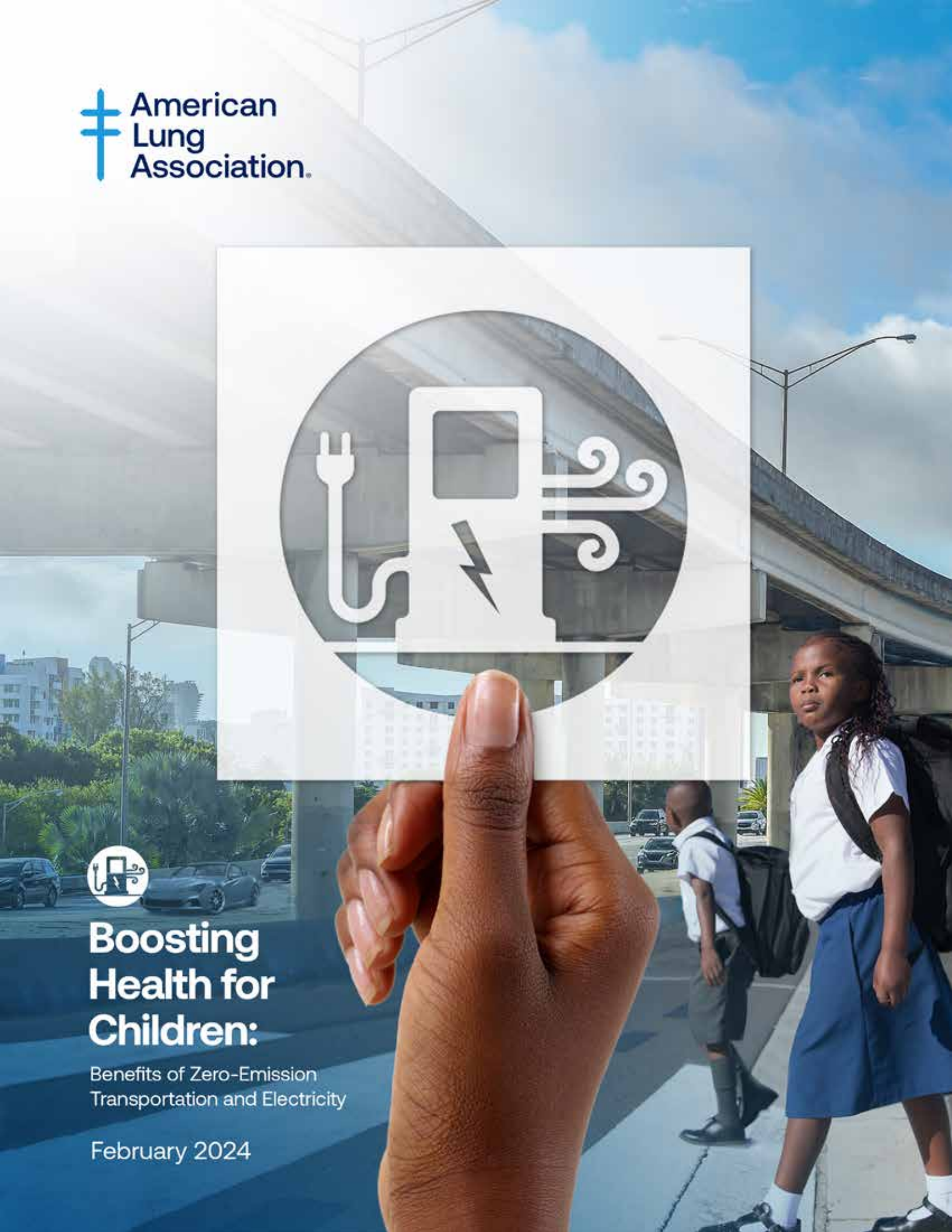
American Lung Association.



