



EPA's 2008 Report on the Environment (ROE)- Human Exposure and Health

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RESEARCH & DEVELOPMENT

LTG 4 Poster 01

Science Questions

The ROE Human Exposure and Health chapter presents biomonitoring and health outcome indicators to address three fundamental questions:

- What are the trends in human exposure to environmental contaminants, including across population subgroups and geographic regions?
- What are the trends in health status in the United States?
- What are the trends in human disease and conditions for which environmental contaminants may be a risk factor, including across population subgroups and geographic regions?

Research Goals

EPA established several goals for its Report on the Environment:

- Compile in one place the most reliable national-level indicators currently available to answer questions that EPA believes are of critical importance to its mission and the nation's environment.
- In the health area, show trends in human exposure and disease across time, geographic areas, and/or subpopulations such as age groups, races, and ethnicities.
- Identify potential gaps and limitations that may require further research.
- Present trend information that helps EPA and the public assess whether the Agency is succeeding in its overall mission to protect human health and the environment.
- To provide input to EPA in developing its strategic outlook and priorities.

Specific conclusions include:

- National-level indicators of exposure and human disease identify notable trends that can help to inform planning, evaluation, and research needs in EPA.
- Relationships among and between environmental contamination and disease are complex, and environmental contaminant exposure is just one of many factors that can lead to disease. Therefore, independently collected national contaminant, exposure, and disease data alone cannot establish linkages or causal relationships between environmental contaminants and disease.

Consequently, trends in ROE Air, Water, and Land chapters cannot be linked with trends in the Human Exposure and Health chapter. Though causal links cannot be made (because data are collected independent of exposure), exposure and health indicators enable the evaluation of exposure and disease patterns and emerging trends.

Findings and Conclusions

- The ability to describe trends in human exposure to environmental contaminants (Question 1) will evolve over time. NHANES 1999-2002 (which represents two survey periods) serves as the primary data source for the biomonitoring indicators. Differences in reported exposure levels are described across demographic groups, but time trends cannot be presented until additional survey results are available. The chapter provides some additional perspective for blood lead and blood cotinine levels, where declines over time have been reported.

- Trends in U.S. health status (Question 2) show that the overall health of the nation is improving. The three leading causes of death (heart disease, cancer, and stroke) remain unchanged over the past several years. Life expectancy is increasing. Infant mortality in the U.S. has shown a long-term decline but remains among the highest in the industrialized world.

- No striking trends are evident across the set of indicators presenting trends in human disease and conditions for which environmental contaminants may be a risk factor (Question 3), as the indicators represent a diverse set of diseases and outcomes and are associated with a variety of risk factors. Chronic diseases are generally increasing with the aging of the population. Over the past decade, asthma prevalence rates have fluctuated, but have increased overall in adults and children. Varying trends are seen across racial and ethnic groups.

Methods/Approach

Question 1: What are the trends in human exposure to environmental contaminants...?

- Indicators selected to help understand the extent to which human populations are being exposed to environmental contaminants and how exposures are changing over time, and to identify populations who may be disproportionately exposed.
- Focuses on biomonitoring indicators (or biomarkers of exposure) to represent exposure levels of environmental contaminants or metabolites present in human tissue (blood and urine).
- Indicators include blood cotinine, lead, mercury, cadmium, persistent organic pollutant, and urinary pesticide and phthalate levels.

Question 2: What are the trends in general health status...?

- Indicators selected to:
 - Paint a broad picture of health across the nation.
 - Provide a general context for understanding trends in specific diseases and conditions that may be more closely linked with environmental contaminants
 - Track trends to help identify where interventions have improved health or where they may be needed.
- Indicators include leading causes of death, life expectancy, and infant mortality.
- Compares U.S. health status trends with worldwide trends.

Question 3: What are the trends in human diseases and conditions...?

- Indicators selected to represent diseases and conditions known or suspected to be caused to some degree by environmental contaminants.
- Indicators studied to identify diseases, conditions, and possible risk factors that warrant further study or intervention.
- Indicators include cancer, cardiovascular disease, respiratory diseases, infectious diseases, selected birth outcomes.

