

# ENVIRONMENTAL HEALTH SERIES

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## Children's Health and the Environment

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Children tend to be more vulnerable to substances in the environment because they breathe more air, drink more fluids and eat more food in proportion to their body weight than adults. Exposures that would not harm an adult can cause permanent damage to a child's developing body. The U.S. Environmental Protection Agency is presently revising pesticide residue limits insure sure they provide a margin of safety for children as well as adults. States may be required to update environmental standards to comply with federal regulations. Currently, most state and federal regulations are based on adults, only recently has legislation been introduced to take children's special vulnerabilities into account.

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### OVERVIEW

Traces of man-made synthetic compounds can be found throughout the world, even in the plants and animals of our planet's most remote regions. With more than 70,000 chemicals in use in the United States and 2,000 new compounds being introduced every year, the average citizen is likely to be exposed to a large cocktail of chemical substances. These compounds are present in food, water and air, and little is known about many of their effects on children's health. A child's environment also contains particles and chemicals that result from incineration, smelting, transportation and other industrial processes.

Although state and federal regulatory agencies attempt to set standards that protect the public's health—including children, pregnant women, and the elderly—most standards are based on data collected from adult humans or adult animals. As differences between the adult and child response to environmental hazards become more apparent, government agencies are realizing that testing and standard setting should accommodate the sensitivities of developing children.

## WHAT MAKES CHILDREN MORE SUSCEPTIBLE?

Children's quick development and growth make them more vulnerable to environmental pollutants. The complex processes of cell division, development of the nervous system and hormonal activity can easily be disrupted by toxic exposure, particularly in the case of the fetus. The resulting abnormal growth and development can lead to permanent immunological disorders, brain disorders, cancer and birth defects. The cause of most birth defects is unknown and may be due to unidentified environmental exposures. In addition, the immune systems of the very young, being less well developed than those of adults, make them less resistant to environmental risks. (1)

A child's faster metabolism and small size subjects them to higher exposures than adults. Also, because children breathe, eat and drink more than adults relative to their body mass, they will ingest more pollutants per pound of body weight. Children's diets, which often include proportionally larger amounts of fruits and vegetables, also contribute to increased pesticides exposure.

An additional risk factor involves activities that engage the typical child. Children tend to play on the ground, amplifying chemical exposure through the inhalation of ground-level contaminants and hand-to-mouth behavior. These behaviors dramatically increase exposure in the case of lead, and in all likelihood, pesticides.

Developing organs and other physiological differences often cause children to absorb a higher percentage of the toxics to which they are exposed. A child's liver and kidneys may not be as efficient as an adult's when it comes to removing toxic substances, while differences in skin and the gastrointestinal tract also can increase absorption. Due to physiological differences, children absorb nearly five times more of the lead they ingest than adults.

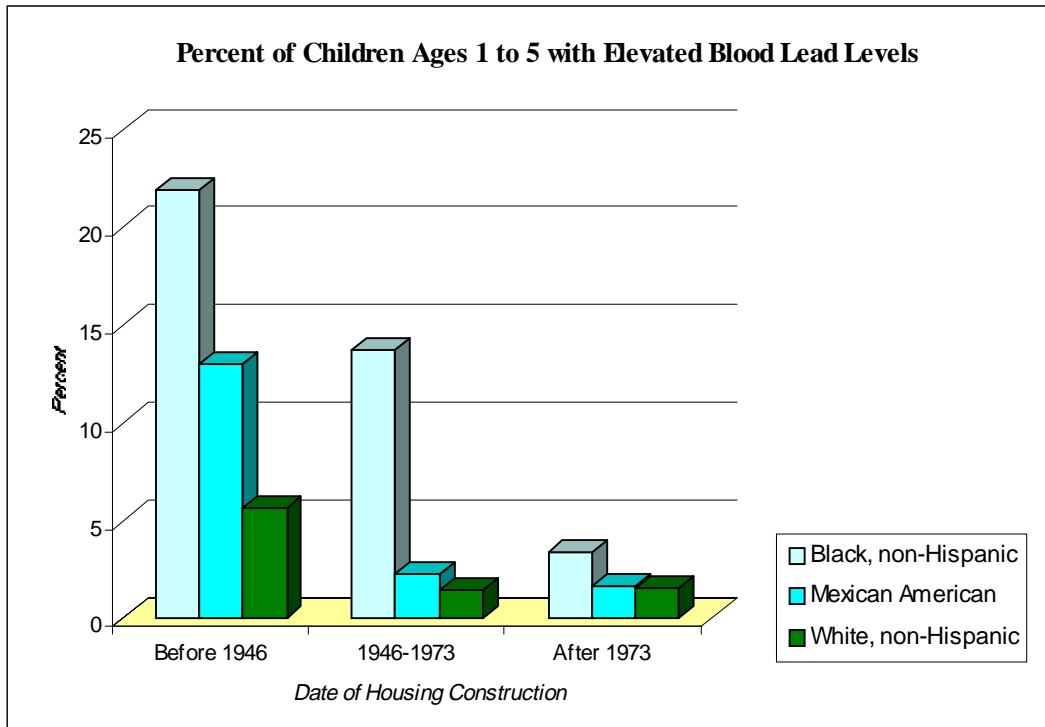
## WHICH CHILDREN ARE MOST AFFECTED?