Boosting Health for Children:

Benefits of Zero-Emission Transportation and Electricity

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Introduction

The transition to cleaner transportation and electricity will benefit everyone's health, but it is especially important for children. In 2024 the Biden administration has an unprecedented opportunity to lead this lifesaving transition. By shifting to zero-emission transportation and non-combustion electricity generation, America can help shield children from traumatizing health emergencies and deaths associated with air pollution and climate change.

Everyone's health is at risk from the impacts of climate change, and with every year that passes, this issue is becoming personal for more and more people. In 2023 alone, the United States experienced 28 extreme weather disasters that caused at least $1 billion in damages.[1] The official reported death toll of these "billion-dollar" events was 492 people. Each of these disasters harmed the health and disrupted the lives of an untold number of people. Further, many more events that didn't officially hit the billion-dollar mark, including the historic smoke episodes driven by Canadian wildfires in 2023, created substantial health risks. From wildfire smoke that spread across nearly every corner of the country, to devastating floods, hurricanes and tornadoes, these symptoms of our climate change crisis are becoming an increasingly significant component of children's lived experiences.

Power plants, refineries, cars and trucks all produce an array of harmful pollutants – including particle pollution, volatile organic compounds (VOCs) and nitrogen oxides (the precursors of ground-level ozone pollution), carbon monoxide, sulfur dioxide, and more. On top of the direct harm that air pollution causes children, transportation and electricity generation are also leading sources of greenhouse gases that cause climate change and amplify health risks further.

Children face greater risks from air pollution and climate change, and these threats can harm their health today and for the rest of their lives. Children exposed to unhealthy levels of air pollution associated with catastrophic wildfire smoke events or extreme heat episodes can experience immediate health emergencies as well as longer-term impacts on lung function and development among other impacts. Children may face traumas associated with experiences of forced relocation or evacuation due to wildfires, hurricanes, flooding and other events. Physical health impacts of climate change can include heat-related stress, impacts on fetal development, drowning, injuries and death. Children are especially vulnerable to these impacts; meaningful and substantial attention must be paid to reducing these threats to their health and their future.

This report analyzes the positive impacts that a nationwide transition to zero-emission transportation and electricity generation would have on children's health outcomes. The analysis finds that through 2050, nearly 3 million pediatric asthma attacks and millions of other health impacts on people up to 18 years of age, along with hundreds of infant deaths, could be avoided over the coming decades. Policymakers have the power to set the nation on a course to reducing harmful emissions to protect health.

[1]National Oceanic and Atmospheric Administration. National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2023). https://www.ncei.noaa.gov/access/billions/

Health Risks of Air Pollution and Climate Change on Children

How Many Children Currently Face Unhealthy Levels of Air Pollution?

Nearly 120 million people in the United States live in communities that receive a failing grade in the American Lung Association's "State of the Air" 2023 report for registering harmful levels of ozone and/or particle pollution. This includes 27.2 million children under the age of 18 – or 37% of all U.S. children – who live in a community with at least one failing grade for air quality. More than 1.7 million of these children have asthma, which is one-third of all children with asthma in this country. More must be done to reduce air pollution, including traffic pollution, that puts the health of these children and all children at risk. People of color are more likely to be impacted by poor air quality, and are 3.7 times more likely to live in a community with the worst air pollution in America.[2]

27 Million

Children in the United States live in a community impacted by unhealthy levels of air pollution.

Even before they are born, air pollution and climate change harm children's health.

Exposure to both ozone and particle pollution during pregnancy is strongly associated with premature birth, low birth weight and stillbirth. These risks are amplified in higher-risk pregnancies, such as people of color and those with chronic conditions, especially asthma.[3] The inflammation and oxidative stress resulting from exposure to air pollution during pregnancy can increase the risk of hypertensive disorders in the mother, including preeclampsia, and lead to intrauterine inflammation and damage to the placenta that can disrupt the growth and development of the fetus. Fetal health may also be impacted in a number of ways by environmental contaminants that have been shown to cross the placenta.[4]

Beyond air pollution, people who are pregnant and their fetuses are especially vulnerable to the health impacts of climate change for a number or reasons. First, climate-fueled extreme weather, including extreme heat, flooding, and wildfires, have been linked to certain health problems including low birth weight, preterm birth, and even miscarriage.[5] Extreme weather events can also prevent people who are pregnant from getting necessary medical care. Additionally, individuals who are pregnant can be more prone to insect, food, and water-related illnesses. Some of these illnesses, which may increase due to climate change, can also threaten maternal and fetal health.[6]

After children are born, they continue to face greater risks from air pollution and climate change.

