

Protect Children, Protect Our Future



Children are 30% of the world's population, but 100% of our future.



Take Action to Protect Children Where They Live, Learn, and Play

Risks from environmental exposure at home, school, and at play can be reduced if care is taken to assure a healthy environment. Governments, non-government organizations, private industry, educational institutions, and individuals can make a difference in protecting children from environmental harm. Through policy-making, research, and education we can work together to protect our children and our future.



Promote Policies that Protect Children

Communities, states, and the federal government can create policies that protect children from environmental risks and provide proper medical care to those children exposed to such risks. Legislation, regulations, and standards in areas such as housing, transportation, education, agriculture, health, and the environment, should explicitly consider children's environmental exposures and health effects.



Increase Scientific Knowledge about Children's Environmental Health

Scientific evidence shows that children are different from adults in terms of their exposure and susceptibility to pollutants. This evidence may explain the relationship between environmental risks and some childhood illnesses. Still, gaps exist in our understanding of how, and to what extent,

environmental contaminants cause or exacerbate childhood diseases and developmental disorders. Children's environmental health research should be a priority.



Enhance Diagnosis and Treatment of Environment-Related Illnesses

The public turns to health care professionals for environmental health information. The health care community must be trained in environmental health, and equipped to share information about environmental risks and children's health.



Educate the Next Generation

Youth involvement in recycling programs created a cultural change in the way we manage our trash. Programs aimed at children and youth will create a new generation of experts on environmental health—a generation that will be prepared to answer the new questions that our ever-changing world poses.



Protect Children Beyond Our Borders

Children's environmental health issues span the globe and transcend political boundaries. The priorities of developed countries may not be the same as those in developing countries, but they are similar enough to warrant international cooperation and collaboration for technical, scientific, and economic reasons.

For more information about children's environmental health and ways you can get involved, visit EPA's Office of Children's Health Protection Web site at www.epa.gov/children or call toll-free 1-877-590-KIDS.



Protecting children from environmental risks is fundamental to the U.S. Environmental Protection Agency's (EPA) efforts to make the world a healthier place, now and for future generations.

Children need clean air to breathe, clean water to drink, safe food to eat, and a healthy environment to learn, grow, and thrive. Yet every day, children are exposed to environmental risks that may stand in the way of these basic necessities. They may even be more vulnerable to some environmental risks than adults for several reasons:

- Children's nervous, immune, digestive, and other systems are still developing and their ability to metabolize or inactivate toxicants may be different than adults;
- Children eat more food, drink more fluids, and breathe more air in proportion to their body weight than adults; and
- Children's behavior—such as crawling and placing objects in their mouths—may result in greater exposure to environmental contaminants.

Many of the health problems that result from exposure to harmful environmental conditions can be prevented, managed, and treated. This is why EPA considers risks to children when setting standards to control pollution. You can play a role, too.

Children Need Protection Where They Live, Learn, and Play

Each day, children may be exposed to a variety of environmental contaminants at home, school, and outdoors. These environmental exposures can have harmful effects on children's health and behavior, and the amount and timing of exposure can influence the magnitude of these effects. Children need our protection. Learning about children's environmental health is the first step to protecting them from environmental risks.

Children are often at risk of exposure to indoor air pollution.

Poor indoor air quality can cause respiratory illness in children because their respiratory systems are still developing. They also breathe more air than adults in proportion to their body weight. Respiratory diseases, such as asthma, can severely affect a child's ability to live an active life.

Exposure to allergens and irritants, including animal dander, cockroaches, mold, and dust mites, plays a significant role in triggering asthma episodes in children. Secondhand tobacco smoke is another asthma trigger that typically occurs in the home. It may cause bronchitis, pneumonia, and ear infections, and is believed to be associated with sudden infant death syndrome (SIDS). Since

children spend a lot of their time at home, day care, and school, reducing their exposure to indoor environmental triggers in these places is especially important.



Outdoor air pollution may affect children more than adults.

Outdoor activity is part of a healthy lifestyle, but when air pollution levels are high, adverse health effects may result. Outdoor air pollutants that have been shown to be particularly harmful to children include ozone and fine particulate matter. Other air pollutants, such as sulfur dioxide (SO₂), nitrogen oxides (NO_x), and toxic air pollutants, also may affect children's health.

Ground-level ozone (a component of smog) is formed when NO_x and other air pollutants react in the presence of heat and sunlight. Smog can cause coughing, throat irritation, and chest pain. It can reduce lung function, inflame the linings of the lungs, and trigger asthma attacks, even the day after ozone levels are high. Repeated inflammation over time may permanently scar lung tissue. Children and teenagers who are active outdoors—especially those with asthma or other respiratory illnesses—are particularly vulnerable to smog.