Children of poverty and of color are most likely to suffer from exposure to environmental hazards (see figure 1). Two of the most common hazards—poor indoor air quality and lead-based paint—are common in low-income neighborhoods and are associated with poorly maintained housing. Hazardous waste dumps and industrial sites are more likely to be in low-income neighborhoods than in middle- and upper-class neighborhoods. Additionally, lack of access to health care compounds the treatment of environmentally related health problems such as asthma and lead poisoning.

## TOXIC ELEMENTS

**Lead** Lead is a leading example of an environmental hazard that disproportionately affects children. Commonly caused by deteriorating lead paint in pre-1978 housing, lead poisoning in

Figure 1.

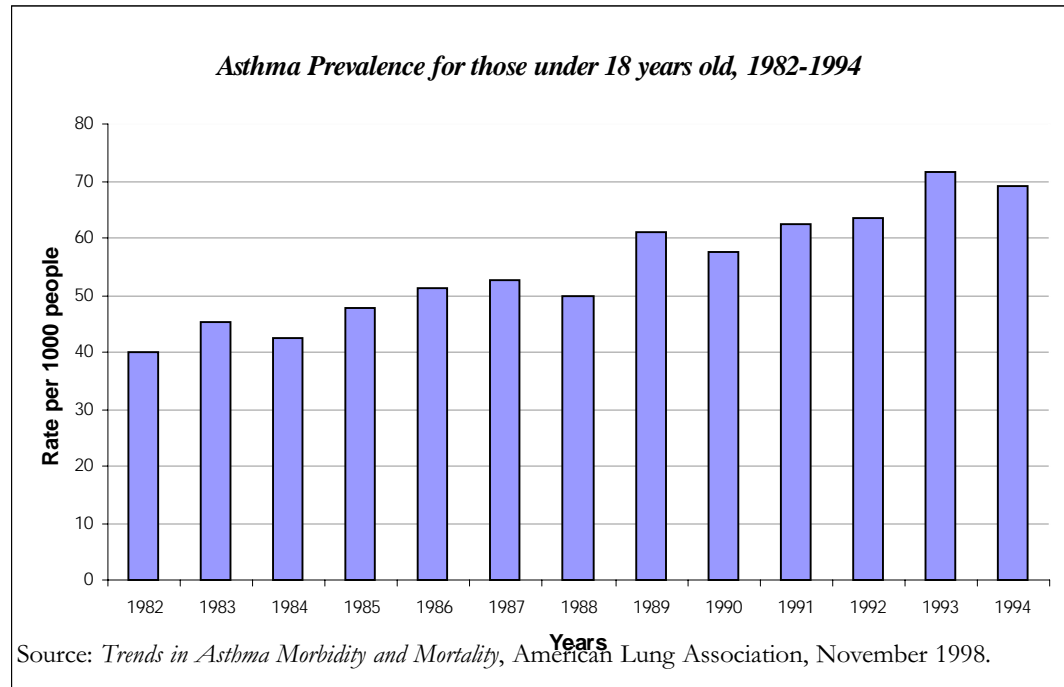


Source: *National Health Interview Survey*, National Center for Health Statistics, 1982-1994.

young children can cause learning disabilities, behavioral problems, I.Q. deficits and nervous system disorders. Results of research conducted by the Centers for Disease Control and Prevention (CDC) in 1994 found that approximately 900,000 children suffer from lead poisoning and the potential for permanent health effects. Great strides in reducing lead poisoning have been made during the last 25 years, including the phasing out of leaded gasoline, the elimination of lead-based paint for household use, and the elimination of lead solder in plumbing and food cans. Although these measures have helped to reduce the average levels of lead in children and adults by 80 percent since the 1970s, lead poisoning remains a problem for children who live in older housing and near mining and industrial sites.