I am a pediatric pulmonologist practicing in New York City. Our hospital center is located near the George Washington Bridge, the busiest motor vehicle bridge in the world. Children in the community are at greater risk for asthma. They're also facing worse climate impacts, like the wildfire smoke that brought many patients into the ER last summer. We must improve the quality of air that children breathe so they can live long, healthy, and productive lives.

-Stephanie Lovinsky-Desir, MD

[2]American Lung Association. State of the Air 2023. April 2023. www.lung.org/sota

[3]Bekkar B Pacheco S, Basu R, DeNicola N_Association of air pollution and heat exposure with preterm birth, low birth weight and stillbirth in the U.S.: A systemic review. JAMA Network Open. 2020; 3(6):e208243. https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2767260

[4]Klepak P, Locatelli I, Korošec S, Künzli N, Kukec A. Ambient air pollution and pregnancy outcomes: a comprehensive review. Environ Research. 2018; 167:144-159. https://pubmed.ncbi.nlm.nih.gov/30014896/

[5, 6] Gamble, J.L., et al. (2016). Ch. 9: Populations of concern. In: The impacts of climate change on human health in the United States: A scientific assessment. U.S. Global Change Research Program, Washington, DC, p. 255 - p. 257.

Why are children uniquely vulnerable to air pollution?

Their bodies are still developing.
The growth and development of a child's lungs and breathing ability start in utero and continue into early adulthood. Eighty percent of the air sacs within the lungs develop after birth. Those sacs, called the alveoli, are where the life-sustaining transfer of oxygen to the blood takes place.

The body's defenses that help adults fight off infections are still developing in children. The protective barrier surrounding the brain is not fully developed in young children, and their nasal passages aren't as effective at filtering out pollutants.[7]

They have increased exposure to air pollution compared to adults.
Children breathe more quickly than adults, and breathe in more air in relation to their body weight than adults do. They are often outside for longer periods and are usually more active when outdoors. Consequently, they inhale more polluted outdoor air than adults typically do.

For these same reasons and others, children also face greater risks from climate change.
Their developing bodies are more vulnerable to various different climate-related health impacts beyond air quality. For example, they are less able to regulate temperature, putting them at greater risk from extreme heat. Children are also still developing emotionally. Climate change increases risks to children's mental health as well. Additionally, children must rely on parents or caregivers to provide for basic needs. Children separated from their caregivers during weather events, such as during wildfires and floods, are at increased risk of health impacts. The United States Environmental Protection Agency (EPA) issued a sweeping report on health effects of climate change on children in 2023, noting: "Climate change-related impacts in childhood can have lifelong consequences due to effects on learning, physical health, chronic disease, and other complications."[8]

[7]D'Angiulli A. Severe Urban Outdoor Air Pollution and Children's Structural and Functional Brain Development, From Evidence to Precautionary Strategic Action. Front Public Health. 2018; 6: 95.
[8]United States Environmental Protection Agency. Climate Change and Children's Health and Well-Being in the United States Report. April 2023. https://www.epa.gov/cira/climate-change-and-childrens-health-report

The Health Burden of Air Pollution on Children Isn't Equally Shared

While all children are especially vulnerable to the health impacts air pollution, children who live in communities near pollution sources such as highways and ports, and children who have existing health issues like asthma, children of color and children from low-income communities face even greater risks. Lower income communities and communities of color are often the most over-burdened by pollution sources today due to decades of inequitable land use decisions and systemic racism.[9] Policies and investments made in transitioning to zero-emissions must account for disparities in present-day burdens to ensure benefits are equitably shared and experienced.

