, study lacked discussion of uncertainties or biases.

Overall Quality Determination   **Medium**

Study Citation:	Huang, P. C., Chang, W. H., Wu, M. T., Chen, M. L., Wang, I. J., Shih, S. F., Hsiung, C. A., Liao, K. W. (2020). Characterization of phthalate exposure in relation to serum thyroid and growth hormones, and estimated daily intake levels in children exposed to phthalate-tainted products: A longitudinal cohort study. Environmental Pollution 264:114648.
HERO ID:	6815852

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	While urine sample collection is relatively straightforward, the study's description of sampling methods is still limited.
	Metric 2:	Analytical Methodology	Medium	The analytical protocol mostly referenced previously published methods and did not include general information on key information (e.g., extraction).
	Metric 3:	Biomarker Selection	High	MBP is specific to DBP.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study was performed in Taiwan.
	Metric 5:	Currency	High	Sampling began in 2012 and lasted through 2016.
	Metric 6:	Spatial and Temporal Variability	Low	Researchers recruited 166 children to participate. Spot urine samples - presumably unpooled - were collected.
	Metric 7:	Exposure Scenario	High	This is a biomonitoring study were exposure has presumably occurred during the 2011 food scandal.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics and no raw data were provided.
	Metric 9:	Quality Assurance	Low	QA/QC techniques were not discussed but can be implied through the study's use of previously published protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Variance was characterized and uncertainties and limitations were discussed.

Overall Quality Determination   Medium

Study Citation:	Kim, J. H., Kim, D., Moon, S. M., Yang, E. J. (2020). Associations of lifestyle factors with phthalate metabolites, bisphenol A, parabens, and triclosan concentrations in breast milk of Korean mothers. Chemosphere 249:126149.		
HERO ID:	6815879		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Key sampling methods (e.g., equipment, collection procedure, storage conditions) were reported.
	Metric 2: Analytical Methodology	High	Key analytical methods (e.g., extraction, instrumentation, LOQs, recoveries) were reported.
	Metric 3: Biomarker Selection	High	MiBP is specific to DiBP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Korea.
	Metric 5: Currency	High	Samples were collected in 2018.
	Metric 6: Spatial and Temporal Variability	Medium	221 samples were collected without replicates.
	Metric 7: Exposure Scenario	High	This is a biomonitoring study that presumed exposure already occurred. Authors broadly discussed possible sources of exposure and aimed to evaluate associations between endocrine disruptions detected in breast milk and consumption of certain foods or use of certain products.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not reported.
	Metric 9: Quality Assurance	High	QA/QC techniques included tests of linearity, accuracy, precision, LOQs, and recoveries. Recoveries were acceptable.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variance characterized with standard deviation. Some gaps and limitations were reported, but focused mostly on estimates of daily intake.

Overall Quality Determination   High

Study Citation:	Kim, S., Lee, Y. S., Moon, H. B. (2020). Occurrence, distribution, and sources of phthalates and non-phthalate plasticizers in sediment from semi-enclosed bays of Korea. Marine Pollution Bulletin 151:110824.		
HERO ID:	6815967		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling methods were only briefly described and references to other published studies were provided for more details.
	Metric 2: Analytical Methodology	High	All key analytical methods (e.g., extraction method, instrumentation) were reported, but individual LOQs were not provided for each phthalate.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemicals in sediment.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected in Musan Bay, Korea.
	Metric 5: Currency	Medium	Samples were collected in 2013.
	Metric 6: Spatial and Temporal Variability	Medium	Sixty samples were collected without replicates.
	Metric 7: Exposure Scenario	High	Industrial and domestic discharges to the bay and its ecological risks were described.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not reported.
	Metric 9: Quality Assurance	Low	QA/QC techniques were described in detail. Recoveries were <70% for several of the phthalates, and no corrections were explained.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Gaps and limitations were only minimally discussed.

Overall Quality Determination   **Medium**

Study Citation:	SUNY, (2019). Semi-volatile organic compounds in infant homes: Levels, influence factors, partitioning, and implications for human exposure. Environmental Pollution 251:609-618.		
HERO ID:	6815979		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling methodology were provided and described, including sampling procedure, equipment, storage, and matrix characteristics.
Metric 2:	Analytical Methodology	High	Analytical methodology was provided and briefly described. Samples were Soxhlet extracted and analyzed using GC-MS.
Metric 3:	Biomarker Selection	N/A	The analyte measured is the TSCA chemical.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	The samples were collected in China.
Metric 5:	Currency	Medium	Data were collected from December 2013 to March 2014.
Metric 6:	Spatial and Temporal Variability	Medium	25 air samples, 25 dust samples, and 18 window filmsamples were collected. No replicate data were collected.
Metric 7:	Exposure Scenario	High	The samples were collected in indoor environment, which represent the exposure of anyone who comes into contact with these home environment.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data were not reported. Summary statistics including median, mean, and standard deviation were reported.
Metric 9:	Quality Assurance	High	Analytical QA/QC were reported. The recoveries in this study ranged from 64.1% to 132%. All the SVOC concentrations in real samples were corrected with blanks and recoveries.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Some sources of variability and uncertainty were discussed and significance values were reported (p values).

Overall Quality Determination   High

Study Citation:	Lee, Y. S., Lim, J. E., Lee, S., Moon, H. B. (2020). Phthalates and non-phthalate plasticizers in sediment from Korean coastal waters: Occurrence, spatial distribution, and ecological risks. Marine Pollution Bulletin 154:111119.		
HERO ID:	6815985		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling regimen was not reported, and description of other methods (e.g., equipment) was sparse.
	Metric 2:	Analytical Methodology	High	Key analytical methods were reported, including reference to previously published method. LOQs presented in Table S3.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals in sediment.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected from Korean coastal waters.
	Metric 5:	Currency	High	Samples were collected in 2016.
	Metric 6:	Spatial and Temporal Variability	Medium	Sediment was collected from 50 locations without replicates.
	Metric 7:	Exposure Scenario	Medium	Exposure source was not well characterized.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not reported.
	Metric 9:	Quality Assurance	Medium	QA/QC techniques were reported. The mean recovery for each chemical is >70%, but when considering the standard deviations, almost all recoveries fall below 70%.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Limitations and gaps were not characterized.

Overall Quality Determination   **Medium**

Study Citation:	Li, X. H., Ma, L. L., Liu, X. F., Fu, S., Cheng, H. X., Xu, X. B. (2006). Phthalate ester pollution in urban soil of Beijing, People's Republic of China. Bulletin of Environmental Contamination and Toxicology 77(2):252-259.		
HERO ID:	6816020		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Key sampling methods reported- including equipment, procedures, and storage.
	Metric 2:	Analytical Methodology	Medium	Key analytical methods reported for extraction and analysis (centrifugation and GC). Recoveries reported. LOD reported as a range and equipment calibration not reported.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Beijing, China
	Metric 5:	Currency	Low	Sampling date not reported. Study published in 2006.
	Metric 6:	Spatial and Temporal Variability	Medium	At least 30 samples. No replicates
	Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized- soil in urban and rural area.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data not reported. Summary statistics provided (min, max, range, mean).
	Metric 9:	Quality Assurance	High	QA criteria reported, such as recoveries and matrix blanks reported as ranges.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	The study mentions that there is a lack of environmental quality standard for soil about PAEs in China. SD reported and spatial variation analyzed.

Overall Quality Determination   Medium

Study Citation: Lucas, D., Polidoro, B. (2019). Urban recreational fisheries: Implications for public health in metro-Phoenix. Chemosphere 225:451-459.
HERO ID: 6816022

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Fishing techniques and catch limits as per Arizona Game and Fish Department regulations, 2018. Missing information such as how many caught in each area.
	Metric 2:	Analytical Methodology	Low	Analytic method recoveries ranged from 20% to 40% for phthalates; results uncorrected for recovery; MDLs not reported; MDLs might be found in Supplemental Materials for a different report (Pulford et al. 2017; HERO 3974170).
	Metric 3:	Biomarker Selection	Low	From each fish, 5 gram "tissue" sample collected, presumably muscle but not reported. All species (sunfish, trout, bluegill, catfish, bass) among those caught and eaten by local anglers.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Arizona, metro-Pheonix lakes and ponds
	Metric 5:	Currency	High	2018
	Metric 6:	Spatial and Temporal Variability	Medium	21 fish from 11 urban lakes/ponds. Unclear if there are replicates.
	Metric 7:	Exposure Scenario	High	Recreational anglers consuming self-caught fish; urban aquatic ecosystems.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Frequency of detection by lake = 10/11 for DBP. Concentrations of individual phthalates reported as different colors in stacked bar graphs by lake or by fish species; however, sample sizes, variance within and across lakes and fish species not reported. Individual points not reported as well.
	Metric 9:	Quality Assurance	Low	Very low spiked phthalate recoveries (20% to 40%). Results presented are uncorrected for method recoveries.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Concentrations shown in stacked bar graphs by fish species and by lake/pond from which one could estimate the individual phthalate concentration (wet weight); however, only one sampling season. No limitations reported.

Overall Quality Determination   Medium

Study Citation:	Ma, B., Wang, L., Tao, W., Liu, M., Zhang, P., Zhang, S., Li, X., Lu, X. (2020). Phthalate esters in atmospheric PM2.5 and PM10 in the semi-arid city of Xi'an, Northwest China: Pollution characteristics, sources, health risks, and relationships with meteorological factors. Chemosphere 242:125226.		
HERO ID:	6816027		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling equipment and methods are described in sufficient detail, but certain aspects (e.g. duration of storage) were absent that are unlikely to have a substantial impact on results.
	Metric 2:	Analytical Methodology	Medium	Analytical instrumentation and methods are described in sufficient detail, including reporting of method detection limits for each analyte, but certain aspects (e.g. instrument calibration) were absent that are unlikely to have a substantial impact on results.
	Metric 3:	Biomarker Selection	N/A	This study is testing for the parent chemical of interest in an environmental medium.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Xi'an, China
	Metric 5:	Currency	High	December 2016 - November 2017
	Metric 6:	Spatial and Temporal Variability	Medium	24h particulate matter samples from two sites over the course of a year, but no replicates (130 total samples)
	Metric 7:	Exposure Scenario	High	The sampling sites were well characterized (urban or suburban, seasonal weather patterns) and reasonably separated from any point sources of pollution
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data are not reported; summary statistics include the minimum, maximum, mean, standard deviation, and coefficient of variation of concentrations.
	Metric 9:	Quality Assurance	High	QA/QC methods include the use of blanks and surrogate standards to determine background contamination, which was corrected if present, and average recoveries, which were in acceptable ranges.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Characterization of variation is reported. Limitations and sources of uncertainty are only briefly discussed, including the relatively limited number of samples for stratified analyses.

Overall Quality Determination   High

Study Citation:	Liu, X., Peng, C., Shi, Y., Tan, H., Tang, S., Chen, D. (2019). Beyond Phthalate Diesters: Existence of Phthalate Monoesters in South China House Dust and Implications for Human Exposure. Environmental Science & Technology 53(20):11675-11683.		
HERO ID:	6816038		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology is thoroughly described and scientifically sound. No key details are omitted.
	Metric 2:	Analytical Methodology	High	Analytical method is thoroughly described and sound. LOQ is provided in supplemental material.
	Metric 3:	Biomarker Selection	High	Acceptable biomarker selected for concentration in urine.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples collected in China.
	Metric 5:	Currency	High	Samples collected from 2018-2019.
	Metric 6:	Spatial and Temporal Variability	Medium	No replicates collected.
	Metric 7:	Exposure Scenario	Medium	The source of exposure was not well characterized, but this is an exposure scenario of interest.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data is not provided, but summary statistics are given.
	Metric 9:	Quality Assurance	High	QA/QC methods are provided and no issues were identified.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Limited gaps and limitations are reported. Characterization of variability is limited but the range is provided.

Overall Quality Determination   High

Study Citation:	Miao, H., Liu, X., Li, J., Zhang, L., Zhao, Y., Liu, S., Ni, S., Wu, Y. (2020). Associations of urinary phthalate metabolites with risk of papillary thyroid cancer. Chemosphere 241:125093.		
HERO ID:	6816073		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Some important sampling methodological information was not reported. In particular, sampling equipment and whether samples were collected in containers free of phthalates was not reported. In addition, whether the samples were first morning voids some of the time or none of the time was not reported. We just know the samples were collected in the morning. One of the more minor aspects of the methods that was unreported included sample storage duration.
	Metric 2:	Analytical Methodology	Low	Details analytical methodology was reported in a separate paper, but the equipment used was identified. No information about instrument calibration or recovery samples was mentioned. Detection limits were not reported.
	Metric 3:	Biomarker Selection	High	Metabolites of phthalates were measured in urine. One metabolite could be derived from multiple parents (including this chemical), and no effort was made to apportion it.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	High	Samples were collected in 2017.
	Metric 6:	Spatial and Temporal Variability	Low	There were 111 "matched" pairs sampled - individuals with and without papillary thyroid cancer. No replicates were reported. These appear to be unpooled spot samples, so selected low for this metric.
	Metric 7:	Exposure Scenario	Medium	These samples reflect exposures from unknown sources. Differences in levels of exposures to phthalates from different sources was not well characterized.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not reported. They did not report standard deviation, but did report minima, maxima, means, 10th, 25th, 50th, 75th, and 90th percentiles and detection frequency.
	Metric 9:	Quality Assurance	Low	QA was not discussed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Some gaps and limitations (which point to possible confounding factors and uncertainty in terms of whether the association between higher levels of some phthalates and papillary thyroid cancer represent a correlation) were reported, but overall there was little discussion of and variability (beyond identification of percentiles).

Overall Quality Determination   Medium

Study Citation:	Nagorka, R., Koschorreck, J. (2020). Trends for plasticizers in German freshwater environments - Evidence for the substitution of DEHP with emerging phthalate and non-phthalate alternatives. Environmental Pollution 262:114237.		
HERO ID:	6816080		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Provides overview of sampling procedure with additional details in supplemental info (Section 1, Tables S1 and S2); follows the German Environmental Specimen Bank (ESB) procedures.
Metric 2:	Analytical Methodology	High	Used LC-MS and provide LOD in supplemental info (Table S6)
Metric 3:	Biomarker Selection	N/A	Water sampling
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Germany
Metric 5:	Currency	High	2017
Metric 6:	Spatial and Temporal Variability	High	13 sampling sites with monthly samples at each site pooled into one annual sample; n = 11 for plasticizer concentration average.
Metric 7:	Exposure Scenario	High	Monitoring plasticizers in waters (previous studies have found DEHP and other phthalates).
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Provide average, median, range, sample size (n=11), and detection frequency; do not provide individual sample concentrations.
Metric 9:	Quality Assurance	High	Recoveries >75% (see Table 7 supplementary info); used blanks and controls.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Measured relative standard deviation for repeatability; discuss some limitations.

Overall Quality Determination — High

| Study Citation: | Paluselli, A., Kim, S. K. (2020). Horizontal and vertical distribution of phthalates acid ester (PAEs) in seawater and sediment of East China Sea and Korean South Sea: Traces of plastic debris?. Marine Pollution Bulletin 151:110831. |
| HERO ID: | 6816206 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	sampling horizontal and vertically in water column and sediments in the area; sampling location (Fig 1 and p.3); water collected in Niskin bottles; duplicates at each water depth; stored at 4C; sediment collected via grab sampler, stored in glass bottles at -20C and freeze dried, ground, and sieved
	Metric 2:	Analytical Methodology	High	SPE (seawater) and ultrasonic bath (sediments); GC/MS; recoveries; LOQ provided in Table S1
	Metric 3:	Biomarker Selection	N/A	Environmental media
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Northwest Pacific marginal seas (South China Sea, East Sea/Sea of Japan, Yellow Sea, and the East China Sea)
	Metric 5:	Currency	High	2018
	Metric 6:	Spatial and Temporal Variability	High	88 seawater samples from 8 stations in September; sediment collected from each station (8 samples total). Duplicate water samples collected at each water depth
	Metric 7:	Exposure Scenario	High	seawater at different water depths and sediment from northwest Pacific marginal sea
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 1 provides the concentration in sediment from the three main water masses (mean and range per each sector); Raw data not provided
	Metric 9:	Quality Assurance	High	recoveries in seawater and sediments provided Table S1; blanks
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	compared results in water and sediment by area and recent studies

Overall Quality Determination   High

Study Citation:	Ramzi, A., Gireeshkumar, T. R., Rahman, K. H., Balachandran, K. K., Shameem, K., Chacko, J., Chandramohanakumar, N. (2020). Phthalic acid esters - A grave ecological hazard in Cochin estuary, India. Marine Pollution Bulletin 152:110899.		
HERO ID:	6816241		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Authors provided some sampling procedures and cited a peer-reviewed method they followed.
	Metric 2: Analytical Methodology	Low	No LOD or LOQ reported
	Metric 3: Biomarker Selection	N/A	Study measures parent chemical in the environment.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Cochin estuary, India
	Metric 5: Currency	Medium	data collected in 2013
	Metric 6: Spatial and Temporal Variability	High	data collected in 15 locations in triplicate
	Metric 7: Exposure Scenario	High	Surface and bottom water samples collected from an area of ecological and economic significance
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	no raw data
	Metric 9: Quality Assurance	High	Pertinent QA/QC information (e.g., blanks, recoveries) was provided
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	No limitations reported

Overall Quality Determination   High

Study Citation:	Tang, Z., Chai, M., Cheng, J., Wang, Y., Huang, Q. (2019). Occurrence and distribution of phthalates in sanitary napkins from six countries: Implications for women's health. Environmental Science & Technology 53(23):13919-13928.		
HERO ID:	6816332		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	The study mentions that random supermarkets were chosen and brands were chosen based on a questionnaire but no details on the supermarkets and the questionnaire are reported.
	Metric 2:	Analytical Methodology	Medium	Extraction methods, analytical instruments and methods described. Quantitation was performed using the internal calibration method based on 35 five-point calibration curve for individual phthalates. LOQ reported as a range and not for individual chemicals.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Japan, South Korea, US, UK, Australia, Germany
	Metric 5:	Currency	High	Samples collected in 2016.
	Metric 6:	Spatial and Temporal Variability	High	72 samples. It is not explicitly mentioned but inferred that there is a replicate for each sample (6 samples for 6 countries- two samples each for 72 total).
	Metric 7:	Exposure Scenario	High	Exposure source relevant for sanitary napkin exposure to women.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Median, 10th, 50th, and 90th percentiles reported. Raw data not reported.
	Metric 9:	Quality Assurance	High	QA reported. The recoveries of 15 target phthalates in spiked matrices ranged from 81.9 to 107%. Procedural blanks used.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	High	Several limitations mentioned. Variation in locations and brands analyzed.

Overall Quality Determination   High

| Study Citation: | Wei, L., Li, Z., Sun, J., Zhu, L. (2020). Pollution characteristics and health risk assessment of phthalate esters in agricultural soil and vegetables in the Yangtze River Delta of China. Science of the Total Environment 726:137978. |
| HERO ID: | 6816706 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	The sampling methods for topsoil and vegetables, including sampling equipment, procedures and storage conditions, were adequately described, however sample storage duration was not detailed. The detailed collection procedures followed a previous study (Sun et al., 2016).
	Metric 2:	Analytical Methodology	High	Analytical methods were adequately described and included descriptions of extraction, analytical instrumentation, instrument calibration and limits of detection (range 0.1 to 0.5ng/g) and recoveries.
	Metric 3:	Biomarker Selection	N/A	The sampling was conducted in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Sampling was conducted in the Yangtze River Delta area of China.
	Metric 5:	Currency	High	The study was conducted in 2018.
	Metric 6:	Spatial and Temporal Variability	Medium	A total of n=228 topsoil and vegetable samples were obtained however replicate sampling was lacking.
	Metric 7:	Exposure Scenario	High	The exposure scenario within the Yangtze River delta area of China was adequately described, however use of exposure controls was lacking.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Summary statistics included detection frequency, min, max, mean, median however raw data was lacking.
	Metric 9:	Quality Assurance	Medium	Quality assurance procedures were adequately described and included laboratory recoveries and method blanks.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty were not discussed, however no obvious concerns were identified.

Overall Quality Determination   Medium

Study Citation:	Wu, H., Kupsco, A. J., Deierlein, A. L., Just, A. C., Calafat, A. M., Oken, E., Braun, J. M., Mercado-Garcia, A., Cantoral, A., Téllez-Rojo, M. M., Wright, R. O., Baccarelli, A. A. (2020). Trends and patterns of phthalates and phthalate alternatives exposure in pregnant women from Mexico City during 2007-2010. Environmental Science & Technology 54(3):1740-1749.		
HERO ID:	6817118		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling equipment and methods are described in sufficient detail, but certain aspects (e.g. duration of storage) are absent that are unlikely to have a substantial impact on results.
	Metric 2: Analytical Methodology	Low	Analytical instrumentation and methods (high-performance liquid chromatography coupled with tandem MS) are only briefly described but are referenced to a previous publication. LOD is only provided as a range for all analytes.
	Metric 3: Biomarker Selection	Low	Metabolites of phthalates were measured in urine. However, two metabolites could be derived from multiple parents (including this chemical), and no effort was made to apportion them.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Mexico
	Metric 5: Currency	Medium	Samples were from 2007-2011.
	Metric 6: Spatial and Temporal Variability	Medium	Pooled urine spot samples from 948 participants in the second trimester of pregnancy and samples from 792 of the same participants in the third trimester. No replicates were collected from the same population at the same point in time.
	Metric 7: Exposure Scenario	High	Exposure scenario is relevant for pregnant women and fetuses during gestation.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data are not reported in the paper or SI. Summary statistics reported include detection rate and percentiles (25, 50, 75, 90) of the metabolite concentrations measured.
	Metric 9: Quality Assurance	Medium	QA is not discussed much. There is a passing reference to "standard analytical QC protocols of the CDC laboratory." Additionally, a random sample collected outside the study design was analyzed 92 times as a blinded replicate sample.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	There is no discussion of uncertainty. Some information about variability can be gleaned from reporting the 25th/50th/75th/90th percentile measurements. There is some discussion of limitations.

Overall Quality Determination   **Medium**

Study Citation:		SUNY, (2020). Phthalate exposure in Chinese homes and its association with household consumer products. Science of the Total Environment 719:136965.	
HERO ID:		6817545	

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sample matrix/characteristics, equipment, regimen, storage, and more were well described.
	Metric 2: Analytical Methodology	High	Extraction, analytical instruments, LODs/LOQs, recoveries and more were well described.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemicals in indoor dust.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected from homes in Tianjin and Cangzhou, China.
	Metric 5: Currency	Medium	Data collected between Sept 2013 and Jan 2016.
	Metric 6: Spatial and Temporal Variability	Medium	Dust was collected from 399 homes without replicates.
	Metric 7: Exposure Scenario	High	Phthalate exposure via indoor dust from household products is relevant.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	No raw data were provided.
	Metric 9: Quality Assurance	High	QA/QC described, including blanks, spiked samples, and recoveries (all acceptable).
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	No information was provided on gaps and limitations.

Overall Quality Determination   High

Study Citation:	Zhao, X., Shen, J. M., Zhang, H., Li, X., Chen, Z. L., Wang, X. C. (2020). The occurrence and spatial distribution of phthalate esters (PAEs) in the Lanzhou section of the Yellow River. Environmental Science and Pollution Research 27(16):19724-19735.		
HERO ID:	6817577		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Surface water samples (0-50cm) collected and stored in glass bottles while 50g surface sediment (0-10cm) concurrently collected and stored in steel jars; Fig 1 and Table 2 provide information on location of sampling sites; water stored at 4C and sediment at -20C; water passed through filter; sediment freeze dried and grinded
	Metric 2:	Analytical Methodology	Medium	Liquid-liquid extraction; GC-MS; recoveries; LOD reported as a range from 0.05-0.74 ng/L for water and 0.008-0.26 ng/g for sediment; SI has more information. No instrument calibration.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Yellow River, Lanzhou, Gansu Province, China
	Metric 5:	Currency	High	August 2016-March 2017
	Metric 6:	Spatial and Temporal Variability	Medium	12 stations, each sampled during dry and wet periods. No replicates.
	Metric 7:	Exposure Scenario	High	Surface water and sediment from a river in an industrial base and integrated transportation hub.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 3 provides average, range, and DF for water in rainy season and dry season; Table 4 for sediment. Individual points not reported.
	Metric 9:	Quality Assurance	High	Recoveries ranged from 70-140%. Deionized water and diatomite sediment blank samples (n = 3) were extracted similar to the real samples.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Examined temporal and spatial distribution in the river (fig 2 and 3; Table 5 and 6); compared findings to previous studies and other areas. No limitations reported.