Some fine particles are emitted directly into the air from combustion sources such as cars, trucks, buses, construction and farming equipment, and electric utilities. Fine particles in urban air also result from chemical reactions of SO₂ and NO_x with other chemicals in the atmosphere. Exposures to fine particles have been linked to a number of children's health problems, including bronchitis and asthma. Diesel exhaust is a source of fine particles and is also a likely human carcinogen.

SO₂ is formed when fuel containing sulfur—mainly coal, oil, and diesel—is burned, and during metal smelting and other industrial processes. The majority of SO₂ released into the air comes from electric utilities and refineries, particularly those that burn coal. SO₂ contributes to respiratory disease, and may aggravate existing heart and lung disease.

NO_x refers to a group of highly reactive gases emitted by motor vehicles, electric utilities, and other fuel-burning industrial and commercial sources. NO_x gases can contribute to respiratory illnesses especially in children, and as noted above, both SO₂ and NO_x can react to form harmful particles in the air.

Toxic air pollutants, also known as hazardous air pollutants, are emitted from combustion sources, such as motor vehicles and power plants, and industrial activities. A number of commonly occurring toxic air pollutants, including



solvents, organic chemicals, and heavy metals, have been shown to harm the developing nervous system, reproductive organs, and immune system—all of which grow and develop rapidly during the first months and years of life. Long-term exposure to some toxic air pollutants may cause cancer.

Lead is a risk to children's physical and mental development.

Removing lead from gasoline in the U.S. is considered by many to be one of the great public health achievements of this generation. Lead levels in children's blood dropped dramatically from the 1970s to the mid-1980s, as the use of leaded gasoline was phased out. However, lead still poses a risk.

Lead was a common ingredient in household paint until it was banned in 1978. Children living in homes built before 1978 may be exposed to hazards from deteriorated lead paint and lead dust. Because children play outside and frequently put their hands in their mouths, contaminated soil near automobile repair shops, abandoned mines, industrial sites, and highways also may be a source of exposure. In addition, lead

in drinking water can contribute to overall lead exposure.

Childhood exposure to lead may result in damage to the nervous system leading to behavioral problems and reduced intelligence, and may cause impaired growth and hearing.

Mercury is toxic during child development.

Children born to women with substantially elevated blood mercury levels are at increased risk for nervous system and developmental effects, delayed onset of walking and talking, and abnormalities in vision, hearing, and speech. At far lower exposures, reduced neurological and developmental test scores occur. Children exposed to mercury after birth may be sensitive to the toxic effects of mercury because their nervous systems are still developing.



Mercury is found in the environment in several forms, but coal-fired power electric utilities are the largest source of mercury emissions in the U.S. Mercury emitted from plants and other combustion sources is deposited on surface water and transformed into methylmercury, which builds up in fish. People are exposed to methylmercury almost exclusively by eating fish. Though fish is an important part of a balanced diet, federal and state fish advisories guide consumers to limit their intake of certain fish that contain higher levels of mercury.



Children may be exposed to contamination through the water supply.

The U.S. has one of the safest water supplies in the world. Public water systems test water for more than 90 chemical, microbial, and radiological contaminants, and are required to treat water to remove harmful substances under the *Safe Drinking Water Act*.

While actual events of serious drinking water contamination are infrequent and usually of short duration, it is possible for children to ingest contaminated water from a public water system or, more commonly, from a private well or by swimming in polluted bodies of water. Microbial contaminants, such as bacteria and viruses, are of special concern because they may cause immediate or acute reactions, such as vomiting or diarrhea. Long-term exposure to some contaminants, including pesticides, minerals, and solvents, at levels above standards may cause gastrointestinal problems, skin irritations, cancer, reproductive and developmental problems, and other chronic health effects. High levels of nitrates in drinking water can cause serious illness in infants. If contamination poses an immediate health threat, water suppliers are required by law to notify customers right away. Individuals with private wells are responsible for testing to assure that the water is safe to drink.



Children may be more sensitive and more exposed to pesticides.

Children, due to their relative body size, may be more exposed to pesticides because they drink more water, breathe more air, and eat more of certain foods

compared to adults. Young children eat three to four times more food than adults in proportion to their body size, and they often eat greater proportionate quantities of a more limited variety of foods. Children may be disproportionately exposed to certain pesticide residues that may be present in food. Still, for children and adults alike, the benefits of a diet that includes fruits and vegetables far outweigh the potential risks of pesticides.