What Are the Health Impacts of Air Pollution and Climate Change on Children?

The changing climate has sweeping impacts on children's health, including by worsening air pollution. Climate change drives the increased formation of ground-level ozone pollution and fuels more frequent and intense wildfires which contribute to significant particle pollution. The health harms for children associated with breathing polluted air are wide-ranging and long-lasting. Exposure to air pollution in children can not only cause immediate respiratory harm like coughing, wheezing and the worsening of respiratory diseases like asthma, it can reduce lung growth and function and increase asthma incidence.[10,11] Air pollution exposure in children is also associated with neurodevelopmental disorders, IQ loss, pediatric cancers, and increased risks for adult chronic diseases like cardiovascular disease.[12]

"I'm a pediatrician in practicing in Orange County, California. I see young patients every day who suffer because they live near warehouses and highways, including port traffic. The heavy exposure to the vehicle pollution worsens asthma and increases the risk and severity of upper airway illnesses. Those same patients are also at greater risk of harm from wildfire smoke."

Afif El-Hasan,
MD, FAAP

[9]Landrigan, P. Rauh, V., Galvez, M. Environmental Justice and the Health of Children. Mt Sinai J Med. 2010 Mar-Apr; 77(2): 178–187.

[10]American Academy of Pediatrics. (2021). "Ambient Air Pollution: Health Hazards to Children"

[11]Health Effects Institute Panel on the Health Effects of Traffic Related Air Pollution. "Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects." Boston, MA: Health Effects Institute; 2010. Available at: https://www.healtheffects.org/publication/traffic-related-air-pollution-critical-review-literature-emissions-exposure-and-health.

[12]American Academy of Pediatrics. Ibid.

The Growing Climate Change Burden

Growing Impacts of Climate-Related Disasters in the United States

Climate change is driving more intense and frequent extreme heat events, droughts, storms and flooding, longer and more intense allergy seasons, and increasing risk from water- and vector-borne diseases. Between 1980 and 2023, the United States experienced 376 weather and climate-related disasters that each caused over $1 billion in damages according to the National Oceanic and Atmospheric Administration (NOAA). Further, these events have increased markedly over the past four decades, with an average of 22 such events annually from 2020-2022. In 2023 alone, NOAA notes that 28 billion-dollar disasters occurred in the United States, causing over $93 billion in damage.[13] This included drought, wildfire, severe storm and winter storm impacts, cyclone and flooding episodes that threatened, harmed and even killed children.

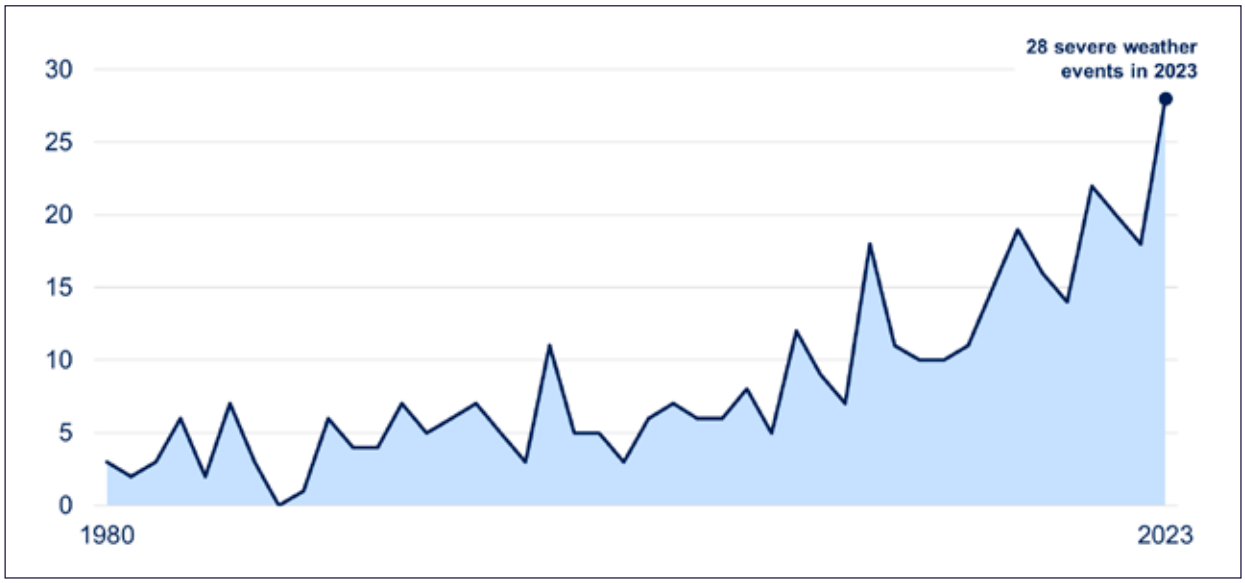
28 climate-related disasters that caused $1 billion or more in damages across the United States in 2023.