**Poor Indoor Air Quality** Research indicates that indoor air pollution is a potential environmental hazard in many homes and schools. Poor ventilation, lack of upkeep, leaky roofs and use of indoor chemicals such as solvents and pesticides all are associated with poor indoor air quality. One of the most visible results of poor indoor air quality is the rising rate of asthma. Common air pollutants such as cigarette smoke can bring on asthma attacks and increase their severity. Asthma deaths in children and youths increased by more than 100% between 1980 and 1993 (see figure 2), and asthma-related illness is the number one cause of hospital admissions among the nation's children.

Figure 2.



**Poor Outdoor Air Quality** According to the U.S. Environmental Protection Agency (EPA), nearly 25 percent of the nation's children live in areas that do not meet national air quality standards. Research shows that particulate matter, ground-level ozone and sulfur dioxide have harmful effects on lung function and the upper respiratory tract. Children are particularly sensitive to these particles, and many studies indicate that lost school days, restricted activity and reduced lung function correspond to increases in air pollutants.

**Pesticides** Children are exposed to pesticides through household use, eating produce and drinking water that contains pesticide residue. Because children consume significantly more produce and play on the ground where pesticide residues may linger, they can receive higher doses of many different pesticides. Studies have shown that children of parents who use pesticides occupationally or in the household are three to nine times more likely develop leukemia. (2,3) The U.S. Geological Survey recently finished the largest pesticide and water study to date. Within the study regions, it found that 95 percent of streams and 50 percent of wells near agricultural and urban areas contain one or more pesticides. Although most did not violate current safe drinking water standards, these standards are valid only for exposure to individual pesticides, not to mixtures of various pesticides that are present in most contaminated sources. For most of the streams tested, half of which supply drinking water, pesticide levels exceeded aquatic-life guidelines as defined by the U.S. Environmental Protection Agency.

**Solvents** Some studies have linked occupational solvent exposure of pregnant women to birth defects in their children. Solvents—chemicals that dissolve or disperse other substances—are present in gasoline, paints, paint thinners, glues and many other products. (4,5,6)

**Poor Water Quality** Children swim in our lakes and streams, and eat freshwater fish. Swimming in polluted freshwater or coastal areas can cause respiratory, gastrointestinal, eye and ear symptoms, and fever. This pollution usually is the result of sewage dumping, industrial effluent and agricultural runoff. Thousands of rivers, lakes and streams across the nation have signs posted that warn pregnant women, children and other sensitive individuals to avoid eating fish caught in these water bodies due to contamination. The EPA states that from January to September 1994, 1,500 fish advisories were posted; 73 percent of these postings were related to mercury contamination, the rest were related to PCBs, pesticides, and other toxics.

**Endocrine Disruptors** Chemicals such as DDT, PCB and others found in common pesticides are known to disrupt the endocrine systems (the body's chemical communication network) of wildlife and laboratory animals. Humans also may be at risk. Endocrine disruptors can interfere with the hormonal activity in the body during sensitive stages of prenatal development, creating a potential for birth defects and abnormal growth and development in children. They also may promote the development of reproductive cancers. The EPA, CDC and other organizations currently are developing tests and conducting research to find out more about endocrine disrupting chemicals in our environment.

**Mercury** Mercury may damage the nervous system and cause severe mental retardation and cerebral palsy in newborns of mothers who consume too much mercury-contaminated fish, which occurred on a large scale in Minimata, Japan. The EPA states that from January to September 1994, 1,075 fish advisories were posted due to mercury contamination; more than 40 states have issued mercury fish consumption advisories for at least one of their water bodies. Mercury is a pollutant that can persist in the environment for hundreds of years. The largest sources of mercury pollution are waste incinerators and power plants. When pregnant mothers ingest too much mercury-contaminated fish, it can result in permanent brain damage and cerebral palsy in their newborns.

To better understand the effects of these toxic chemicals, the CDC uses biomonitoring to accurately assess chemical exposures. Biomonitoring uses blood or urine samples to measure toxic substances in the body. These techniques are leading to a better understanding of the environmental exposures that lead to disease.

