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Testimony of
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On behalf of the
American Academy of Pediatrics

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"The Clean Air Act and Public Health"

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Good morning. I appreciate this opportunity to testify today before the Committee on Environment and Public Works regarding the Clean Air Act and public health. My name is Jerome A. Paulson, MD, FAAP, and I am proud to represent the American Academy of Pediatrics (AAP), a non-profit professional organization of more than 60,000 primary care pediatricians, pediatric medical sub-specialists, and pediatric surgical specialists dedicated to the health, safety, and well-being of infants, children, adolescents, and young adults. I am the incoming chair of the AAP's Council on Environmental Health, and I direct the Mid-Atlantic Center for Children's Health & the Environment, one of ten Pediatric Environmental Health Specialty Units (PEHSU) in the United States, based at Children's National Medical Center here in Washington, D.C.

It has been more than 40 years since the Congress first passed the Clean Air Act, which, for the first time, gave the Environmental Protection Agency (EPA) the authority to enforce regulations to limit air pollution. Since the Clean Air Act was enacted, we have learned much about the relationship between air pollution and health through thousands of epidemiologic and controlled studies. The Clean Air Act has made incredible improvements in the environment, in the health of infants and children, and in the quality of life for all Americans. However, the impacts of the Clean Air Act have not been universally felt. Air quality in some areas of the United States has improved, but in some areas it has actually decreased, and millions of Americans still live in areas where monitored air fails to meet EPA standards for at least one of six criteria pollutants. In addition, in the last 40 years, we have learned that serious health effects of air pollutants are experienced at levels much lower than previously considered "safe" levels of exposure, particularly for vulnerable populations such as infants, children, the elderly, and individuals with respiratory diseases.

There is overwhelming evidence linking air pollution with a variety of adverse health outcomes. The AAP believes it is necessary for Congress to strengthen the Clean Air Act and the EPA's ability and authority to set, implement, and enforce Clean Air Act regulations throughout the country. Congress must not weaken or restrict these efforts. As a pediatrician who has cared for children suffering from the health impacts of air pollution, I am incredibly concerned about threats to clean air and the effect of air pollution on children's health.

Children are Disproportionately Impacted by Air Pollution

All aspects of the environment have especially profound effects on children's health. Children are disproportionately vulnerable to all environmental exposures; they breathe faster than adults, spend more time outside, and have proportionately greater skin surface exposed to the environment. A given dose of a pollutant will have a greater impact on a child than on an adult not only due to their smaller size, but because of the nature of their growing bodies and minds. At sensitive points in child development, environmental exposures can have especially harmful effects.

Infants and children are among the most susceptible to the adverse effects of ambient air pollution and are far more vulnerable compared to adults for a number of health and developmental reasons. First, children are more greatly impacted by air pollution due to their

extensive lung growth and development after birth. Eighty percent of alveoli (the part of the lungs where oxygen is absorbed and carbon dioxide is released from the blood) are formed postnatally, and the developing lung is highly susceptible to damage from environmental toxicant exposure during the early post-neonatal period.[1, 2, 3] Changes in the lungs continue through adolescence as respiratory cells actively proliferate and differentiate during this period of increased growth and development, creating increased susceptibility to the harmful effects of air pollution's chemicals and particulates.

Children also have increased exposure to many air pollutants compared with adults because of their higher minute ventilation (the amount of air breathed in or out of the lungs per minute), higher levels of physical activity, and because they spend more time outdoors. [4, 5, 6] Children in communities with higher levels of urban air pollution and children who spend more time outdoors are likely to have decreased lung function and growth. In addition to the increase in short-term respiratory symptoms, long-term exposure to air pollution may have lifelong consequences for children. In fact, air pollution is associated with impaired lung growth that may have permanent, lifelong impacts on an individual's ability to breathe. [7, 8] These impacts can have health consequences and impose increased health costs across the lifespan.

