

## **PARTICLE POLLUTION AND HEALTH**

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On Dec. 14, 2012, the U.S. Environmental Protection Agency (EPA) strengthened the nation's air quality standards for fine particle pollution (also called fine particulate matter, or PM<sub>2.5</sub>) to improve public health protection by revising the primary annual PM<sub>2.5</sub> standard to 12 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) and retaining the 24-hour fine particle standard of 35  $\mu\text{g}/\text{m}^3$ . EPA has issued a number of rules that will help states meet the revised standards by making significant strides toward reducing emissions of fine particles.

Studies indicate that fine particles pose a serious public health problem. Exposure to fine particle pollution can cause premature death and harmful effects on the cardiovascular system (the heart, blood, and blood vessels). Fine particle exposure also is linked to a variety of other public health problems, including respiratory diseases. In addition, particle pollution harms public welfare, including causing haze in cities and in some of our nation's most treasured national parks.

People most at risk from particle pollution include people with diseases that affect the heart or lung (including asthma), older adults, children, and people of lower socioeconomic status. Research indicates that pregnant women, newborns, and people with certain health conditions, such as obesity or diabetes, also may be at increased risk of PM-related health effects.

### **THOUSANDS OF STUDIES SHOW PARTICLE POLLUTION CAN HARM PUBLIC HEALTH**

Scientific studies have found evidence indicating that breathing in fine particulate matter can lead to a variety of public health effects.

***Fine Particles:*** An extensive body of scientific evidence indicates that breathing in PM<sub>2.5</sub> over the course of hours to days (short-term exposure) and months to years (long-term exposure) can cause serious public health effects that include premature death and adverse cardiovascular effects. The evidence also links PM<sub>2.5</sub> exposure to harmful respiratory effects.

- ***Long-term and short-term exposure to fine particles can cause:***
  - Premature death, especially due to cardiovascular effects.
    - Breathing in fine particles can cause death by harming the heart and blood vessels. This includes changes in the way the heart and blood vessels function, which can lead to heart attacks, stroke, cardiac arrest, and/or congestive heart failure.

- o Non-fatal cardiovascular events, such as heart attacks and strokes, as well as increased hospital admissions and emergency department visits for congestive heart failure and ischemic heart disease (reduced blood supply to the heart).

For example, breathing in fine particles can:

- Trigger inflammation and alter blood vessels, which can include clogging arteries (atherosclerosis) or forming blood clots. These changes can result in a reduction in the supply of oxygen and nutrients to the heart -- and subsequently, lead to a heart attack.
  - Alternatively, clogged arteries and clots may prevent blood from getting to the brain, resulting in the brain not receiving enough oxygen to function – and subsequently, lead to a stroke.
- Exposure to fine particles has also been linked to a number of other health effects. These include:
    - Respiratory effects in children, such as reduced lung development and the development of chronic respiratory diseases, such as asthma;
    - Increased hospital admissions and emergency department visits for respiratory effects, such as asthma attacks;
    - Increased respiratory symptoms, such as coughing, wheezing and shortness of breath; and
    - Reduced lung function, especially in children and people with lung diseases such as asthma.
  - Some studies also suggest that long-term PM<sub>2.5</sub> exposures may be linked to cancer and to harmful developmental and reproductive effects, such as infant mortality and low birth weight.

**Coarse particles:** Scientific evidence also indicates that breathing in larger sizes of particulate matter, coarse particles (PM<sub>10</sub>), may also have public health consequences. Studies suggest that **short-term exposure to coarse particles** may be linked to premature death and hospital admissions and emergency department visits for heart- and lung-related diseases. EPA is retaining the PM<sub>10</sub> standard, which is a 24-hour standard of 150 µg/m<sup>3</sup>

## SCIENTIFIC EVIDENCE FOR PM-RELATED HEALTH EFFECTS

- During this review of the PM standards, EPA examined thousands of studies, including hundreds of new studies published since EPA completed the last review of the PM standards in 2006.

- For example, the 2009 Integrated Science Assessment (ISA) evaluated more than 300 new epidemiological studies of PM<sub>2.5</sub>, which included extended analyses of key multi-city studies. Many of the new studies report adverse health effects even in areas that meet the current (2006) PM<sub>2.5</sub> standards.
- EPA also conducted a provisional assessment of significant new studies published since the ISA was completed in 2009. Those new studies continue to report a wide range of health effects associated with both long- and short-term exposure to fine particles and the results do not materially change the conclusions of the 2009 PM ISA.
- Today's revisions to the primary annual PM<sub>2.5</sub> standard are consistent with advice and recommendations of the independent Clean Air Scientific Advisory Committee, the body established by Congress specifically to advise the Administrator on the national ambient air quality standards (NAAQS).

#### **MORE INFORMATION**

- To read the standards and additional summaries, visit <http://www.epa.gov/airquality/particlepollution/actions.html>
- For more information on the science on PM and health, see the [Integrated Science Assessment](#) prepared for this review of the PM Standards at <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546>
- For [risk and exposure assessments](#), visit [http://www.epa.gov/ttn/naaqs/standards/pm/s\\_pm\\_2007\\_risk.html](http://www.epa.gov/ttn/naaqs/standards/pm/s_pm_2007_risk.html)