Overall Quality Determination   High

Domain	Metric		Rating	Comments
Study Citation:		Streck, G., Herrmann, R. (2000). Distribution of endocrine disrupting semivolatile organic compounds in several compartments of a terrestrial ecosystem. Water Science and Technology 42(7):39-44.		
HERO ID:		6821588		

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Most sampling methods described, including equipment, procedures, and storage. Missing equipment calibration and study site could be described in more detail.
	Metric 2:	Analytical Methodology	Low	Equipment described for extraction and analysis (GPC and GC/MS). Calibration and LOD not provided.
	Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Germany
	Metric 5:	Currency	Low	1998-1999
	Metric 6:	Spatial and Temporal Variability	Medium	n = 5-7, no replicates
	Metric 7:	Exposure Scenario	Medium	Analyzed for chemicals in rain, snow, topsoil, spruce needles. More information could be given for how this affects exposure.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Range provided (no mean or median) for aerosol particles, vapour phase and precipitation. Only averaged concentrations reported for topsoil and spruce needles.
	Metric 9:	Quality Assurance	Low	No QA methods discussed but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability and uncertainty not discussed, no SD reported. No limitations of monitoring discussed.

Overall Quality Determination   Low

Study Citation:	Agarwal, R., Shukla, K., Kumar, S., Aggarwal, S. G., Kawamura, K. (2020). Chemical composition of waste burning organic aerosols at landfill and urban sites in Delhi. Atmospheric Pollution Research 11(3):554-565.		
HERO ID:	6824497		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Calibration of sampler is missing
	Metric 2:	Analytical Methodology	Medium	Detection limits are not reported
	Metric 3:	Biomarker Selection	N/A	Chemical is measured in outdoor air
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Delhi, India
	Metric 5:	Currency	Medium	December 2011 and October 2014 (see 2.1 Sampling)
	Metric 6:	Spatial and Temporal Variability	Medium	No replicate samples
	Metric 7:	Exposure Scenario	High	"Total suspended particles collected from an open waste burning landfill site and an urban site of Delhi, one of the most populated cities of Asia was studied."
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual data points are not reported.
	Metric 9:	Quality Assurance	Medium	Brief mention of quality assurance in Section 2.2. Chemical analyses "Field blank filters were treated the similar way for quality assurance."
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Minimum and maximum concentrations are reported in Table 2. Limited discussion of key uncertainties.

Overall Quality Determination   **Medium**

Study Citation:	Chuang, S. C., Chen, H. C., Sun, C. W., Chen, Y. A., Wang, Y. H., Chiang, C. J., Chen, C. C., Wang, S. L., Chen, C. J., Hsiung, C. A. (2020). Phthalate exposure and prostate cancer in a population-based nested case-control study. Environmental Research 181:108902.		
HERO ID:	6826333		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Certain details of sample collection (e.g. collection procedures) are missing that could have a substantial impact on results (but may have been reported elsewhere where the cohort was first described). The spot urine samples were frozen at -30 C for over 20 years before analysis. The discussion mentions that the samples were stored in plastic vials.
	Metric 2: Analytical Methodology	Medium	Analytical instrumentation and methods are described in sufficient detail. LODs are reported. Blanks were used, but certain aspects (e.g., recovery samples and instrument calibration) are not discussed, but are not likely to have a substantial impact on results.
	Metric 3: Biomarker Selection	Low	One monoester phthalate biomarker is a metabolite of multiple parent chemicals, not just this chemical, and there is not a stated method to apportion the estimate to just the chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Taiwan
	Metric 5: Currency	Low	1991-1992
	Metric 6: Spatial and Temporal Variability	Low	Spot urine samples from 236 participants. I do not see evidence of the samples having been pooled, so I rated this as low.
	Metric 7: Exposure Scenario	Medium	A "lifestyle questionnaire" was administered to participants who gave urine samples, which would reflect the totality of their exposures to phthalates. Data were not broken down based on different characteristics, such as whether the participant smoked.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual data points are not reported; summary statistics include the detection rate, geometric mean, and percentiles (5, 25, 50, 75, 95) of concentration. Samples were broken out by whether the participant was or was not later diagnosed with prostate cancer.
	Metric 9: Quality Assurance	Medium	Measurements were performed at a laboratory which conducts annual external quality assurance following accepted protocols. Additionally, inter- and intra-batch coefficients of variance are reported and were less than or equal to 27%. Blanks were also sampled in each batch. No other discussion of particular QA measures was included.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Coefficients of variation were reported for each metabolite batch, but there was little other information on variability. There was discussion of various limitations/sources of uncertainty. Plastic vials were used for sample collection, but samples were frozen right away, and the authors thought "there should be minimum interaction between the plastic vials and the biological content."

Overall Quality Determination   **Low**

Study Citation:	Baek, K. M., Kim, M. J., Seo, Y. K., Kang, B. W., Kim, J. H., Baek, S. O. (2020). Spatiotemporal variations and health implications of hazardous air pollutants in Ulsan, a multi-industrial city in Korea. Atmosphere 11(5):547.		
HERO ID:	6950643		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling equipment and methods are described in sufficient detail, but certain aspects (e.g. duration of storage) were absent that are unlikely to have a substantial impact on results.
	Metric 2: Analytical Methodology	Medium	Analytical instrumentation and methods are described in excellent detail. However, method detection limits are only provided as a range across all analytes in each class.
	Metric 3: Biomarker Selection	N/A	This study is testing for the parent chemical in an environmental medium (air).
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Ulsan, Korea
	Metric 5: Currency	Medium	2009-2010
	Metric 6: Spatial and Temporal Variability	Medium	Air samples were collected over eight days per season from five sampling sites for a total of 40 samples per season, but no replicate samples were collected.
	Metric 7: Exposure Scenario	High	Each air sampling site is assigned either industrial or residential and thoroughly described in terms of surrounding buildings, traffic conditions, etc.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Raw data are not reported; so summary statistics can not be preproduced. Summary statistics include the mean and standard deviation for each sampling site. Supplemental information also provides mean and maximum concentrations for combined sites (industrial or residential).
	Metric 9: Quality Assurance	High	QA/QC measures included uses of surrogate standards and internal standards, and recoveries for phthalates were within acceptable ranges (81.8%-99.5%).
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Standard deviation is reported for each mean concentration. While there is some discussion of uncertainty and limitations, it focuses on health risk assessment subsequent to monitoring data and not the monitoring data itself.

Overall Quality Determination   Medium

Study Citation:	Philips, E. M., Jaddoe, V. W. V., Deierlein, A., Asimakopoulos, A. G., Kannan, K., Steegers, E. A. P., Trasande, L. (2020). Exposures to phthalates and bisphenols in pregnancy and postpartum weight gain in a population-based longitudinal birth cohort. Environment International 144:106002.		
HERO ID:	6957398		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sample storage time was not specified.
	Metric 2:	Analytical Methodology	Medium	LOD was reported as a range for all phthalates.
	Metric 3:	Biomarker Selection	High	The biomarkers (metabolites of phthalates) are appropriate.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study population is from Rotterdam, Netherlands. Urine samples were transported to New York for analysis.
	Metric 5:	Currency	Medium	Samples were collected from 2004 to 2005.
	Metric 6:	Spatial and Temporal Variability	Medium	Urine spot samples were collected.
	Metric 7:	Exposure Scenario	High	There is no clear exposure scenario, but this is a biomonitoring study among pregnant and postpartum women.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Individual raw data were not reported in the main study. However, in a large cohort study like this, providing raw data might not be feasible.
	Metric 9:	Quality Assurance	Low	Quality control measures were not discussed.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	The study includes a discussion of its strengths and limitations. Characterization of variance only for maternal weight gain but not metabolite concentrations measured in urine.

Overall Quality Determination   **Medium**

Study Citation:	Zhang, Z. M., Zhang, J., Zhang, H. H., Shi, X. Z., Zou, Y. W., Yang, G. P. (2020). Pollution characteristics, spatial variation, and potential risks of phthalate esters in the water-sediment system of the Yangtze River estuary and its adjacent East China Sea. Environmental Pollution 265(PT A):114913.		
HERO ID:	6957439		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	provide details about sampling sites, equipment, and procedure (additional info in supplementary section)
	Metric 2:	Analytical Methodology	Medium	used GC-MS and report method detection limit/detection frequency
	Metric 3:	Biomarker Selection	N/A	environmental samples
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Yangtze River estuary and East China Sea
	Metric 5:	Currency	High	2015 and 2017
	Metric 6:	Spatial and Temporal Variability	High	166 seawater samples and 56 sediment samples
	Metric 7:	Exposure Scenario	Medium	studying phthalates in water
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	report average concentrations (Table S3 in supplementary info) but no summary stats or individual sample data
	Metric 9:	Quality Assurance	Medium	procedural standards and blanks used; most recoveries >75%
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	no measures of variance or uncertainty but interesting discussion about ecological risks

Overall Quality Determination   Medium

Study Citation:	Zhang, J., Yin, W., Li, P., Hu, C., Wang, L., Li, T., Gao, E., Hou, J., Wang, G., Wang, X., Wang, L., Yu, Z., Yuan, J. (2019). Interaction between diet- and exercise-lifestyle and phthalates exposure on sex hormone levels. Journal of Hazardous Materials 369:290-298.		
HERO ID:	6957457		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Some information missing such as what was urine stored in and blood sampling methods.
	Metric 2: Analytical Methodology	Medium	Limited description of analytical methods, only equipment reported. LOD for each metabolite detailed.
	Metric 3: Biomarker Selection	High	Biomarker is known to represent exposure to parent chemical. Metabolites are derived from parent chemical (MnBP, MBzP).
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	China
	Metric 5: Currency	High	Sampling began in 2014, finished in 2015
	Metric 6: Spatial and Temporal Variability	Low	106 study participants, 3 replicates. Spot sampling for urine.
	Metric 7: Exposure Scenario	Medium	Characterized the population but not their relation to the source of exposure.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Results are shown as averages in seasons and odds ratios.
	Metric 9: Quality Assurance	Medium	Limited QA/QC discussed. The recovery of the method ranged from 74.6% and 104.8%. Urinary levels of nine phthalate metabolites were corrected with the corresponding urinary creatinine concentrations.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability in seasons measured. Limitations not discussed.

Overall Quality Determination   Medium

Study Citation:		Lim, S. (2020). The associations between personal care products use and urinary concentrations of phthalates, parabens, and triclosan in various age groups: The Korean National Environmental Health Survey Cycle 3 2015-2017. Science of the Total Environment 742:140640.	
HERO ID:		6957474	

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling procedure was described in details, including equipment, storage, population characters.
	Metric 2: Analytical Methodology	High	Analytical procedure was described. HPLC–MS/MS was used. The limit of detections (LODs) of phthalate metabolites were reported to be 0.040 μg/L for MnBP and 0.141 μg/L for MECPP.
	Metric 3: Biomarker Selection	High	Biomarker (metabolite) is derived from exposure to the chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Korea
	Metric 5: Currency	High	The KoNEHS Cycle 3was conducted during August 2015 to July 2017.
	Metric 6: Spatial and Temporal Variability	Medium	5962 study participants were included in this study. No Replicate.
	Metric 7: Exposure Scenario	High	The data closely represent relevant exposure scenario. The sample information included the products used.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Supplementary or raw data are not reported, and therefore summary statistics cannot be reproduced.
	Metric 9: Quality Assurance	High	The study applied quality assurance/quality control measures and all pertinent quality assurance information is provided in the data source or companion source.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	Key uncertainties, limitations, and data gaps have been identified.

Overall Quality Determination   High

Study Citation:	Tang, S., He, C., Thai, P., Vijayasarathy, S., Mackie, R., Toms, L. L., Thompson, K., Hobson, P., Tscharke, B., O'Brien, J. W., Mueller, J. F. (2020). Concentrations of phthalate metabolites in Australian urine samples and their contribution to the per capita loads in wastewater. Environment International 137:105534.		
HERO ID:	6957476		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Sampling equipment and procedures were reported in the study. Some sampling methods not reported such as sampler calibration.
	Metric 2:	Analytical Methodology	High	Key analytical methods were reported. The LOQ was reported. Recovery samples were reported.
	Metric 3:	Biomarker Selection	Medium	This study included an acceptable biomarker.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	This study was conducted in Southeast Queensland, Australia.
	Metric 5:	Currency	Medium	The samples were collected between 2012 to 2017.
	Metric 6:	Spatial and Temporal Variability	High	>10 samples were collected but there were no replicates.
	Metric 7:	Exposure Scenario	Medium	Specific sources of exposure were not well characterized in this study. This was a biomonitoring study so specific sources were not documented.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data in this study were not reported.
	Metric 9:	Quality Assurance	High	Key QA was reported in this study. Recovery samples were reported, controls were collected, etc.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No gaps or limitations were reported in this study.

Overall Quality Determination   **Medium**

Study Citation:	Araki, A., Bamai, Y. A., Bastiaensen, M., Van den Eede, N., Kawai, T., Tsuboi, T., Miyashita, C., Itoh, S., Goudarzi, H., Konno, S., Covaci, A., Kishi, R. (2020). Combined exposure to phthalate esters and phosphate flame retardants and plasticizers and their associations with wheeze and allergy symptoms among school children. Environmental Research 183:109212.		
HERO ID:	6957526		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sample storage duration was not reported. The study cites a different published work for full details on sampling methodology.
	Metric 2: Analytical Methodology	Low	The study reports little more than the type of instrumentation used and a description of how the LOQ was calculated. The study cites a different published work for full details on analytical methodology.
	Metric 3: Biomarker Selection	High	Metabolite is derived from exposure to the chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was conducted among elementary school children inSapporo, Japan.
	Metric 5: Currency	Low	No sampling date is provided, but a publication date is available. Also, the articles indicates (reference provided) that details on the collection of samples have been reported elsewhere.
	Metric 6: Spatial and Temporal Variability	Medium	The study is not clear if urine samples were 24 hrs samples collected (vs first morning).
	Metric 7: Exposure Scenario	Medium	The study did not discussed product/chemical use in the building or building characteristics. The article often cites that details on collection of samples were reported in other studies.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Individual data points were not reported. Several summary statistics were reported, including min, 25th percentile, 50th percentile, 75th percentile, and max.
	Metric 9: Quality Assurance	Low	Urine sample specific gravity and osmolality were not reported. Quality control/quality assurance was not discussed.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	The study includes a discussion of its limitations. No measure of variance is reported.

Overall Quality Determination   Medium

Study Citation:	Li, Y. L., Lv, J., Du, Z. P., Feng, S., Sheng, J., Jin, Z. X., Liu, K. Y., Gao, H., Li, X. D., Cao, H. J., Yang, L. S., Xu, D. X., Tao, F. B., Wang, Q. N. (2020). The levels of phthalate exposure and associations with obesity in an elderly population in China. Ecotoxicology and Environmental Safety 201:110749.		
HERO ID:	6957578		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Study population selection detailed but only brief description on collection of urine sample which is primary media of interest.
	Metric 2:	Analytical Methodology	Medium	Analytical methods described with more detail in cited study Gao et al. 2015. Reported LOD
	Metric 3:	Biomarker Selection	High	Biomarker is known to be related to external exposure
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	High	Sampling in 2016
	Metric 6:	Spatial and Temporal Variability	Medium	942 samples, no replicates
	Metric 7:	Exposure Scenario	Medium	Limited discussion of relation to exposure source
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics
	Metric 9:	Quality Assurance	High	Analyzed control samples, discussed QA/QC techniques
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	discussed study limitations and uncertainties, didn't characterize variability

Overall Quality Determination   High

Dibutyl Phthalate   Monitoring   HERO ID: 6957607

Study Citation:	Sol, C. M., Santos, S., Duijts, L., Asimakopoulos, A. G., Martinez-Moral, M. P., Kannan, K., Jaddoe, V. W. V., Trasande, L. (2020). Fetal phthalates and bisphenols and childhood lipid and glucose metabolism: A population-based prospective cohort study. Environment International 144:106063.		
HERO ID:	6957607		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Low	Sampling equipment and methods are only briefly mentioned, and missing details may have a substantial impact on results.
	Metric 2: Analytical Methodology	Low	Analytical instrumentation and methods are cited to an external source and very little detail is provided. LOD is reported in supplementary information.
	Metric 3: Biomarker Selection	Low	The monoester phthalate biomarker is a metabolite of multiple parent chemicals, not just the chemical of interest, and there is not a stated method to apportion the estimate to just the chemical of interest.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The Netherlands
	Metric 5: Currency	Low	2004-2005
	Metric 6: Spatial and Temporal Variability	Medium	Pooled urine spot samples from757 participants at three timepoints
	Metric 7: Exposure Scenario	High	The exposure scenario of fetuses during gestation is highly relevant
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Raw data are not reported therefore summary statistics can not be reproduced. Summary statistics include percentage below LOD, median, and percentiles (25, 75) of concentration.
	Metric 9: Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard laboratory protocols
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	No characterization of variation of results was reported, and limitations/sources of uncertainty are only briefly discussed.

Overall Quality Determination   **Low**

Study Citation:	Bach, C., Rosin, C., Munoz, J. F., Dauchy, X. (2020). National screening study investigating nine phthalates and one adipate in raw and treated tap water in France. Environmental Science and Pollution Research International 27(29):36476-36486.		
HERO ID:	6957772		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Raw and treated water from surface water and groundwater collected from 101 departments; collected twice n glass vials; immediately wrapped in aluminum foil and capped; stored at 4C before analysis; detailed sampling protocol in Fig S1; no pretreatment for treated water, but raw water was centrifuged.
	Metric 2: Analytical Methodology	High	Extraction, analytical instrument (SPE-LC-MS/MS), calibration solutions, internal standard calibration, recoveries described. LOQ provided Table 2.
	Metric 3: Biomarker Selection	N/A	Parent chemical in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	France
	Metric 5: Currency	High	November 2015-July 2016
	Metric 6: Spatial and Temporal Variability	High	101 sites (271 raw water samples and 283 treated samples); collected twice in single sampling campaign.
	Metric 7: Exposure Scenario	High	Concentration in raw and treated drinking water throughout France.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Table 4 provides concentration in raw water (surface water and ground water) and tap water (from surface water, groundwater, and mixture of the two); n, DF, max, average.
	Metric 9: Quality Assurance	High	QA described in detail. Recoveries provided in Table 3; field blanks described.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Compared between tap and raw water; compared results to previous studies. No limitations reported.

Overall Quality Determination   High

Dibutyl Phthalate   Monitoring   HERO ID: 6958936

Study Citation:	England-Mason, G., Grohs, M. N., Reynolds, J. E., Macdonald, A., Kinniburgh, D., Liu, J., Martin, J. W., Lebel, C., Dewey, D. (2020). White matter microstructure mediates the association between prenatal exposure to phthalates and behavior problems in preschool children. Environmental Research 182:109093.		
HERO ID:	6958936		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling methods are described in moderate detail, but certain aspects (e.g. duration of storage, time of day of collection) were not reported; these are unlikely to have a substantial impact on results.
Metric 2:	Analytical Methodology	Medium	Analytical instrumentation and methods were described in detail, and the LODs were reported. It's unclear if it is standard practice to operate the so-called QTRAP equipment in "negative multiple reaction monitoring (MRM) mode, [with] the detection and quantification of metabolites [being] based on two MRM transitions combined with the retention time." Assigned it medium since neither calibration nor recoveries were reported.
Metric 3:	Biomarker Selection	Low	Metabolites of parent chemicals were measured in urine. However, one of the metabolites could have come from multiple parent chemicals, including this one. No effort was made to apportion the estimate to each chemical of interest.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Canada
Metric 5:	Currency	Medium	Maternal urine samples were taken during pregnancy from mothers of children who were ages 3-5 from 2013-2017; therefore, urine samples were collected sometime between 2008-2014 (not otherwise specified). It should be noted that the study also collected information about the white matter microstructure in children's brains and childhood behavior problems, reporting on potential association between these characteristics and phthalate exposure as a fetus.
Metric 6:	Spatial and Temporal Variability	Low	One spot urine sample was collected per participant (76), without the use of replicates. Rated low because it appears each was an unpooled spot sample.
Metric 7:	Exposure Scenario	Medium	Urinary metabolites are likely a good indicator of relative exposure of fetuses to maternal blood during gestation. A detailed questionnaire with information about potential sources of exposure to phthalates was not used, but these chemicals are ubiquitous.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Individual data points are not reported; summary statistics include the percentage of samples above LOD, minimum, maximum, percentiles (25th, 50th, 75), and the median molar concentration.
Metric 9:	Quality Assurance	Medium	QC "experiments using liquid chromatography grade water as a surrogate for urine (n = 20 control samples) did not find any contamination during collection, storage, and/or analysis." No other QA/QC techniques and results (e.g., recoveries) were directly discussed, but others may have been used given the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	The only information on variability is embedded in the data on percentiles. There was some discussion of limitations (e.g., the small sample size) and sources of uncertainty, most of them related to the study of white matter microstructure and reporting of child behavior.

Overall Quality Determination   Medium

| Study Citation: | Kotowska, U., Kapelewska, J., Sawczuk, R. (2020). Occurrence, removal, and environmental risk of phthalates in wastewaters, landfill leachates, and groundwater in Poland. Environmental Pollution 267:115643. |
| HERO ID: | 6958938 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Samples were from WWTPs and landfills located in 11 cities (Fig 1). Groundwater was collected from piezometers. Wastewater was from sampler at inlet to plant and pipe draining the treated water. Landfill leachate and groundwater were obtained from drainage wells, open drainage pools, and piezometers. Samples were gathered through glass samplers, filtered, and stored in freezer at -18C.
	Metric 2:	Analytical Methodology	High	All pertinent information was reported (e.g., SPME for extraction, GC-MS for analysis, recoveries, LODs/LOQs in Tables 3 and 4).
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemical in effluent wastewater, landfill leachate, and groundwater.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Poland.
	Metric 5:	Currency	Medium	Samples were collected during May 2010 - May 2014.
	Metric 6:	Spatial and Temporal Variability	Medium	72 wastewater (36 influent and 36 effluent), 22 leachate, and 16 groundwater samples were collected from 11 Polish cities. Samples were collected once per month or once every two months for 2 years. No replicates were reported.
	Metric 7:	Exposure Scenario	High	Contaminants measured in influent and effluent wastewater from 11 different-sized Polish, municipal WWTPs, as well as landfill leachates and groundwater from three MSW landfills are relevant when discharged into surface waters to aquatic organisms.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Table 5 and 6 provide range, std, mean, median, and DF. No raw data were provided.
	Metric 9:	Quality Assurance	High	QA/QC was fully described. Recoveries were acceptable.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Limitations and uncertainties were not discussed.

Overall Quality Determination   High

Study Citation: Song, J., Lu, S., Wu, Y., Zhou, C., Li, X., Li, J. (2020). Migration and distribution characteristics of organic and inorganic fractions in condensable particulate matter emitted from an ultralow emission coal-fired power plant. Chemosphere 243:125346.

HERO ID: 6959325

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Low	Sampling equipment and methods are briefly described, but most details are missing which may have a substantial impact on results.
Metric 2:	Analytical Methodology	Low	Analytical instrumentation and methods are briefly described, but most details are missing and no form of detection limit is reported.
Metric 3:	Biomarker Selection	N/A	This study is testing for the parent chemical of interest in an environmental medium.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	China
Metric 5:	Currency	Low	Paper was published in 2019. The sampling date was not reported.
Metric 6:	Spatial and Temporal Variability	Low	Single samples were collected from four sites, with no mention of replicates.
Metric 7:	Exposure Scenario	Low	The sampling sites evaluate various stages of a coal-fired power plant, but it is unclear if there are later steps in the system prior to any likely exposure.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Critically Deficient	Data are only reported in the form of total concentration for all phthalate, the identity of the detected phthalates, and the percentage of phthalates that were not DBP. While the concentration for DBP can be determined from this, the calculated value might be highly uncertain without more precise information.
Metric 9:	Quality Assurance	Medium	QA/QC measures described include determination of linearity and recovery rate, both of which were within acceptable levels, but the methods by which these were determined were not described.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Low	No characterization of variability is presented and there is no discussion of limitations or sources of uncertainty.

