



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.