Ambient air pollution has been associated with several adverse birth outcomes. Air pollution has been linked to sudden infant death syndrome and mortality due to respiratory disease in normal birth weight infants,[9] with one study demonstrating that nearly one-quarter of deaths were attributable to elevated particulate matter.[10]

Because the lung is in direct contact with the air, children with underlying or chronic respiratory diseases are even more susceptible to the adverse effects of air pollution. In individuals with cystic fibrosis, elevated levels of particulate matter and ozone are associated with an increased risk of exacerbations and decline in lung function. For children with asthma, the most common chronic disease in childhood, ozone levels—even those below current EPA standards—are associated with increased respiratory symptoms and the need for rescue medication. School absences, emergency room visits, and hospital admissions are all directly associated with ambient air pollution. In a prospective cohort of children living in southern California, children with asthma living in communities with increased levels of air pollution (especially particulates, nitrogen dioxide, and acid vapor) were more likely to have bronchitis symptoms. The same mix of air pollutants was also associated with deficits in lung growth (as measured by lung function tests).

Impacts of Specific Air Pollutants on Children's Health

The scientific research on air pollution and its impacts on child health is comprehensive and has consistently proven over the past four decades that reducing exposure to toxicants and particulates in the air leads to healthier individuals. The following list of air pollutants have all been proven to have significant impacts on child health, and Congress and the Administration should take every effort to reduce their emissions and prevalence in the environment. It is also important to note that air pollutants never occur alone or in isolation from one another. Air pollutants occur in mixtures with different concentrations in different geographic areas

throughout the United States. Air pollutants interact with each other in the environment in different and sometimes exacerbating ways and it is less clear how pollutants interact once they enter the human body. In order to promote child health, it is necessary to address air pollutants as a whole and not take a piecemeal approach in addressing these environmental and health hazards.

Mercury: Coal fired power plants are the largest human-caused source of mercury emissions in the United States. Power plants that burn fossil fuels release mercury into the air, which then deposits in water, where living organisms convert it to methylmercury. Mercury emissions from power plants are of particular concern because mercury settles in our waterways and then accumulates in fish that are consumed by humans.

Methylmercury consumed through seafood is toxic to the developing brain of the fetus and young child. The damage it causes is permanent and irreversible. In studies of areas with high exposures to mercury outside of the United States, mothers gave birth to infants who initially appeared normal, but who went on to develop problems such as blindness, deafness, and seizures. In utero exposure to lower levels of mercury has been associated with more subtle effects on memory, attention, and language. The developing fetus and young children are disproportionately affected by methylmercury exposure, because many aspects of development, particularly brain maturation, can be disturbed by the presence of methylmercury. Minimizing mercury exposure is essential to optimal child health.

Ozone: Ozone is a powerful oxidant and respiratory tract irritant in adults and children, causing shortness of breath, chest pain when inhaling deeply, wheezing, and cough.[11] Children have decreases in lung function, increased respiratory tract symptoms, and asthma exacerbations on days with higher levels of ambient ozone. [12, 13, 14, 15] Increases in ambient ozone have been associated with respiratory or asthma hospitalizations, [16, 17]emergency department visits for asthma, and school absences for respiratory tract illness.[18] In Atlanta, Georgia, summertime children's emergency department visits for asthma increased 37% after six days when ozone levels exceeded 0.11 ppm.[19] In southern California, school absences for respiratory tract illness increased 63% in association with a 0.02-ppm increase in ozone.[20]

Ozone may be toxic at concentrations lower than 0.075 ppm, the current federal regulatory standard. Field studies suggest potential thresholds of as low as 0.04 ppm (one-hour average) for effects on lung function.[21, 22, 23] Studies of hospitalizations for respiratory tract illness in young children and emergency department visits for asthma suggest that the effects of ozone may occur at ambient concentrations below 0.09 ppm.[24, 25] In addition to studies on short-term effects, two studies of college freshmen suggest that increasing cumulative childhood exposure to ozone may affect lung function when exposed children reach young adulthood, particularly in measures of flow in small airways.[26, 27] Early childhood exposures may, therefore, be particularly important.

Particulate Matter: In children, particulate pollution affects lung function[28, 29, 30] and lung growth.[31] Recent studies in different countries have also found associations between ambient air pollution (especially particulates and/or carbon monoxide) and preterm birth,[32,33, 34, 35] low birth

weight, and post-neonatal infant mortality (attributable to respiratory causes and possibly sudden infant death syndrome).[36,37]

Particle pollution contributes to excess mortality and hospitalizations for cardiac and respiratory tract disease. The mechanism for particulate matter–associated cardiac effects in adults may be related to disturbances in the cardiac autonomic nervous system, cardiac arrhythmias, or increased blood concentrations of markers of cardiovascular risk.[38,39] Daily changes in mortality rates and numbers of people hospitalized are linked to changes in particulate air pollution.[40,41,42,43] These studies and others have estimated that for every 10 microg/m^3 increase in PM10, there is an increase in the daily mortality rate between 0.5% and 1.6%.

