National Institute of Environmental Health Sciences
Your Environment. Your Health.

Children's Health: Why the Environment Matters

We all want our children to thrive where they live, learn, and play. Because children are smaller than adults, their risk for harm is greater when exposed to chemicals, pollution, or drugs. They are also more vulnerable to toxic effects because their brains and other organs are still developing.

Protecting children's health is a shared responsibility, with parents being supported by their communities, public health professionals, clinicians, and local, state, and federal governments.

What causes children's health problems?

Many factors contribute to development and overall health. Some health conditions are genetic, passing from grandparents to parents to children. Some health problems may be caused by factors in the environment. Many diseases arise from an interaction between genes and environment. Learning more about these interactions offers hope for preventing some health problems.

What does NIEHS research tell us about children's health?

Using a variety of research approaches, the National Institute of Environmental Health Sciences (NIEHS) addresses exposures to chemicals and circumstances during all stages of development. Research conducted or funded by NIEHS leads to discoveries about how the environment affects children's health, which, in turn, become a basis for ways to reduce or stop harmful exposures.

Environmental factors

Environmental factors can be external to your body, such as pollutants in air, water, and soil or social circumstances, or internal, such as stress.

Air pollution comes from vehicle, manufacturing, construction, and power generation emissions, and sources such as wildfires. A long-running, NIEHS-funded

study has linked higher levels of air pollution with increased respiratory infections and measurable lung damage. And, on the other hand, it found that children's respiratory health improved when air pollution levels declined or the children moved to less polluted areas.[1]

A type of air pollution exposure, particulate matter 2.5, at even relatively low levels, in children aged 9 to 10, may alter the developing brain. This effect could later increase the risk for cognitive and emotional problems in adolescence.[2]

Arsenic, a carcinogen, is a metalloid that occurs naturally in soil and groundwater. Early-life exposure to arsenic is linked to an increased risk of infection, lung and liver disfunction, neurodevelopment and cognitive effects, and skin changes, according to the American Academy of Pediatrics. Arsenic exposure may predispose children to health problems later in life. An increased incidence of lung and bladder cancers was found in adults exposed to arsenic early in life, even up to 40 years after high exposures ceased. These findings provide rare evidence that an early-life environmental exposure can be associated with risk of cancer as an adult.[3]

PO Box 12233 • Research Triangle Park, NC 27709
Phone: 919-541-3345 • **https://www.niehs.nih.gov**

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Fluoride added to drinking water is a public health initiative for improving oral health. The U.S. Public Health Service recommends 0.7 milligrams (mg) of fluoride per liter (L) of water to help prevent tooth decay. But fluoridation of water has also raised concerns. The National Toxicology Program, an interagency program located at NIEHS, found that exposure to fluoride at 1.5 mg/L and higher — twice the recommended level for water — may be linked to lower IQ in children.[4]

Lead in any amount in the body can damage health. Even low lead levels in children's blood are associated with behavioral problems, delayed puberty, and decreased hearing, cognitive scores, and growth or height.[5] Lead exposure is also associated with autism spectrum disorder.[6] High blood lead levels in children are due mostly to contaminated paint dust and soil.

Neighborhood characteristics, particularly high poverty and unemployment, may pose an environmental risk to the developing brains of children, according to NIEHS-funded research.[7] Disadvantaged neighborhoods may also lack quality health services, access to nutritious foods, parks and recreational facilities, and have more pollutants.

Racial segregation may make the consequences of lead exposure worse. A study linked detailed birth records with lead screening, standardized testing, and Census data for almost 26,000 children. Among the children with higher blood lead levels, test scores decreased as racial segregation increased. This effect became more marked as blood lead levels increased.[8]

Extreme Heat

Extreme heat can have a significant impact on children's health, often amplifying the risks of other factors. For example, higher temperatures can lead to more ground-level formation of ozone, a respiratory irritant. Children's developing lungs are especially vulnerable and these exposures can lead to worsening asthma,[9] lower respiratory tract infections, and chronic bronchitis.[10] Studies have shown that heat waves frequently spur an increase in emergency department visits by urban children, with asthma listed as one of the most common reasons.[11]