Overall Quality Determination   **Uninformative**

Study Citation:	Zhao, X., Jin, H., Ji, Z., Li, D., Kaw, H. Y., Chen, J., Xie, Z., Zhang, T. (2020). PAES and PAHs in the surface sediments of the East China Sea: Occurrence, distribution and influence factors. Science of the Total Environment 703:134763.		
HERO ID:	6959327		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Site characteristics/matrix were reported in detail, but missing information on sample equipment, storage condition, etc.
	Metric 2: Analytical Methodology	High	Key analytical methods were reported in both the main paper and supplemental, with the latter offering a lot of details.
	Metric 3: Biomarker Selection	N/A	Study measured parent chemicals in sediment.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study was conducted in China.
	Metric 5: Currency	High	Samples were collected in 2017.
	Metric 6: Spatial and Temporal Variability	Medium	29 samples were collected without any reporting of replicates.
	Metric 7: Exposure Scenario	High	Exposure source was characterized.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were provided in Table S3, but most summary statistics were missing.
	Metric 9: Quality Assurance	Medium	QA/QC was reported. Recoveries reported as a range for all phthalates combined (59.8-104.8). That was no reporting of how the low recoveries were corrected.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Variance characterized by range, but key gaps and limitations were not reported.

Overall Quality Determination   High

Study Citation:	Lee, Y. S., Lee, S., Lim, J. E., Moon, H. B. (2019). Occurrence and emission of phthalates and non-phthalate plasticizers in sludge from wastewater treatment plants in Korea. Science of the Total Environment 692:354-360.		
HERO ID:	6959335		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Most sampling information provided, such as site information, storage conditions and methods. However, missing the equipment used to collected the sludge.
Metric 2:	Analytical Methodology	High	Analytical methods, instrument, calibration reported. LOQ reported in table S4.
Metric 3:	Biomarker Selection	N/A	Parent chemical in environmental sample.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	South Korea
Metric 5:	Currency	Medium	Samples collected in 2011.
Metric 6:	Spatial and Temporal Variability	Medium	40 samples. No replicates.
Metric 7:	Exposure Scenario	High	Measuring phthalates in sludge from WWTP.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not provided. Summary statistics (mean, range) provided in table 1.
Metric 9:	Quality Assurance	High	Procedural blanks and recovered detailed. All recoveries, except DMP above 70%.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	There is comparison of different types of WTTP. Gaps and limitations not reported.

Overall Quality Determination   High

Dibutyl Phthalate HERO ID: 6966453

Study Citation:	Schmidt, N., Castro-Jimenez, J., Fauvelle, V., Ourgaud, M., Sempere, R. (2020). Occurrence of organic plastic additives in surface waters of the Rhone River (France). Environmental Pollution 257:113637.		
HERO ID:	6966453		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Sampling methodology was well described, including sampling procedure, sampling storage, study site characteristics.
	Metric 2: Analytical Methodology	Medium	Analytical methodologies were well described. LOQ range was reported in paper, all LODs and LOQs may be reported in SI.
	Metric 3: Biomarker Selection	N/A	The analyte was measured in environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Samples were collected from the Rhone River, France.
	Metric 5: Currency	High	Samples were collected from May 2017 to April 2018.
	Metric 6: Spatial and Temporal Variability	High	Samples were collected in duplicate over the course of a year.
	Metric 7: Exposure Scenario	High	Site and potential sources were well characterized. Data represented exposure to anyone who comes into contact with these rivers.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not reported. Several summary statistics were reported, including min, max, median, mean, and standard deviation.
	Metric 9: Quality Assurance	High	The study applied quality assurance measures and no issues were identified. Recovery rates were reported for individual analytes.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	High	The study characterized variability, fluxes, and other sources to the Rhone River. The study described other potential sources that might result in underestimation of the concentrations of analytes in the river.

Overall Quality Determination   High

Study Citation: Heo, H., Choi, M., Park, J., Nam, T., Cho, J. (2020). Anthropogenic occurrence of phthalate esters in beach seawater in the Southeast Coast Region, South Korea. Water 12(1):122.

HERO ID: 6966475

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some aspects of sampling methodology not described, such as sample storage time, coordinates from which samples were collected, and distance from the shoreline where surface water was collected.
	Metric 2:	Analytical Methodology	Low	They reported LOO and recoveries. While well-described, it is not clear how well-accepted the analytical method was: they used stirbar sorptive extraction (SBSE) and thermal desorption (TD), an extraction method for organic chemicals in a liquid matrix involving stirring with a polydimethylsiloxane-coated stir bar. The stir bar is inserted directly into the extraction of the TD unit. The TD unit desorbs extracted compounds in the stir bar by heating, concentrates the desorbed compounds, and injects the concentrate into a GC/MS. However, the National Institute of Environmental Research of Korea suggests another standard method for phthalate ester determination, and the paper to which the method is cited calls it "a novel extraction technique." In addition, method validation is not described.
	Metric 3:	Biomarker Selection	N/A	Samples were from environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	South Korea
	Metric 5:	Currency	High	Sampling was in 2017-2018.
	Metric 6:	Spatial and Temporal Variability	Critically Deficient	Total number of samples is not reported: there were 5 beaches, each sampled in spring and summer. In the case of at least one beach, samples were collected from both ends and the middle. One site underwent additional sampling in the spring before and after a rainstorm. No replicates were reported.
	Metric 7:	Exposure Scenario	Medium	Description of the timing of the collection of the samples is vague, and inclusion of more climate data would have made the results more meaningful. Sample size could impact the characterization of the exposure scenario.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	No raw data reported, and absent are mean detections, standard deviations, and ranges of most individual chemicals detected. IN most cases, summaries of data collected are reported on figures from which only approximate values for the levels of individual chemicals detected can be estimated. One exception was values of some individual chemicals reported at one beach from which three samples were collected.
	Metric 9:	Quality Assurance	Critically Deficient	Discussion of QA/QC was absent, making it impossible to assess reliability of the data. Control samples were not analyzed. Also, recoveries were 13.5%, 46.7%, 136.0%, and 102.0% for DMP, DEP, DnBP, and DEHP, but they did not correct for recovery.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Uncertainties, limitations and data gaps were not discussed at all.

Overall Quality Determination   **Uninformative**

Study Citation:	Ma, L. L., Chu, S. G., Xu, X. B. (2003). Phthalate residues in greenhouse soil from Beijing suburbs, People's Republic of China. Bulletin of Environmental Contamination and Toxicology 71(2):394-399.		
HERO ID:	6967234		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Some sampling methods not reported such as sampler calibration.
	Metric 2:	Analytical Methodology	Medium	LOD reported as a range not for individual chemicals.
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Beijing, China
	Metric 5:	Currency	Low	Samples collected in 2001
	Metric 6:	Spatial and Temporal Variability	Medium	5-10 samples; no replicates
	Metric 7:	Exposure Scenario	Medium	Exposure sources not well characterized
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	raw data reported- no summary statistics.
	Metric 9:	Quality Assurance	Medium	QA not directly reported- standards and recoveries reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	No discussion of variation or limitations.

Overall Quality Determination   Medium

Study Citation:	Qian, X.,i, Li, J., Xu, S., Wan, Y., Li, Y., Jiang, Y., Zhao, H., Zhou, Y., Liao, J., Liu, H., Sun, X., Liu, W., Peng, Y., Hu, C., Zhang, B.,in, Lu, S.,hi, Cai, Z., Xia, W.,ei (2019). Prenatal exposure to phthalates and neurocognitive development in children at two years of age. Environment International 131:105023.		
HERO ID:	6967437		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	Medium	Sampling methodology is adequately described and generally appropriate. Discussion does not include every detail, e.g. duration of sample storage, but this is unlikely to have a substantial impact on results.
Metric 2:	Analytical Methodology	Medium	Analytical methodology is detailed in a separate reference, and limits of detection are provided in supplemental materials.
Metric 3:	Biomarker Selection	Low	MBP is specific to DBP.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples were collected in Hubei Province, China.
Metric 5:	Currency	Medium	Samples were collected in 2014-2015.
Metric 6:	Spatial and Temporal Variability	Medium	Urine spot samples were collected at multiple timepoints throughout pregnancy
Metric 7:	Exposure Scenario	Medium	Study population is likely representative of mother-child pairs. This is a biomonitoring study were children are exposed in-utero and mothers are exposed due to widespread use of phthalates.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Individual data points were not reported.
Metric 9:	Quality Assurance	High	QC measures included analysis of blanks and QC samples alongside batch samples. Within-batch and between-batch coefficients of variation were 9.9% and 13.7%, respectively. Specific gravity was accounted for.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	There was a limited characterization of variance and a brief discussion of study limitations, including the use of averaging across urine spots instead of a measurement error model.

Overall Quality Determination   Medium

Study Citation:	Bartsch, P. W., Edwards, T. M., Brock, J. W. (2019). Prevalence of eight phthalate monoestersin water from the Okavango Delta, Northern Botswana. Bulletin of Environmental Contamination and Toxicology 103(2):274-279.		
HERO ID:	6968214		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Key methods reported. Site characteristics, sampling equipment, method, and storage described. More information referenced in (Blount 2000; Silva 2010).
Metric 2:	Analytical Methodology	High	Key analytical methods reported. Methods, equipment (LCMS-8040 and HPLC column), calibration, and LOD reported.
Metric 3:	Biomarker Selection	Medium	Metabolites measured in water samples. It is not mentioned that these biomarkers are derived from the parent chemical of interest.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Botswana
Metric 5:	Currency	High	Samples collected in 2016
Metric 6:	Spatial and Temporal Variability	Medium	46 samples no replicates
Metric 7:	Exposure Scenario	High	Samples taken from The Okavango Delta, where there is wildlife and human activity that can be exposed.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not reported. Average, range, and highest levels reported for each metabolite.
Metric 9:	Quality Assurance	Medium	Little QA discussion but there were sample controls and recovery. Concentrations were corrected for original sample volumefrom field records.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Variability in different sites reported and comparison of concentrations to other bodies of water. SD was mentioned to be calculated but not reported in study. Few gaps and limitations reported.

Overall Quality Determination   **High**

Study Citation:	Shin, H., Moschet, C., Young, T. M., Bennett, D. H. (2019). Measured concentrations of consumer product chemicals in California house dust: Implications for sources, exposure, and toxicity potential. Indoor Air 30(1):60-75.
HERO ID:	6968217

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Method for recruiting the 38 households not explained.
	Metric 2:	Analytical Methodology	High	Standard LC and GC protocols were described and LODs were reported.
	Metric 3:	Biomarker Selection	N/A	Testing for the parent chemical in an environmental media
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Northern California.
	Metric 5:	Currency	High	Samples were collected in 2015-2016.
	Metric 6:	Spatial and Temporal Variability	Medium	No replicates were reported among 38 samples.
	Metric 7:	Exposure Scenario	Medium	Limited information on chemical use.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not reported. Summary statistics were reported.
	Metric 9:	Quality Assurance	Low	No discussion of QA/QC although standard protocols were used. No discussion of recoveries.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Some uncertainties and limitations are discussed in the section entitled "Overview and scope of this study".

Overall Quality Determination   Medium

Study Citation:	Wang, R., Ji, M., Zhai, H., Liu, Y. (2020). Occurrence of phthalate esters and microplastics in urban secondary effluents, receiving water bodies and reclaimed water treatment processes. Science of the Total Environment 737:140219.		
HERO ID:	6968279		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology is explained in detail.
	Metric 2:	Analytical Methodology	High	Analytical methods reported in detail in both main text and supplemental. Detection limits provided in Table S1.
	Metric 3:	Biomarker Selection	N/A	Study measured parent chemicals from waste water treatment plants.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Study was performed in China.
	Metric 5:	Currency	High	Samples collected in 2017 and 2018
	Metric 6:	Spatial and Temporal Variability	Medium	Replicates were not reported.
	Metric 7:	Exposure Scenario	High	Possible exposure to phthalates from wastewaster treatment plant effluents is relevant.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	No raw data were reported. Table S6 only provides physiochemical properties of water samples and not the concentrations of analytes themselves. Data presented visually with some ranges provided in Results text.
	Metric 9:	Quality Assurance	Low	Limited, if any, QA/QC methods were reported.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Gaps and limitations were not reported. Variance reported with a range in text.

Overall Quality Determination   **Medium**

Study Citation:	Borges Ramirez, M. M., Dzul Caamal, R., Rendon von Osten, J. (2019). Occurrence and seasonal distribution of microplastics and phthalates in sediments from the urban channel of the Ria and coast of Campeche, Mexico. Science of the Total Environment 672(Elsevier):97-105.		
HERO ID:	6968287		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sediments were collected at 5cm depth from surface layer with van Veen grab, placed in aluminum foil, wrapped in black bags, and stored in refrigerator/freezer. They were then thawed, dried in an oven at 45C for 24 h, grounded in a mortar, and sieved. Sample sites are provided in Fig 1 and Table 1. The number of samples per site was not provided.
	Metric 2:	Analytical Methodology	High	Extraction done using a microwave oven (p.99-100). Samples were analyzed with GC-FID. Recoveries and LODs (0.015ug/g) were reported in text.
	Metric 3:	Biomarker Selection	N/A	The study measured parent chemicals in sediment.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Campeche, Mexico.
	Metric 5:	Currency	High	Samples were collected from 2015-2017.
	Metric 6:	Spatial and Temporal Variability	Medium	36 samples were collected from nine sites over three different seasons (rainy, cold, and dry (Table 1)). No replicates were reported.
	Metric 7:	Exposure Scenario	High	Study measured concentrations and seasonal distribution in coastal sediment and in urban and natural drainage system, which is relevant because of its proximity to urban settlements.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Low	Fig 6 provides concentration at each site graphically. Some exact concentration data are provided in text. No other results are available.
	Metric 9:	Quality Assurance	High	QC was reported, including blanks and recoveries that ranged from 85-103%.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Authors discussed variation by sites and compared results to those from previous studies and different countries, but did not characterize data variance. There was no discussion of uncertainties or limitations.

Overall Quality Determination   High

Study Citation:	Kim, K., Kim, H., Lim, Y., Shin, C. H.,o, Kim, J. I., Kim, B. N., Lee, Y. A.,h, Hong, Y. (2020). Prenatal and early childhood phthalate exposures and thyroid function among school-age children. Environment International 141:105782.		
HERO ID:	6968345		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Sampling equipment and methods are sufficiently described but are missing some details (e.g. duration of storage) that are unlikely to have a substantial impact on results.
	Metric 2: Analytical Methodology	High	Analytical instrumentation and methods are sufficiently described and LOD is reported.
	Metric 3: Biomarker Selection	High	Biomarkers are derived from multiple parent chemicals, not only the chemical of interest, and there is NOT a stated method to apportion the estimate to only the chemical of interest
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Korea
	Metric 5: Currency	Medium	2012-2015
	Metric 6: Spatial and Temporal Variability	Medium	n = 492. No replicates. Pooled urine spot samples were used in this study for during pregnancy and at ages 2, 4, and 6 years. All samples were collected between 9-11 am, but only one sample at each developmental timepoint.
	Metric 7: Exposure Scenario	Medium	Prenatal and early childhood phthalate exposures and thyroid function among children.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Summary statistics for biomarker concentration include geometric mean, geometric standard deviation, and percentiles (5th, 25th, 50th, 75th, 95th). Individual data points are not reported.
	Metric 9: Quality Assurance	Medium	The study reported use of assurance/quality control measures (blank, spike); however, results of those measures were not described. Missing information is unlikely to have a substantial impact on results
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Metrics of variance did not reveal any high uncertainty. Authors acknowledge limitations in their study including short half-lives of analyzed metabolites

Overall Quality Determination   Medium

Study Citation:	Feng, Y. L., Liao, X. J., Chen, D., Takser, L., Cakmak, S., Chan, P., Zhu, J. P. (2020). Correlations of phthalate metabolites in urine samples from fertile and infertile men: Free-form concentration vs. conjugated-form concentration. Environmental Pollution 263(Pt. A):114602.		
HERO ID:	6968351		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	Medium	Demographics of participants, storage, and collection procedures were explained but missing some information on duration of storage and collection equipment.
	Metric 2: Analytical Methodology	High	Detailed analytical methods with LOD reported in supplementary information.
	Metric 3: Biomarker Selection	High	MBP is specific to DBP.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Study conducted in Canada.
	Metric 5: Currency	Medium	Sampling was conducted in 2009-2012.
	Metric 6: Spatial and Temporal Variability	Low	A single urine sample was collected from each of 150 participants without replicates.
	Metric 7: Exposure Scenario	High	This is a biomonitoring study were exposure was presumed to occur through phthalates' ubiquity in consumer products.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Only summary statistics were reported (i.e., no raw data).
	Metric 9: Quality Assurance	High	QA/QC techniques were reported in detail.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variance was characterized with percentiles, and some limitations were reported in the conclusions.

Overall Quality Determination   **High**

Study Citation:		Yue, N., Deng, C., Li, C., Wang, Q.,i, Li, M., Wang, J., Jin, F. (2020). Occurrence and distribution of phthalate esters and their major metabolites in porcine tissues. Journal of Agricultural and Food Chemistry 68(25):6910-6918.	
HERO ID:		6968617	

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Critically Deficient	The sampling methodology is not discussed. Only information given is 16 pigs from a livestock farm in Shangzhuang village, Beijing.
	Metric 2:	Analytical Methodology	Medium	LOD and LOQ range provided; instrumentation described; recovery rates in SI
	Metric 3:	Biomarker Selection	High	parent and metabolite in pig tissues
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	China
	Metric 5:	Currency	High	2017
	Metric 6:	Spatial and Temporal Variability	High	16 pigs: Three samples were taken from each of thesix types of porcine tissue samples (liver, heart, kidney, muscle, spleen, and lungs)
	Metric 7:	Exposure Scenario	Medium	livestock farm
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	average reported; SD or SE not specified
	Metric 9:	Quality Assurance	Medium	blanks, recovery described in QA/QC section
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	variability and uncertainty not discussed; no obvious concerns

Overall Quality Determination   **Uninformative**

Study Citation:	Zhang, B. T., Gao, Y. M., Lin, C. Y., Yang, W., Liu, T., Liu, X. T., Wang, Y. (2020). Spatial distribution of phthalate acid esters in sediments of the Laizhou Bay and its relationship with anthropogenic activities and geochemical variables. Science of the Total Environment 722:137912.		
HERO ID:	6968622		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Key sampling methods reported
Metric 2:	Analytical Methodology	High	Key analytical methods reported. LOD reported in supplemental.
Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Laizhou Bay, China
Metric 5:	Currency	High	Samples collected in 2018
Metric 6:	Spatial and Temporal Variability	High	>10 samples; there is mention of duplicate samples.
Metric 7:	Exposure Scenario	High	Statistical analyses that characterize exposure scenario
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	Medium	Raw data not provided. Summary statistics reported.
Metric 9:	Quality Assurance	High	Key QA reported and in supplemental.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Limited gaps and limitations reported. There is discussion of variation.

Overall Quality Determination　　　　　　High

Study Citation:	Sugeng, E. J., Symeonides, C., O'Hely, M., Vuillermin, P., Sly, P. D., Vijayasarathy, P., Thompson, N. K., Pezic, A., Mueller, M., Ponsonby, A. (2020). Predictors with regard to ingestion, inhalation and dermal absorption of estimated phthalate daily intakes in pregnant women: The Barwon infant study. Environment International 139:105700.
HERO ID:	6968855

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	Sample collection is only briefly discussed, and missing details may substantially impact the results. These details are also missing from the cited reference.
	Metric 2:	Analytical Methodology	High	Analytical instrumentation and methods are based on multiple cited references and described in sufficient detail. LOD is reported for each analyte.
	Metric 3:	Biomarker Selection	Low	The monoester phthalate biomarker is a metabolite of multiple parent chemicals, not just the chemical of interest, and there is not a stated method to apportion the estimate to just the chemical of interest.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Australia
	Metric 5:	Currency	Medium	2010-2013
	Metric 6:	Spatial and Temporal Variability	Medium	Pooled spot urine samples from 841 pregnant women. Not clear if there were replicate samples.
	Metric 7:	Exposure Scenario	High	The exposure scenario to fetuses during gestation is highly relevant.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data are not reported; summary statistics include percentage above LOD, geometric mean, minimum, maximum, and percentiles (25, 50, 75) of concentration
	Metric 9:	Quality Assurance	Medium	QA/QC techniques included use of replicates and blanks; no other techniques were directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	No measure of variability was reported, but there is robust discussion of limitations/sources of uncertainty.

Overall Quality Determination   Medium

Study Citation:	Kıralan, S. S., Toptancı, I., Abacıgil, T. O., Ramadan, M. F. (2020). Phthalates levels in olive oils and olive pomace oils marketed in Turkey. Food Additives & Contaminants: Part A, Chemistry, Analysis, Control, Exposure & Risk Assessment 37(8):1332-1338.		
HERO ID:	6968889		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Key sampling methods reported.
Metric 2:	Analytical Methodology	High	Key analytical methods provided.
Metric 3:	Biomarker Selection	N/A	The study is testing for the parent chemical in oil olive samples.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Turkey
Metric 5:	Currency	High	Samples collected in 2019.
Metric 6:	Spatial and Temporal Variability	Medium	>10 samples; no replicates.
Metric 7:	Exposure Scenario	Medium	Exposure source not well characterized.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	Raw data provided.
Metric 9:	Quality Assurance	Medium	Limited QA/QA reported.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	Medium	Few gaps and limitations reported.

Overall Quality Determination   High

Study Citation:	Henriksen, L. S., Mathiesen, B. K., Assens, M., Krause, M., Skakkebæk, N. E., Juul, A., Andersson, A. M., Hart, R. J., Newnham, J. P., Keelan, J. A., Pennell, C., Main, K. M., Frederiksen, H. (2020). Use of stored serum in the study of time trends and geographical differences in exposure of pregnant women to phthalates. Environmental Research 184:109231.		
HERO ID:	6968891		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Medium	Limited description of sampling methods.
	Metric 2:	Analytical Methodology	Medium	Limited description of analytical methods, mentioned LOD but didn't report it.
	Metric 3:	Biomarker Selection	High	Metabolites are known to be related to external exposure.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Australia and Denmark
	Metric 5:	Currency	Low	Samples from 1997 to 2001, and 2012-2014.
	Metric 6:	Spatial and Temporal Variability	Low	213 samples, no replicates.
	Metric 7:	Exposure Scenario	Medium	Missing discussion of relation to the source of exposure.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Only summary statistics.
	Metric 9:	Quality Assurance	Medium	Analyzed control samples, did not describe QA/QC techniques.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Did not characterize variability. Discussed uncertainties and study limitations.

Overall Quality Determination   Medium

Study Citation:	U.S. EPA, (1977). Evaluation and wastewater characterization: Northeast Philadelphia water pollution control plant, Philadelphia, Pennsylvania (September 16-23, 1976).		
HERO ID:	6985025		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Samples were collected according to publicly available SOPs that are scientifically sound and widely accepted (i.e., procedures approved by EPA for monitoring of industrial effluents). See Page 11, Appendix E - Analytical Procedures and Quality Control, and Appendix F - Organics Analytical Methodology.
	Metric 2: Analytical Methodology	Medium	Analytical methodology is discussed in detail (Appendices E, F, and G) and is clear and appropriate (i.e., scientifically sound) for the chemical and media of interest; however, one or more pieces of analytical information is not described (LOQ, LOD, detection limits, and/or reporting limits not provided). The missing information is unlikely to have a substantial impact on results.
	Metric 3: Biomarker Selection	N/A	The study is testing in an environmental media (water).
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	Geographic location is reported; Northeast Philadelphia
	Metric 5: Currency	Low	Timing of sample collection for monitoring data is not consistent with when current exposures (September 1976; >15 years old) may be expected and likely to have a substantial impact on results.
	Metric 6: Spatial and Temporal Variability	High	Sampling approach accurately captures variability of environmental contamination in population/scenario/media of interest. The study used a large sample size; >10 samples were collected as part of a compliance program and replicates were collected.
	Metric 7: Exposure Scenario	High	The exposure scenario is relevant (Influent and effluent of wastewater treatment plant). Microenvironment data (location, time, climate) provided.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Supplementary or raw data (i.e., individual data points) are not reported, and therefore summary statistics cannot be reproduced.
	Metric 9: Quality Assurance	Low	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study's use of standard field and laboratory protocols.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	The report had limited discussion on the characterization of variability and uncertainty.