Children's behavior, such as playing on lawns, floors, or carpeting recently treated with pesticides,

as well as putting their fingers or objects, including dirt and toys that may be contaminated with pesticide residues, in their mouths, also can lead to higher exposures. Access to containers of pesticides and other chemicals in the house, garage, or storage sheds can result in dangerous exposures.

The dose, toxicity, and timing of exposure can have a significant impact on the nature and severity of the resulting health effect. During early years of development, children's bodies metabolize substances differently than adults. In some cases, this may make a pesticide more toxic to a child. Too much exposure to pesticides may lead to a variety of health effects, such as acute poisoning, disruption of the hormone and immune systems, respiratory problems, neurological damage, and cancer.

Elevated levels of radon in indoor air may cause cancer.

Radon is an invisible, odorless, radioactive gas that comes from the natural breakdown of uranium in soil, rock, and water. Radon can enter into basements or crawl spaces through cracks and porous foundations, leading to high levels in indoor air where children may sleep or play. In some locations, well water containing dissolved radon also may affect children's health. Testing homes for radon is simple and inexpensive, and if discovered, radon problems can usually be fixed.

Carbon monoxide can be a risk to fetuses, infants, and children.

Carbon monoxide (CO) is a colorless, odorless, tasteless gas produced whenever any fuel such as gas, oil, kerosene, wood, or charcoal is burned. If indoor and outdoor appliances that burn fuel are properly installed, vented, maintained, and used, the amount of CO in the air we breathe is usually not hazardous. However, dangerous levels of CO can accumulate where appliances are not working with proper ventilation or are used incorrectly. If a pregnant woman is exposed to elevated levels of CO, it may harm the fetus. Infants and children are believed to be more susceptible to CO exposure than adults. Exposure to very high levels of CO can result in severe injury or death.

Unprotected sun exposure during childhood increases lifetime risk for skin cancer.

Children spend much of their time outdoors, exposed to the sun. Overexposure to ultraviolet (UV) radiation from the sun can cause sunburns in the short term, but also may lead to long term health problems such as skin cancer, cataracts, and premature aging of the skin. Just one or two blistering childhood sunburns may double the risk of some skin cancers as an adult. Artificial sources of UV light such as sunbeds and sunlamps also can damage the skin and unprotected eyes. Preliminary scientific research suggests that UV radiation also may harm the immune system.







Asthma 20 million people, including 6.1 million children, have asthma.¹

Hospitalizations for asthma increased from 21 per 10,000 children in 1980 to 27 per 10,000 children in 2002.²

In 1999, asthma was the fourth ranking cause of non-injury-related hospitalization among children less than 15 years of age.³

In 2002, 187 children under 18 years of age died from asthma.⁴ The number of children ages 1-14 dying from asthma increased 186 percent from 1979 to 2002.⁵

Asthma disproportionately affects children from lower-income families and children from different racial and ethnic groups.⁶

Asthma is the most common chronic childhood disease in the United States.⁷

Economic Impact of Asthma In 1994-1996, children with asthma missed approximately 14 million school days a year.⁸

The direct and indirect costs of asthma to the U.S. economy were estimated at \$16.1 billion in 2004.⁹

- About 1/3 of the costs are associated with children's asthma.¹⁰
- School absenteeism costs approximately \$1.5 billion each year in lost productivity.¹¹

Asthmatic patients and their families pay a higher portion of their medical care costs than patients with other diseases because of heavy reliance on prescription medication combined with lower insurance coverage for prescription drugs.

- They pay about 25 percent of the cost themselves compared to 10 percent for other general medical care costs.¹²

Lead Poisoning About 430,000 American children (approximately 2 percent) ages 1-5 had elevated levels of lead in their blood (that is, levels at or greater than 10 ug/dL) in 1999-2000. That number of lead poisoned children declined significantly from 4.7 million in 1978.¹³

Childhood lead poisoning reduces IQ, which can never be regained.¹⁴

The decline in blood lead levels is due largely to the phasing out of lead in gasoline between 1973 and 1995¹⁵ and to the reduction in the number of homes with lead-based paint from 64 million in 1990 to 38 million in 2000.¹⁶

Today, elevated blood lead levels are due mostly to the ingestion of contaminated dust, paint, and soil.¹⁷

Blood lead levels are higher for children ages 1-5 from lower-income families and for certain racial and ethnic groups.¹⁸

¹ EPA, Asthma Facts, Indoor Environments Division, Office of Air and Radiation, EPA 402-F-04-019, May 2006.

² CDC Asthma Prevalence, Health Care Use and Mortality, 2002. See <http://www.cdc.gov/nchs/data/hestat/asthma/asthma.htm>.

