

**Written Testimony of Mary B. Rice MD MPH
on behalf of the American Thoracic Society
Before the Senate Environment and Public Works Committee, Clean Air and Nuclear Safety
Subcommittee
Regarding Ozone and EPA NAAQS
June 22, 2016**

Testimony Summary

The American Thoracic Society supports the U.S. Environmental Protection Agency's decision to establish a more protective National Ambient Air Quality Standard for ozone and opposes legislative efforts to weaken or delay EPA's authority to establish and implement a more protective standard for ozone. The adverse human health effects of exposure to ozone are well-established through decades of medical research. These health effects include asthma attacks in children and adults with asthma, exacerbations of chronic obstructive pulmonary disease, and premature death. Ozone's effects are most prominent among vulnerable populations, including children, the elderly and patients with cardiopulmonary disease. The current evidence also demonstrates that the previous ozone standard of 75 ppb/8-hours failed to sufficiently protect public health and needed to be strengthened.

Mr. Chairman, Ranking member, and members of the Committee, my name is Mary Rice. I am a pulmonary and critical care physician in the Division of Pulmonary, Critical Care & Sleep Medicine Beth Israel Deaconess Medical Center, at Harvard Medical School. On behalf of the American Thoracic Society, I would like to thank the Committee for the opportunity to testify regarding the Ozone National Ambient Air Quality Standard proposed by the U.S. Environmental Protection Agency (EPA). The American Thoracic Society is a medical professional organization with over 15,000 professionals and patients who are dedicated to the prevention, detection, treatment and cure of respiratory disease, critical care illnesses and sleep-disordered breathing. We pursue our mission through research, clinical care, education and advocacy.

The Clean Air Act stipulates that the EPA review the latest health effects research every five years and, based on what the current research shows, determine whether the National Ambient Air Quality Standards protect public health with an adequate margin of safety. The American Thoracic Society supports the approach required by the US Congress in the Clean Air Act. As physicians and scientists, we value the importance of regular scholarly reviews to evaluate emerging research and interpret the findings. Our members seek to treat their patients according to the most up-to-date assessment of the science. The approach required in the Clean Air Act follows those principles.

Looking at current research, the ATS supports the EPA's decision to establish a more protective for ozone and, in fact, supports a more stringent standard of 60 ppb/8-hour¹⁻³. The ATS opposes legislative



efforts to weaken or delay EPA's authority to establish and implement a more protective standard for ozone. The adverse human health effects of exposure to ozone are well-established, including increases in mortality and significant morbidity. Effects are most prominent in vulnerable populations including children, the elderly and patients with cardiopulmonary disease. The latest medical evidence clearly demonstrates that the previous ozone standard of 75 ppb/8-hours failed to protect human health and needed to be strengthened.

Ozone Air Pollution Increases Mortality

Ozone air pollution kills. Studies have found that a 75 ppb ozone standard – the previous EPA standard for ozone - is insufficient to protect the public from ozone-related death.

The link between ozone pollution and higher mortality risk has become increasingly evident over the last few years and has been replicated in multiple medical studies⁴⁻⁹. The pooled dose-response effect of ozone based on 39 studies is a 0.9% increase in mortality for each 10 ppb increase in daily averaged ozone⁴. Even ten years ago, the 2006 Integrated Science Assessment concluded that evidence was “highly suggestive” of a link between short-term ozone exposure and increased mortality¹⁰. The 2013 assessment strengthened this conclusion, finding there is “[l]ikely to be a causal relationship” between increased total mortality and short-term ozone exposure¹¹. The same assessment noted that evidence now also suggests a causal relationship between long-term ozone exposure and increased mortality. Studies examining the relationship between ozone and mortality have been published yearly since the ozone standard was reviewed in 2006. These studies have overwhelmingly concluded that ozone exposure increases risk of premature death, particularly for certain more vulnerable adults including the elderly, women, African Americans and people with pre-existing heart disease^{9,12}.

