

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.

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.



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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 (NOx), and toxic air pollutants, also may affect children's health.

Ground-level ozone (a component of smog) is formed when NOx 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 NOx 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.

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





ONLINE RESOURCES TO PROTECT CHILDREN



The following is a list of online tools and resources provided by the U.S. Environmental Protection Agency (EPA) to educate and encourage the public to protect children from environmental risks at home, at school, and outdoors. EPA is working with many partners to protect children's environmental health and links to non-EPA Web sites can be found at www.epa.gov/children.

LIVE

Indoor Air Quality – Provides information about indoor air quality topics, resources, and hotline numbers.

www.epa.gov/iaq

A Brief Guide to Mold, Moisture, and Your Home – Provides information and guidance for homeowners and renters on how to clean up residential mold problems and how to prevent mold growth.

www.epa.gov/iaq/molds/moldguide.html

Lead Poisoning Prevention – Provides information about lead, lead hazards, and simple steps to protect your family.

www.epa.gov/lead

Pesticides and Lead Poisoning – Offers simple tips to protect children from pesticides and lead poisoning in the home.

www.epa.gov/oppfead1/cb/10_tips

Ground Water and Drinking Water – Provides information about the quality and safety of our drinking water.

www.epa.gov/safewater

Drinking Water from Household Wells – Gives private household well owners answers to the most frequently asked questions, describes potential problems, and offers maintenance suggestions.

www.epa.gov/safewater/faq/faq/html1#pwell

Asbestos Home Page – Provides information and resources about asbestos in the home.

www.epa.gov/asbestos

Pesticides and Food – Explains what your family needs to know about children's health risks associated with pesticides and food.

www.epa.gov/pesticides/food

LEARN

Healthy School Environments – Serves as a gateway to EPA and other online resources to help facility managers, school administrators, architects, design engineers, school nurses, parents, teachers, and staff address environmental health issues in schools.

www.epa.gov/schools

Indoor Air Quality 'Tools for Schools' – Helps school personnel identify, solve, and prevent indoor air quality problems in the school environment.

www.epa.gov/iaq/schools

Integrated Pest Management in Schools – Encourages school officials to adopt Integrated Pest Management (IPM) practices to reduce children's exposure to pesticides.

www.epa.gov/pesticides/ipm

Student Environmental Human Health Information – Explores ways in which students can protect their health.

www.epa.gov/students/health.htm

Sunwise School Program – Focuses on children's health risks associated with overexposure to the sun, UV radiation, and ozone depletion.

www.epa.gov/sunwise

Lead-Free Schools and Day Care Centers – Provides information on reducing the risk of lead exposure from drinking water in educational facilities.

www.epa.gov/safewater/lead/schoolanddccc.htm

PLAY

Beach Watch – Describes EPA's goals of improving public health and environmental protection programs for beach goers, and provides the public with information about the quality of their beach water.

www.epa.gov/waterscience/beaches

Mercury Fish Advisories – Provides consumption advisories for commercial and non-commercial fish, and information on the risks associated with mercury in freshwater fish.

www.epa.gov/ost/fish

www.epa.gov/mercury/fish.htm

Outdoor Air Quality – Offers information about air quality in your area and provides links to air pollution data and maps.

www.epa.gov/air/urbanair/whappen.html

AIR NOW – Provides information on ozone maps, air quality forecasts, and health facts.

www.epa.gov/airnow

Diesel Exhaust and School Bus Idling – Encourages school districts to establish school bus idling guidelines to protect children from exposure to diesel exhaust.

www.epa.gov/region01/eco/diesel/assets/pdfs/Diesel_Factsheet_Schoolbus.pdf

Chromated Copper Arsenate (CCA) Treated Wood – Provides information about wood pressure treated with chromated copper arsenate (CCA), which is commonly used on playground equipment.

www.epa.gov/pesticides/factsheets/chemicals/cca_qa.htm

Other useful tools and resources:

EPA's President's Task Force on Environmental Health Risks and Safety Risks to Children

http://yosemite.epa.gov/ochp/ochpweb.nsf/content/Whatwe_fedtask.htm

EPA's Strategy for Research on Environmental Risks to Children

www.epa.gov/ncea/pdfs/strat4resrch.pdf

Children's Environmental Health and Safety Inventory of Research (CHEHSIR)

www.oaspub.epa.gov/chehsir/chehsir.page

America's Children and the Environment: A First View of Available Measures

[http://yosemite.epa.gov/ochp/ochpweb.nsf/content/pdf50.htm/\\$File/ACE-Report.pdf](http://yosemite.epa.gov/ochp/ochpweb.nsf/content/pdf50.htm/$File/ACE-Report.pdf)

Smart Growth Information

www.epa.gov/livablecommunities

*For links to additional online resources about children's environmental health, visit EPA's Office of Children's Health Protection web site at www.epa.gov/children.