³ EPA, America's Children and the Environment, Second Edition, 2003, p.75. See http://yosemite.epa.gov/ochnp/ochpweb.nsf/content/ACEReport3_19final.htm#File/ACEReport2_21final.pdf.

⁴ CDC, <http://www.cdc.gov/nchs/data/hestat/asthma/asthma.htm>.

⁵ American Lung Association, Trends in Asthma Morbidity and Mortality, May 2005, Table 4. See <http://www.lungusa.org/finding-cures/our-research/trend-reports/asthma-trend-report.pdf>.

⁶ EPA, America's Children and the Environment, p. 71.

⁷ National Academy of Science, Clearing the Air: Asthma and Indoor Air Exposures, 2000, Executive Summary, p.1.

⁸ Mannino, D., DHoma, L. Akinbami, J. Moorman, C. Gwynn, and S. Redd, Surveillance for Asthma-United States, 1980-1999, Morbidity and Mortality Weekly Report 51(SS01), p. 5. See <http://www.cdc.gov/mmwr/PDF/SS/SS5101.pdf>

⁹ National Institutes of Health. May 2004. Morbidity & Mortality: 2004 Chart Book on Cardiovascular, Lung, and Blood Diseases.

¹⁰ EPA, National Costs of Asthma for 1997, p. 24.

¹¹ American Lung Association, Table 20.

¹² EPA, National Costs of Asthma for 1997, pp. 21-22.

¹³ EPA, America's Children and the Environment, Second Edition, 2003, p. 53. See http://yosemite.epa.gov/ochnp/ochpweb.nsf/content/ACEReport3_19final.htm#File/ACEReport2_21final.pdf.

¹⁴ ATSDR, Case Studies in Environmental Medicine, Lead Toxicity, revised September 1992. See <http://wonder.cdc.gov/wonder/prevguid/p0000017/p0000017.asp>.

¹⁵ EPA, National Air Quality and Emissions Trends Report, 1998 (2000), p. 78. See <http://www.epa.gov/air/airtrends/laqrnd98>.

¹⁶ D. Jacobs, R. Clickner, J. Zhou, S. Viet, D. Marker, J. Rogers, D. Zeldin, P. Broene, and W. Friedmann, 2002, The Prevalence of Lead-Based Paint Hazards in U.S. Housing, Environmental Health Perspectives 110(10): 599-606 (2002).

¹⁷ CDC, Screening Young Children for Lead Poisoning: Guidance for State and Local Public Health Officials, 1997. See <http://www.cdc.gov/nceh/lead/publications/screening.htm>.

¹⁸ CDC, <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5420a5.htm>.

¹⁹ President's Task Force on Environmental Health Risks and Safety Risks to Children, Eliminating Childhood Lead Poisoning: A Federal Strategy Targeting Lead Paint Hazards, February 2000, p. A-26. See <http://yosemite.epa.gov/ochnp/ochpweb.nsf/content/pdf13.htm#File/leadhaz.pdf>.

²⁰ Ibid, p. A-28

Economic Impact of Lead Poisoning Reduced cognitive ability, as measured by IQ scores and valued in terms of forgone earnings, is estimated to be about \$9,600 per IQ point lost.¹⁹

The cost of not eliminating lead exposure to children between 2000-2010 is expected to be about \$22 billion in forgone earnings.²⁰

Childhood Cancer In 2005, an estimated 9,510 cancer cases are expected to occur among children aged 0 -14. An estimated 1,585 deaths from all cancer cases are expected in 2005.²¹

Cancer is ranked fourth as the cause of death by disease among children between 1 and 19 years of age behind unintentional injuries, homicides, and suicides.²²

Leukemia is the most common cancer diagnosis for children under age 15, accounting for about 30 percent of all cases, followed by brain and other nervous system cancers (21 percent).²³

The causes of childhood cancer are poorly understood, though in general it is thought that different forms of cancer have different causes.²⁴

Economic Impact of Childhood Cancer The total cost per case of childhood cancer is estimated to be approximately \$623,000 (in 1998 dollars).²⁵

The estimated annualized cost of cancer for children under 15 years of age is \$4.8 billion (in 1998 dollars).²⁶

Developmental Disorders Approximately 12 million children (17 percent) under age 18 suffer from one or more developmental disabilities, which include physical, cognitive, psychological, sensory, and speech impairments.²⁷

In 1997-2000 about 0.6 percent of children were reported to be diagnosed with mental retardation.²⁸

Between 3 and 8 percent of the babies born each year will be affected by developmental disorders such as attention-deficit/hyperactivity disorder or mental retardation.²⁹

Mental retardation is more common for children from lower-income families and for certain racial and ethnic groups.³⁰

The causes of developmental disorders are generally unknown.³¹

Economic Impact of Developmental Disorders During the 1999-2000 school year, the 50 states and the District of Columbia spent approximately \$50 billion on special education services, amounting to \$8,080 per special education student.³²

Expenditures can range from 1.6 times (for students with specific learning disabilities) to 3.1 times (for students with multiple disabilities) higher than expenditures for a regular education student.³³

Estimated lifetime costs in 2003 dollars are expected to total \$51.2 billion for persons born in 2000 with mental retardation.³⁴

²¹American Cancer Society, *Cancer Facts and Figures 2005*. Atlanta, 2005.