Overall Quality Determination   **Medium**

Study Citation: Bohlin-Nizzetto, P., Aas, W., Nikiforov, V. (2019). Monitoring of Environmental Contaminants in Air and Precipitation, 2018.
HERO ID: 6994279

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Air samples were collected using high volume air samplers. All important details were reported and the methodology was scientifically sound.
	Metric 2:	Analytical Methodology	Low	Samples were spiked with internal standards, extracted, and quantified using UPLC-MSMS. All important details were reported and the methodology is scientifically sound. However, while LOD and LOQ were referenced throughout the report, the specific values of these limits were not reported.
	Metric 3:	Biomarker Selection	N/A	This study was testing for the chemical of interest in environmental media.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	Samples were collected in Norway.
	Metric 5:	Currency	High	Samples were collected in 2017-2018.
	Metric 6:	Spatial and Temporal Variability	Medium	Active air samples were collected over on a weekly basis over the course of a year. The number of samples per year was reported to be compound and site specific, between 12 and 52, but not explicitly reported for each compound. Further, use of replicates was not reported.
	Metric 7:	Exposure Scenario	High	Air samples were well characterized and highly relevant for possible exposure.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	Medium	Raw data were not reported. Summary statistics included detection frequency and mean concentrations.
	Metric 9:	Quality Assurance	Medium	Analyses were carried out by NILU laboratories, which were accredited in accordance with NS-EN ISO/IEC 17025. QC measures included field and lab blank samples, but were not further explained.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Medium	Variability was characterized qualitatively over time. There was brief discussion of uncertainty inherent in the more newly developed procedures for "organic contaminants of emerging concern," but was not further explained.

Overall Quality Determination   Medium

Study Citation:	NYIEQ, (2005). Indoor environmental quality: Assessing and mitigating the impact of exposure to multiple indoor contaminants. Phase I: Collection of multiple pollutants from indoor and laboratory evaluated sources (compiles). Final report.. :0-0.		
HERO ID:	7002239		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The study authors reported their sample equipment, collection regimen, storage condition and duration, as well as location characteristics. Sampling information provided in the Summary of Research Project Activities and on pg 18. Serum and urine samples were also collected, but the compounds measured in these matrices are not relevant. Pg 18 describes indoor air sample collection.
	Metric 2: Analytical Methodology	Low	Recoveries and LODs/LOQs/MDLs were not reported. MDLs were only reported for particulate matter, nitrogen dioxide, and allergens.
	Metric 3: Biomarker Selection	N/A	The study measured the parent chemical in the indoor air.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was conducted in Syracuse, New York.
	Metric 5: Currency	Low	Samples were collected between 2001 and 2004.
	Metric 6: Spatial and Temporal Variability	Low	Samples were collected from 150 homes, as reported on pg 37. However, DBP is not included in Table B3 presumably because its occurrence ration was less than 0.06. It is only reported in Table B2 for an indoor air sample from one home.
	Metric 7: Exposure Scenario	Medium	This was a monitoring study but there was limited linkages between the sources of exposures and concentrations.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Raw data were not reported by study authors. Median, mean, min and max were reported.
	Metric 9: Quality Assurance	Low	Some QA/QC methods were discussed, including a QAPP that was submitted to an EPA project officer to review which "conforms to EPA requirements for Quality Management Plans for organizations that receive funding from EPA." However, no recoveries were mentioned.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Some gaps, limitations, and uncertainties were reported throughout the document. Min and max were provided to characterize variance.

Overall Quality Determination   **Medium**

Study Citation:	Dong, C. D., Wang, M. H., Chen, C. F., Shih, Y. J., Chang, K. L., Lee, S. H., Lin, Y. L., Wu, C. H., Chen, C. W. (2020). Detecting phthalate esters in sludge particulates from wastewater treatment plants. Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances & Environmental Engineering 55(10):1233-1240.		
HERO ID:	7976582		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Sampling methodology of dehydrated sludge samples and operating conditions of seven WWTPs were described thoroughly. The study included the sample collection equipment, procedures, and storage conditions.
	Metric 2:	Analytical Methodology	High	The analytical methodology was described in detail, including the extraction method, analytical instrumentation, calibration, and analytical method. Detection limits relative percent differences, and recoveries were reported in Table 3.
	Metric 3:	Biomarker Selection	N/A	Parent chemical was measured in sludge samples.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study samples were collected at WWTPs in southern Taiwan.
	Metric 5:	Currency	Low	The study did not provide a sample collection date, the publication date was 2020.
	Metric 6:	Spatial and Temporal Variability	Low	1 kg of sludge was collected at each of the 7 WWTPs. No replicate samples were reported. It appears that samples were collected at one time, which does not account for spatial and temporal variability within the WWTP.
	Metric 7:	Exposure Scenario	Medium	The study provides concentrations in the wastewater sludge which is indicative of contamination in the environment that people could be exposed to prior to accumulation at the WWTP. However, more discussion could have been provided about sources of exposure. There was no use of exposure controls.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	The individual data points for the sample collected at each WWTP was reported in Table 4. There are not summary statistics reported.
	Metric 9:	Quality Assurance	High	Quality assurance and quality control were discussed including instrument calibration, detection limits, blanks, sample duplicates, and matrix spike standards.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variation of concentrations across the different WWTPs were discussed on p. 1236 and the concentrations in this study were compared across other studies. Limitations and uncertainties were not reported.

Overall Quality Determination   Medium

Study Citation:	McConnell, M. L. (2007). Distribution of phthalate monoesters in an aquatic food web.		
HERO ID:	10365669		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The environmental sampling methods were described in detail and are scientifically sound.
	Metric 2: Analytical Methodology	High	The analytical methods were described, including LOD and recoveries.
	Metric 3: Biomarker Selection	N/A	The author analyzed environmental media.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was conducted in Canada.
	Metric 5: Currency	Medium	The samples were collected in 2005.
	Metric 6: Spatial and Temporal Variability	High	n>10 samples (multiple environmental matrices).
	Metric 7: Exposure Scenario	High	The data closely represent relevant exposure scenarios related to phthalates in water bodies in Canada.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Medium	Only summary statistics were reported (min, max, mean, SD).
	Metric 9: Quality Assurance	High	QA/QC techniques were described in detail.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Medium	Variability was characterized (SD). Uncertainties and limitations were briefly discussed.

Overall Quality Determination   High

Study Citation:	WSDE, (2022). Chemicals of emerging concern in pretreated industrial wastewater in Northwestern Washington state: Screening study results, 2021.		
HERO ID:	11505405		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	The study reports a description of each of the study locations and sampling methods, including sampling materials, QC procedures and sample storage.
	Metric 2: Analytical Methodology	High	The samples were analyzed using the EPA 8270E method. Detection and reporting limits are in appendix C.
	Metric 3: Biomarker Selection	N/A	The parent chemical was measured in waste water.
Domain 2: Representativeness			
	Metric 4: Geographic Area	High	The study was conducted in the Puget Sound region of Washington State, USA.
	Metric 5: Currency	High	The study was conducted from January to April 2021.
	Metric 6: Spatial and Temporal Variability	Low	Although sample size not reported, sampling conducted in accordance with quality assurance project plan (QAPP) described in field methods section. Grab samples collected at each of the 9 facilities.
	Metric 7: Exposure Scenario	High	The study evaluates concentrations in pretreated industrial wastewater in Washington state.
Domain 3: Accessibility/Clarity			
	Metric 8: Reporting of Results	Low	Raw data is not reported. Concentrations are reported in figure 5.
	Metric 9: Quality Assurance	High	The study reported a series of field and laboratory quality control samples.
Domain 4: Variability and Uncertainty			
	Metric 10: Variability and Uncertainty	Low	Study limitations are reported in page 39. There is not characterization of variability.

Overall Quality Determination   Medium

| Study Citation: | Wang, M. H., Chen, C. F., Albarico, F. P. J.,B, Chen, C. W., Dong, C. D. (2022). Occurrence and distribution of phthalate esters and microplastics in wastewater treatment plants in Taiwan and their toxicological risks. Chemosphere 307(Pt 2):135857. |
| HERO ID: | 11784627 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	Low	The study described the sources that the sludge samples were taken from but did not report sample equipment, sampling procedures, or sample storage conditions.
	Metric 2:	Analytical Methodology	High	Analytical methodology was thoroughly described, including the instrument calibration, analytical instrumentation, and extraction method, recovery samples, relative percent difference, and detection limits. MDLs are reported in Tables 1 and S4.
	Metric 3:	Biomarker Selection	N/A	Parent chemical was measured in sludge samples from wastewater treatment plants.
Domain 2: Representativeness				
	Metric 4:	Geographic Area	High	The study area was western Taiwan.
	Metric 5:	Currency	Low	The study did not provide a sample collection date, the study was published in 2022.
	Metric 6:	Spatial and Temporal Variability	Low	The study collected between 3-8 samples for each type of treatment plant, locations are reported in Figure 1. No replicate samples were mentioned. Timeline of sample collection was also not reported.
	Metric 7:	Exposure Scenario	High	The authors discuss the potential for human exposure the chemical in soil after application of the sludge samples from WWTPs.
Domain 3: Accessibility/Clarity				
	Metric 8:	Reporting of Results	High	The concentration of the sludge sample from each plant (n=17) and the MDL were reported in Table 1.
	Metric 9:	Quality Assurance	High	The study thoroughly describes QC measures including the use of a calibration curve, procedural blanks, check standard, sample duplicates, and certified reference materials. The ranges of recoveries and relative percent difference of sample duplicates are reported in text.
Domain 4: Variability and Uncertainty				
	Metric 10:	Variability and Uncertainty	Low	Variability in concentrations within each WWTP type were shown in box plots in Figure 4. They also performed a principal component analysis to explain the variability in concentrations based on the sludge basic properties in section 3.4. Limitations and uncertainties were not discussed.

Overall Quality Determination   Medium

Study Citation:	Billings, A., Carter, H., Cross, R. K., Jones, K. C., Pereira, M. G., Spurgeon, D. J. (2023). Co-occurrence of macroplastics, microplastics, and legacy and emerging plasticisers in UK soils. Science of the Total Environment 880:163258.		
HERO ID:	11785155		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Sampling Methodology	High	Sampling methodology for soil and plastic item collection was thoroughly described including sampling equipment, procedures, storage conditions, study site characteristics, and matrix characteristics.
Metric 2:	Analytical Methodology	High	Analytical methodology was described in detail, including the soil digestion method, instrument calibration, analytical instrumentation, recovery samples, and limits of detection. Limits of detection are reported in Table 1 and Table S4.
Metric 3:	Biomarker Selection	N/A	The parent chemical was measured in environmental soil samples.
Domain 2: Representativeness			
Metric 4:	Geographic Area	High	Samples were collected in central and southern England (UK).
Metric 5:	Currency	High	Sampling took place in January and February of 2020.
Metric 6:	Spatial and Temporal Variability	Medium	There were 3-7 samples for each different land use scenario, multiple samples were taken at each site and combined to account for spatial variation across the site. Samples were only collected one time
Metric 7:	Exposure Scenario	Medium	Exposure to humans was not explicitly discussed. However, this is an environmental monitoring study where exposure to phthalates can occur through contaminated soil. Information regarding the microenvironment was provided. There was a use of exposure controls, using woodland soils that were expected to have minimal phthalate concentrations.
Domain 3: Accessibility/Clarity			
Metric 8:	Reporting of Results	High	Results are reported in Table 2. Summary statistics are detailed and complete including mean, median, range, and detection frequency.
Metric 9:	Quality Assurance	High	Quality assurance and quality control were described in detail including recoveries, blanks, positive controls, and microplastic control measures.
Domain 4: Variability and Uncertainty			
Metric 10:	Variability and Uncertainty	High	Limitations and uncertainties are discussed in detail in section 3.3. Additionally, they discuss the limitation of a relatively small number of sampling sites. Variability was characterized using the range in Table 2. They also statistically examined the variation of different contaminants between land uses.

Overall Quality Determination   High

Study Citation:	Bauer, M. J., Herrmann, R. (1997). Estimation of the environmental contamination by phthalic acid esters leaching from household wastes. Science of the Total Environment 208(1-2):49-57.		
HERO ID:	679229		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology and Conditions	High	The authors describe the sample collection and treatment.
	Metric 2: Analytical Methodology	Low	The authors describe the methods and equipment used for the analysis, but they do not include the LODs.
	Metric 3: Biomarker Selection	N/A	Biomarkers were not used.
Domain 2: Representative			
	Metric 4: Testing Scenario	High	The testing conditions were appropriate for the chemical studied.
	Metric 5: Sample Size and Variability	Medium	The authors mention that the values presented in Table 3 were based on six or nine extractions.
	Metric 6: Temporality	Low	The time of sample collection was more than 15 years before the current year.
Domain 3: Accessibility/Clarity			
	Metric 7: Reporting of Results	Medium	The authors present the mean (and minimum and maximum) in Table 3 but do not include the frequency of detection or measures of variation.
	Metric 8: Quality Assurance	Medium	The authors asserted that they understood the need for careful attention to the issues of contamination during the sample handling and analysis processes. They claimed that blanks were monitored. They claimed that "recovery was complete," which I assumed meant 100%. In all cases, the authors did not provide the results (values) for the experiments.
Domain 4: Variability and Uncertainty			
	Metric 9: Variability and Uncertainty	Medium	The authors identify some of the discrepancies between controlled laboratory experiments and real-world scenarios, and describe some of the reasons these differences are relevant. They could not provide numerical evidence that could be used to correct for the differences (although this is not a detriment to the study).

Overall Quality Determination   **Medium**

Study Citation:	Tsumura, Y., Ishimitsu, S., Kaihara, A., Yoshii, K., Nakamura, Y., Tonogai, Y. (2001). Di(2-ethylhexyl) phthalate contamination of retail packed lunches caused by PVC gloves used in the preparation of foods. Food Additives and Contaminants 18(6):569-579.		
HERO ID:	683035		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology and Conditions	High	Sampling methodology and conditions are clearly reported in the text.
	Metric 2:	Analytical Methodology	High	The analytical procedure and materials are reported, the study also reported the LOD.
	Metric 3:	Biomarker Selection	N/A	The study reports the parent chemical in gloves.
Domain 2: Representative				
	Metric 4:	Testing Scenario	High	The study evaluates the migration of the chemical to food by the use of PVC gloves.
	Metric 5:	Sample Size and Variability	Low	Sample size is small but reported.
	Metric 6:	Temporality	Low	Material tested in 1999
Domain 3: Accessibility/Clarity				
	Metric 7:	Reporting of Results	Low	Weight fractions reported per each chemical. Raw data reported for the concentrations of chemicals in each glove.
	Metric 8:	Quality Assurance	High	The study reports techniques to follow QA/QC criteria.
Domain 4: Variability and Uncertainty				
	Metric 9:	Variability and Uncertainty	Low	Variability or uncertainty not reported for the gloves.

Overall Quality Determination   Medium

Study Citation:		Uhde, E., Bednarek, M., Fuhrmann, F., Salthammer, T. (2001). Phthalic esters in the indoor environment–test chamber studies on PVC-coated wallcoverings. Indoor Air 11(3):150-155.		
HERO ID:		789761		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology and Conditions	High	Sampling equipment, testing conditions and procedures were clearly defined. Methods were cited.
	Metric 2:	Analytical Methodology	Low	Detection limits were not provided for study, study did mention detection limits used in other cited studies. Analytical method was described. GC/MS used for chamber air samples. CIS/GC-MS used for analyzing fogging plates. Missing calibration for instrument.
	Metric 3:	Biomarker Selection	N/A	No biomarkers used in this study.
Domain 2: Representative				
	Metric 4:	Testing Scenario	Medium	Samples of PVC-coated wall coverings were initially screened and then the samples with representative high, medium, and low detections were used in the chamber study. Scenario parameters included temperature, RH, AER, and loading).
	Metric 5:	Sample Size and Variability	Low	Study did not mention replicate samples. Six samples were tested over 14 days in the chamber. Samples results were reported as air concentrations (chamber) and mass collected (fogging plates).
	Metric 6:	Temporality	Low	Study was published in 2001 (>15 years ago).
Domain 3: Accessibility/Clarity				
	Metric 7:	Reporting of Results	Medium	Maximum air concentration data provided for DBP for each chamber test and Time vs Concentration was plotted. Total mass accumulated for DBP was reported for fogging plate results. Some raw and supplemental data were provided.
	Metric 8:	Quality Assurance	Low	Study provided chamber blank results but did not discuss QA/QC measures taken. Can only assume additional measures were taken since they reportedly followed published methods.
Domain 4: Variability and Uncertainty				
	Metric 9:	Variability and Uncertainty	Medium	The study started the screening process with 14 different wall coverings (these were narrowed down to six for the chamber test). Limitations and uncertainties were minimally discussed.

Overall Quality Determination   Low

Study Citation:		Mo, C. H., Cai, Q. Y., Li, Y. H., Zeng, Q. Y. (2008). Occurrence of priority organic pollutants in the fertilizers, China. Journal of Hazardous Materials 152(3):1208-1213.	
HERO ID:		1003896	

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology and Conditions	High	Fertilizer samples collected from Chinese factories and companies; Sample extraction following USEPA methods 3540C and 3630C with some modifications, explained in the study
	Metric 2:	Analytical Methodology	High	GCMS analysis with modified USEPA 8270C method, all instrumentation details and detection limits provided
	Metric 3:	Biomarker Selection	N/A	Biomarker not used
Domain 2: Representative				
	Metric 4:	Testing Scenario	Medium	Exposure to chemicals in fertilizers may be reasonable consumer scenario, but the fertilizers tested were selected due to their wide use in China rather than USA
	Metric 5:	Sample Size and Variability	High	22 samples of fertilizers
	Metric 6:	Temporality	Medium	Study from 2007, no indication of samples or fertilizers being older
Domain 3: Accessibility/Clarity				
	Metric 7:	Reporting of Results	Medium	Concentration by weight reported for each chemical for all samples; some summary data in text
	Metric 8:	Quality Assurance	Low	Recoveries reported; QA/QC procedures discussed as being presented in previous studies
Domain 4: Variability and Uncertainty				
	Metric 9:	Variability and Uncertainty	Low	Limited discussion on variability in fertilizers and detected concentrations; no real discussion on uncertainties

Overall Quality Determination   **Medium**

Study Citation:	Fierens, T., Vanermen, G., Van Holderbeke, M., De Henauw, S., Sioen, I. (2012). Effect of cooking at home on the levels of eight phthalates in foods. Food and Chemical Toxicology 50(12):4428-4435.		
HERO ID:	1311695		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology and Conditions	Medium	Sampling methodology appears reasonable, but is not described in full detail.
	Metric 2:	Analytical Methodology	Medium	Analytical procedure refers back to a previous study (Fierens et al., 2012). Analysis seems to have been performed using GC-EI-MS. LOQs are reported in Section 2.4.
	Metric 3:	Biomarker Selection	N/A	Biomarkers are not used in this study; phthalate levels are assessed directly.
Domain 2: Representative				
	Metric 4:	Testing Scenario	Medium	The experiment is designed to mimic typical home-cooking procedures and equipment. General environmental conditions are not described.
	Metric 5:	Sample Size and Variability	High	Fifteen foods were sampled. Each sample was taken in duplicate.
	Metric 6:	Temporality	Medium	Data was collected in 2011, between 5 and 15 years ago.
Domain 3: Accessibility/Clarity				
	Metric 7:	Reporting of Results	Medium	Raw data is reported, but summary statistics are minimal.
	Metric 8:	Quality Assurance	Low	There is no specific discussion of QA/QC procedures, but also no indication of issues.
Domain 4: Variability and Uncertainty				
	Metric 9:	Variability and Uncertainty	Low	There is no specific discussion of variability or uncertainty.

Overall Quality Determination   Medium

Study Citation:	Dodson, R. E., Nishioka, M., Standley, L. J., Perovich, L. J., Brody, J. G., Rudel, R. A. (2012). Endocrine disruptors and asthma-associated chemicals in consumer products. Environmental Health Perspectives 120(7):935-943.		
HERO ID:	1325358		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology and Conditions	Low	Sampling methodology explained but not from an authoritative or referenced source. Choose to use composite samples (mixed different sources to make one average product).
	Metric 2: Analytical Methodology	High	Analytical methods described and appear scientifically sound. LOD and additional information in the supplemental file.
	Metric 3: Biomarker Selection	N/A	Tested consumer products.
Domain 2: Representative			
	Metric 4: Testing Scenario	High	Data likely to represent relevant exposure from alternative products.
	Metric 5: Sample Size and Variability	Medium	Number of products used to make "composite" product ranged from 1-8; 27 different products tested; included duplicate samples.
	Metric 6: Temporality	Medium	Tested products from between 5-10 years ago.
Domain 3: Accessibility/Clarity			
	Metric 7: Reporting of Results	Medium	Raw data not reported - exact concentrations remain unknown.
	Metric 8: Quality Assurance	High	QA/QC described (details in supplemental file).
Domain 4: Variability and Uncertainty			
	Metric 9: Variability and Uncertainty	High	Discussion included on variability and uncertainty.

Overall Quality Determination   High

Study Citation:	Grynkiewicz-Bylina, B. (2011). Dangerous phthalates in children's environment. Ecological Chemistry and Engineering S 18(4):455-463.		
HERO ID:	1325712		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology and Conditions	Low	Sampling methodology described but not in detail or in accordance with authoritative source or widely accepted guidelines; samples cut from toys/articles and fragmented using cryogenic mill before extraction view Soxhlet method using dichloromethane.
	Metric 2: Analytical Methodology	Medium	Analytical methodology described (GC-MS) including calibration and calculations needed for unit conversions; LOD for concentration 0.05%
	Metric 3: Biomarker Selection	N/A	Biomarker not used.
Domain 2: Representative			
	Metric 4: Testing Scenario	Low	Samples collected under one set of conditions; also unclear where the toys were collected (no name brands, for example, to verify their use and composition).
	Metric 5: Sample Size and Variability	High	Total of 228 products tested (172 toys, 56 articles) further divided into type of material; two samples per product.
	Metric 6: Temporality	Medium	Toys and articles sampled in 2009-2011, may not represent current market products.
Domain 3: Accessibility/Clarity			
	Metric 7: Reporting of Results	Low	Raw concentration data reported with uncertainty at 95% confidence level; no summary statistics.
	Metric 8: Quality Assurance	Low	QA/QC techniques not directly discussed but inference of some based on calibration in analytical procedures.
Domain 4: Variability and Uncertainty			
	Metric 9: Variability and Uncertainty	Medium	Variability in types of products sampled and distinction of products vs articles; uncertainty measures included in data reporting for each chemical and type of material.