Additionally, millions of people in the United States were impacted by the dangerous toll of far-reaching wildfire smoke from events not included among the billion-dollar disasters. Notably, Canada's record 2023 fire season pushed particle pollution to hazardous levels across wide swaths of the United States, which broadly impacted children's daily activities. Children faced school closures and restrictions on recess, physical education, sporting events, field trips, graduations and other outdoor activities in addition to direct risks to their health.[14,15] With increasing frequency, events of this magnitude are taking a serious toll on children's physical and mental health, amplifying existing risks to public health, air quality and health disparities.

Billion-Dollar Disasters

Combined count of drought, flooding, freeze, severe storm, tropical cyclone, wildfire, and winter storm

Source: NOAA



[13]NOAA. Ibid.

[14]School District of Philadelphia. Blog: "Since Air Quality Has Not Significantly Improved, Schools will Shift to Remote Learning Tomorrow." June 2023. https://www.philasd.org/blog/2023/06/08/airqualityremoteshift/

[15]USA Today. "Schools cancelling outdoor activities due to wildfire smoke in New York, New Jersey, DC" by Kate Perez. June 7, 2023. https://www.usatoday.com/story/news/education/2023/06/07/schools-cancel-activities-wildfire-smoke/70298064007/

Benefits of Zero-Emission Technologies for Children's Health

The transportation and power sectors are leading sources of harmful air and climate pollution today. The shift to zero-emission technologies in these sectors has the potential to yield major climate reductions and improve health in communities impacted by pollution from coal, oil and gas extraction, transportation and combustion on the road or in power plants.

Key Modeling Assumptions

- 100% of new passenger vehicle sales are zero-emission by 2035.
- 100% of new medium- and heavy-duty vehicle sales are zero-emission by 2040.
- 100% clean, non-combustion grid by 2035.

The broad impacts of this transition are stunning. The "Zeroing in on Healthy Air" report published by the American Lung Association in 2022 found that the cumulative national public health benefits of the shift to zero-emission technologies could reach $1.2 trillion, while global climate benefits could reach $1.7 trillion by 2050.[16] For this report, we selected the health benefits from the "Zeroing in on Healthy Air" analysis that specifically applied to pediatric cases. Narrowing in on children's health, we found major reductions in health impacts among children aged 18 years old or younger. By 2050, this transition could result in:

- **2.79 million asthma attacks** avoided
- **2.67 million upper respiratory symptoms** avoided (wet cough, runny nose, burning eyes)
- **1.87 million lower respiratory symptoms avoided** (coughing, wheezing or chest pain)
- **147,000 acute bronchitis cases** avoided
- **508 infant mortality cases** avoided

