STATEMENT OF DR. GEORGE D. THURSTON, Sc. D.

TO THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS

OF THE

UNITED STATES SENATE

RE: THE SCIENCE AND RISK ASSESSMENT OF

PARTICULATE MATTER (PM) AIR POLLUTION HEALTH EFFECTS

JULY 19, 2006

I am George D. Thurston, a tenured Associate Professor of Environmental Medicine at the New York University (NYU) School of Medicine. In addition, I served as the Deputy Director of the NYU-EPA Particulate Matter (PM) Health Research Center for the past four years. My scientific research involves the investigation of the human health effects of air pollution. In this testimony, I will primarily address three factors that need to be considered in the EPA's proposed revisions to the particulate matter air quality standards. First, I will address the fact that we are now far more certain of the adverse impacts and biological mechanisms of PM health effects: most of the uncertainties raised at the time of the initial setting of the $PM_{2.5}$ standard are far better understood. Second, I will document that reducing ambient PM levels can and do result in significant reductions in the mortality risk associated with this pollutant. Finally, I will show that the adverse health impacts of PM air pollution extend below the current $PM_{2.5}$ standard, and that there is, therefore, a public health imperative to reduce the fine particle ($PM_{2.5}$) annual standard below15 $u g/m^3$, consistent with the advice of the U.S. EPA's Clean Air Science Advisory Committee (CASAC).

Despite progress over the last few decades, Americans are still suffering from the adverse health effects of air pollution. The adverse health consequences of breathing air pollution are severe and well documented in the published medical and scientific literature. Over the past few decades, medical researchers examining air pollution and public health, including myself, have shown that air pollution is associated with a host of serious adverse human health effects, including: asthma attacks, heart attacks, hospital admissions, adverse birth outcomes, and premature death.

PM is one of the air pollutants most carefully studied in the last decade. Small particles can bypass the defensive mechanisms of the lung, and become lodged deep in the lung where they can cause a variety of health problems. Indeed, the latest evidence indicates that exposures cannot only cause respiratory damage, but also cardiac effects, including heart attacks. Moreover, long-term exposure to fine particles increases the risk of death, and has been estimated to take years from the life expectancy of people living in the most polluted cities, relative to those living in cleaner cities (Brunekreef, 1997).

The state of the science on particulate matter and health was thoroughly reviewed in the recently released U.S. EPA Criteria Document for Particulate Matter (U.S. EPA, 2004). Since the $PM_{2.5}$ standard was last set in 1997, more than 100 new published studies, taken together, collectively confirm the relationship between $PM_{2.5}$ pollution and severe adverse human health effects. In the process, this new research has eliminated many of the doubts that were raised in the

past regarding the causality and size of the PM-health effects relationships, and has now provided plausible biological mechanisms for the serious impacts associated with PM exposure. As outlined in Figure 1, the PM research funded since the setting of the last $PM_{2.5}$ standard has collectively shown the existence of numerous biological pathways capable of causing damage in the human heart, lung, nervous system, and circulatory system consistent with the health impacts found by the PM epidemiology studies upon which the $PM_{2.5}$ standard was set.