High temperatures also can pose a more direct danger, producing physical reactions and even heat stroke. Playgrounds and playing fields, especially those with artificial surfaces, can become places of concern for children. Researchers have found that temperatures on artificial turf rise to much higher temperatures than those on natural grass, raising the risk of heat stress for those using fields with those coverings.[12]

Prenatal health effects

Research shows that prenatal contact with certain environmental factors influences whether some diseases may happen later in life. NIEHS researchers reported that when pregnant women improved their nutrition and reduced exposure to hazardous chemicals, they were more likely to have healthy babies, and their children were better able to cope with environmental stressors later in life.[13]

Autism spectrum disorder rates are lower in children whose mothers took a prenatal vitamin with folic acid during early pregnancy.[14] Additionally, when mothers of children with autism spectrum disorder took prenatal vitamins with folic acid beginning in the first month of subsequent pregnancies, the occurrence of autism in those children was reduced by about half.[15]

Cancer, particularly leukemia and cancers of the brain and central nervous system, is the second leading cause of death among children under 14, according to the Centers for Disease Control and Prevention. Its incidence may be affected by prenatal nutrition or exposure to chemicals. For example, the children of women who took vitamins, including folic acid, before and during pregnancy had a reduced chance of developing childhood leukemia.[16] Other research showed a greater chance of leukemia developing in children whose mothers were exposed to pesticides during pregnancy, or whose fathers were exposed to pesticides around the time of conception.[17]

Childhood health effects

Asthma, a chronic disease in lung airways, is triggered by mold, air pollution, pest allergens, tobacco smoke, and other exposures. NIEHS-funded research shows vitamin D appears to have a protective effect for children with asthma. Children with asthma who had low blood levels of vitamin D had worse asthma than children with higher vitamin D levels.[18]

Neurodevelopmental disorders, such as symptoms of attention deficit hyperactivity disorder, problems with fine motor coordination, and lower cognition, were found in children exposed to high levels of flame retardants, polybrominated diphenyl ethers.[19] Flame-retardant chemicals are often applied to upholstered furnishings, mattresses, carpets, electronics and electrical devices, and construction materials.

Air pollutants called polycyclic aromatic hydrocarbons (PAHs) come from burning fossil fuels and other combustion. Studies have found consistent evidence that lower IQ scores and behavior problems are associated with exposure to PAHs.[20]

Puberty in girls is changing. Girls in the U.S. appear to be getting their first menstrual periods earlier, about six months sooner on average than decades ago.[21] Early onset puberty is a concern because of

links to diabetes, heart issues, breast and endometrial cancers, fertility issues, and mental health, according to the Endocrine Society.

Puberty may be affected by chemicals known as endocrine disruptors. These chemicals can mimic, or interfere with, the body's hormones and alter the balance needed for proper development and good health. Small hormonal disruptions can cause significant biological effects.

- NIEHS and other researchers are seeing early onset puberty tied to endocrine disruptor exposures. To advance understanding of this connection, certain chemical structures were identified that may cause the body to release puberty-related hormones earlier than it would otherwise.[22]
- During puberty, frequent use of personal care products that contain endocrine disruptors is associated with an increased chance of developing breast cancer later in life.[23] Some of the commonly found endocrine disruptors are chemicals called phthalates, parabens, and phenols.

Protecting children's health

The American Academy of Pediatrics provides guidance for "Promoting Healthy Environments for Children." Topic areas include air pollutants, arsenic, climate change, lead, personal care products, and pesticides.

https://www.aap.org/en/patient-care/environmental-health/promoting-healthy-environments-for-children

NIEHS children's health research

NIEHS Children's Environmental Health Translation Centers: These centers collaborate and translate key research findings into clinical and public health practice. Examples of research translation may include communication and risk management strategies, public health interventions and practices, clinical guidelines, and curriculums and educational activities.

NIEHS Pediatric and Reproductive Environmental Health Scholars: This program trains pediatricians, obstetricians, gynecologists, and others to create a network of professionals who tackle the complexities of pediatric and reproductive environmental health.

National Institutes of Health Environmental Influences on Child Health Outcomes (ECHO): Researchers focus on pre-, peri-, and postnatal outcomes; upper and lower airway health; obesity; neurodevelopment; and positive health, such as a sense of well-being. NIEHS contributes to ECHO studies.

For more information on the National Institute of Environmental Health Sciences, visit https://www.niehs.nih.gov.

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