The latest medical evidence also indicates that increases in mortality are attributable to ozone exposure at concentrations lower than previously documented, and lower than the previous 75 ppb standard. For example, a 2009 study of twelve Canadian cities demonstrated “positive and statistically significant associations” between increased ozone exposure and higher cardiovascular mortality, with seven cities meeting the 70 ppb standard and five meeting an even lower 65 ppb standard¹³. A long-term exposure study examining the effect of daily maximum ozone concentration on mortality demonstrated a 2 to 4 percent increase in the risk of death from respiratory causes with each 10 ppb increase in ozone concentration⁵. This study suggested an adequate safety threshold of ozone exposure was around 56 ppb as an 8-hr. average. These and other results collectively indicate that ozone exposures at a level of 70 ppb and even 65 ppb increase the risk of death, particularly for the many adults over age 65 with heart or lung disease.

Ozone Causes Asthma Symptoms and Asthma Attacks

Ozone pollution acts as a direct respiratory irritant by oxidizing the lining of the lung, and is particularly harmful to people with lung diseases like asthma. Asthma is a chronic lung disease affecting as many as 24 million Americans—7.4 percent of all adults and 8.6 percent of all children in the US¹⁴. Asthma inflames and narrows the airways of the lungs, making it difficult for an individual to breathe¹⁵. People with asthma have heightened sensitivity to irritants like ozone¹⁶, because airway irritation leads to asthma symptoms such as wheezing, chest tightness, shortness of breath, and coughing. An asthma attack can be sudden and is often frightening; recurrent asthma exacerbations frequently require



expensive treatment¹⁷. Left untreated, asthma attacks can lead to permanent airway and lung damage, limiting a person's ability to work and exercise, and reducing overall life expectancy¹⁸. Asthma attacks can even result in death due to an inability to breathe, and each year approximately 3,630 adults and children die from asthma in the US¹⁹.

Health experts maintain that air pollution is “one of the most under-appreciated contributors to asthma exacerbation²⁰.” The EPA's ozone Integrated Science Assessment concluded that “[t]he clearest evidence for health effects associated with exposure to [ozone] is provided by studies of respiratory effects¹¹.” A large number of health studies have discovered that people with asthma, particularly children with asthma, experience asthma symptoms including wheeze, chest tightness, shortness of breath and cough, when exposed to ozone at levels below 75 ppb and this leads to emergency room and hospital visits, doctor visits and increased medication use for asthma^{21–26}.

Ozone Worsens Chronic Obstructive Pulmonary Disease

Studies also link ozone pollution with increased hospitalization among adults suffering from Chronic Obstructive Pulmonary Disease (COPD). COPD is an incurable, progressive, and debilitating disease. The Center for Disease Control reports that 15 million patients in the United States have physician-diagnosed COPD²⁷ and it is the third-leading cause of death in the US²⁸. Studies have found that exposure to ozone increases risk of hospitalization among people with COPD^{29–31}. For example, a study including 13 years of hospital admission data for 36 cities in the United States found that for every 5 ppb increase in the two-day average ozone level, the number of COPD hospitalizations increased significantly³⁰.

Ozone Causes Cardiovascular Effects

Medical evidence also links ozone exposure to cardiovascular effects like premature death due to heart disease. A large, multi-continent study demonstrated an increased risk of premature death from cardiovascular disease triggered by ozone pollution¹³. Several other large epidemiologic studies from the United States⁸, Europe⁶, and Asia³² have provided further confirmation of premature death from cardiovascular disease after ozone exposure, including two large studies that confirmed this effect after controlling for the effects particulate matter air pollution exposure^{13,33}. Previous studies have also shown adverse associations between ozone exposure and various cardiovascular effects, including alterations in heart rate variability in older adults³⁴, cardiac arrhythmias³⁵, strokes³⁶, heart attacks³⁷, and hospital admissions for cardiovascular diseases³⁸. People with pre-existing chronic diseases, including COPD, appear to be at especially high risk for the cardiovascular effects of ozone exposure³⁹. The EPA's Integrated Science Assessment concluded that “[o]verall, the body of evidence indicates that there is likely to be a causal relationship between short-term exposures to [ozone] and cardiovascular effects, including cardiovascular mortality¹¹.”

Ozone Has Even More Severe Effects on Vulnerable Populations

Recent research also demonstrates that children, the elderly, and adults with preexisting respiratory disease are especially susceptible to ozone pollution effects. Low-income urban communities and outdoor seasonal workers also experience increased risk of health effects from exposure to this harmful air pollutant. EPA has a statutory duty to set a standard that provides adequate protection for these most vulnerable subpopulations.