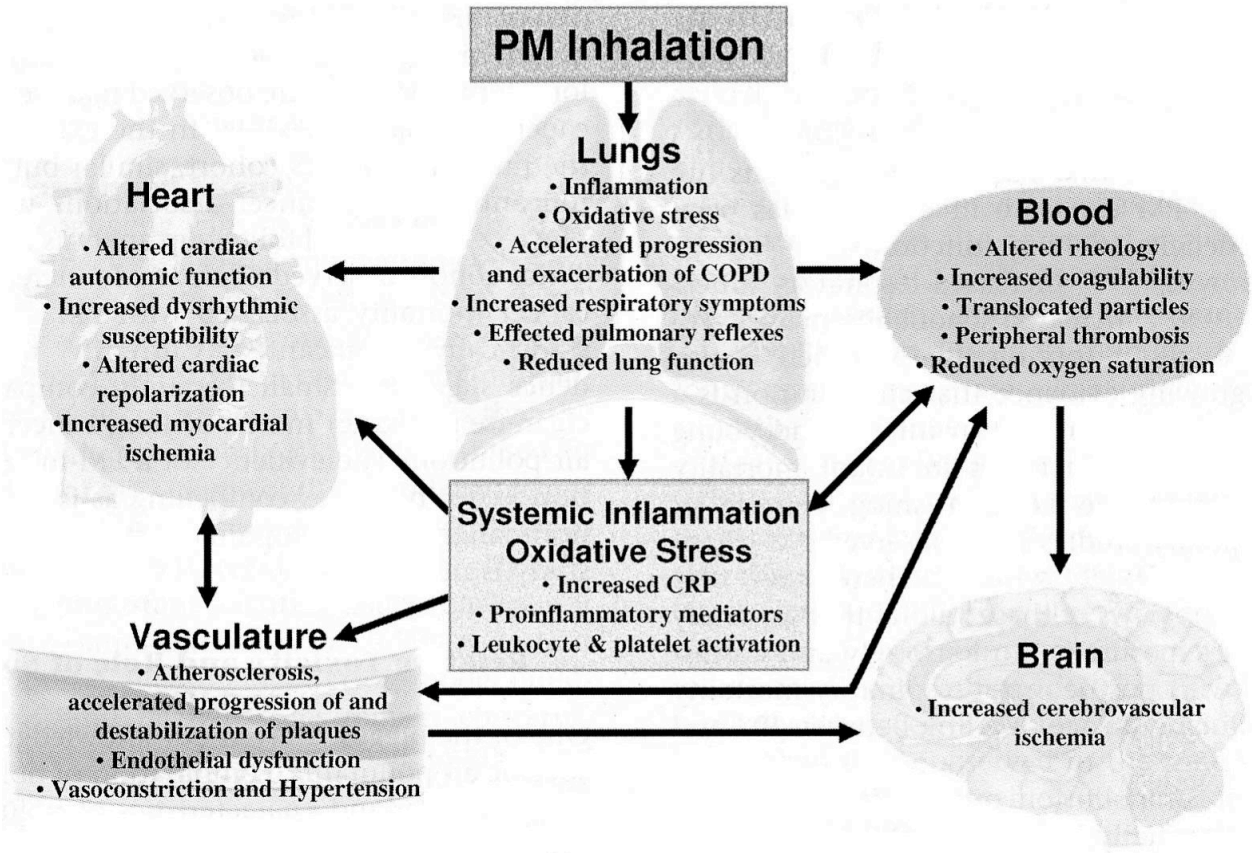


Figure 1. New Research Has Found Many New Pathways for PM Health Effects (Source: Pope & Dockery, 2006)

At the time of the last PM standard revisions, the largest landmark studies on particulate matter and death were the Harvard Six Cities Study (Dockery et al, 1993) and the American Cancer Society Study (Pope et al, 1995). The American Cancer Society study examined half a million people in over 150 metropolitan areas throughout the United States, finding a 17 percent greater risk of mortality between the city with the least PM and the city with the highest levels of this particulate pollution. The results of these studies were challenged by industry, resulting in an independent reanalysis by the Health Effects Institute (HEI)— an organization funded by both industry and government. The results of those HEI re-analyses have now confirmed the associations

found by the original investigators, increasing our confidence in the results of these two already highly regarded studies of PM mortality.

Since the setting of the original $PM_{2.5}$ standard, more recent follow-up analyses of the Harvard and ACS studies have now considered longer records of time, and have confirmed and extended the conclusions from these two major studies. An extended analysis of the Harvard Six Cities Study (to include follow-up through 1990) has now shown that reductions in long-term ambient PM pollution results in concomitant reductions in the health risks associated with PM. As shown in Figure 2, large reductions in PM at four of the Harvard cities have resulted in likewise large reductions in the relative risk (RR) of mortality in those cities: Steubenville, OH (S), Harriman, TN (H), St. Louis, MO (L), and Watertown, MA (W). Other published studies have similarly found indications that reductions in ambient PM are associated with reduced mortality risk (e.g., Clancy et al., 2002). Thus, although we still carry very large health risks in the United States from our present levels of PM air pollution, amounting to tens of thousands of premature deaths per year, and although we still have a long way to go to have what can be called "clean air", recent research shows that the lowering of PM levels in the air is an effective way to improve public health.