Overall Quality Determination   Low

Study Citation: Rohm and Haas, (1990). Air monitoring of freshly painted interior rooms with cover letter.
HERO ID: 1332993

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology and Conditions	Medium	Descriptions and diagram of experimental setup are provided; sample collection method by mixed cellulose ester filter is briefly mentioned in Table III on p. 19/40.
	Metric 2:	Analytical Methodology	Low	Sampling method using MCEF is mentioned but there is no direct discussion of analysis - may be included as part of sample method.
	Metric 3:	Biomarker Selection	N/A	Not applicable.
Domain 2: Representative				
	Metric 4:	Testing Scenario	Medium	Tests with roller and spray painting exposure scenarios were conducted in test houses under various ventilation conditions.
	Metric 5:	Sample Size and Variability	Medium	5 tests for each set of conditions for Spring House Farm Study III.
	Metric 6:	Temporality	Low	>>15 years old; study; TSCA submittal is from 1990.
Domain 3: Accessibility/Clarity				
	Metric 7:	Reporting of Results	Low	Summary data (range of values) is provided. Individual data points are provided by test, but exact number of total samples is not reported, so difficult to confirm. Many concentrations are non-detects.
	Metric 8:	Quality Assurance	Low	QA/QC not directly discussed.
Domain 4: Variability and Uncertainty				
	Metric 9:	Variability and Uncertainty	Low	No measure of variability was reported; it might be possible to calculate it from study results, but many values were ND.

Overall Quality Determination   Low

Study Citation:	Llompart, M., Sanchez-Prado, L., Pablo Lamas, J., Garcia-Jares, C., Roca, E., Dagnac, T. (2013). Hazardous organic chemicals in rubber recycled tire playgrounds and pavers. Chemosphere 90(2):423-431.		
HERO ID:	1597738		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology and Conditions	Medium	Sampling procedure described in general terms, and appears to be reasonable.
	Metric 2: Analytical Methodology	High	Analytical methodology is described in detail. Analysis performed using GC-MS. Instrumental detection limits are included in Table 1.
	Metric 3: Biomarker Selection	N/A	Biomarkers are not used in this study.
Domain 2: Representative			
	Metric 4: Testing Scenario	Medium	Section 3.4 discusses the connection between laboratory conditions and potential real-world scenarios.
	Metric 5: Sample Size and Variability	Low	17 samples were taken from playground locations and 7 purchased commercially. No indication of replicates being used.
	Metric 6: Temporality	Medium	Based on publication information, data can be assumed to be between 5 and 15 years old.
Domain 3: Accessibility/Clarity			
	Metric 7: Reporting of Results	Medium	Raw data is not reported, but summary statistics are relatively complete.
	Metric 8: Quality Assurance	Medium	Quality control procedures are mentioned briefly.
Domain 4: Variability and Uncertainty			
	Metric 9: Variability and Uncertainty	Low	There is no specific discussion of variability or uncertainty in the results.

Overall Quality Determination   Medium

Study Citation:	Ionas, A. C., Dirtu, A. C., Anthonissen, T., Neels, H., Covaci, A. (2014). Downsides of the recycling process: Harmful organic chemicals in children's toys. Environment International 65:54-62.
HERO ID:	2345985

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology and Conditions	Medium	Sampling methodology described in detail but not citation provided for publicly available or accepted SOPs or guidelines.
	Metric 2:	Analytical Methodology	High	GCMS methodology discussed in detail, with LOQs provided and recovery samples.
	Metric 3:	Biomarker Selection	N/A	A biomarker was not used in this study.
Domain 2: Representative				
	Metric 4:	Testing Scenario	High	Exposure from toys is a relevant scenario, and the delineation of material type, year of production, and country of production allow for more nuanced consideration of data.
	Metric 5:	Sample Size and Variability	Medium	Sample size varies by chemical group and is divided by sample type (hard plastic, wood, etc.); n=50 for phthalates and n=114 for PFRs.
	Metric 6:	Temporality	Medium	Study published in 2014 but the production year of the toys sampled ranges from1993 to 2012.
Domain 3: Accessibility/Clarity				
	Metric 7:	Reporting of Results	Medium	Detection frequency, median, 90th%, and maximum concentration reported by chemical in study; median, mean, and max reported by exposure time and exposure pathway in the supplemental file.
	Metric 8:	Quality Assurance	High	Reference materials used and accuracy and precision results reported for the methods used; full method validation writeup in the supplemental file.
Domain 4: Variability and Uncertainty				
	Metric 9:	Variability and Uncertainty	Medium	Uncertainty discussed in exposure potential; variability addressed through toy types and correlation considerations by different parameters.

Overall Quality Determination   High

Study Citation:	Schulz, S., Wagner, S., Gerbig, S., Waechter, H., Sielaff, D., Bohn, D., Spengler, B. (2015). DESI MS based screening method for phthalates in consumer goods. Analyst 140(10):3484-3491.		
HERO ID:	2914652		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology and Conditions	Medium	Samples were provided by German state laboratories. No information was provided on the sample selection process.
	Metric 2:	Analytical Methodology	High	Evaluation of the performance of desorption electrospray ionization (DESI) mass spectrometry (MS) method. All pertinent info is provided, and results are compared to validated methods (GC FID, GC MS, HPLC DAD).
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representative				
	Metric 4:	Testing Scenario	Medium	Data represent consumer exposure. Products included false teeth, various toys and catering glove. No information was provided on where they were purchased or country of origin.
	Metric 5:	Sample Size and Variability	High	11 real world samples were tested for product concentrations in triplicate.
	Metric 6:	Temporality	High	Sample purchase date was not provided. Paper published in 2015.
Domain 3: Accessibility/Clarity				
	Metric 7:	Reporting of Results	Medium	No raw data provided. Summary stats include weight fraction % and variation.
	Metric 8:	Quality Assurance	Medium	QA/QC measured applied and issues explained Calibration curves were obtained from matrix-matched reference materials with coefficients of determination >0.985.
Domain 4: Variability and Uncertainty				
	Metric 9:	Variability and Uncertainty	Medium	Intra- and inter-day reproducibility was measured. Measurement error was calculated. Differences in results with DESI MS method and confirmatory methods was explained.

Overall Quality Determination   High

Study Citation:	Jeon, S., Kim, K., Choi, K. (2016). Migration of DEHP and DINP into dust from PVC flooring products at different surface temperature. Science of the Total Environment 547(Elsevier):441-446.		
HERO ID:	3222272		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology and Conditions	Medium	Sampling methodology clearly described with equipment and conditions (in small chamber and FLEC).
	Metric 2: Analytical Methodology	Medium	Analytical methods clearly described for identifying phthalates in flooring (soxhlet extraction and GC/MS), migration testing (auto thermal adsorber and GC/MS), and analysis in dusts (GC/MS). Generic detection limit provided for chemicals not detected.
	Metric 3: Biomarker Selection	N/A	Biomarker not used.
Domain 2: Representative			
	Metric 4: Testing Scenario	Medium	Environmental conditions reflect scenario of interest (home environment) but the flooring samples are from the Korean market and may not reflect US materials.
	Metric 5: Sample Size and Variability	Low	Four types of PVC flooring sampled, two coated with UV curing paint, one coated with wax, and one not coated; one sample for each chemical for each surface.
	Metric 6: Temporality	High	Flooring samples collected for study in 2016, likely temporally relevant (5 years).
Domain 3: Accessibility/Clarity			
	Metric 7: Reporting of Results	Low	Single concentration data provided in flooring samples and dust; no summary statistics.
	Metric 8: Quality Assurance	Medium	Concentrations compared to measured values from multiple studies; recovery samples for dust measurements reported (97+/ 9 and 122+/30).
Domain 4: Variability and Uncertainty			
	Metric 9: Variability and Uncertainty	Medium	Limited variability in flooring samples, limited variability in temperature (heating vs not).

Overall Quality Determination   **Medium**

Study Citation:	Jiang, C., Li, D., Zhang, P., Li, J., Wang, J., Yu, J. (2017). Formaldehyde and volatile organic compound (VOC) emissions from particleboard: Identification of odorous compounds and effects of heat treatment. Building and Environment 117(Elsevier):118-126.		
HERO ID:	3870467		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology and Conditions	High	Sampling protocol was not based on a publicly available SOP but was clear, appropriate and included pertinent sampling information.
	Metric 2:	Analytical Methodology	Low	Analytical methods were not based on a publicly available SOP but were described but was missing some pertinent information. No detection limit was found.
	Metric 3:	Biomarker Selection	N/A	Parent chemical was the focus of the study, instead of metabolites.
Domain 2: Representative				
	Metric 4:	Testing Scenario	High	Testing conditions likely to represent a relevant exposure scenario and included testing at different conditions (different temperatures).
	Metric 5:	Sample Size and Variability	Medium	Concentrations taken at 5 different time points (for the four different temperatures).
	Metric 6:	Temporality	Medium	Particleboard samples were obtained between 5-15 years ago.
Domain 3: Accessibility/Clarity				
	Metric 7:	Reporting of Results	High	Raw data can be found reported in the supplemental material.
	Metric 8:	Quality Assurance	Low	QA/QC not directly discussed but can be implied through the studies use of replicate samples.
Domain 4: Variability and Uncertainty				
	Metric 9:	Variability and Uncertainty	Medium	Limited discussion included on uncertainties, limitations, and data gaps have been identified. Section 3.2 includes text of the missing effects of humidity.

Overall Quality Determination   Medium

Study Citation:	Negev, M., Berman, T., Reicher, S., Sadeh, M., Ardi, R., Shammai, Y. (2018). Concentrations of trace metals, phthalates, bisphenol A and flame-retardants in toys and other children's products in Israel. Chemosphere 192(Elsevier):217-224.		
HERO ID:	4285931		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology and Conditions	Low	Sampling methodology is described only in broad terms.
	Metric 2: Analytical Methodology	Medium	The analytical method is not given in detail but is cited as an EU standard, and uses GC-MS. A limit of detection is given.
	Metric 3: Biomarker Selection	N/A	No biomarker is used in this study.
Domain 2: Representative			
	Metric 4: Testing Scenario	Low	Minimal data is provided regarding testing conditions.
	Metric 5: Sample Size and Variability	Medium	72 items were tested for phthalates, in categories of 9-20 items each. No indication whether replicates were used.
	Metric 6: Temporality	High	Based on publication date, this is a recent study (less than 5 years old).
Domain 3: Accessibility/Clarity			
	Metric 7: Reporting of Results	Low	Only a few summary statistics are reported for phthalates.
	Metric 8: Quality Assurance	Low	There is no specific discussion of QA/QC procedures.
Domain 4: Variability and Uncertainty			
	Metric 9: Variability and Uncertainty	Low	There is no specific discussion of variability or uncertainty.

Overall Quality Determination   Low

Study Citation:	Dong, H., Jiang, L., Shen, J., Zhao, Z., Wang, Q., Shen, X. (2019). Identification and analysis of odor-active substances from PVC-overlaid MDF. Environmental Science and Pollution Research 26(20):20769-20779.		
HERO ID:	5432879		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology and Conditions	High	Sampling methods and conditions were clearly described in the Materials and Methods section of the paper.
	Metric 2: Analytical Methodology	High	Analytical methods and conditions were clearly described in the Materials and Methods section of the paper.
	Metric 3: Biomarker Selection	N/A	The study is testing for the parent chemical (VOCs) in an environmental media (indoor air).
Domain 2: Representative			
	Metric 4: Testing Scenario	Medium	Testing conditions closely represent relevant exposure scenario, but the test was not conducted under a broad range of conditions.
	Metric 5: Sample Size and Variability	Medium	Samples were taken at six different time points
	Metric 6: Temporality	High	PVC- overlaid MDF was obtained in China prior to 2019; < 5 years ago
Domain 3: Accessibility/Clarity			
	Metric 7: Reporting of Results	High	All data is reported in the paper - Table 4 and Table 5.
	Metric 8: Quality Assurance	Low	Quality assurance/quality control techniques and were not directly discussed, but the study did include information on how the samples were stored and comparisons of retention indexes (discussed on pg 20771-2).
Domain 4: Variability and Uncertainty			
	Metric 9: Variability and Uncertainty	Low	There was little to no discussion included on the variability and uncertainty associated with the study.

Overall Quality Determination   Medium

Study Citation:	Gu, J., Wensing, M., Uhde, E., Salthammer, T. (2019). Characterization of particulate and gaseous pollutants emitted during operation of a desktop 3D printer. Environment International 123:476-485.		
HERO ID:	5708386		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology and Conditions	Medium	The study consisted of basic thermoplastic filaments used in 3D printing. The filaments were used in a 3D printer as they would normally, but the 3D printer was placed in a stainless steel chamber to capture emissions while in use. The sampling procedure was not cited but it was briefly described in the study.
	Metric 2: Analytical Methodology	Medium	A GC/MS method was used to analyze the samples.
	Metric 3: Biomarker Selection	N/A	A biomarker was not used in this study.
Domain 2: Representative			
	Metric 4: Testing Scenario	Medium	This can potentially be an exposure scenarios in DIY settings.
	Metric 5: Sample Size and Variability	Medium	Adequate sample size per sampling type.
	Metric 6: Temporality	High	The study was published in 2019.
Domain 3: Accessibility/Clarity			
	Metric 7: Reporting of Results	Low	The study did not provide raw sample data nor an LOD or LOQ. The was provided in tabular format (Table 3).
	Metric 8: Quality Assurance	Medium	Adequate discussion; Filter sampling of the chamber blank was taken in a separate test (sampling for 4 h in the empty chamber).
Domain 4: Variability and Uncertainty			
	Metric 9: Variability and Uncertainty	Medium	Adequate discussion of future research direction based on outcomes; Discussed methods that were not successful; Difficulty in obtaining the particle chemical composition due to low concentration and the limitation of the air sampling volume; sample flow rate is limited by the chamber size and air exchange rate; and a short printing time restricts the sampling time.

Overall Quality Determination   Medium

Study Citation:	Tang, Z., Chai, M., Cheng, J., Wang, Y., Huang, Q. (2019). Occurrence and distribution of phthalates in sanitary napkins from six countries: Implications for women's health. Environmental Science & Technology 53(23):13919-13928.		
HERO ID:	6816332		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology and Conditions	High	The sample collection mimics consumer behavior (on-line and store purchases). The study design called for a selection of ten whole samples and the creation of two composite samples for analysis made from subsets cut from the whole samples. The authors recognized the potential for contamination and sealed the composite samples quickly.
	Metric 2:	Analytical Methodology	Medium	The authors describe the instrument used and the sample preparation briefly in Section S1 of the Supplementary file. I do not see that they describe how they created the analysis sample (0.5g aliquot) from a large composite sample of pieces of ten whole sanitary napkins. I presume that the authors chose not to describe this detail, but it leaves out an important step if one wanted to repeat the experiment. The authors present a range of LOQs for phthalates in Section S1; from this, I could deduce that the LOQ for each chemical is presented as the "<#" in Table 1 of the main report that presents the results.
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representative				
	Metric 4:	Testing Scenario	High	The sample collection mimics consumer behavior (on-line and store purchases). The study did not include actual testing but is considered an Experimental type due to the samples being commercial products (i.e., not biological samples).
	Metric 5:	Sample Size and Variability	High	Each composite sample was composed of subsets derived from ten different sanitary napkins. The authors analyzed both composites and summarized by country of origin (n = 12 composites).
	Metric 6:	Temporality	High	The authors collected the samples in 2016, which is within five years of the current year (2021).
Domain 3: Accessibility/Clarity				
	Metric 7:	Reporting of Results	Medium	The authors did not include raw data in the material. They adjusted the concentrations for the amounts found in blanks, but they did not adjust the results for the recoveries. The information in Table 1 includes sample size, median, range, and detection frequency.
	Metric 8:	Quality Assurance	Medium	The authors recognized the potential for contamination and sealed the composite samples quickly. The study included blanks at intervals and tested for recoveries. Although the authors did not correct the concentrations for the recoveries, the rates for recoveries were high; from this, I assessed that the reported values would be suitable for extraction (with this caveat included in the notes).
Domain 4: Variability and Uncertainty				
	Metric 9:	Variability and Uncertainty	Medium	The authors described how different manufacturing methods (sometimes in different countries) could affect the concentrations of the phthalates in the products. The authors briefly mention that these chemicals have been found in other products in other studies, but they did not clarify how the results compare to studies of sanitary napkins except for their own previous work.

Overall Quality Determination   High

| Study Citation: | Lin, W. T., Chen, C. Y., Lee, C. C., Chen, C. C., Lo, S. C. (2021). Air phthalate emitted from flooring building material by the micro-chamber method: Two-stage emission evaluation and comparison. Toxics 9(9):216-216. |
| HERO ID: | 9384670 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology and Conditions	High	Six different flooring materials were tested, representing green building material and non-green building material labels in Taiwan. All pertinent details (e.g. temperature and humidity) of the micro-chamber method according to ISO 16000-25 were provided.
	Metric 2:	Analytical Methodology	Medium	GC/MS analysis method was used according to ISO 16000-33. The detection limit was 100 ppb and calibration curve was established. LC/MSMS analysis method was also used, and the detection limit was 2 ppb.
	Metric 3:	Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference
Domain 2: Representative				
	Metric 4:	Testing Scenario	High	Testing was done in two stages representing normal temperatures and high temperatures. Blank experiment was done before the floor material tests.
	Metric 5:	Sample Size and Variability	Low	Six different flooring materials were tested. Replicate tests were not performed.
	Metric 6:	Temporality	High	The publication date is 2021.
Domain 3: Accessibility/Clarity				
	Metric 7:	Reporting of Results	Medium	One result per building material/stage of the experiment is reported in Table 5. Table 6 shows box plot summarizing all building materials.
	Metric 8:	Quality Assurance	Low	QA measures were described such as establishment of calibration curve and blank experiment. The recoveries were not reported.
Domain 4: Variability and Uncertainty				
	Metric 9:	Variability and Uncertainty	Low	The study captures variability in different types of green and non-green labeled flooring materials. However, uncertainties or limitations were not adequately discussed.

Overall Quality Determination   Medium

Study Citation:		Danish EPA, (2020). Survey of unwanted additives in PVC products imported over the internet.	
HERO ID:		11374030	
Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology and Conditions	High	Products were selected according to various priority criteria including those that are commonly made from PVC (hard and soft) and are available to purchase by Danish consumers from frequently used foreign websites. Products also were required to contain chlorine.
	Metric 2: Analytical Methodology	Medium	Danish Technological Institute's accredited Method OA-500 was used for phthalates, as detailed provided in Appendix 4. The method is GC-MS and is based on DS/ISO 16181. The detection limit is provided. Expanded analytic uncertainty (k=2): 35% RSD. Recovery values were not provided.
	Metric 3: Biomarker Selection	N/A	Biomarkers of interest were not addressed in this reference.
Domain 2: Representative			
	Metric 4: Testing Scenario	Medium	Data represent consumer exposure scenario for multiple age groups. Products analyzed include children toys, pet toys, personal belongings (bags), hobby materials (tape, cutting board), mats, fitness equipment, footware, and rainwear. While products were purchased in the EU, they were all purchased on-line and all produced in China or other foreign countries. Pictures of products are provided.
	Metric 5: Sample Size and Variability	High	Concentrations/weight fraction measurement for 41 soft PVC consumer product samples. Duplicate determination of the sample has been performed.
	Metric 6: Temporality	High	Specific purchase data was not provided, but project was from May until December 2019.
Domain 3: Accessibility/Clarity			
	Metric 7: Reporting of Results	Medium	Individual results reported for each sample/product, but raw data was not provided, and results were not summarized across product categories.
	Metric 8: Quality Assurance	Low	Full evaluation of QA/QC was not provided.
Domain 4: Variability and Uncertainty			
	Metric 9: Variability and Uncertainty	Low	Analytic uncertainty discussed. Full evaluation of variability and uncertainty was not provided.

Overall Quality Determination   Medium

Study Citation:	Hoenicke, R., Oros, D. R., Oram, J. J., Taberski, K. M. (2007). Adapting an ambient monitoring program to the challenge of managing emerging pollutants in the San Francisco Estuary. Environmental Research 105.0(1):132-144.		
HERO ID:	789114		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Sampling Methodology	High	Detailed methods available at http://www.sfei.org/rmp/pulse/ pulse2003.pdf. Water and sediment samples using the EPA's Environmental Monitoring Program (EMAP) Generalized Random Tessellation Stratified (GRTS) sample design
	Metric 2: Analytical Methodology	Medium	Detailed methods available at http://www.sfei.org/rmp/pulse/ pulse2003.pdf. Analysis by GC–MS (Oros et al., 2003). Identification by NIST 98 mass spectral reference library or comparison with literature. Could not locate information on recoveries or calibration in text.
Domain 2: Representative			
	Metric 3: Geographic Area	High	Samples collected in San Francisco Bay
	Metric 4: Temporal	High	Number of samples varied by media, but were a minimum of 5 up to 95. Sampling covered 2 year (2002-2003). Sites covered entire Bay and repeated measurements were taken at some sites. Refer to http://www.sfei.org/rmp/pulse/ pulse2003.pdf.
	Metric 5: Exposure Scenario	High	The exposure scenario is well characterized and is of interest for the chemical. Details about the microclimate are provided.
Domain 3: Accessibility/Clarity			
	Metric 6: Availability of Database and Supporting Documents	High	Website with supporting reports are available. http://www.sfei.org/rmp/pulse/ pulse2003.pdf. https://www.sfei.org/rmp/data
	Metric 7: Reporting Results	High	Data available on website, https://www.sfei.org/rmp/data. Study provides range, DF, median.
Domain 4: Variability and Uncertainty			
	Metric 8: Variability and Uncertainty	Medium	There is a lengthy discussion of analytical uncertainty. Variability not discussed for chemicals of interest.

Overall Quality Determination   High

Study Citation: U.S. EPA, (2022). Ambient Monitoring Technology Information Center (AMTIC) - Ambient Monitoring Archive for HAPs.
HERO ID: 11195094

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Sampling Methodology	High	Widely accepted sampling methodologies, the sampling frequency, duration, and description of sampling collection are reported in columns SAMPLING_FREQUENCY_CODE, DURATION_DESC, and SAMPLE_COLLECTION_DESC.
	Metric 2:	Analytical Methodology	High	Analytical methodology described at the SAMPLE_ANALYSIS_DESC column. A description of all the methods is reported in the compendium: https://www.epa.gov/amtic/compendium-methods-determination-toxic-organic-compounds-ambient-air.
Domain 2: Representative				
	Metric 3:	Geographic Area	High	Data was collected in the United States. Columns MONITOR_LATIDUDE and MONITOR_LONGITUDE report the exact monitoring location.
	Metric 4:	Temporal	High	The database reports data from 1990-2020.
	Metric 5:	Exposure Scenario	High	The exposure scenario is the measurement of key hazardous air pollutants across cities, regions and specific areas of interest.
Domain 3: Accessibility/Clarity				
	Metric 6:	Availability of Database and Supporting Documents	High	The database is widely accepted, and guidance materials are available which describes all of the data fields.
	Metric 7:	Reporting Results	High	The database is organized, and key information is readily accessible. Raw data is provided in the output file, and a summary of statistics is presented here: https://www.epa.gov/system/files/documents/2022-10/AMA2020_annual.xlsx
Domain 4: Variability and Uncertainty				
	Metric 8:	Variability and Uncertainty	High	Variability reported in the annual statistics as variance of daily averages and percentiles. Uncertainty reported as data qualifiers.

Overall Quality Determination   High

Study Citation:	PRC Environmental Management, (1995). Final baseline risk assessment for the Jayhawk Plant in Jayhawk, Kansas, with cover letter dated 02/22/95.		
HERO ID:	666891		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	Medium	The assessment uses techniques that are from reliable sources and are generally accepted by the scientific community; however, a discussion of sampling methodology for data previously collected is limited.
Domain 2: Representative			
	Metric 2: Exposure Scenario	Medium	Characterization of geographic area with maps provided of site exposure sources, details and modeling of potential exposure, media of interest described, summary statistics and number of samples lacking within most tables, although raw data printouts provided. Data printout tables difficult to read at times.
Domain 3: Accessibility/Clarity			
	Metric 3: Documentation of References	Medium	References are available and provided, however some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty			
	Metric 4: Variability and Uncertainty	Low	Statistical summary measures of variability for concentration data lacking, robust discussion of limitations lacking, however model and exposure data uncertainties discussed.