Nitrogen Dioxide: Controlled-exposure studies of people with asthma have found that short-term exposures (30 minutes) to nitrogen dioxide at concentrations as low as 0.26 ppm can increase the allergic response after subsequent challenge with allergens.[44, 45] These findings are of concern, because some urban communities that are in compliance with the federal standards for nitrogen dioxide (annual average) may experience substantial short-term peak concentrations (one-hour average) that exceed 0.25 ppm. Epidemiologic studies have reported relationships between increased ambient nitrogen dioxide and risks of respiratory tract symptoms[46, 47]and asthma exacerbations.[48]

Traffic-Related Pollution: Motor vehicles represent the principal source of air pollution in many communities, and concentrations of traffic pollutants are greater near major roads. Increased respiratory tract complications in children (e.g., wheezing, chronic productive cough, and asthma hospitalizations) have been associated with residence near areas of high traffic density, particularly truck traffic.[49, 50, 51, 52] Other investigators have linked various childhood cancers to proximity to traffic.[53, 54, 55]

Diesel exhaust, a known carcinogen and respiratory tract irritant as well as a source of fine particulate matter, is a particular concern for children. On the basis of extensive toxicologic and epidemiologic evidence, national and international health authorities, including the EPA and the International Agency for Research on Cancer, have concluded that there is considerable evidence of an association between exposure to diesel exhaust and an increased risk of lung cancer.[56, 57] Additionally, fine particles in diesel exhaust may increase allergic and inflammatory responses to antigen challenge and may facilitate development of new allergies or worsen symptoms in individuals with allergic rhinitis or asthma.[58, 59]

School buses operate in close proximity to children, and most of the nation's school bus fleets run on diesel fuel. The EPA and some state agencies are establishing programs to eliminate unnecessary school bus idling and to promote use of cleaner buses to decrease children's exposures to diesel exhaust and the amount of air pollution created by diesel school buses (www.epa.gov/cleanschoolbus). One recent study found that a child riding inside a school bus may be exposed to as much as four times the level of diesel exhaust as someone riding in a car.[60] These findings underscore the need for increased regulation of diesel emissions, especially in areas where children congregate, such as school buses. The EPA should be encouraged to

continue to work with school districts to replace or retrofit diesel buses with pollution-reducing devices and limit school bus idling where children congregate.

Indoor Air Pollutants: Secondhand smoke is among the most harmful and common indoor dangers to children. According to the 2006 Report of the Surgeon General almost 60 percent of children aged 3-11 years are exposed to secondhand smoke. These children are at increased risk for multiple serious health effects like asthma, respiratory infections, decreased lung growth and exercise tolerance, and sudden infant death syndrome. This exposure is most dangerous for the youngest children because their lungs are not fully developed and they often spend time in close proximity to their parents who smoke. Other effects of secondhand smoking may include childhood cancer, childhood leukemia, childhood lymphomas, and childhood brain tumors. Smoking and exposure to secondhand smoke among pregnant women contributes to low birth-weight babies, preterm delivery, perinatal deaths, and sudden infant death syndrome. Well over 30,000 births per year in the U.S. are affected by one or more of these problems.

Other Air Pollutants: Airborne levels of lead, sulfur dioxide, and carbon monoxide have decreased dramatically over the past 40 years because of the implementation of the Clean Air Act. However, levels of these pollutants may still be high near major sources. For example, high lead levels may be found near metals-processing industries, high sulfur dioxide levels may occur near large industrial facilities (especially coal-fired power plants), and high levels of carbon monoxide may occur in areas with heavy traffic congestion.[61]

In addition to criteria air pollutants, there are numerous other air pollutants produced by motor vehicles, industrial facilities, residential wood combustion, agricultural burning, and other sources that are hazardous to children. More than 80,000 chemicals are used commercially, and many are released into the air. For most of these chemicals, data on toxicity are sparse.[62] Some pollutants remain airborne or react in the atmosphere to produce other harmful substances. Other air pollutants deposit into and contaminate land and water.