Children: Our nation's infants and young children are especially susceptible to harm from exposure to ozone pollution^{25,40-42}. Even before birth, prenatal exposure of the pregnant mother to ozone may harm her baby's fetal lung and central nervous system development, and reduce fetal growth, resulting in lower birthweight⁴³. Babies and children also face increased risks from ozone compared to adults, because their lungs are still developing, a process that continues throughout childhood and adolescence⁴⁴. Further, children breathe more air per pound of body weight than adults, which increases the dose of inhaled pollutants². Relative to adults, children spend more time outdoors where they are often more physically active, increasing the volume of polluted air that is inhaled.

Acute health effects of ozone exposure include difficulty breathing and hospitalization for respiratory illness among infants and toddlers⁴⁵⁻⁴⁷, and increased hospitalizations and medical care for asthma attacks among children^{23-25,40,48-51}. Many of these studies have demonstrated a relationship between ozone exposure below 75 ppb, even 65 ppb, and hospital admissions for asthma among young children. For example, a very large study of children under the age of six in New York State, where ozone levels are 37 ppb on average, found that the risk of hospitalization for asthma in these children increased 22 percent with each 1 ppb increase in average ozone concentration during the summer season, and that effects were greatest among very young children and low income children⁴⁰. EPA estimates that 230,000 asthma attacks among children aged 6 to 18 could be avoided each year by 2025 with the attainment of a 70 ppb ozone standard, and this estimate excludes the state of California⁵².

The Elderly: For the elderly and those with pre-existing heart and lung disease, exposure to high levels of ozone can lead to hospitalization and death^{8,12}. (49) Older adults are more susceptible to the adverse health effects of exposure to air pollution, including ozone, because they have a higher prevalence of pre-existing chronic illness. In particular, these populations experience both heightened prevalence of heart and lung disease—conditions exacerbated by ozone exposure—and a gradual decline in the functioning of the body's biological defenses against ozone. Even low levels of ozone pollution can increase emergency room visits for respiratory illnesses among older populations⁵³. As discussed above, older adults are also most at risk of death from ozone exposure.

Low Income Communities: Several large studies have determined that children of low socioeconomic status or of African American race face higher risk of hospital admissions and emergency department visits associated with ozone pollution^{24,40}. Communities with fewer homes using central air conditioning face greater risk of respiratory hospitalization due to ozone compared to communities with more air conditioning³⁰. People living in communities with high unemployment, lower prevalence of central air conditioning, or other markers of low socioeconomic status are also at greater risk of premature death from ozone pollution compared to people of higher socioeconomic status⁵⁴. Americans in poverty may be more vulnerable to ozone pollution because they are more likely to have chronic diseases such as asthma and heart disease, conditions worsened by ozone. They may be more heavily exposed due to infiltration of outdoor air into their homes, especially during the hot summer months. These Americans also have reduced access to medication and medical care that could prevent the worst health consequences of ozone exposure.

Conclusion

The medical community and the American public depend on the US EPA to conduct a thorough safety assessment, and to examine the full body of research concerning the health effects of ozone (and the other harmful criteria air pollutants regulated by the Clean Air Act) every 5 years. The purpose of the



National Ambient Air Quality Standard is to set a standard that protects public health with an adequate margin of safety. With last year's review of ozone, the Clean Air Scientific Advisory Committee⁵⁵ and the US EPA⁵⁶ **both concluded that the evidence clearly demonstrates serious harms to human health at levels below the previous standard of 75 ppb.** This body of evidence included a number of landmark studies that have emerged in the past 5 years, demonstrating the adverse effects of ozone on mortality among adults, and respiratory hospitalization among young children at levels below 75 ppb. While the American Thoracic Society and other medical professional organizations^{1,57} would have preferred an even more protective standard, the American Thoracic Society opposes any legislation that would weaken or delay EPA's authority to issue and implement a revised and more protective National Ambient Air Quality Standard for ozone. We rely on the US EPA to review the most up-to-date evidence at regular intervals, in keeping with the pace of medical progress, and to establish and implement standards based on those regular reviews in order to protect the health of Americans. Above all, we must protect the most vulnerable members of our society, including young children and the elderly, who have no other way of protecting themselves from the health effects of outdoor pollution.



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