Overall Quality Determination   **Medium**

Study Citation:	Goldberg-Zoino & Assoc Inc, (1989). Monsanto 409 building phase II - site risk characterization Everett, Massachusetts volume III with attached tables, appendices and cover letter dated 072889.		
HERO ID:	1269798		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Sampling and analytic methodologies, modeling equations reported in detail.
Domain 2: Representative			
	Metric 2: Exposure Scenario	Medium	Characterization of geographic area with map provided of site exposure sources, media of interest described, sample sizes not noted, temporal variability limited.
Domain 3: Accessibility/Clarity			
	Metric 3: Documentation of References	Medium	References are available and provided, however some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty			
	Metric 4: Variability and Uncertainty	Low	Statistical summary measures of variability for concentration data lacking for most concentration data reported (some data reports concentration range), robust discussion of limitations lacking.

Overall Quality Determination   Medium

Study Citation:	Union Carbide, (1994). Remedy selection report: River Road Landfill: Human health and environmental assessment, with cover letter dated 05/18/94.		
HERO ID:	1316263		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	Low	Low: There is only a brief discussion of sampling, however text reports investigation followed RCRA Facility Investigation (RFI) and New Jersey Department of Environmental Protection and Energy guidance.
Domain 2: Representative			
	Metric 2: Exposure Scenario	Medium	Medium: The exposure activity assessed likely represents the population/scenario/media of interest. Characterization of geographic area with maps provided of site exposure sources. Variability in sampling of soil and surface water depths. Report notes potentially exposed populations will be characterized, however details not provided within PDF. Risk characterization concludes with brief assessment of human health and environmental impact.
Domain 3: Accessibility/Clarity			
	Metric 3: Documentation of References	Medium	Medium: References are available and provided, however some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty			
	Metric 4: Variability and Uncertainty	Low	Low: Statistical summary measures of variability for concentration data lacking, discussion of limitations lacking.

Overall Quality Determination   Low

	Domain	Metric	Rating	Comments
Study Citation:		Geraghty & Miller Inc, (1994). Risk assessment for the BFGoodrich chemical division facility, Henry, Illinois with cover letter dated 05/06/94.		
HERO ID:		1333011		

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Low	Other than years and media of sample collection, sampling and analytic methodology not described. However, there is a detailed discussion of sampling assumptions provided.
Domain 2: Representative	Metric 2: Exposure Scenario	Medium	The exposure activity assessed likely represents the population/scenario/media of interest. Characterization of geographic area with maps provided of site exposure sources, however characterization of population at risk lacking.
Domain 3: Accessibility/Clarity	Metric 3: Documentation of References	Medium	References are available and provided, however some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty	Metric 4: Variability and Uncertainty	Medium	Statistical summary measures of variability for concentration data for some, but not all reported concentrations in tables. Discussion of uncertainties detailed.

Overall Quality Determination   **Medium**

Study Citation: Woodward-Clyde Consultants, (1993). BFGoodrich Akron plant risk assessment with cover letter dated 01/06/1994.
HERO ID: 1333013

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Standard EPA methodology for modeled concentration data and risk described and referenced. Sampling methods for primary sampling data not detailed, however quality assurance review conducted.
Domain 2: Representative				
	Metric 2:	Exposure Scenario	High	The exposure activity assessed likely represents the population/scenario/media of interest. Characterization of geographic area with maps provided of site exposure sources, characterization of residential population at risk, and temporality consideration for risk estimations of future residential exposures.
Domain 3: Accessibility/Clarity				
	Metric 3:	Documentation of References	Medium	References are available and provided, however some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty				
	Metric 4:	Variability and Uncertainty	Medium	The study characterizes variability in the population/media studied for most reported result tables, key uncertainties in risk assessment and exposure data identified that are unlikely to have a substantial impact on results.

Overall Quality Determination   **Medium**

Study Citation:	Wehran-New York,, Inc., (1990). Risk assessment for Buffalo Color area D.		
HERO ID:	1335671		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	The assessment describes sampling methodology in detail and uses technical approaches generally accepted by the scientific community with assumptions, measurements and models documented and described and no perceived errors in logic.
Domain 2: Representative			
	Metric 2: Exposure Scenario	Medium	The exposure activity assessed likely represents the population/scenario/media of interest. Characterization of geographic area with maps provided of site exposure sources, characterization of residential population at risk lacking in terms of demographics however detailed discussion of potential pathways of exposure.
Domain 3: Accessibility/Clarity			
	Metric 3: Documentation of References	Medium	References are available and provided, however some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty			
	Metric 4: Variability and Uncertainty	Medium	The study characterizes variability in the population/media studied for some reported result tables, key uncertainties in risk assessment and exposure data identified that are unlikely to have a substantial impact on results.

Overall Quality Determination   Medium

Study Citation: Dow Environmental Inc, (1996). The Dow Chemical Company Slaughter Road site baseline risk assessment report with cover letter dated 01/05/96.
HERO ID: 1335695

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	The assessment utilizes methods generally accepted by the scientific community for sampling and risk assessment. Followed EPA guideline.
Domain 2: Representative				
	Metric 2:	Exposure Scenario	Medium	The exposures likely represent the population scenarios of interest, with potentially exposed populations, geographic maps, and potential exposure pathways discussed.
Domain 3: Accessibility/Clarity				
	Metric 3:	Documentation of References	Medium	References are available and provided, however some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty				
	Metric 4:	Variability and Uncertainty	High	Characterization of variability within statistical summary modeled results included standard deviation, standard error, range and variation within reported results tables. Discussion of uncertainties presented.

Overall Quality Determination   High

Study Citation:	Radian Corp, (1995). Initial submission: Baseline risk assessment for the Jayhawk site Galena, Kansas with attachments and cover letter dated 030195.		
HERO ID:	1482017		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	The methodology is well described across the document, equations reported inside tables
Domain 2: Representative			
	Metric 2: Exposure Scenario	High	Exposure to contaminants from the Jayhawk chemical site
Domain 3: Accessibility/Clarity			
	Metric 3: Documentation of References	High	Reported data well documented
Domain 4: Variability and Uncertainty			
	Metric 4: Variability and Uncertainty	Medium	Section 2.4.5 reports uncertainty. No statistics of variability reported

Overall Quality Determination   High

Study Citation:	Rohm and Haas, (1988). Biological risk assessment for the Redwood City facility {\&} final site investigation report for the Rohm and Haas Redwood City facility with attachments {\&} cover letter dated 092588 (Part a).		
HERO ID:	1745617		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	The methodology for the risk assessment is well described. Soil and groundwater monitoring methods in sections 2.1 and 2.2. Air quality methodology in section 6
Domain 2: Representative				
	Metric 2:	Exposure Scenario	High	Fish and wildlife exposure to selected contaminants in the groundwater beneath the Rohm and Hass facility in Redwood City
Domain 3: Accessibility/Clarity				
	Metric 3:	Documentation of References	High	Data inputs, references all reported in the study
Domain 4: Variability and Uncertainty				
	Metric 4:	Variability and Uncertainty	Medium	Variability across matrices not reported in terms of summary of statistics . Limitations reported in the text

Overall Quality Determination   High

Study Citation:	Wang, W., Wu, F. Y., Huang, M. J., Kang, Y., Cheung, K. C., Wong, M. H. (2013). Size fraction effect on phthalate esters accumulation, bioaccessibility and in vitro cytotoxicity of indoor/outdoor dust, and risk assessment of human exposure. Journal of Hazardous Materials 261:753-762.		
HERO ID:	2000934		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Limited description of the assessment methodology in the main manuscript. Details about the risk assessment are available in the supplementary material.
Domain 2: Representative			
	Metric 2: Exposure Scenario	High	Data closely represent relevant exposure scenarios.
Domain 3: Accessibility/Clarity			
	Metric 3: Documentation of References	High	References are available for all reported data.
Domain 4: Variability and Uncertainty			
	Metric 4: Variability and Uncertainty	Medium	Variability was characterized, uncertainties and limitations were not discussed.

Overall Quality Determination   High

Study Citation:	Chang, J. W., Yan, B. R., Chang, M. H., Tseng, S. H., Kao, Y. M., Chen, J. C., Lee, C. C. (2014). Cumulative risk assessment for plasticizer-contaminated food using the hazard index approach. Environmental Pollution 189:77-84.		
HERO ID:	2345995		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	The study describes sampling, analysis and models in detail.
Domain 2: Representative			
	Metric 2: Exposure Scenario	High	Exposure to phthalates in food.
Domain 3: Accessibility/Clarity			
	Metric 3: Documentation of References	High	Data reported in both main text and supplementary information.
Domain 4: Variability and Uncertainty			
	Metric 4: Variability and Uncertainty	Medium	Variability is reported across the data, no limitations reported.

Overall Quality Determination   High

Study Citation:	CHAP, (2014). Chronic Hazard Advisory Panel on phthalates and phthalate alternatives (with appendices).		
HERO ID:	2439960		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Report by the Chronic Hazard Advisory Panel on Phthalates and Phthalate Alternative. Systematic review process reported in page 11.
Domain 2: Representative			
	Metric 2: Exposure Scenario	High	Worldwide HBM data from 1988 to 2007 reported.
Domain 3: Accessibility/Clarity			
	Metric 3: Documentation of References	High	References available.
Domain 4: Variability and Uncertainty			
	Metric 4: Variability and Uncertainty	High	Variability and uncertainty reported in section 4.1.

Overall Quality Determination　　　　　　　High

Study Citation:	Li, R., Liang, J., Gong, Z., Zhang, N., Duan, H. (2017). Occurrence, spatial distribution, historical trend and ecological risk of phthalate esters in the Jiulong River, Southeast China. Science of the Total Environment 580(Elsevier):388-397.		
HERO ID:	3483279		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Scientifically sound methodology.
Domain 2: Representative			
	Metric 2: Exposure Scenario	High	Data closely represent exposure scenarios of interest.
Domain 3: Accessibility/Clarity			
	Metric 3: Documentation of References	High	References are available for all reported data.
Domain 4: Variability and Uncertainty			
	Metric 4: Variability and Uncertainty	Medium	Characterized variability, limited description of uncertainties.

Overall Quality Determination   High

Study Citation:	Giovanoulis, G., Bui, T., Xu, F., Papadopoulou, E., Padilla-Sanchez, J. A., Covaci, A., Haug, L. S., Cousins, A. P., Magnér, J., Cousins, I. T., de Wit, C. A. (2017). Multi-pathway human exposure assessment of phthalate esters and DINCH. Environment International 112:115-126.
HERO ID:	4166920

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	High	Monitoring methodology, equipment and storage are reported. Analytical methods and instrument reported. Modeling equations and inputs are reported with references.
Domain 2: Representative				
	Metric 2:	Exposure Scenario	Medium	The study measured daily intake through inhalation, dermal and oral of phthalates. However, sampling was done 2013-104 in Norwegian and may not represent scenarios in the US.
Domain 3: Accessibility/Clarity				
	Metric 3:	Documentation of References	High	References are available for all reported data, inputs, and defaults.
Domain 4: Variability and Uncertainty				
	Metric 4:	Variability and Uncertainty	High	Characterized variability through different media tested. The study discussed uncertainties and limitations.

Overall Quality Determination   High

Study Citation:	U.S. Consumer Product Safety Commission (CPSC) (2015). Estimated phthalate exposure and risk to pregnant women and women of reproductive age as assessed using four NHANES biomonitoring data sets (2005/2006, 2007/2008, 2009/2010, 2011/2012).		
HERO ID:	5155509		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	The study reports the considerations used for daily intakes, hazard quotients and the use of the biomonitoring data.
Domain 2: Representative			
	Metric 2: Exposure Scenario	High	Phthalate exposure and risk to pregnant women and women of reproductive age.
Domain 3: Accessibility/Clarity			
	Metric 3: Documentation of References	High	The study reports the references from NHANES data.
Domain 4: Variability and Uncertainty			
	Metric 4: Variability and Uncertainty	Medium	The study reports variability across different populations.

Overall Quality Determination   High

Study Citation:	EC/HC, (2017). Draft screening assessment: Phthalate substance grouping.
HERO ID:	5353181

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Most of the techniques and assumptions cited references, with models providing equations and inputs.
Domain 2: Representative				
	Metric 2:	Exposure Scenario	High	The data closely represent relevant exposure scenarios related to phthalates in water bodies from Canada, consumer products, and biomonitoring daily intakes.
Domain 3: Accessibility/Clarity				
	Metric 3:	Documentation of References	Medium	References are available for most reported data, inputs, and defaults; however, some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty				
	Metric 4:	Variability and Uncertainty	High	Variability (arithmetic mean, percentiles) and uncertainty were characterized in detail throughout the report.

Overall Quality Determination   **High**

Study Citation:	Anderson, D., Dicianna, D., Yance, J., Tarnay, A. (1989). Preliminary data summary for the solvent recycling industry.
HERO ID:	5478191

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Methodology	Medium	Sampling are referenced in other sources for each plant in section 5.3.1. Analytical methods and instrument are reported, including detection limit range. Simple standard dilution model used to calculate effluent concentrations in Section 6, although effluent concentrations don't appear to reported.
Domain 2: Representative				
	Metric 2:	Exposure Scenario	Medium	The study measured chemicals in wastewater. However, the study and sampling dates are old (1986 and 1987).
Domain 3: Accessibility/Clarity				
	Metric 3:	Documentation of References	Low	Document is well referenced, but many references don't appear to be published.
Domain 4: Variability and Uncertainty				
	Metric 4:	Variability and Uncertainty	Medium	Data specifically examined for three facilities. Some discussions of analytical uncertainties provided.

Overall Quality Determination   **Medium**

Study Citation:	Christia, C., Poma, G., Harrad, S., De Wit, C. A., Sjostrom, Y., Leonards, P., Lamoree, M., Covaci, A. (2019). Occurrence of legacy and alternative plasticizers in indoor dust from various EU countries and implications for human exposure via dust ingestion and dermal absorption. Environmental Research 171:204-212.		
HERO ID:	5772597		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Monitoring methods, equipment and storage were reported. Analytical methods and instrument reported. Modeling equations and inputs provided with references.
Domain 2: Representative			
	Metric 2: Exposure Scenario	Medium	The study analyzed exposure to indoor dust, with samples taken from 2016-2017. However, the study was conducted in Europe and may not be representative of the US.
Domain 3: Accessibility/Clarity			
	Metric 3: Documentation of References	High	References are available for all reported data, inputs, and defaults.
Domain 4: Variability and Uncertainty			
	Metric 4: Variability and Uncertainty	Medium	The study characterized variability with different seasons and microenvironments measured. There is no description of uncertainty.

Overall Quality Determination   High

Study Citation:	Danish EPA, (2009). Survey and health assessment of the exposure of 2 year-olds to chemical substances in consumer products.		
HERO ID:	6302975		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	The study reports the methodology for selecting the consumer products, laboratory methods for chemical analysis, migration analysis, and calculation of exposure.
Domain 2: Representative			
	Metric 2: Exposure Scenario	High	This study is a health assessment to evaluate the exposure of 2-year-olds to selective chemicals in consumer products including toys and clothing.
Domain 3: Accessibility/Clarity			
	Metric 3: Documentation of References	High	The references are available for all the reported data.
Domain 4: Variability and Uncertainty			
	Metric 4: Variability and Uncertainty	High	The study characterizes the variability of chemicals and exposure in a range of consumer products. The limitations of the study are reported in the conclusion section page 260.

Overall Quality Determination   High

Study Citation:	Danish EPA, (2011). Annex XV restriction report: Proposal for a restriction, version 2. Substance name: bis(2-ehtylhexyl)phthlate (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), diisobutyl phthalate (DIBP).		
HERO ID:	7265437		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	The assessment uses technical approaches generally accepted by the scientific community and provides detailed methods of sampling, with assumptions, uncertainties in sampling presented.
Domain 2: Representative			
	Metric 2: Exposure Scenario	Medium	Exposure activity assessed likely represents the scenario of interest with consumer product exposures and estimated daily dose from exposure environments (indoor air, household dust, food and biomonitoring results from previous studies) described.
Domain 3: Accessibility/Clarity			
	Metric 3: Documentation of References	Medium	References are available and provided, however some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty			
	Metric 4: Variability and Uncertainty	Medium	Study characterization of variability presented within most results; discussion of key assumptions and study limitations extensive.

Overall Quality Determination   **Medium**

Study Citation:	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates: Annexes.		
HERO ID:	7325405		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	Medium	The assessment uses technical approaches generally accepted by the scientific community and lacks a literature flow diagram but provides details on databases and search terms utilized.
Domain 2: Representative			
	Metric 2: Exposure Scenario	Medium	Exposure activity assessed likely represents the scenario of interest, some key details on geographic location of sampling lacking but consumer product exposures and estimated daily dose from exposure environments from previous studies described.
Domain 3: Accessibility/Clarity			
	Metric 3: Documentation of References	Medium	References are available and provided, however some references may not be publicly available or are not from peer reviewed sources.
Domain 4: Variability and Uncertainty			
	Metric 4: Variability and Uncertainty	Medium	Study characterization of variability presented within some results; discussion of key assumptions and study limitations and assumptions in exposure modeling presented within text and tables.

Overall Quality Determination   Medium

Study Citation: Danish EPA, (2012). Survey No. 117: Exposure of pregnant consumers to suspected endocrine disruptors.
HERO ID: 10622425

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	The assessment reports the methodology to assess concentrations in selected consumer products and the methods to evaluate the exposure.
Domain 2: Representative			
	Metric 2: Exposure Scenario	High	This health assessment evaluates the exposure of pregnant women to a selected chemicals by the use of consumer products.
Domain 3: Accessibility/Clarity			
	Metric 3: Documentation of References	High	References are available for all reported data, inputs, and defaults.
Domain 4: Variability and Uncertainty			
	Metric 4: Variability and Uncertainty	Medium	Variability of concentrations is reported for selected consumer products, but the results do not report statistical variability. Some limitations are reported in the conclusion section.

Overall Quality Determination   High

Study Citation:	Koo, J. W., Parham, F., Kohn, M. C., Masten, S. A., Brock, J. W., Needham, L. L., Portier, C. J. (2002). The association between biomarker-based exposure estimates for phthalates and demographic factors in a human reference population. Environmental Health Perspectives 110(4):405-410.		
HERO ID:	673288		

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	Equations for estimating intakes and intermediate values required are all provided, described, and cited (Kohn et al).
	Metric 2:	Model Evaluation	High	Regression analysis conducted in LIFEREG, SAS 8.0, widely accepted. The model is from peer reviewed study and has undergone evaluation.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Concentration data used in model from 2000 and limited discussion of exposure factors.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	Low	SAS 8.0 is not freely and publicly available. Some references might not be publicly available.
	Metric 5:	Model Inputs and Defaults	High	Fractional excretions are provided with descriptions, all inputs are provided.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	Low standard error in regression estimates and significant demographic variations in exposure and metabolism of phthalates; some discussion on uncertainty related to sufficient data, range of data sources, issues and assumptions relating to estimates from metabolites.

Overall Quality Determination   Medium

Study Citation:	David, R. M. (2000). Exposure to phthalate esters. Environmental Health Perspectives 108(10):A440.
HERO ID:	675063

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	Medium	Equation for estimating daily intake from measured urinary concentrations provided, with citation to source that is not publicly available to review methodology.
	Metric 2:	Model Evaluation	Medium	Limited discussion on methodology for converting concentrations to intakes. Some reference to other agencies/studies doing similar work.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Response to a 2000 study (Blount et al) using NHANES data for urinary levels of phthalate ester metabolites.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	Low	Equation is provided but methodology/source cannot be publicly accessed.
	Metric 5:	Model Inputs and Defaults	Medium	Inputs are described but values not provided; may be available in the Blount et al. paper referenced.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Low	Limited discussion of uncertainties and variability; 95th percentile and highest values provided for comparison.

Overall Quality Determination   **Low**

Study Citation:		Kohn, M. C., Parham, F., Masten, S. A., Portier, C. J., Shelby, M. D. (2000). Human exposure estimates for phthalates. Environmental Health Perspectives 108(10):A440-A442.		
HERO ID:		675254		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	Daily exposure is estimated using a linear 2-compartment model, with equations 1 & 2 provided for total and urinary excretion fractions (and rate constants), and equation 3 for individual intake.
	Metric 2:	Model Evaluation	Medium	Model has at least limited evaluation through comparison with data from other models.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Low	Article is from 2000; >15 years and may not represent current exposures.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	There is some documentation available in the data source; this article is cited in other studies.
	Metric 5:	Model Inputs and Defaults	Medium	Inputs and defaults are generally identified, referenced and described. Metabolite concentrations may be found in Blount et al 2000.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	Measures of uncertainty are discussed on pp. A441 and A442. Limitations not discussed.

Overall Quality Determination   **Medium**

| Study Citation: | Tan, B. L., Hawker, D. W., Muller, J. F., Leusch, F. D., Tremblay, L. A., Chapman, H. F. (2007). Modelling of the fate of selected endocrine disruptors in a municipal wastewater treatment plant in South East Queensland, Australia. Chemosphere 69(4):644-654. |
| **HERO ID:** | 675442 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	Medium	Most equations were referenced from peer reviewed sources. Mass balance approach was explained and a scientifically sound approach.
	Metric 2:	Model Evaluation	Medium	Many studies were referenced supporting the current approach. Evaluation was conducted by author of study (reported good correlation between measured and estimated effluent concentrations)
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Low	Exposure scenario of > 15 years ago
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	Low	Many different peer reviewed papers were referenced; not all of free to the public
	Metric 5:	Model Inputs and Defaults	High	All inputs were defined, values provided, and referenced when applicable.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	some discussion included on variability and uncertainty.

Overall Quality Determination   Medium

| | Study Citation: | Björklund, K., Cousins, A. P., Strömvall, A. M., Malmqvist, P. A. (2009). Phthalates and nonylphenols in urban runoff: Occurrence, distribution and area emission factors. Science of the Total Environment 407(16):4665-4672. |
| HERO ID: | | 679890 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	Medium	The QWASI model is a known model and information about the sedimentation rates is reported in the supplemental file.
	Metric 2:	Model Evaluation	Medium	Though the model appears to be a reputable one, however, it has not previously been used for the current purpose of this study.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Low	The scenario is of potential interest, but the data is more than 5 years old and is from Sweden rather than the US.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	The QWASI model does appear to be available online and model references are in the study and supplemental.
	Metric 5:	Model Inputs and Defaults	High	Table S2 of the supplemental material appears to list the input values used - most are noted as either defaults in the QWASI model, or based on the monitoring data.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	There is some discussion of variability and the potential shortfalls of the QWASI model for the scenario described.

Overall Quality Determination   Medium

Study Citation:		Fromme, H., Gruber, L., Schlummer, M., Wolz, G., Bohmer, S., Angerer, J., Mayer, R., Liebl, B., Bolte, G. (2007). Intake of phthalates and di(2-ethylhexyl)adipate: Results of the Integrated Exposure Assessment Survey based on duplicate diet samples and biomonitoring data. Environment International 33(8):1012-1020.	
HERO ID:		680285	

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	Intake modeling equation is given and appears to be based on previously published and peer-reviewed material.
	Metric 2:	Model Evaluation	Medium	The intake equation used for modeling is cited as being based on two previous papers. There is no specific evaluation of its appropriateness for this group of chemicals.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Low	Data was collected at some point between late 2005 and 2007, so it may not reflect current exposure conditions. The population of the study was German, so results may not correspond to US populations.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	The model intake equation input variables are given in the paper.
	Metric 5:	Model Inputs and Defaults	High	The input values that were used are provided in the paper, and are cited to previous peer-reviewed works.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	There is discussion of variability within the subjects, and there is a discussion of the limitations of the approach used for calculation.

Overall Quality Determination   Medium

Study Citation:	Kondo, F., Ikai, Y., Hayashi, R., Okumura, M., Takatori, S., Nakazawa, H., Izumi, S., Makino, T. (2010). Determination of five phthalate monoesters in human urine using gas chromatography-mass spectrometry. Bulletin of Environmental Contamination and Toxicology 85(1):92-96.		
HERO ID:	697322		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	This study uses a standard equation for estimating phthalate intake from urinary metabolites (Kohn et al. 2000; Koch et al.2003; Itoh et al. 2005).
	Metric 2:	Model Evaluation	High	The equation used in this paper is frequently used in the literature for this purpose and is peer reviewed.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Low	The biomonitoring scenario is relevant, but the data is more than five years old, and was collected in Japan rather than the US.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	The intake equation and the necessary input variables are given in this paper and referenced.
	Metric 5:	Model Inputs and Defaults	High	The values used are inputs are provided, and are cited to previous peer-reviewed works.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	There is some discussion of variability and uncertainty in the paper's approach and its results. Limitations are not described.