## **LEGISLATIVE ACTIVITY AND POLICY**

Action on children's environmental health has slowly increased in recent years, growing in momentum since the Federal Executive Order of 1997, titled "Protection of Children from

Environmental Health Risks and Safety Risks.” This order charges agencies to consider special environmental risks to children in their activities. The EPA created the Office of Children’s Health Protection (OCHP) in 1997 to support this order and is cooperating with other agencies to establish federally funded research centers that are devoted to protecting children from environmental health threats.

### ***Federal***

**Food Quality Protection Act (FQPA)**—Amends both the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Federal Food, Drug, and Cosmetic Act (FFDCA) to make a more consistent, protective regulatory system that is supported by sound science. It mandates a single health-based standard for all pesticides in foods and provides special protection for infants and small children. It also takes into account the possible additive or multiplicative effects of different pesticides from all sources of exposure. To make up for the lack of children’s toxicity data, the FQPA requires the EPA to use an additional, tenfold (10X) safety factor in setting tolerance levels, unless “reliable data” for children’s toxicity and exposure exists to prove that this unnecessary .

**Chemical Right to Know**—The EPA intends to promulgate a Children’s Health Test Rule under section 4 of the Toxic Substances Control Act (TSCA). This rule will require the testing of chemicals to which children are likely to be exposed, but lack sufficient toxicity data for risk assessment. Manufacturers, importers and processors of the selected chemicals can be required to conduct the tests.

**New Clean Air Standards**—In July 1997 the EPA issued stricter ozone and particulate matter air quality standards, taking into account children’s susceptibility to air pollution. The more stringent standards aim to reduce the effects of outdoor air pollution on asthma and other illnesses.

**Asthma Initiative**—On January 28, 1999, the administration announced a comprehensive, national \$68 million initiative aimed at combating childhood asthma. This program will invest in research to determine the environmental causes of asthma and to develop new strategies to reduce asthma. It also provides funds to states and providers to help them implement effective disease management strategies to lower hospitalizations, emergency room visits and deaths from asthma.

**Residential Lead-Based Paint Reduction Act**—Enacted in 1992, this law directs the EPA, the U.S. Department of Housing and Urban Development (HUD), and the Occupational Safety and Health Administration (OSHA) to develop lead hazard reduction programs. As a result of this act, states are given the option of developing their own lead programs or having the EPA run a program for the state. As of February 1999, 38 states had enacted legislation to create lead programs.

## *State*

Legislative activity on children's environmental health issues has consisted mainly of bills targeting specific hazards, such as lead poisoning or parental notification before school pesticide use. State legislation that targets children's special vulnerabilities to general environmental hazards did not appear until 1998. Local data—lead notwithstanding—does not exist in relation to children's environmental health. Data that can help guide decisions at the state and local levels still is needed.

Michigan House Bill 4550, introduced in April 1999, proposes the creation of the Office of Children's Health Protection within the Department of Environmental Quality. The goal of this department is to protect children's health while taking into account the special vulnerability of children to pollution in their environment. The bill requires that the office review proposed environmental legislation, statutes and rules, and subsequently make recommendations to ensure children have adequate health protection. The bill also requires the office to coordinate research and public education programs to make parents aware of children's environmental health risks.

California has introduced similar but less comprehensive legislation relating to children's environmental health concerns. Senate Bill 25, introduced in December 1998, requires review of the state's air quality standards to determine if they adequately protect the health of children and infants, and provides for revisions if standards are deemed inadequate. A second California bill, Assembly Bill 1207, introduced February 1999, seeks to protect children at schools and daycare centers from environmental hazards such as radon, asbestos, indoor air pollution and toxic pesticides.

New Jersey introduced Assembly Bill 2069, the "Children's Environmental Health and Safety Rights Act," in May 1998. The bill creates an advisory council on children's environmental health to ensure that risk assessments upon which standards, regulations, and guidance are based adequately consider child-specific susceptibilities. The council also must seek out research on children-specific environmental vulnerabilities and make sure that recommendations include these concerns. The state education department and the departments of environmental conservation and health will revise standards and regulations to reflect the findings of the council.

New York Assembly Bill 2068, the "Children's Environmental Health and Safety Bill of Rights," was introduced January 20, 1999. This bill requires that the departments of Environmental Protection and Health and Senior Services review standards, regulations and guidelines that are intended to protect the environmental health and safety of children, taking into account a child's special environmental susceptibilities. The departments will evaluate risk assessments upon which standards are based and establish procedures to insure that future risk assessments take into account children's sensitivity to environmental hazards. Additionally, the department

should develop new comprehensive policies to address cumulative and simultaneous exposures of children to environmental hazards.

## NOTES

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