The Clean Air Act and Health Care Costs

As a pediatrician, I know that preventive health care is a fundamental investment in the health of all children and preventive health care at a young age can have lifelong impacts. Healthy children are far more likely to grow up into healthy adults. Conversely, children who experience poor health are more likely to suffer from ill health in adulthood. Inadequate attention to preventive health care mortgages the future health and welfare not only of children, but of society itself. Research across a broad range of interventions has shown that preventive health and wellness for children consistently produces a high return on investment. Ensuring that children breathe air that is free of chemicals and pollutants is an extremely effective and economical intervention for promoting lifelong health and reducing long term health costs.

According to the EPA's recent report "The Benefits and Costs of the Clean Air Act from 1990 to 2020," the Clean Air Act prevented 160,000 cases of premature adult mortality, 230 cases of infant mortality, 130,000 heart attacks, 3.2 million lost school days, 86,000 emergency

department visits, and 1.7 million asthma attacks. These health quality measures and lives saved are expected to continue to improve significantly over the next decade.

According to the EPA's report, complying with the Clean Air Act will cost about $65 billion per year, but the benefits are projected at $2 trillion per year, most of which is saved through reduced morbidity and mortality. As a pediatrician, the Clean Air Act's tremendous cost savings represent not just economics, they represent children: fewer children suffering from asthma attacks, fewer hospitalizations, less respiratory tract illnesses, improved lung capacity and function for growing children, and healthier infants and newborns. Treating chronic conditions that are created or exacerbated by air pollution is currently expensive to our public and private sectors, and health care costs will continue to increase each year. At a time when lawmakers are intensely focused on reducing health care costs, expanding efforts to regulate and limit air pollutants could prove to be a successful and effective tool in accomplishing this goal.

AAP Recommendations

The AAP recommends in the strongest terms possible that the Clean Air Act should not be weakened in any way that decreases the protection of children's health. Weakening standards now will almost certainly result in increased emergency room visits and hospital admissions for children with respiratory issues, resulting in increased direct costs for medical care, and increased indirect costs from lost productivity due to missed school and work. Weakening standards now will almost certainly result in adults with increased chronic lung disease as they age.

Air quality standards should be drafted or revised to ensure that the most vulnerable groups are protected. Potential effects of air pollution on the fetus, infant, and child should be evaluated and all standards should include a margin of safety for protection of children. Congress and the Administration must keep these principles in mind when considering any changes or modifications to the Clean Air Act. If we fail to protect children against air pollution, we accept the cost of living with and treating preventable birth defects, chronic diseases, and disability among our nation's infants and children. If we fail to protect children against air pollution, we also accept the cost of permanently reduced lung capacity and productivity in adults.

In addition, the American Academy of Pediatrics submits the following recommendations to the Committee, which we believe will lead to cleaner air and better health for all American infants, children, and families:

Children's exposure to diesel exhaust particles should be decreased. Idling of diesel vehicles in places where children live and congregate should be minimized. Ongoing programs to fund conversion of diesel school bus fleets to cleaner alternative fuels and technologies should be pursued and supported.

Federal and state governments' policies should encourage reductions in mobile and stationary sources of air pollution, including increased support for mass transit, carpooling, retiring or

retrofitting old power plants that do not meet current pollution-control standards, and programs that support marked improvements in fuel emissions of gasoline- and diesel-powered vehicles. Additionally, the development of alternative fuel fleets, low-sulfur diesel, and other "low-emission" strategies should be promoted. Before promoting new alternative fuels, these alternative fuel sources should be critically evaluated and determined by governmental authorities to have a good safety profile.

EPA should increase funding for Pediatric Environmental Health Specialty Units. Pediatric Environmental Health Specialty Units serve a vital function in providing each of the ten EPA regions with direct access to pediatric environmental health experts. The PEHSUs could be directed to use a portion of this funding to increase the education of health and education professionals and others about air pollution and the impact of those pollutants on the health of children.

In conclusion, the American Academy of Pediatrics commends you, Madame Chairwoman, for holding this hearing today to call attention to the public health impacts of the Clean Air Act. We look forward to working with you to continue to improve air quality and children's health throughout the country. I appreciate this opportunity to testify, and I will be pleased to answer any questions you may have.

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