Methods Description for Measure E8

Measure

E8. Percentage of fruits, vegetables, grains, and other food and drink products with detectable residues of organophosphate pesticides.

Summary

The U.S. Department of Agriculture (USDA) has been conducting the Pesticide Data Program (PDP) since 1991. Since 1994 the PDP has measured pesticide residues on fresh fruits and vegetables, canned and frozen fruits and vegetables, fruit juices, whole milk, wheat, soybeans, oats, corn syrup, peanut butter, poultry, beef, pork, drinking water, bottled water, and groundwater. The 24 commodities sampled in 2007 are apple juice, almonds, fresh and frozen blueberries, bananas, broccoli, celery, cherries, heavy cream, corn grain, carrots, green beans, greens (kale and collard), honey, nectarines, peaches, frozen potatoes, raisins, summer squash, tomatoes, and ground, finished, and untreated water. In order to maintain comparability across the years 1994 to 2007, the organophosphate detection rates reported in this measure include only detections of the original 34 organophosphate pesticides and metabolites included in the PDP in 1994 above the minimum of the original limits of detection available in 1994. Measure E8 is the percentage of fruits, vegetables, grains, and other food and drink products with detectable residues of organophosphate pesticides. This measure is calculated as the number of food samples with a detectable residue divided by the total number of food samples analyzed for one or more of the 34 pesticides.

Overview of Data Files

The following files are needed to calculate this measure. They were all obtained from the Pesticide Data Program website

http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateG&topNav=&leftNav=ScienceandLaboratories&page=PDPDownloadData/Reports&description=Download+PDP+Data/Reports&acct=pestcddataprg

.

This webpage contains downloadable, zipped, database files in the MDB format with pre-written macros and instructions to assemble the various component text files into a single database for each calendar year. In each assembled year's database file are two data files describing the sample data and testing results and translations for all fields used in the database.

Two files are used to perform the analysis here:

- 1994 Pesticide Sample data (PDP94PES.ASC): Pesticide Data Program pesticide names and codes for 1994. The three digit pesticide codes are used to extract the data for the 34 pesticides from the Analytical Results data files.

- Current Year Database Tables (XXResultsData and XXSampleData within the database, PdpXXSamples.txt and PdpXXResults.txt as text files outside of the database): Pesticide Data Program Analytical Results data for calendar year (XX). Each record is for a single sample and pesticide. The sample is identified by the combination of the following codes: STATE, YEAR, MONTH, DAY, SITE, COMMOD (commodity), LAB (laboratory), and SOURCE_ID (Code to make sample ID unique). The pesticide analyzed is given by the pesticide code (PESTCODE). For these analyses we also needed the level of detection (LOD) and the measured concentration (CONCEN); the concentration value is missing if it is at or below the level of detection.

Pesticide Data Program Metadata for Measure E8

Measure Name	Percentage of fruits, vegetables, grains, and other food and drink products with detectable residues of organophosphate pesticides.
Measure Number:	E8
Data Set Name:	PDP
Who provides the Data set:	U.S. Department of Agriculture, Agricultural Marketing Service
Source location of the Data set:	http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateG&topNav=&leftNav=ScienceandLaboratories&page=PDPDownloadData/Reports&description=Download+PDP+Data/Reports&acct=pestcddataprg
Years reported for this measure:	1994-2007
Data Collection Frequency:	62 samples per commodity per month, except for highly seasonal commodities.
Brief Data Set Description:	The Pesticide Data Program is managed by the USDA Agricultural Marketing Service and is used primarily by EPA to prepare realistic dietary exposure assessments for implementing the 1996 Food Quality Protection Act. PDP provides measurements of pesticide residues in food, particularly food most likely consumed by infants and children, including minor crops. Sampling and/or testing is currently carried out in 12 states, that represent about 50 % of the U.S. population. In 2007, PDP collected and analyzed more than 12,000 unique food and drink samples, of which about 77 % were fruit

	and vegetable products. For the fruit and vegetable products, they analyzed 374 pesticides and metabolites.
Variables Used to Calculate This Indicator:	STATE, YEAR, MONTH, DAY, SITE, COMMOD (commodity), LAB (laboratory), SOURCE_ID (Sample Source ID), PESTCODE (pesticide code), PESTNAME (pesticide name), LOD (level of detection), CONCEN (concentration).
Comments:	Only the 34 pesticides analyzed in 1994 are used for this measure.