Overall Quality Determination   **High**

Study Citation:	Lin, S., Ku, H., Su, P., Chen, J., Huang, P., Angerer, J., Wang, S. (2011). Phthalate exposure in pregnant women and their children in central Taiwan. Chemosphere 82(7):947-955.		
HERO ID:	699479		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Mathematical Equations	High	Estimated daily intake equation provided with an example calculation; intermediate equation also provided for parent compounds from metabolite concentrations
	Metric 2: Model Evaluation	Low	No evaluation indicated in the study, but assumption of some degree due to peer review publication.
Domain 2: Representative			
	Metric 3: Exposure Scenario	Medium	2011 study with data going back to 2001 limits temporal relevance and data are specific to Taiwanese population, which may limit spatial relevance to US as well.
Domain 3: Accessibility/Clarity			
	Metric 4: Model and Model Documentation Availability	High	Equations and inputs can be followed. Additional documentation not needed.
	Metric 5: Model Inputs and Defaults	High	All inputs are provided with references where needed or calculations where appropriate.
Domain 4: Variability and Uncertainty			
	Metric 6: Variability and Uncertainty	Medium	Some variability in the population and media (exposure via urine, milk, blood vs plastics) discussed. Some discussion of uncertainties around additive effects and secretion fractions.

Overall Quality Determination   **Medium**

Study Citation:		Guo, Y., Wu, Q., Kannan, K. (2011). Phthalate metabolites in urine from China, and implications for human exposures. Environment International 37(5):893-898.	
HERO ID:		787930	

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	Medium	Section 3.3 includes the equation used to calculate estimated daily intake. However, the source of the equation is not reported.
	Metric 2:	Model Evaluation	Medium	The daily intake equation in section 3.3 resembles others found in the literature, but does not appear to use creatine excretion as a factor.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Low	The data in this study is between 5 and 15 years old, and is drawn from the Chinese population. The biomonitoring scenario is of interest, but the results may not be fully applicable to the current US population.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	The intake modeling equation is given in the paper, and the required input variables are described.
	Metric 5:	Model Inputs and Defaults	Medium	Input values used for variables are generally provided; most are cited to Chinese government references.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Low	There is no specific discussion of variability or uncertainty pertaining to the results of the modeling. Limitations are not reported.

Overall Quality Determination   Medium

	Domain	Metric	Rating	Comments
Study Citation:	Frederiksen, H., Aksglaede, L., Sorensen, K., Skakkebaek, N. E., Juul, A., Andersson, A. M. (2011). Urinary excretion of phthalate metabolites in 129 healthy Danish children and adolescents: Estimation of daily phthalate intake. Environmental Research 111(5):656-663.			
HERO ID:	787933			

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	The estimated daily intake equation is provided in Section 2.4.
	Metric 2:	Model Evaluation	High	The equation used here is of a type frequently used in the literature for this purpose, and is cited to a previous peer-reviewed study.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Low	The data used in this study is between 5 and 15 years old, and is taken from Danish sources. The scenario is of interest, but the results may not be entirely applicable to the current US population.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	The equation used for modeling intakes is provided in this paper, and the required input variables are described. Equation is from peer reviewed source and has been reviewed.
	Metric 5:	Model Inputs and Defaults	High	The inputs are either based on the monitoring results, or are cited from previous peer-reviewed sources.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	High	There is some discussion of how variability in storage conditions may have affected the monitoring samples, which were used in calculating the daily intake values. Limitations are described for the estimated DI.

Overall Quality Determination   High

Study Citation:	Fromme, H., Gruber, L., Seckin, E., Raab, U., Zimmermann, S., Kiranoglu, M., Schlummer, M., Schwegler, U., Smolic, S., Völkel, W. (2011). Phthalates and their metabolites in breast milk - Results from the Bavarian Monitoring of Breast Milk (BAMBI). Environment International 37(4):715-722.
HERO ID:	787934

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	Low	Equation used to estimate daily intakes not provided. Variables used are described.
	Metric 2:	Model Evaluation	Low	No discussion of model evaluation. Intakes compared to TDIs and assumption of some evaluation based on peer review publication.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Monitoring data used for concentrations in modeled doses collected from BAMBI survey, specific to German/Bavarian mothers. May not be exactly comparable to US. Study published in 2011.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	Low	Intake equation(s) not provided.
	Metric 5:	Model Inputs and Defaults	Low	Inputs are provided but cannot validate/ensure relevance without the model equation.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	Uncertainties discussed in monitoring/concentration data around detection levels and assumptions made. Some variability in the population of mothers of the infants.

Overall Quality Determination   Low

Study Citation:	Guo, Y., Alomirah, H., Cho, H. S., Minh, T. B., Mohd, M. A., Nakata, H., Kannan, K. (2011). Occurrence of phthalate metabolites in human urine from several Asian countries. Environmental Science & Technology 45(7):3138-3144.		
HERO ID:	787935		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Mathematical Equations	High	Equation provided for simple steady-state DI exposure model.
Metric 2:	Model Evaluation	Low	Limited discussion of the methodology, it is unclear whether the model has undergone evaluation.
Domain 2: Representative			
Metric 3:	Exposure Scenario	Low	Urine samples collected 2006-2007; Asian countries.
Domain 3: Accessibility/Clarity			
Metric 4:	Model and Model Documentation Availability	Low	Some description in text but no documentation. Scored conservatively - simple model so information may be publicly available/widely understood.
Metric 5:	Model Inputs and Defaults	High	Model inputs are discussed and provided and reference US EPA values.
Domain 4: Variability and Uncertainty			
Metric 6:	Variability and Uncertainty	Medium	There is some discussion of variability in the different countries modeled and limitation that the DI are probably overestimated.

Overall Quality Determination   Medium

Study Citation:	Otake, T., Yoshinaga, J., Yanagisawa, Y. (2004). Exposure to phthalate esters from indoor environment. Journal of Exposure Science & Environmental Epidemiology 14(7):524-528.		
HERO ID:	789515		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Mathematical Equations	Medium	A basic equation is provided with the values populated (not variables) indicating intake of concentration times inhalation rate (volume/day).
Metric 2:	Model Evaluation	Low	The basic multiplication model is not strictly evaluated, but the intake outputs are compared to intakes from other studies.
Domain 2: Representative			
Metric 3:	Exposure Scenario	Medium	Exposure to and inhalation of VOCs in homes using measured concentrations represent relevant conditions, but the samples are from Tokyo and represent conditions of 5-10 years old.
Domain 3: Accessibility/Clarity			
Metric 4:	Model and Model Documentation Availability	High	Intake estimates can be followed based on documentation provided.
Metric 5:	Model Inputs and Defaults	High	Inputs (concentration and inhalation rate) are provided with citations.
Domain 4: Variability and Uncertainty			
Metric 6:	Variability and Uncertainty	Medium	Intakes are presented for maximum, median, and mean scenarios based on the respective concentrations measured in the study; limited variability in the inhalation rates or other exposure factors. Some discussion of limitations and uncertainties.

Overall Quality Determination   Medium

Study Citation:		Schlumpf, M., Kypke, K., Wittassek, M., Angerer, J., Mascher, H., Mascher, D., Vökt, C., Birchler, M., Lichtensteiger, W. (2010). Exposure patterns of UV filters, fragrances, parabens, phthalates, organochlor pesticides, PBDEs, and PCBs in human milk: correlation of UV filters with use of cosmetics. Chemosphere 81(10):1171-1183.	
HERO ID:		1249442	

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	Medium	Equations for intake of chemicals analyzed in milk fat and intake of parabens and phthalates for dose provided in text. No citation provided for parabens and phthalates but appears standard and scientifically sound.
	Metric 2:	Model Evaluation	Medium	No indication of evaluation of for parabens and phthalates equation, seems to be conducted by author.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Exposure is specific to infants ingesting breast milk; the paper proposes a correlation of breast milk concentrations with use of personal care products and certain diets, but that does not necessarily modify the infant intake scenario.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	Low	Milk fat equation reference provided, but not for parabens and phthalates equation.
	Metric 5:	Model Inputs and Defaults	Medium	Daily intake of chemicals by milk are reported in table 7. Some inputs have citations. However, methods for calculations are unclear.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Low	Minimal discussion of variability or uncertainty. Some discussion on the lack of data and studies related to temporal variability of human exposure.

Overall Quality Determination   **Medium**

Study Citation: Weschler, C. J., Nazaroff, W. W. (2012). SVOC exposure indoors: Fresh look at dermal pathways. Indoor Air 22(5):356-377.
HERO ID: 1315313

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	All equations are provided in detail with cited references, assuming some validity based on previous peer review
	Metric 2:	Model Evaluation	Medium	Model equations discussed across studies and some estimates compared to other studies
Domain 2: Representative				
	Metric 3:	Exposure Scenario	High	Dermal exposure to chemicals is a relevant scenario and can be applied to a variety of products; Data used in the models is from USEPA study of Children's Total Exposure to Persistent Pesticides and Other Persistent Organic Pollutants (CTEPP)
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	Model can be followed through in order of presentation with use of references, no user guide needed
	Metric 5:	Model Inputs and Defaults	High	All inputs are provided with citations for values or equations
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	High	Discussion of chemical specific properties and other pathways not covered by the presented models as limitations; uncertainties discussed around assumption of equilibrium

Overall Quality Determination   **High**

		Domain	Metric	Rating	Comments

Study Citation: Frederiksen, H., Nielsen, J. K., Mørck, T. A., Hansen, P. W., Jensen, J. F., Nielsen, O., Andersson, A. M., Knudsen, L. E. (2013). Urinary excretion of phthalate metabolites, phenols and parabens in rural and urban Danish mother-child pairs. International Journal of Hygiene and Environmental Health 216(6):772-783.

HERO ID: 1588874

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Mathematical Equations	Medium	Equations are referenced and from peer reviewed sources.
Metric 2:	Model Evaluation	Low	Equations are from and in peer reviewed sources; no more formal evaluation mentioned.
Domain 2: Representative			
Metric 3:	Exposure Scenario	Medium	Exposure from 2011; between 5 - 15 years ago.
Domain 3: Accessibility/Clarity			
Metric 4:	Model and Model Documentation Availability	Low	Some of the referenced sources for the equations are not free to the public.
Metric 5:	Model Inputs and Defaults	High	Model inputs are defined, values are provided and referenced when applicable.
Domain 4: Variability and Uncertainty			
Metric 6:	Variability and Uncertainty	Medium	Discussion included on variability and uncertainty; the use of metabolites for parent compounds was addressed.

Overall Quality Determination   Medium

Study Citation:	Zeman, F. A., Boudet, C., Tack, K., Floch Barneaud, A., Brochot, C., Péry, A. R., Oleko, A., Vandentorren, S. (2013). Exposure assessment of phthalates in French pregnant women: Results of the ELFE pilot study. International Journal of Hygiene and Environmental Health 216(3):271-279.		
HERO ID:	1588878		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	Equation provided and well-described for daily intake calculated from urinary phthalate metabolites (from Kohn et al., 2000). Scenario-based exposure media model (Wormuth et al., 2006) was also used for comparison but was not as well described.
	Metric 2:	Model Evaluation	Medium	Some evaluation and comparison with other models; foreign study.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Samples collected fall 2007, French study.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	Low	Limited documentation was provided; additional documentation might be found in cited references.
	Metric 5:	Model Inputs and Defaults	Medium	Inputs are generally identified, especially for calculation of daily intake from metabolites.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	Large sample size but study was considered a pilot and some uncertainties were identified.

Overall Quality Determination   **Medium**

| Study Citation: | Cheng, Z., Nie, X. P., Wang, H. S., Wong, M. H. (2013). Risk assessments of human exposure to bioaccessible phthalate esters through market fish consumption. Environment International 57-58:75-80. |
| **HERO ID:** | 1600107 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	Estimated daily intake equation and inputs are found in section 2.5 and are from USEPA sources.
	Metric 2:	Model Evaluation	High	The estimated daily intake equation is cited to a USEPA reference.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Study is more than 5 years old and based on data from Chinese sources which may not necessarily reflect the dietary intake of the US population.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	Intake equation and necessary input variables are provided in the paper.
	Metric 5:	Model Inputs and Defaults	High	Input values are provided and are based mostly on USEPA references.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	There is discussion of variability by using adult and children body weights for inputs. There is no discussion of limitations or uncertainties.

Overall Quality Determination — High

Study Citation: Monsanto Chemical Company, (1995). Whole effluent and chemical specific evaluation (o-dichlorobenzene) of Monsanto's Antwerp plant aqueous discharge, with cover letter dated 07/10/95.

HERO ID: 2048254

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Mathematical Equations	Critically Deficient	Equations are not provided for the extrapolation between measured concentration and concentration in the receiving stream. Paper only mentions a computerized Lotus spreadsheet was used.
	Metric 2: Model Evaluation	Critically Deficient	It is unknown if the model has undergone evaluation.
Domain 2: Representative			
	Metric 3: Exposure Scenario	Low	Paper appears to originate in 1995.
Domain 3: Accessibility/Clarity			
	Metric 4: Model and Model Documentation Availability	Low	No model documentation is available.
	Metric 5: Model Inputs and Defaults	Medium	There is some description on what the inputs were in the estimated concentration of the receiving stream.
Domain 4: Variability and Uncertainty			
	Metric 6: Variability and Uncertainty	Low	There is little discussion on variability and uncertainty.

Overall Quality Determination   Uninformative

Study Citation:	Shen, L., Xia, B., Dai, X. (2013). Residues of persistent organic pollutants in frequently-consumed vegetables and assessment of human health risk based on consumption of vegetables in Huizhou, South China. Chemosphere 93(10):2254-2263.		
HERO ID:	2149595		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Mathematical Equations	High	Weight-specific daily intake equations are provided in section 2.6.
	Metric 2: Model Evaluation	High	The intake equations appear to be of the standard type, and the results are evaluated by comparing them against similar studies from around the world.
Domain 2: Representative			
	Metric 3: Exposure Scenario	Medium	This study is more than five years old and based on data collected in China, so it may not accurately reflect the US population.
Domain 3: Accessibility/Clarity			
	Metric 4: Model and Model Documentation Availability	High	The intake equations are provided and the required input variables are described.
	Metric 5: Model Inputs and Defaults	Medium	Model inputs appear to be based partly on monitoring data and survey results, and partly on previous published values which are cited.
Domain 4: Variability and Uncertainty			
	Metric 6: Variability and Uncertainty	Medium	There was some discussion of what might account for variation found between different categories of vegetables.

Overall Quality Determination   **High**

Study Citation:	Fromme, H., Lahrz, T., Kraft, M., Fembacher, L., Dietrich, S., Sievering, S., Burghardt, R., Schuster, R., Bolte, G., Völkel, W. (2013). Phthalates in German daycare centers: Occurrence in air and dust and the excretion of their metabolites by children (LUPE 3). Environment International 61:64-72.		
HERO ID:	2215411		

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	The equation for total daily intake of phthalates as estimated using urinary metabolite concentrations was provided and referenced (David 2000) in Section 2.6, p. 66.
	Metric 2:	Model Evaluation	Medium	Accepted model (David 2000) has been cited in other references.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Study was conducted 2011-2012 at German daycare centers.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	Low	Possible incorrect reference citation. Refer to HERO #675063, which includes David 2000 and Kohn et al. 2000; Equation in study under review looks like equation from Kohn et al.
	Metric 5:	Model Inputs and Defaults	High	Model inputs and defaults, with references, are provided in section 2.6, p. 66.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	Large study of young children in German daycare centers. Uncertainty is discussed regarding inappropriateness of creatinine-adjustment of samples from children, and also in terms of sample timing relative to half-life of analyses.

Overall Quality Determination   Medium

| Study Citation: | Shin, H. M., Mckone, T. E., Nishioka, M. G., Fallin, M. D., Croen, L. A., Hertz-Picciotto, I., Newschaffer, C. J., Bennett, D. H. (2014). Determining source strength of semivolatile organic compounds using measured concentrations in indoor dust. Indoor Air 24(3):260-271. |
| HERO ID: | 2215665 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	Most equations provided in text, with additional equations and figures provided in the supplemental file with citations; equations for surface area emission rates, gas/dust concentrations, and saturation concentrations.
	Metric 2:	Model Evaluation	Medium	All equations have peer reviewed citations, estimated emission rates only compared to reported values in two studies for DEHP.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Estimates and models relevant for plastics and building materials but not personal care products.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	Equations are all provided and supplemental documentation is available.
	Metric 5:	Model Inputs and Defaults	Medium	Inputs listed in supplemental table 2 and throughout paper after their relevant equations; most of the inputs are secondary or estimated.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	High	Uncertainty analysis conducted for the input variables.

Overall Quality Determination   High

Study Citation:	Qian, H., Chen, M., Kransler, K. M., Zaleski, R. T. (2015). Assessment of chemical coexposure patterns based upon phthalate biomonitoring data within the 2007/2008 National Health and Nutrition Examination Survey. Journal of Exposure Science & Environmental Epidemiology 25(3):249-255.		
HERO ID:	2345931		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Mathematical Equations	Medium	Equation for daily intakes provided and briefly described, estimating from urinary metabolite concentrations. Equation is cited to David 2000 and Kohn et al 2000 but authors do not specify the specific contributions of each source. The equation for exposure to multiple metabolites is not cited but appears scientifically sound and consistent with single metabolite estimates.
	Metric 2: Model Evaluation	Medium	Peer review needed for publication, but no specific validation of model or outputs by the authors.
Domain 2: Representative			
	Metric 3: Exposure Scenario	Medium	Daily intakes are based on NHANES 2007-2008 data.
Domain 3: Accessibility/Clarity			
	Metric 4: Model and Model Documentation Availability	High	Intake equations and inputs are mostly sufficient but the concentrations used from NHANES are not reported in this study for reference.
	Metric 5: Model Inputs and Defaults	Medium	Fractional urinary excretion rates of the metabolites are tabulated with citations, but other sample data not provided (concentrations, body weights).
Domain 4: Variability and Uncertainty			
	Metric 6: Variability and Uncertainty	Medium	Daily intakes estimated for 5, 10, 25, 50, 75, 90, and 95 percentiles. Limited discussion on uncertainties related to singular exposures, but some discussion presented on coexposure patterns.

Overall Quality Determination   Medium

Study Citation:	Frederiksen, H., Kuiri-Hänninen, T., Main, K. M., Dunkel, L., Sankilampi, U. (2014). A longitudinal study of urinary phthalate excretion in 58 full-term and 67 preterm infants from birth through 14 months. Environmental Health Perspectives 122(9):998-1005.		
HERO ID:	2347101		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Mathematical Equations	Medium	Daily intake equation is provided, briefly described, and appears scientifically sound. Not clear if the entire equation or just the CEsmoothed parameter is cited to Al-Dahhan et al 1988.
	Metric 2: Model Evaluation	Medium	Proposed model is evaluated for relevance to the scenario and modified accordingly for different phthalates based on previous research, but no other indication of evaluation outside of peer review for publication.
Domain 2: Representative			
	Metric 3: Exposure Scenario	Medium	Mothers included in the Finnish Minipuberty study were recruited between 2006 and 2008.
Domain 3: Accessibility/Clarity			
	Metric 4: Model and Model Documentation Availability	High	The model and documentation (user guide, documentation manual) are publicly available or there is sufficient documentation in the data source or in a companion reference.
	Metric 5: Model Inputs and Defaults	Medium	Most inputs are identified, described, and provided with particular detail given to the excretion fractions for each metabolite, including references; BW and CE not tabulated.
Domain 4: Variability and Uncertainty			
	Metric 6: Variability and Uncertainty	Medium	Median, 70 and 90 percentiles, and maximum daily intakes provided for full term and preterm infant exposures; intakes are presented for each phthalate at four ages (7 days, 2 months, 6 months, 14 months). Uncertainty discussed primarily as it relates to hazard index rather than daily intake, though related. Some uncertainty discussed related to other sources of exposure based on correlations identified between terms. Limitations not described.

Overall Quality Determination   Medium

Study Citation:	Sakhi, A. K., Lillegaard, I. T., Voorspoels, S., Carlsen, M. H., Løken, E. B., Brantsæter, A. L., Haugen, M., Meltzer, H. M., Thomsen, C. (2014). Concentrations of phthalates and bisphenol A in Norwegian foods and beverages and estimated dietary exposure in adults. Environment International 73:259-269.		
HERO ID:	2501495		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	Low	General modeling approach is given and seems to be standard, but no specific equation is provided.
	Metric 2:	Model Evaluation	Low	General modeling approach is given and seems to be standard, but no specific equation is provided.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Low	This is a moderately recent study (5-15 years old) but the study population is Norwegian, so there may be dietary differences from the US population.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	Low	The model is only broadly described, and must be inferred to be typical of dietary intake modeling.
	Metric 5:	Model Inputs and Defaults	Low	Some relevant values such as body weight are taken from a previous survey and not reported in this paper.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	There is some discussion of variation from country to country in similar dietary studies.

Overall Quality Determination   Low

Study Citation:	Myridakis, A., Fthenou, E., Balaska, E., Vakinti, M., Kogevinas, M., Stephanou, E. G. (2015). Phthalate esters, parabens and bisphenol-A exposure among mothers and their children in Greece (Rhea cohort). Environment International 83:1-10.		
HERO ID:	2914665		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Mathematical Equations	High	Equation used to estimate daily intake from urinary metabolite concentration provided with citations and description of sound approach.
Metric 2:	Model Evaluation	Low	Peer reviewed publication of equation, so some evaluation. Urinary concentrations were compared to other studies, which directly impacts estimated daily intakes but daily intake was not directly evaluated.
Domain 2: Representative			
Metric 3:	Exposure Scenario	Medium	Intakes are representative of pregnant Greek women (Rhea project) from 2007-2008.
Domain 3: Accessibility/Clarity			
Metric 4:	Model and Model Documentation Availability	Low	Equation and data are provided, but statistics were done in SPSS which is not free and publicly accessible.
Metric 5:	Model Inputs and Defaults	High	Model inputs are identified, described, and values are cited when needed.
Domain 4: Variability and Uncertainty			
Metric 6:	Variability and Uncertainty	Medium	Median, 95th percentile, maximum, and arithmetic and geometric means provided with 95% CI for both mothers and children; minimum only provided for DEP. Variability characterized for concentrations but not intakes. There is some discussion on exposure patterns in the data.

Overall Quality Determination   **Medium**

Study Citation:	Wei, W., Mandin, C., Blanchard, O., Mercier, F., Pelletier, M., Le Bot, B., Glorennec, P., Ramalho, O. (2017). Predicting the gas-phase concentration of semi-volatile organic compounds from airborne particles: Application to a French nationwide survey. Science of the Total Environment 576(Elsevier):319-325.		
HERO ID:	3454652		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	Medium	Equations are all referenced from peer reviewed sources; Monte Carlo approach was also described.
	Metric 2:	Model Evaluation	Medium	Validation of new methods used was conducted by the authors.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Low	Data used in study was from 2003-2005.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	All reference equations used are not free to the public (e.g., Wei et al 2016a).
	Metric 5:	Model Inputs and Defaults	High	Inputs are all described (some are in supplemental material).
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	High	Discussion included on uncertainty and variability.