[16]American Lung Association. Zeroing in on Healthy Air: Health and Climate Benefits of Zero-Emission Transportation and Electricity. March 2022. https://www.lung.org/clean-air/electric-vehicle-report/zeroing-in-on-healthy-air

Children's asthma attacks avoided by state due to widespread transition to zero-emission technologies

State	**Asthma Attacks Avoided** (2020-2050)
California	**440,000**
Texas	**346,000**
New York	**159,000**
Pennsylvania	**148,000**
Florida	**142,000**
Illinois	**138,000**
Ohio	**137,000**
Michigan	**97,400**
New Jersey	**92,400**
Indiana	**83,000**
North Carolina	**79,100**
Georgia	**78,500**
Virginia	**70,900**
Maryland	**63,600**
Tennessee	**53,800**
Kentucky	**43,000**
Missouri	**41,300**
Louisiana	**40,800**
Wisconsin	**39,300**
Arizona	**38,500**
Minnesota	**36,600**
Massachusetts	**35,500**
South Carolina	**32,000**
Oklahoma	**31,700**
Colorado	**31,200**

State	**Asthma Attacks Avoided** (2020-2050)
Alabama	**28,300**
Connecticut	**27,400**
Utah	**26,100**
Iowa	**24,500**
Arkansas	**20,300**
Mississippi	**18,300**
Kansas	**18,100**
West Virginia	**16,100**
Washington	**15,000**
Nevada	**14,800**
Nebraska	**14,300**
Delaware	**11,200**
New Mexico	**7,380**
Rhode Island	**6,570**
Maine	**5,870**
New Hampshire	**5,860**
District of Columbia	**5,680**
Oregon	**5,600**
Idaho	**4,850**
South Dakota	**4,140**
North Dakota	**3,300**
Vermont	**2,880**
Montana	**2,550**
Wyoming	**2,290**

Note: this analysis relies on modeling tools that exclude results for Alaska and Hawaii.

Recommendations to Protect Children's Health

To achieve these levels of health protection and community benefits, the Biden administration must establish the strongest possible standards for cleaning up harmful emissions in these sectors. Specifically, the United States Environmental Protection Agency (EPA) must immediately strengthen and complete regulations to ensure transportation and energy generation move to zero-emissions. Similarly, the National Highway Traffic Safety Administration (NHTSA) must update the Corporate Average Fuel Economy (CAFE) standards to reflect the urgent need to reduce fossil fuel consumption and ensure ongoing vehicle efficiency improvements. In recent months, EPA has taken important actions, but has several outstanding decisions to make that will affect the health of children for decades to come. EPA must complete the following standards with an eye toward transitioning transportation and electricity generation away from combustion and toward zero-emissions:

There is an urgency to act to reduce emissions of greenhouse gases that cause climate change, while also taking actions to reduce health risks to children.

US EPA, 2023
Climate Change and Children's Health and Well-Being in the United States Report

- EPA must quickly finalize the strongest possible Phase 3 greenhouse gas standards for heavy-duty vehicles.
- EPA must quickly finalize strong multi-pollutant standards for light- and medium-duty vehicles that not only reduce greenhouse gas emissions but also maximize reductions in particulate matter and other criteria pollutants.
- In parallel with EPA, NHTSA must establish the strongest possible Corporate Average Fuel Economy (CAFE) standards to reduce fossil fuel dependence as the nation makes the shift to zero-emission vehicles.
- EPA must approve California's pending Clean Air Act waivers related to more health-protective state-level programs for transportation sources, many of which will spur the transition to zero-emission transportation.
- EPA must continue its rollout of funding for electric school buses, and all federal agencies must put additional federal investments to work to ensure that the infrastructure built today protects our kids from pollution now and in the long run.

Conclusion

Children are uniquely vulnerable to the effects of the nation's ongoing air pollution challenges and growth in extreme events driven by our changing climate. Policymakers at the federal, state and local levels must focus strategies to rapidly move away from combustion technologies and toward zero-emission technologies to best protect health today and ensure children have safe and sustainable communities in which to grow.