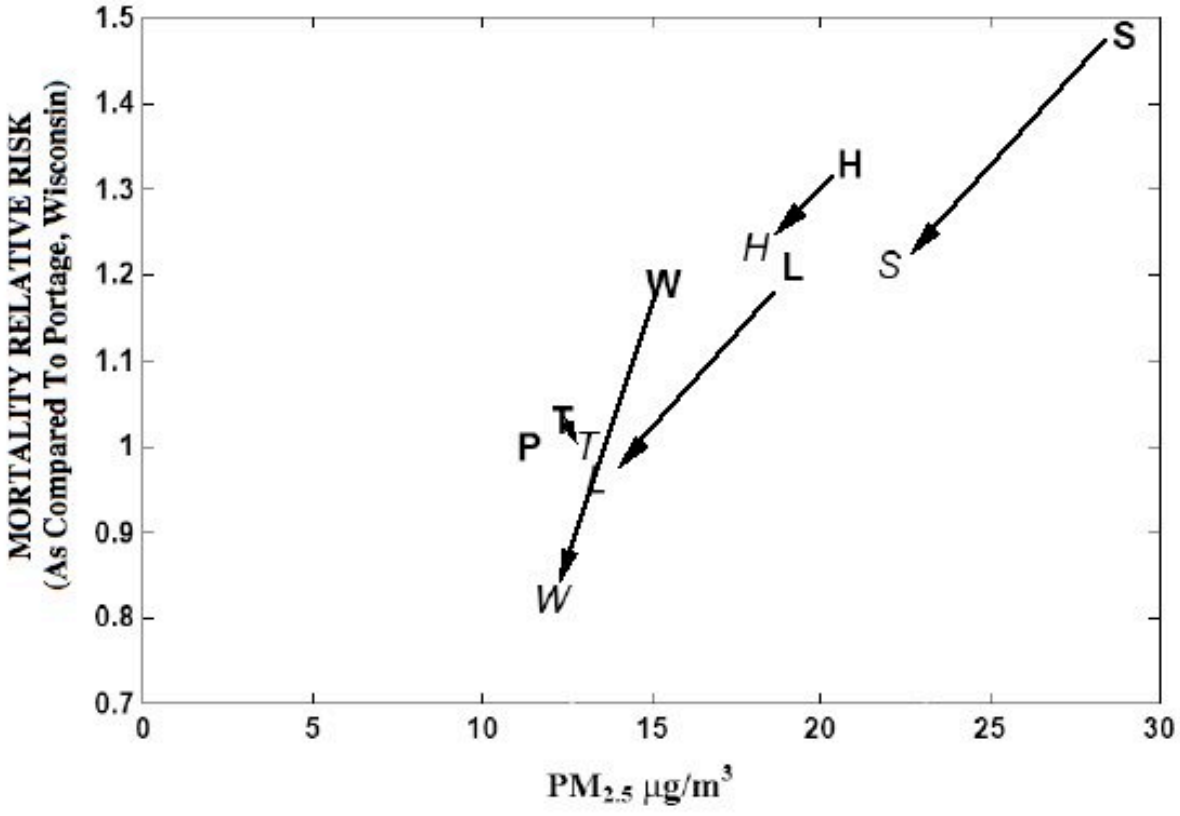


Figure 2. Reducing long-term PM exposure reduces mortality risk (Derived from Laden et al., 2006)

In addition, a recent National Institute of Environmental Health Sciences (NIEHS)-funded extension of the ACS study, of which I was Principal Investigator, strengthens the original conclusions of the ACS study and, importantly, now links increased risk of lung cancer to long-term exposure to particulate matter (Pope et al, 2002). As seen in Figure 3, this recent JAMA study also clearly indicates that the risks from $PM_{2.5}$ exposure extend below 15 ug/$m^3$, supporting a reduction in the annual $PM_{2.5}$ standard at this time, consistent with the advice of the EPA's Clean Air Scientific Advisory Committee (Henderson, 2006).