Pesticide Data Program

Pesticide residue data for the years 1994 to 2007 were obtained from the Pesticide Data Program website:

http://www.ams.usda.gov/AMSv1.0/ams.fetchTemplateData.do?template=TemplateG&topNav=&leftNav=ScienceandLaboratories&page=PDPDownloadData/Reports&description=Download+PDP+Data/Reports&acct=pestcddataprg

For each year, the analytical results data are reported in the ASCII files PdpXXResults.txt and PdpXXSamples.txt, where "XX" denotes the last two digits of the calendar year. A single sample is defined by the combination of the variables STATE, YEAR, MONTH, DAY, SITE, COMMOD (commodity), LAB (laboratory), SOURCE_ID (Sample Source ID). The same sample can be measured for pesticide residues of one or more pesticides or metabolites, as defined by the three digit pesticide code (PESTCODE). The pesticide codes and names are reported in the table PesticideRef inside the assembled database. For these analyses we extracted only those sample/pesticide combinations where the pesticide compound was one of the 34 organophosphate (OP) compounds in the following list of compounds analyzed in 1994:

34 OP Compounds Analyzed in 1994	
Acephate	Malathion
Azinphos ethyl	Methamidophos
Azinphos methyl	Methidathion
Chlorpyrifos	Mevinphos Total
Demeton	Omethoate
Demeton-S	Parathion ethyl
Diazinon	Parathion methyl
Dichlorvos (DDVP)	Phorate
Dimethoate	Phorate oxygen analog
Disulfoton	Phorate sulfone
Disulfoton sulfone	Phorate sulfoxide
Disulfoton sulfoxide	Phosalone
Ethion	Phosmet

Ethoprop	Phosphamidon
Fenamiphos	Terbufos
Fenamiphos sulfone	Terbufos oxygen analog sulfone
Fenamiphos sulfoxide	Terbufos sulfone

For all years, we compared the measured values with the 1994 minimum detection limit. For each pesticide, the 1994 minimum detection limit is defined as the minimum of all the detection levels (LOD) for that pesticide in the 1994 analytical results file, across all samples, laboratories and commodities.

Calculation of Measure

Measure E8 is calculated as follows.

1. The number of unique samples is calculated for each year: Each sample is defined by the combination of the variables STATE, YEAR, MONTH, DAY, SITE, COMMOD (commodity), LAB (laboratory), and SOURCE_ID (Sample Source ID). The same sample can appear multiple times in the database. For each sample, we only count the first of the records where one of the 34 pesticide compounds listed above was measured. Samples where none of the 34 pesticide compounds listed above were measured are not included.

2. The number of unique samples with a detectable residue is calculated for each year: For this step, we first list the subset of records where the measured pesticide compound was among the 34 compounds tabulated above, the concentration was above the detection limit for that laboratory measurement (i.e., the concentration field is not blank), and the concentration is greater than and not equal to the 1994 minimum detection limit for the same pesticide. (As above, for each pesticide, the 1994 minimum detection limit is defined as the minimum of all the detection levels (LOD) for that pesticide in the 1994 analytical results file, across all samples, laboratories and commodities.) Note that a measured value might exceed the detection limit for that pesticide compound, measurement year, laboratory, and commodity, but not exceed the 1994 minimum detection limit for the compound. Note also that 1994 samples of the 34 OPs have units of parts per million (ppm), while units of measure for later years may vary. Thus, to compare to 1994 thresholds, all reported concentrations are converted to ppm before comparison. The number of unique samples with a detectable residue is the number of distinct samples in this subset.

3. The percentage of fruits, vegetables, grains, and other food and drink products with detectable residues is calculated by dividing the total number of food samples with detectable residues (step 2) by the total number of samples analyzed (step 1):

Percentage of fruits, vegetables, grains, and other food and drink products with detectable residues =

[Number of unique samples with a detectable residue /

Number of unique samples] × 100 %.

Questions and Comments

Questions regarding these methods, and suggestions to improve the description of the methods, are welcome. Please use the “Contact Us” link at the bottom of any page in the America’s Children and the Environment website.