Asthma An estimated 6.3 million children (8.7 %) under 18 years of age had asthma in 2001.¹ Hospitalizations for asthma increased from 21 per 10,000 children in 1980 to 29 per 10,000 children in 1999.²

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

In 2000, 233 children under 18 years of age died from asthma.⁴ The number of children ages 1-14 dying from asthma increased 180 % from 1979 to 1998.⁵

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 \$14 billion in 2002.⁹

- About 1/3 of the costs are associated with children's asthma.¹⁰
- School absenteeism costs over \$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 % of the cost themselves compared to 10 % 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 regained¹⁴.

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

¹EPA, America's Children and the Environment, Second Edition, 2003, p. 69. See <http://yosemite.epa.gov/ochp/ochpweb.nsf/content/publications.htm>.

²Ibid, p. 75.

³Ibid.

⁴CDC, <http://www.cdc.gov/nchs/products/pubs/pubd/hestats/asthma/asthma.htm>.

⁵American Lung Association, Trends in Asthma Morbidity and Mortality, March 2003, Table 4. See <http://www2.lungusa.org/data/asthma/ASTHMAdt.pdf>.

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

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

⁸Mannino, D., D. Homa, 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>

⁹NIH, http://www.nhlbi.nih.gov/resources/docs/02_chtbk.pdf.

¹⁰EPA, National Costs of Asthma for 1997, pp. 21-22.

¹¹American Lung Association, Table 17.

¹²EPA, National Costs of Asthma for 1997, p. 24.

¹³EPA, America's Children and the Environment, Second Edition, 2003, p. 53. See <http://yosemite.epa.gov/ochp/ochpweb.nsf/content/publications.htm>.

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

¹⁵EPA, National Air Quality and Emissions Trends Report, 1998 (2000), p. 78. See <http://www.epa.gov/oar/aqtrnd98/toc.html>

¹⁶D. 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).

¹⁷CDC, Screening Young Children for Lead Poisoning: Guidance for State and Local Public Health Officials, 1997. See <http://www.cdc.gov/nceh/lead/guide/guide97.htm>.

¹⁸CDC, <http://www.cdc.gov/nceh/lead/factsheets/childhoodlead.htm>.

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 1998, approximately 12,400 children younger than 20 years of age were diagnosed with cancer and 2,500 died.²¹

Cancer is the leading cause of death by disease among children between 1 and 19 years of age in the United States. It is the third most common overall cause of death, preceded only by intentional injuries and accidents.²²

Leukemia was the most common cancer diagnosis for children under age 20 from 1975-1995, followed by central nervous system tumors, and lymphomas.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 State and federal education departments spend about \$36 billion each year on special education programs for individuals with developmental disabilities who are 3-21 years of age.³²

Although it is hard to estimate the costs of caring for children with more serious forms of mental retardation, the costs may be as much as 10 times higher than caring for a child who does not have a disability.³³

¹⁹President'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/ochp/ochpweb.nsf/content/leadhaz.htm?file/leadhaz.pdf>.

²⁰*Ibid.*, p. A-28.

²¹L. Reis, M. Smith, J. Gurney, M. Linet, T. Tamra, J. Young, and G. Bunin, *Cancer Incidence and Survival among Children and Adolescents: United States SEER Program 1975-1995*, National Cancer Institute, NIH Pub. No. 99-4649, 1999, p. 1. See <http://seer.cancer.gov/publications/childhood/introduction.pdf>.

²²*Ibid.*

²³*Ibid.*, p. 2.

²⁴EPA, *America's Children and the Environment*, Second Edition, 2003, p. 76. See <http://yosemite.epa.gov/ochp/ochpweb.nsf/content/publications.htm>.

²⁵P. Landrigan, C. Schechter, 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.*

²⁷CDC, <http://www.cdc.gov/ncbddd/dd>.

²⁸EPA, *America's Children and the Environment*, Second Edition, 2003, p. 85. See <http://yosemite.epa.gov/ochp/ochpweb.nsf/content/publications.htm>.

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*, p. 85.

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

³²*Ibid.*

³³CDC, <http://www.cdc.gov/ncbddd/dd/ddmr.htm>.