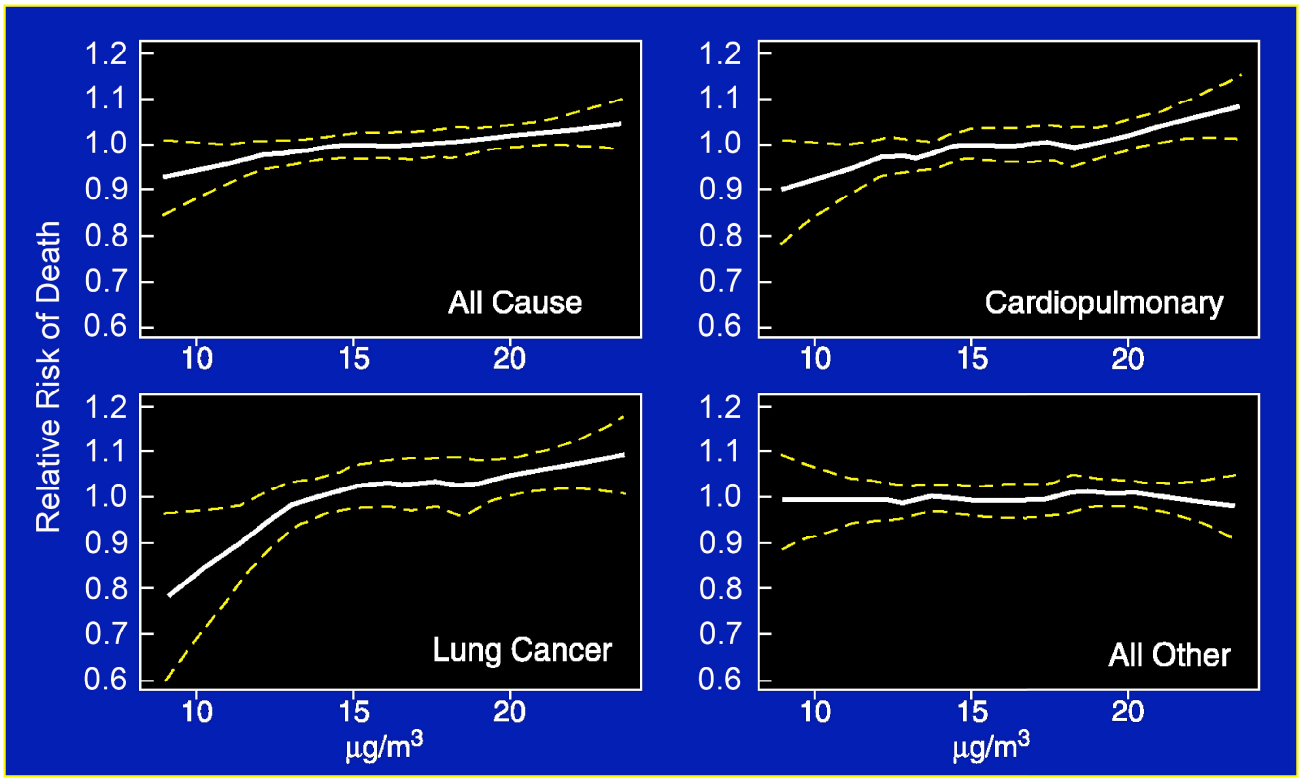


Figure 3. The extended ACS JAMA Study indicates that mortality effects extend well below the present fine particle standard of 15 *u*g/$m^3$ P $M_{2.5}$. (Pope et al, 2002).

In conclusion, since it was the level of uncertainty about PM biological mechanisms and effects at lower concentrations than 15 *u*g/$m^3$ that limited the standard to that level in 1997 (and *not* some specific acceptable level of health risk from PM), and since new sound scientific studies have greatly reduced or resolved those uncertainties, then concern about the health of the public clearly indicates that the long-term $PM_{2.5}$ standard should now be reduced below 15 *u*g/$m^3$, consistent with the advice of CASAC.

Thank you for the opportunity to testify on this important issue.

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