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Air Quality and Children's Health and Well-Being

Amy Rogin and Anne N. Junod

Air quality measures how clean or polluted the air is, whereas air pollution refers to the presence of dangerous or toxic substances in the air that can harm human health and well-being. Pollutants can come in many forms, but top air polluters include:

- **Particulate matter 2.5 ($PM_{2.5}$):** any fine particles in the air that are less than 2.5 microns in diameter; their small size makes them easily inhalable and passable into the lungs and bloodstream
- **Ground-level ozone:** pollution that forms when fuel vapors, industry emissions, and other pollutants react with sunlight, concentrate at low altitudes, and worsen on hot days
- **Diesel particulate matter:** pollution produced from diesel engine exhaust, including toxic organic compounds, heavy metals, and other dangerous substances
- **Airborne carcinogens:** hazardous air toxins that have been shown to increase lifetime cancer risk, including those produced by vehicular traffic, power plants, wildfires, pesticides, and other sources

One consequence of decades of racialized segregation in the United States is that sources of pollution are more likely to be located or concentrated in certain areas and communities. Many people with low incomes and people of color, especially Black Americans, face disproportionate exposure to poor air quality and related negative health outcomes. With increasing temperatures and air stagnation as a result of climate change, air quality is expected to worsen, leading to increased ground-level ozone and $PM_{2.5}$ levels.

HOW AIR POLLUTION AFFECTS CHILDREN

Children are particularly vulnerable to air pollution because their bodies and immune systems are still developing, meaning they are more likely to experience adverse effects on their health, behavior and psychology, and learning.

- **Health:** Very small particles, such as $PM_{2.5}$ and diesel particulate matter, can be absorbed into the respiratory system and bloodstream, causing inflammation, diminished lung functioning, and cardiovascular stress. This can have lasting health effects, particularly for children with existing cardiopulmonary illnesses. Particulate matter is also linked to increased mortality, premature births, asthma, and various forms of cancer. Even at low levels, ground-level ozone has been found to aggravate difficult-to-treat asthma in children, even when they use inhalers.

ADDITIONAL RESOURCES

For more information on reducing air pollution risks for children, see the resources library.

Fact Sheets

To learn about other environmental and climate hazards and their risks to children, see these fact sheets:

- Extreme Heat
- Flooding
- Paved Area and Green Space
- Wildfires

Case Studies

To learn how Head Start programs are addressing environment and climate hazards for children in their programs, see these case studies:

- Creating Outdoor Green Spaces
- Resourcing Head Start Providers to Mitigate Toxic Exposures
- Social-Emotional Programming for Families Exposed to Environmental Risks

Mapping Tool

Explore air pollution exposure and other environmental and climate hazards affecting children in Head Start programs using our interactive map.

To access this fact sheet and other resources to reduce environmental and climate hazard exposures for children, visit https://urbn.is/3OkdZQt. This research is funded by the US Department of Health and Human Services Office of the Assistant Secretary for Planning and Evaluation. The views expressed are those of the authors and should not be attributed to the Urban Institute, its trustees, or its funders. Further information on the Urban Institute's funding principles is available at urban.org/fundingprinciples.

- **Behavior and psychology:** Exposure to air pollution can lead to **attention challenges** and symptoms of anxiety and depression, as well as **challenges with inhibition control** in children. Air pollution can also indirectly affect children's behavior by **inflaming asthma and disrupting sleep patterns**.
- **Learning:** High levels of air pollution can have **detrimental effects on children's learning** by decreasing their ability to focus, increasing absenteeism, and aggravating existing health challenges. A national study found that air pollution was associated with **lower academic performance among children**, and early exposure to air pollution is linked with **slower development of working memory** and inattentiveness. Studies of school-age children have also found that schools serving students of color and students eligible for free or reduced-price meals are more likely to have **higher exposure to air pollution**.

INTERVENTIONS FOR LIMITING EXPOSURE TO AIR POLLUTION

Early childhood educators, child care providers, parents, and caregivers can consider the following actions to reduce children's exposure to air pollution.

- **Keep windows closed during peak traffic times.** Outdoor pollutants can enter buildings through open windows and doors. Keeping windows closed during peak traffic times can limit the amount of outdoor pollution that enters the building.
- **Maintain HVAC systems.** Heating, ventilation, and air conditioning (HVAC) systems control how air moves through a building and help maintain indoor air quality. Ensuring that air filters are regularly cleaned or replaced and that systems are serviced on recommended schedules can keep these systems working properly.
- **Check the local air quality index (AQI).** **Airnow.gov** offers free, daily air quality data for local communities. When air quality is poor, follow recommended guidance for children's outdoor activities. When the AQI is orange, it may be advisable to limit children's outdoor activities as the air quality is unhealthy for sensitive populations, including children with preexisting conditions. When the AQI is worse than orange, experts **recommend keeping children indoors**.
- **Plan outdoor activities away from busy roads or highways.** Busy roads and highways increase the amount of diesel particulate matter in the air. If it is not possible to limit activities near these areas, consider planning outdoor activities during off-peak traffic times to limit children's exposure to vehicle emissions.
- **Consider an anti-idling policy for cars outside child care and school locations.** Car exhaust releases harmful pollutants that can easily enter nearby buildings. **Anti-idling policies in parking lots** limit the amount of time that vehicles can sit with their engines on and can help improve indoor air quality for nearby buildings.
- **Identify opportunities to collaborate with other organizations to advocate for better air quality.** Many community organizations are working to improve air quality. **AVANCE**, which operates Head Start programs in Houston, Texas, is working with area advocacy groups to protect children of color and neighborhoods with high shares of people of color from a proposed expansion to the I-45 interstate through their communities. Other organizations are working on similar projects to add air quality sensors or protect communities from polluting infrastructure nationwide.
- **Consider using federal resources on updating educational and care settings.** If planning for renovations or new facility construction, refer to the US Environmental Protection Agency's **Indoor Air Quality Design Tools for Schools**, which are designed with children in mind to maximize indoor air quality during the construction phases and in the finished building design and operations.

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