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²³EPA, *America's Children and the Environment*, Second Edition, 2003, p. 76. See [http://yosemite.epa.gov/oachp/ochpweb.nsf/content/ACReport3_19final.htm/\\$File/ACReport2_21final.pdf](http://yosemite.epa.gov/oachp/ochpweb.nsf/content/ACReport3_19final.htm/$File/ACReport2_21final.pdf).

²⁴*Ibid.*

²⁵P. Landrigan, C. Schecter, J. Lipton, M. Fahs, and J. Schwartz, *Environmental Pollutants and Disease in American Children: Estimates of Morbidity, Mortality, and Costs for Lead Poisonings, Asthma, Cancer, and Developmental Disabilities*, *Environmental Health Perspectives* 110(7): 771-8 (2002).

²⁶*Ibid.*

²⁷Boyle, CA, Decoufle P., Yeargin-Allsop M., Prevalence and Health Impact of Developmental Disabilities in US Children, *Pediatrics*, March 93 (3):399-403, 1994; and U.S. Census Bureau Population Estimates Program, Washington, DC.

²⁸EPA, *America's Children and the Environment*, Second Edition, 2003, p. 85. See [http://yosemite.epa.gov/oachp/ochpweb.nsf/content/ACReport3_19final.htm/\\$File/ACReport2_21final.pdf](http://yosemite.epa.gov/oachp/ochpweb.nsf/content/ACReport3_19final.htm/$File/ACReport2_21final.pdf).

²⁹B. Weiss and P. Landrigan, *The Developing Brain and the Environment: An Introduction*, *Environmental Health Perspectives* 108 (Suppl.3): 373-4 (2000).

³⁰EPA, *America's Children and the Environment*, Second Edition, 2003, p.85.

³¹CDC, <http://www.cdc.gov/ncbddd/dd>.

³²Chambers, JG, Parrish, T., and Harr, JJ 2002. *What Are We Spending on Special Educations Services in the United States, 1999-2000?* Palo Alto, CA: American Institutes for Research. See <http://www.csef-air.org/publications/seep/national/AdvRpt1.PDF>.

³³Chambers JG, Shkolnik J, Perez M. *Total expenditures for students with disabilities, 1999-2000: spending variation by disability*. Washington, DC: American Institutes for Research, 2003. See http://csef.air.org/publications/seep/national/final_seep_report_5.pdf.

³⁴CDC, <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5303a4.htm>



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³⁰EPA, *America's Children and the Environment*, Second Edition, 2003, p.85.

³¹CDC, <http://www.cdc.gov/ncehd/ddd>.

³²Chambers, JG, Parrish, T., and Harr, JJ 2002. *What Are We Spending on Special Education Services in the United States, 1999-2000?* Palo Alto, CA: American Institutes for Research. See <http://www.csef-air.org/publications/seep/national/AdvRpt1.PDF>.

³³Chambers JG, Shkolnik J, Perez M. *Total expenditures for students with disabilities, 1999-2000: spending variation by disability*. Washington, DC: American Institutes for Research, 2003. See http://csef.air.org/publications/seep/national/final_seep_report_5.pdf.

³⁴CDC, <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5303a4.htm>

EPA's Mission to Protect Children

In 1995, EPA made it a priority to explicitly and consistently take into account environmental health risks to infants and children in all risk studies and public health standards set for the U.S.

The President's Executive Order on Environmental Health Risks and Safety Risks to Children requires all federal agencies to address health and safety risks to children, coordinate research priorities on children's health, and ensure that their standards take into account special risks to children.


EPA established the Office of Children's Health Protection (OCHP) to support and facilitate Agency efforts to protect children's health from environmental risks. The mission of OCHP is to make the protection of children's health a fundamental goal of public health and environmental protection in the U.S.

EPA's mission is to protect human health and to safeguard the natural environment. Protecting children where they live, learn, and play is essential to ensuring that our environment is safe and healthy, now and for future generations.



Office of Children's
Health Protection (1107A)

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