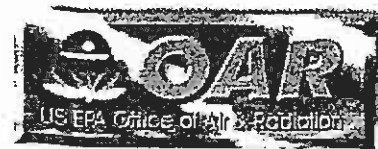




United States Environmental Protection Agency  
Office of Air & Radiation  
Office of Air Quality Planning & Standards



## FACT SHEET

July 17, 1997

# HEALTH AND ENVIRONMENTAL EFFECTS OF PARTICULATE MATTER

## Why are We Concerned About Particulate Matter?

- Particulate matter is the term used for a mixture of solid particles and liquid droplets found in the air. Coarse particles (larger than 2.5 micrometers) come from a variety of sources including windblown dust and grinding operations. Fine particles (less than 2.5 micrometers) often come from fuel combustion, power plants, and diesel buses and trucks.
- These fine particles are so small that several thousand of them could fit on the period at the end of this sentence.
  - They are of health concern because they easily reach the deepest recesses of the lungs.
- Batteries of scientific studies have linked particulate matter, especially fine particles (alone or in combination with other air pollutants), with a series of significant health problems, including:
  - Premature death;
  - Respiratory related hospital admissions and emergency room visits;
  - Aggravated asthma;
  - Acute respiratory symptoms, including aggravated coughing and difficult or painful breathing;
  - Chronic bronchitis;
  - Decreased lung function that can be experienced as shortness of breath; and
  - Work and school absences.

## Who is Most at Risk from Exposure to Fine Particles?

- The Elderly:
  - Studies estimate that tens of thousands of elderly people die prematurely each year from exposure to ambient levels of fine particles.
  - Studies also indicate that exposure to fine particles is associated with thousands of hospital admissions each year. Many of these hospital admissions are elderly people suffering from lung or heart disease.
- Individuals with Preexisting Heart or Lung Disease:

- Breathing fine particles can also adversely affect individuals with heart disease, emphysema, and chronic bronchitis by causing additional medical treatment. Inhaling fine particulate matter has been attributed to increased hospital admissions, emergency room visits and premature death among sensitive populations.
- Children:
  - The average adult breathes 13,000 liters of air per day; children breathe 50 percent more air per pound of body weight than adults.
  - Because children's respiratory systems are still developing, they are more susceptible to environmental threats than healthy adults.
  - Exposure to fine particles is associated with increased frequency of childhood illnesses, which are of concern both in the short run, and for the future development of healthy lungs in the affected children.
  - Fine particles are also associated with increased respiratory symptoms and reduced lung function in children, including symptoms such as aggravated coughing and difficulty or pain in breathing. These can result in school absences and limitations in normal childhood activities.
- Asthmatics and Asthmatic Children:
  - More and more people are being diagnosed with asthma every year. Fourteen Americans die every day from asthma, a rate three times greater than just 20 years ago. Children make up 25 percent of the population, but comprise 40 percent of all asthma cases.
  - Breathing fine particles, alone or in combination with other pollutants, can aggravate asthma, causing greater use of medication and resulting in more medical treatment and hospital visits.

### **How do Particulate Matter and Fine Particles Effect the Environment?**

- The same fine particles linked to serious health effects are also a major cause of visibility impairment in many parts of the U.S.
- In many parts of the U.S. the visual range has been reduced 70% from natural conditions. In the east, the current range is only 14-24 miles vs. a natural visibility of 90 miles. In the west, the current range is 33-90 miles vs. a natural visibility of 140 miles.
- Fine particles can remain suspended in the air and travel long distances. For example, a puff of exhaust from a diesel truck in Los Angeles can end up over the Grand Canyon, where one-third of the haze comes from Southern California. Emissions from a Los Angeles oil refinery can form particles that in a few days will effect visibility in the Rocky Mountain National Park. Twenty percent of the problem on dirtiest days in that Park is attributed to Los Angeles-generated smog.
- Airborne particles can also cause soiling and damage to materials.

### **What Improvements Would Result from EPA's New Standards?**

- EPA's new standards will provide increased health protection from the following effects:
  - About 15,000 lives each year will be saved, especially among the elderly and those with existing heart and lung diseases.
  - Reduced risk of hospital admissions by thousands each year, and fewer emergency room visits, especially in the elderly and those with existing heart and lung diseases.
  - Reduced risk of symptoms associated with chronic bronchitis, tens of thousands fewer cases each year.
  - Reduced risk of respiratory symptoms in children, hundreds of thousands fewer incidences each year of symptoms such as aggravated coughing and difficult or painful breathing.
  - Reduced risk of aggravation of asthma, hundreds of thousands fewer incidences each year, in children and adults with asthma.
  - Reduced risks of susceptibility to childhood illnesses.
- Improved visibility over broad regions in the east and urban areas:
  - The Clean Air Act placed special emphasis on preserving visibility in certain national parks and wilderness areas. In response, EPA is developing a "regional haze" program intended to ensure all parts of the country make continued progress toward the national visibility goal of "no manmade impairment."
  - New standards that EPA has promulgated, together with the "regional haze" program under development, will protect against visibility impairment, soiling and material damage effects, and will further reduce acid rain.

### **Background: What is Particulate Matter and What are "Fine" Particles?**

- Particulate matter originates from a variety of sources, including diesel trucks, power plants, wood stoves and industrial processes. The chemical and physical composition of these various particles vary widely. While individual particles cannot be seen with the naked eye, collectively they can appear as black soot, dust clouds, or grey hazes.
- Those particles that are less than 2.5 micrometers in diameter are known as "fine" particles; those larger than 2.5 micrometers are known as "coarse" particles. Fine particles result from fuel combustion (from motor vehicles, power generation, industrial facilities), residential fireplaces and wood stoves. Fine particles can be formed in the atmosphere from gases such as sulfur dioxide, nitrogen oxides, and volatile organic compounds. Coarse particles are generally emitted from sources such as vehicles traveling on unpaved roads, materials handling, and crushing and grinding operations, and windblown dust.
- EPA is also maintaining a national air quality standard focused on small particles less than 10 micrometers in diameter (known as "PM<sub>10</sub>") to protect against coarse particle effects. Ten micrometers are about one-seventh the diameter of a human hair.
- Before 1987, EPA's standards regulated larger particles (so called "total suspended particulates"), including those larger than 10 micrometers. By 1987, research had shown that the particles of greatest health concern were those equal to or less than 10 micrometers that can penetrate into sensitive regions of the respiratory tract. At that time EPA and states took action

to monitor and regulate particulate matter 10 micrometers and smaller.

- In the years since the previous standard was enacted, hundreds of significant new scientific studies have been published on the health effects of particulate matter. Recent health effects studies suggest those adverse public health effects, such as premature deaths and increased morbidity in children and other sensitive populations, have been associated with exposure to particle levels well below those allowed by the current standard.

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