Overall Quality Determination   Medium

Study Citation:	Fan, G., Xie, J., Yoshino, H., Yanagi, U., Hasegawa, K., Kagi, N., Liu, J. (2017). Environmental conditions in homes with healthy and unhealthy schoolchildren in Beijing, China. Building and Environment 112:270-284.		
HERO ID:	3841179		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	Medium	citations for the equations are not readily accessible but are described and cited alongside EPA methods
	Metric 2:	Model Evaluation	Medium	citations for the equations are not readily accessible but are described and cited alongside EPA methods
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	The study is less than 10 years old, takes place in China, home sizes might not be as applicable but room size could still be used
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	Low	Model sources are research papers. one is accessible but the other is not. EPA sources are cited alongside as basis for the methodology
	Metric 5:	Model Inputs and Defaults	High	model inputs come from a monitoring study. all model inputs are cited if they aren't directly from the study
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	gaps in the sample size used for model inputs are identified. there is not much variability in the study data which the author notes as well

Overall Quality Determination   **Medium**

Study Citation:	Muenhor, D., Moon, H. B., Lee, S., Goosey, E. (2018). Organophosphorus flame retardants (PFRs) and phthalates in floor and road dust from a manual e-waste dismantling facility and adjacent communities in Thailand. Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances & Environmental Engineering 53(1):79-90.		
HERO ID:	4164912		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	Low	Exposure equation not provided but inputs and assumptions are described to follow procedures for standard dust ingestion exposure.
	Metric 2:	Model Evaluation	Low	Exposure estimates are compared to RfDs and the concentrations used in the estimates are compared against other studies.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Data on floor and road dust are from 2018 and represent exposures to e-waste.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	Low	Equation for exposure not provided.
	Metric 5:	Model Inputs and Defaults	Low	Various inputs are identified, described, and cited (body weight, exposure time, ingestion rate) but cannot validate that all inputs have been provided without the equation.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	Limited discussion on the uncertainties in the data or limitations of the study.

Overall Quality Determination   **Low**

Study Citation:	Pelletier, M., Bonvallot, N., Ramalho, O., Mandin, C., Wei, W., Raffy, G., Mercier, F., Blanchard, O., Le Bot, B., Glorennec, P. (2017). Indoor residential exposure to semivolatile organic compounds in France. Environment International 109:81-88.		
HERO ID:	4165791		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	Medium	All equations are cited and from peer reviewed sources.
	Metric 2:	Model Evaluation	High	Methods and Crystal Ball software are well known and have undergone evaluation.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Exposure data from previously published studies; 5-15 years ago.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	Low	All referenced materials for the modeling methods are not free and available to the public.
	Metric 5:	Model Inputs and Defaults	High	All inputs are defined and values referenced (when applicable); Crystal Ball was used in a probabilistic risk assessment so exact values are not always available.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	High	Included relative contribution of key parameters.

Overall Quality Determination   **Medium**

Study Citation:	Hu, J., Li, N., Lv, Y., Liu, J., Xie, J., Zhang, H. (2017). Investigation on Indoor Air Pollution and Childhood Allergies in Households in Six Chinese Cities by Subjective Survey and Field Measurements. International Journal of Environmental Research and Public Health 14(9):979.		
HERO ID:	4166808		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	Medium	Exposure via ingestion and dermal equations cite one EPA source and two other published sources; equations are not specific to a source.
	Metric 2:	Model Evaluation	Medium	Assumption of extensive evaluation based on EPA publication of and peer review of journal publication
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Model is sound and applicable, but the data are based on 2017 samples in Chinese homes, which may be less representative of US exposure.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	Low	Exposure equation is provided with inputs described as needed. DBP and DEHP are not presented individually.
	Metric 5:	Model Inputs and Defaults	High	All inputs are clearly outlined with cited secondary sources.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Low	Variability exhibited in room of use (living room and child's bedroom) in five sampling locations but only one age group. Limitations addressed related primarily to the questionnaires used. DEHP and DBP exposure not presented separately.

Overall Quality Determination   **Medium**

Study Citation:			Quintana-Belmares, R. O., Krais, A. M., Esfahani, B. K., Rosas-Pérez, I., Mucs, D., López-Marure, R., Bergman, Å., Alfaro-Moreno, E. (2018). Phthalate esters on urban airborne particles: Levels in PM10 and PM2.5 from Mexico City and theoretical assessment of lung exposure. Environmental Research 161:439-445.
HERO ID:			4167514

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	Monthly calculations and lung exposure assessment equations reported. Modeling approach seems basically sound; all results can be viewed in the supplemental spreadsheet.
	Metric 2:	Model Evaluation	Medium	Lung exposure assessment equation comes from peer review. Monthly exposure to phthalates via particulate matter does not appear to be a scenario that has much previous study behind it.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	This is a recent study, though based on data collected in Mexico more than 5 years ago. However, it is uncertain whether the findings can be generalized, as the exposure is calculated month-to-month for the specific 7-month period of the samplings, and there is a high degree of temporal variability over that period.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	The study and supplemental spreadsheet file contains all the models and calculations.
	Metric 5:	Model Inputs and Defaults	High	Values used to calculate respiratory flow rates and hourly PM data are cited from previous peer-reviewed sources.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	There is discussion of variability in the monitoring data from which the exposures are calculated, including different months, gender and ages. There is no discussion of limitations.

Overall Quality Determination   High

| Study Citation: | Weiss, J. M., Gustafsson, Å., Gerde, P., Bergman, Å., Lindh, C. H., Krais, A. M. (2018). Daily intake of phthalates, MEHP, and DINCH by ingestion and inhalation. Chemosphere 208:40-49. |
| **HERO ID:** | 4728899 |

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	Inhalation and ingestion exposure equations are provided in the paper.
	Metric 2:	Model Evaluation	High	Ingestion intake equation is cited from a previous published paper; inhalation intake equation seems mathematically sound. MPPD model used for calculating inhalation parameters appears well-attested.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	This is a recent paper, though it is based on data from Sweden rather than the US.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	Inhalation and ingestion exposure equations are provided in the paper itself. The MPPD model used to calculate inhalation parameters appears to be freely available online.
	Metric 5:	Model Inputs and Defaults	High	Input values are cited throughout the paper, and come from the MPPD model or other reputable sources.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	There is some discussion of variance and the limitations of the study, though these seem to apply mainly to the monitoring portion.

Overall Quality Determination   High

Study Citation:	Fan, G., Xie, J., Yoshino, H., Zhang, H., Li, Z., Li, N., Liu, J., Lv, Y., Zhu, S., Yanagi, U., Hasegawa, K., Kagi, N., Zhang, X., Liu, J. (2018). Common SVOCs in house dust from urban dwellings with schoolchildren in six typical cities of China and associated non-dietary exposure and health risk assessment. Environment International 120:431-442.		
HERO ID:	4829253		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	Exposure equations are given in S2 of the supplemental material.
	Metric 2:	Model Evaluation	High	Exposure equations are frequently used in the literature, and are cited from previous papers.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	This is a recent paper, but is based on data from China which may not be fully applicable to the US population.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	The ingestion equations and the input variables are listed in the supplemental material.
	Metric 5:	Model Inputs and Defaults	High	Table S2 in the supplemental material provides the input values used. These are cited from peer-reviewed or authoritative works.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	Section 3.5 is dedicated to a discussion of uncertainties involved with the exposure assessment.

Overall Quality Determination   High

Study Citation:	Okeme, J. O., Nguyen, L. V., Lorenzo, M., Dhal, S., Pico, Y., Arrandale, V. H., Diamond, M. L. (2018). Polydimethylsiloxane (silicone rubber) brooch as a personal passive air sampler for semi-volatile organic compounds. Chemosphere 208:1002-1007.
HERO ID:	5017615

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	Low	Simple calculation to determine inhalation exposure was described in data source but no equation was provided.
	Metric 2:	Model Evaluation	Medium	For evaluation, exposure results were compared with results from an 8-hr sample using a different collection method.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	High	Canadian study was published in 2018.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	Low	There is limited description of the simple inhalation exposure model but there may be additional information in the reference for inhalation rate (USEPA 2011, Exposure Factors Handbook).
	Metric 5:	Model Inputs and Defaults	Medium	Model inputs and defaults are generally identified, described and referenced.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	The study characterizes and discusses variability in the personal air concentration inputs and sampling rates used in the exposure calculation. Uncertainty and data limitations are also discussed.

Overall Quality Determination   Medium

Study Citation:	Chen, Y., Jiang, L., Lu, S., Kang, L., Luo, X., Liu, G., Cui, X., Yu, Y. (2019). Organophosphate ester and phthalate ester metabolites in urine from primiparas in Shenzhen, China: Implications for health risks. Environmental Pollution 247:944-952.		
HERO ID:	5039996		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Mathematical Equations	High	Estimated daily intake equation was referenced and based on a scientifically sound approach.
	Metric 2: Model Evaluation	Medium	Intake equation was referenced from peer reviewed sources; no mention of a more formal review.
Domain 2: Representative			
	Metric 3: Exposure Scenario	Medium	Sampling was conducted 2013 to 2015.
Domain 3: Accessibility/Clarity			
	Metric 4: Model and Model Documentation Availability	Low	Equation references are not free to the public (e.g., Guo et al 2011a).
	Metric 5: Model Inputs and Defaults	High	All model inputs are defined, values provided, and referenced when applicable.
Domain 4: Variability and Uncertainty			
	Metric 6: Variability and Uncertainty	Medium	Some discussion was included on variability and uncertainty. Page 950 discusses uncertainty of using Fraction urinary excretion.

Overall Quality Determination   **Medium**

Study Citation:		Velázquez-Gómez, M., Hurtado-Fernández, E., Lacorte, S. (2019). Differential occurrence, profiles and uptake of dust contaminants in the Barcelona urban area. Science of the Total Environment 648:1354-1370.	
HERO ID:		5043338	

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	Total daily intake equation provided, explained, and cited.
	Metric 2:	Model Evaluation	Medium	Exposure levels compared to other published studies for similarity.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Dust exposure is a relevant scenario, but the concentrations used in the exposure calculations may not be transferrable to US as they are from Spanish monitoring studies. Additionally, the time of collection is not specified, but refers to a previous sampling study.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	Equations are given and references included. Exposure estimation methods based on Cristale et al 2018 and Gevao et al 2006.
	Metric 5:	Model Inputs and Defaults	High	Key inputs (dust ingestion rates) are from Ali et al 2012 and Jones-Otazo et al 2005 for mean and high exposure situations.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	Not much discussion included about uncertainty and variability. Median and high scenarios based on concentrations from multiple locations. Toddlers and teenagers considered separately from adults as "staff" at the key locations.

Overall Quality Determination　　　　　　　　High

Study Citation:	Al Qasmi, N. N., Al-Thaiban, H., Helaleh, M. I. H. (2019). Indoor phthalates from household dust in Qatar: Implications for non-dietary human exposure. Environmental Science and Pollution Research 26(1):421-430.		
HERO ID:	5043469		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Mathematical Equations	High	The intake equation for dust ingestion is provided and described in sufficient detail.
	Metric 2: Model Evaluation	High	The intake modeling equation appears to be of a standard form, and the paper compares its results to similar studies from around the world.
Domain 2: Representative			
	Metric 3: Exposure Scenario	Medium	This is a recent study (<5 years old) but the data collected is from Qatar. As the authors note, climate factors mean that indoor exposure parameters may differ from elsewhere in the world.
Domain 3: Accessibility/Clarity			
	Metric 4: Model and Model Documentation Availability	High	The dust ingestion intake equation is provided, and the necessary input variables are described.
	Metric 5: Model Inputs and Defaults	High	The model inputs are described, and the values used are provided and cited either to a US EPA exposure factors handbook or to previous peer-reviewed works.
Domain 4: Variability and Uncertainty			
	Metric 6: Variability and Uncertainty	Medium	There is some analysis of variability of the monitoring results, which are used as one of the inputs for the exposure model.

Overall Quality Determination   High

Study Citation:	Wei, W., Mandin, C., Blanchard, O., Mercier, F., Pelletier, M., Le Bot, B., Glorennec, P., Ramalho, O. (2019). Semi-volatile organic compounds in French dwellings: An estimation of concentrations in the gas phase and particulate phase from settled dust. Science of the Total Environment 650 Pt. 2:2742-2750.		
HERO ID:	5043472		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Mathematical Equations	Medium	Concentration and intermediate equations provided with citations and explanations.
	Metric 2: Model Evaluation	Medium	Validation through comparing predicted and measured values with previous studies in similar environments/conditions; high R2 values for gas phase conc and particular phase equations/values.
Domain 2: Representative			
	Metric 3: Exposure Scenario	Medium	Exposure to SVOCs via indoor dust is a relevant and current exposure scenario, but this study and methods are based on data inside French homes.
Domain 3: Accessibility/Clarity			
	Metric 4: Model and Model Documentation Availability	High	Equations all detailed and cited, can be followed to repeat the process.
	Metric 5: Model Inputs and Defaults	High	Inputs to all equations provided and cited where applicable.
Domain 4: Variability and Uncertainty			
	Metric 6: Variability and Uncertainty	Medium	Variability and uncertainty in results discussed for different chemicals based on reported concentrations (secondary data) and equilibrium of gaseous/particulate phases.

Overall Quality Determination   Medium

Study Citation:	Giovanoulis, G., Nguyen, M. A., Arwidsson, M., Langer, S., Vestergren, R., Lagerqvist, A. (2019). Reduction of hazardous chemicals in Swedish preschool dust through article substitution actions. Environment International 130:104921.
HERO ID:	5412073

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	Daily intake equation provided and described. No source or citation for the equation but appears scientifically sound.
	Metric 2:	Model Evaluation	Low	No discussion of model evaluation in the study, but assumption of some evaluation during peer review process.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Dust exposure in preschools is realistic scenario, but preschools sampled are in Sweden, potentially limiting the comparative value to the US.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	Equation provided to follow calculations of daily intakes.
	Metric 5:	Model Inputs and Defaults	Medium	All inputs provided. BW cited to EPA and concentration of dust in the monitoring samples, but ingestion rates not cited.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	Intermediate and high ingestion rates considered, and daily intakes presented for median, mean, and 95th percentile concentrations. Correlation considerations provided in supplemental file. Limited discussion of uncertainties related to monitoring samples used in model.

Overall Quality Determination   Medium

Domain	Metric		Rating	Comments
Study Citation:	Luongo, G., Oestman, C. (2016). Organophosphate and phthalate esters in settled dust from apartment buildings in Stockholm. Indoor Air 26(3):414-425.			
HERO ID:	5469670			

Domain	Metric		Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	Medium	No equation is provided but model is described in words and assumed to be: household dust contribution to daily dust intake, as fraction x [(dust ingestion rate x concentration in indoor dust)/bw]. Determinations made using various inputs and defaults for average and high intake scenarios with adults and toddlers agreed with Table 6 reported values.
	Metric 2:	Model Evaluation	Medium	Study monitoring data used as inputs were compared with literature values. General calculations for intake values widely used but no validation for their specific scenario.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	This study was conducted in 2008 in Sweden.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	There appears to be sufficient documentation in data source and/or possibly references.
	Metric 5:	Model Inputs and Defaults	Medium	Model inputs & defaults are generally identified, referenced and described.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	Average and high estimated daily dust exposures were determined for adults and toddlers with some discussion of uncertainty and limitations.

Overall Quality Determination — Medium

Study Citation:		Promtes, K., Kaewboonchoo, O., Kawai, T., Miyashita, K., Panyapinyopol, B., Kwonpongsagoon, S., Takemura, S. (2019). Human exposure to phthalates from house dust in Bangkok, Thailand. Journal of Environmental Science and Health, Part A: Toxic/Hazardous Substances & Environmental Engineering 11(13):1-7.		
HERO ID:		5532759		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	Medium	Daily intake equation is provided with multiple citations, but it is not clear how each source was used or if they all use the same model.
	Metric 2:	Model Evaluation	High	Model estimates compared to doses cited from other studies and are compared to US EPA RfDs. References are peer reviewed.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Estimates are based on 2017 concentrations collected in Thailand and ingestion and body weights of Thai adults and children. This may limit the relevance to US exposure scenarios.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	DI equation and needed inputs are provided and sufficient to follow the calculations.
	Metric 5:	Model Inputs and Defaults	Medium	Inputs for dust ingestion and body weight are provided, concentrations are reported in table 2.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	Discussion of limitations addressed the sampling methods primarily rather than the modeling methodology. Ingestion exposure estimated based on low-end and high-end rates for three housing scenarios.

Overall Quality Determination   Medium

Study Citation:	Weiss, J. M., Gustafsson, Å., Gerde, P., Bergman, Å., Lindh, C. H., Krais, A. M. (2018). Daily intake of phthalates, MEHP, and DINCH by ingestion and inhalation. Chemosphere 208:40-49.		
HERO ID:	5550408		

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Mathematical Equations	High	All EDI equations were provided with cited references from peer reviewed sources and discussed in detail.
	Metric 2: Model Evaluation	Low	The study does not provide any discussion on model evaluation but some level of validation is assumed based on the study being a peer reviewed article.
Domain 2: Representative			
	Metric 3: Exposure Scenario	High	This is a Swedish study conducted in 2018 (<5 years ago). Inhalation and ingestion of phthalates from indoor dust is considered a relevant exposure scenario for both children and adults.
Domain 3: Accessibility/Clarity			
	Metric 4: Model and Model Documentation Availability	High	The model equations are clearly defined and and additional documentation is not required to follow how they were used for these exposure scenarios.
	Metric 5: Model Inputs and Defaults	High	The model inputs were referenced and clearly defined along with any assumptions made. Most inputs were retrieved from the child specific exposure factors handbook.
Domain 4: Variability and Uncertainty			
	Metric 6: Variability and Uncertainty	Medium	The study characterized daily intake variability using two age groups (adults and children) and two exposure pathways (incidental ingestion and inhalation). Very limited discussion was provided concerning study uncertainties, limitations, and data gaps.

Overall Quality Determination   High

Study Citation:	Lee, I., Alakeel, R., Kim, S., Al-Sheikh, Y. A., Al-Mandeel, H., Alyousef, A. A., Kho, Y., Choi, K. (2019). Urinary phthalate metabolites among children in Saudi Arabia: Occurrences, risks, and their association with oxidative stress markers. Science of the Total Environment 654:1350-1357.		
HERO ID:	5750962		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	Equation for estimated daily intake of parent phthalate from concentration of urinary phthalate metabolites. Reference citation was also provided (Koch et al. 2007).
	Metric 2:	Model Evaluation	Medium	Limited evaluation was evident in terms of comparison with other studies and analytical method validation of input concentrations. It can be assumed that the model has undergone peer evaluation.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Study was conducted in 2017; population was Saudi Arabian children.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	Koch reference is frequently cited for estimated daily intake; documentation is likely available.
	Metric 5:	Model Inputs and Defaults	High	Model inputs and defaults are identified, referenced and clearly described. QA/QC concentration data are provided in SI Table S1.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	High	Variability of concentrations was studied and summarized in Table 2. Recommended that study be validated in larger populations using longitudinal study design.

Overall Quality Determination   High

Study Citation:	Kim, J. H., Kim, D., Moon, S. M., Yang, E. J. (2020). Associations of lifestyle factors with phthalate metabolites, bisphenol A, parabens, and triclosan concentrations in breast milk of Korean mothers. Chemosphere 249:126149.		
HERO ID:	6815879		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	Widely accepted daily intake equation, with reference citations from previous studies (Fromme et al. 2010, Kim et al. 2015)
	Metric 2:	Model Evaluation	Medium	Model has had limited evaluation with monitoring data.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Study was conducted in 2018, sampling phthalate metabolites in breast milk from mothers in South Korea
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	Sufficient documentation in data sources and companion references.
	Metric 5:	Model Inputs and Defaults	Medium	Most model inputs are identified, referenced and described. Breast milk intake was measured but not reported.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	Concentration input data include mean and standard deviation (Table 2). Some uncertainties and data limitations are discussed.

Overall Quality Determination   Medium

Study Citation:	SUNY, (2019). Semi-volatile organic compounds in infant homes: Levels, influence factors, partitioning, and implications for human exposure. Environmental Pollution 251:609-618.		
HERO ID:	6815979		

Domain		Metric	Rating	Comments
Domain 1: Reliability				
	Metric 1:	Mathematical Equations	High	Equations provided for EDI via air inhalation, air dermal absorption, dust non-dietary ingestion, dust dermal absorption. All equations are described in detail and have citations, some US EPA.
	Metric 2:	Model Evaluation	Medium	Model evaluation not directly conducted by author, but models are secondary. Assumed peer review and some evaluation during initial publication.
Domain 2: Representative				
	Metric 3:	Exposure Scenario	Medium	Model inputs seem appropriate for estimating total daily intakes for infants via dust and air; not all intermediate values provided for each route and the population is limited to the region in China.
Domain 3: Accessibility/Clarity				
	Metric 4:	Model and Model Documentation Availability	High	Model equations and inputs are sufficient.
	Metric 5:	Model Inputs and Defaults	Medium	Inputs are described and values provided with citations; data quality criteria not discussed but values appear appropriate.
Domain 4: Variability and Uncertainty				
	Metric 6:	Variability and Uncertainty	Medium	The study characterizes the variability in intakes across chemicals but for a single population (infants) and in one scenario (combined air and dust); correlation analysis conducted to identify major routes and influence of each chemical.

Overall Quality Determination   **Medium**

Table 787: Glossary of Select Terms for Data Evaluation

Term	Definition
ADD	Average daily dose
ADC	Average daily concentration
BBP	Butyl benzyl phthalate
BLS	Bureau of Labor Statistics
CASRN	Chemical Abstracts Service Registry Number
CBI	Confidential business information
CDR	Chemical Data Reporting
CEHD	Chemical Exposure Health Data
CEM	Consumer Exposure Model
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Concentration of concern
CPSC	Consumer Product Safety Commission
CRA	Cumulative risk assessment
CWA	Clean Water Act
DBP	Dibutyl phthalate
DCHP	Dicyclohexyl phthalate
DEHP	Diethylhexyl phthalate
DIBP	Diisobutyl phthalate
DIDP	Diisodecyl phthalate
DINP	Dicyclohexyl phthalate
DIY	Do-it-yourself
DMR	Discharge Monitoring Report
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ESD	Emission scenario document
EU	European Union
FDA	Food and Drug Administration
FFDCA	Federal Food, Drug, and Cosmetic Act
GS	Generic scenario
K_{OC}	Soil organic carbon: water partitioning coefficient
K_{OW}	Octanol: water partition coefficient
HEC	Human equivalent concentration
HED	Human equivalent dose
IADD	Intermediate average daily dose
IR	Ingestion rate
LCD	Life cycle diagram
LOD	Limit of detection

Table 787 ... continued from previous page

Term	Definition
LOAEL	Lowest-observed-adverse-effect level
Log K_{OC}	Logarithmic organic carbon: water partition coefficient
Log K_{OW}	Logarithmic octanol: water partition coefficient
MOA	Mode of action
MOE	Margin of exposure
NAICS	North American Industry Classification System
NEI	National Emissions Inventory
NHANES	National Health and Nutrition Examination Survey
NICNAS	National Industrial Chemicals Notification and Assessment Scheme
NOAEL	No-observed-adverse-effect level
NOEC	No-observed-effect-concentration
NPDES	National Pollutant Discharge Elimination System
NTP	National Toxicology Program
OCSPP	Office of Chemical Safety and Pollution Prevention
OECD	Organisation for Economic Co-operation and Development
OEL	Occupational exposure limit
OES	Occupational exposure scenario
OEV	Occupational exposure value
ONU	Occupational non-user
OPPT	Office of Pollution Prevention and Toxics
OSHA	Occupational Safety and Health Administration
PBZ	Personal breathing zone
PECO	Population, exposure, comparator, and outcome
PEL	Permissible exposure limit (OSHA)
PESS	Potentially exposed or susceptible subpopulations
PND	Postnatal day
PNOR	Particulates not otherwise regulated
POD	Point of departure
POTW	Publicly owned treatment works
PV	Production volume
PVC	Polyvinyl chloride
REL	Recommended Exposure Limit
RPF	Relative potency factor
RQ	Risk quotient
SACC	Science Advisory Committee on Chemicals
SDS	Safety data sheet
SOC	Standard occupational classification
SpERC	Specific emission release category
SUSB	Statistics of U.S. Businesses (U.S. Census)
TRI	Toxic Release Inventory
TRV	Toxicity reference value
TSCA	Toxic Substances Control Act

Table 787 . . . continued from previous page

Term	Definition
TSD	Technical support document
TWA	Time-weighted average
UF	Uncertainty factor
U.S.	United States
WWTP	Wastewater treatment plant
7Q10	The lowest 7-day average flow that occurs (on average) once every 10 years
30Q5	The lowest 30-day average flow that occurs (on average) once every 5 years