Types of Data

- Data from living human subjects (biomonitoring data)
- Vital statistics data (births, deaths, fetal deaths)
- Disease surveillance data (disease incidence, prevalence)

Data Sources

- Centers for Disease Control and Prevention (e.g., NCHS, NHANES, NHIS, NVSR)
- National Cancer Institute

Impact and Outcomes

The ROE Human Exposure and Health chapter:

- Serves as an information resource for EPA and other environmental professionals.
- Complements EPA's strategic planning efforts to inform development of strategic outcomes and data priorities. For example, indicators in the health chapter may serve as input data in policy-oriented analyses that examine the impact of various policy options on human health within a particular problem-specific context.
- Identifies data limitations and gaps that hinder answering the science questions, which can be translated into concrete research needs.
- Highlights the need for more scientific and indicator development research that can link source to exposure to health outcome to create true environmental health indicators.

Future Directions

EPA will maintain and evolve the ROE as a living document by:

- Periodically updating and revising the indicators presented.
- Adding new indicators (as supporting data become available) that help EPA answer the research questions.
- Presenting information about the statistical confidence of status and trends.
- Developing geo-referenced presentations for trend data.

Key Products

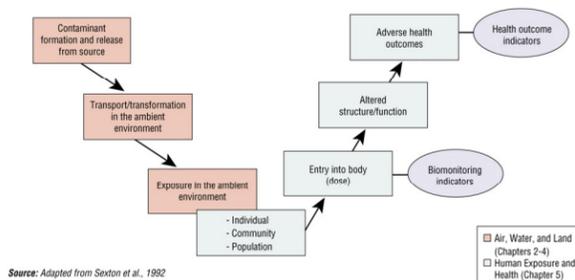
Print Report: EPA's 2008 Report on the Environment
<http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=190806>

Highlights: EPA's Report on the Environment: Highlights of National Trends 2008
www.epa.gov/eroeweb1/pdf/roe_hd_layout_508.pdf

Live Electronic Version: EPA's Electronic Report on the Environment (e-ROE) www.epa.gov/roe/

Chronological History of ROE Development and Review: <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=190806>

Environmental public health paradigm for the ROE Human Exposure and Health chapter



Source: Adapted from Sexton et al., 1992

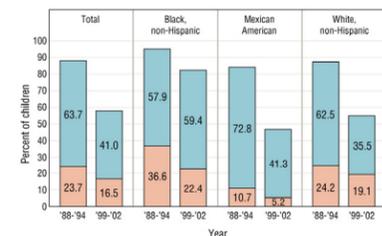
Human Exposure and Health Chapter

- The ROE Human Health and Exposure chapter presents 19 indicators to help answer three questions related to exposure and effects of environmental contaminants (right side of the paradigm).
- All indicators meet high standards for quality, objectivity, and transparency; are national in coverage (and in some cases broken down by EPA Region); and can be tracked over time.
- Each indicator displays trends through graphical displays and describes what the data show; any limitations that generate uncertainty in the trend characterized; and the data sources.

Sample Indicator: Blood Cotinine Level

- Exposure to ETS leaves traces of specific chemicals in people's blood, urine, saliva, and hair. Cotinine is a chemical that forms inside the body following exposure to nicotine, an ingredient in all tobacco products and a component of ETS.
- Following heavy exposure to ETS, non-smokers can have blood cotinine levels between 1 and 10 ng/mL.

Exhibit 2-58. Blood cotinine concentrations in U.S. children age 4 to 17 by race and ethnicity, 1988-1994 and 1999-2002*



*Cotinine concentrations are reported for non-smoking children only.
 †Concentrations below 0.05 ng/mL are not presented here because this was the detection limit for many of the samples.
 Data source: Federal Interagency Forum on Child and Family Statistics, 2005

- Among the three subgroup populations presented, Mexican American children had the lowest percentage of blood cotinine levels greater than 1.0 ng/mL.
- Black, non-Hispanic children had the largest decline of the three subgroups in the percentage of blood cotinine levels greater than 1.0 ng/mL, but that population also started off with the highest percentage above 1.0 ng/mL (36.6 percent).