Introduction to Health Topics

Why is EPA tracking children's health outcomes in *America's Children and the Environment*?

The central goal of efforts to protect children's health is the reduction of disease, disability, and mortality. Many different factors contribute to children's health, including nutrition, prenatal and childhood exposure to toxins in the environment, genetics, socioeconomic status, access to medical care, and exercise. Data on trends in children's health outcomes, including changes over time and differences between socio-demographic groups, provide important information on the successes and shortcomings of efforts to protect children's health, and also identify opportunities for future action. In particular, monitoring health outcomes that have been associated with environmental factors can suggest areas where environmental action may help protect children's health. Monitoring children's health outcomes for which causes are unknown or not well established can stimulate hypotheses, some of which may point to environmental factors.

What health outcomes are included in the draft indicators for *America's Children and the Environment, Third Edition (ACE3)*?

Children's health outcomes were selected for ACE3 based on: (1) their importance for children's health; (2) research findings that indicate environmental contaminants or characteristics may be contributing factors; and (3) the availability of nationally representative data suitable for constructing an indicator. EPA obtained input from its Children's Health Protection Advisory Committee to assist in selecting topics from among the many diseases and health disorders that affect children. The ACE3 health indicators address the following topics:

- Respiratory diseases
- Childhood cancer
- Neurodevelopmental disorders
- Adverse birth outcomes
- Obesity

What data sources were used to develop the health indicators?

Data for all of the selected health outcomes, with the exception of childhood cancer, were obtained from surveys and registries conducted/maintained by the Centers for Disease Control and Prevention (CDC). These include the National Health Interview Survey (NHIS), National Hospital Ambulatory Medical Care Survey (NHAMCS), National Hospital Discharge Survey (NHDS), National Health and Nutrition Examination Survey (NHANES), and the National Vital Statistics System (NVSS). Data on childhood cancer were obtained from the National Cancer Institute's (NCI's) Surveillance, Epidemiology, and End Results (SEER) Program.

The NHIS and NHANES are used to obtain health information from a statistical sample of the U.S. population, and survey results are subsequently extrapolated to the entire population. The

NHAMCS and NHDS are used to obtain patient visit information from a sample of hospitals, and the survey results are extrapolated to estimate the rate of respiratory-related emergency room visits and hospital admissions for all children in the United States. The NVSS is a registry that captures virtually all births that occur in the United States and thus does not rely on sampling. The SEER program has attributes of both a survey and a registry. It is based on a collection of registries located across the United States that record all tumors that occur in specific geographical regions. The registry information is then used to estimate the occurrence of childhood cancer for the entire country.

What can we learn from the health indicators?

For some of the selected health outcomes, the scientific evidence suggests that environmental contaminants play a role in the development of the disease or disorder. For other health outcomes, there is more uncertainty as to whether environmental contaminants are involved. The inclusion of the selected health outcomes in this report does not imply that environmental contaminants or other environmental factors definitely play a role in the development of the health effect. It is very difficult to develop conclusive evidence that environmental factors cause or contribute to the incidence of childhood health effects. Where available, we rely on authoritative reviews of the literature and report their conclusions regarding the strength of the evidence for a causal role of specific environmental factors in the development of childhood diseases and disorders. When such reviews are unavailable, we summarize important findings from individual studies that suggest a role of environmental factors in contributing to an effect.

Furthermore, the inclusion of the selected health outcomes in this report does not imply that environmental factors, even if they do play a role, are the only cause of the disease or disorder. Most often, health outcomes are a result of multiple causes, such as genetics, nutrition, and socioeconomic factors as well as prenatal and childhood exposure to environmental contaminants, and other environmental factors. The various factors may also interact, such as a genetic predisposition that makes a person more susceptible to the effects of an environmental exposure.

The indicators presented in this report focus on presenting health outcomes data collected over multiple years, to determine if the prevalence or rate of each outcome is increasing, decreasing, or not changing over time. An additional focus is to see if any particular groups (defined by race/ethnicity and income) within the population are disproportionately affected by a given health outcome. Such trends and comparisons can generate hypotheses, indicate whether past actions have been effective in reducing the occurrence of disease, and help identify opportunities for future action.

What information is provided in the draft health indicator documents?

There is a separate document for each of the five health outcome topics. An introduction section explains the importance of the topic for children's health, including a discussion of the health outcomes and environmental agents that may play a role.

The introduction section is followed by a description of the indicators, including a summary of the data available and information on how each indicator was calculated. Two to four indicators, each a graphical presentation of the available data, are included for each topic. All topics include an indicator that presents a time series. Some of the topics also include indicators that show a comparison of the most current health outcome data by race/ethnicity and income level. Beneath each figure are explanatory bullet points highlighting key findings from the data presented in the figure, along with key data from any supplemental data tables.

Following the indicator figures and bullet points, each health topic document provides data tables, references, metadata, and details of how the indicators were calculated. When ACE3 is completed, this documentation will be available in appendices and in online files. The detailed information on the calculation of the indicators and statistical testing will not be included in the published report, but will be available through the ACE website.

How were the indicators calculated and presented?

Data files: The indicators were calculated using data files obtained from the CDC and SEER websites. The files include various information such as survey responses (NHIS), diagnosis codes (NHAMCS and NHDS), type of cancer (SEER), gestational age and birth weight (NVSS), and body measurements (NHANES), as well as information on age, sex, race/ethnicity, and income level (i.e., family income above or below poverty level). For the survey data, each individual observation also has a survey weight that is used in calculating population statistics; the weight equals the number of people in the U.S. population represented by the particular observation.

Population age groups: The age groups covered by the indicators differ between the health outcomes topics. The indicators for respiratory diseases used data for children ages 17 years and younger. The indicators for childhood cancer used data for children ages 19 years and younger. The indicators for neurodevelopmental disorders used data for children ages 5 to 17 years. The indicators for adverse birth outcomes used data ascertained at birth. The indicators for obesity used data for children ages 2 to 17 years.

Calculate prevalence or rate of occurrence for each health outcome: Some of the indicators present prevalence data while others express the occurrence of health outcomes as a rate. The main difference between these two measures is that prevalence presents data occurring at one point in time. These prevalence measures are proportions, such as the proportion of children who currently have asthma or the proportion of children who are currently classified as obese. Rates, on the other hand, express the number of events, such as emergency room visits, hospital admissions, new cancer cases, or cancer deaths, that occur over a definite time period (one year for all of the ACE3 indicators), per the population at risk for the event. The population at risk is either all children or all births, depending on the indicator.

Statistical considerations in presenting and characterizing the indicators: In some cases, calculated indicator values have substantial uncertainty. Uncertainty in these estimates is assessed by looking at the relative standard error (RSE), a measure of how large the variability of the estimate is in relation to the estimate (RSE = standard error divided by the estimate). The estimate should be interpreted with caution if the RSE is at least 30%; a notation is provided for such estimates in the indicator figures and tables. If the RSE is greater than 40%, the estimate is considered to have very large uncertainty and is not reported. For respiratory indicator D3, an estimate is also considered to have very large uncertainty and is not reported if it is based on less than 30 sampled visits. In addition, statistical analysis has been applied to the indicators to determine whether any changes in prevalence or rates of occurrence over time, or any differences in prevalence or rates of occurrence between demographic groups, are statistically significant.