

Facts about Particle Pollution

Particle pollution refers to a combination of fine solids and aerosols that are suspended in the air. Particles range in size from the tiny to the microscopic. The body's natural defenses help to cough or sneeze larger particles out of our bodies. But those defenses don't keep out smaller particles, those that are smaller than 10 microns, or micrometers, in diameter, or about one-seventh the diameter of a single human hair. Some are so minute they can pass through the lungs into the blood stream.

- Fine particles in the air are made up of a variety of microscopic substances: acid aerosols such as sulfates and nitrates, organic chemicals, metals, and carbon soot.ⁱ
- Combustion of fossil fuels is the major source of fine particle emissions into the atmosphere. Fine particles can be emitted directly into the air as smoke from wood stoves or agricultural burning or as soot from the exhaust of diesel trucks, buses and heavy equipment. Fine particles can also be formed from gaseous emissions of sulfur and nitrogen oxides and organic compounds that are transformed in the atmosphere into sulfate, nitrate, and carbonaceous aerosols. The major sources of these emissions are coal-fired power plants, factories, and cars.ⁱⁱ Prevailing winds can transport fine particles hundreds of miles in the atmosphere.
- Particles are small enough to lodge deep in the lungs, where they can remain embedded for long periods of time. Some are small enough to slip through the lung into the blood stream, circulating like the oxygen molecules themselves.
- Researchers categorize particles according to size, grouping them as coarse, fine and ultrafine particles. Coarse particles fall between 2.5 microns and 10 microns in diameter and are called PM_{10-2.5}. Fine particles are 2.5 microns in diameter or smaller and are called PM_{2.5}. Ultrafine particles are smaller than 0.1 micron in diameterⁱⁱⁱ.
- Hundreds of community health studies have linked daily increases in particle pollution to reduced lung function, greater use of asthma medications, and increased rates of school absenteeism, emergency room visits, hospital admissions, and premature death.^{iv}
- In people with heart disease, very short-term exposures of one hour to elevated fine particle concentrations have been linked to irregular heart beats and heart attacks.^v
- Long-term epidemiological studies have repeatedly demonstrated that people living in areas with high fine particle concentrations have an increased risk of premature death compared to those in cleaner cities.^{vi} The risk of dying early from cardio-respiratory diseases and lung cancer is higher in more polluted areas.^{vii} Lives might be shortened by one to two years on average.^{viii}
- Fine particle pollution is especially harmful to people with lung diseases such as asthma and chronic obstructive pulmonary disease (COPD), which includes chronic bronchitis and emphysema, because particles can aggravate these diseases.^{ix} Exposure to fine particle air pollution can trigger asthma flare-ups and cause wheezing, coughing, and respiratory irritation in individuals with sensitive airways.^x People with heart disease such as coronary artery disease and congestive heart failure and people with diabetes are at risk of serious cardiac effects.^{xi}

- The elderly are at increased risk from fine particle air pollution. Numerous community health studies have shown that when particle levels are high, senior citizens are more likely to be hospitalized for heart and lung problems, and some may die prematurely.^{xii}
- Infants and children may be especially susceptible to the health effects of fine particle pollution, because their lungs are still developing. Children have greater exposure to air pollution because of their faster breathing rates and the increased amount of time spent playing outdoors.^{xiii} In addition to aggravated wheezing and coughing and reduction in lung function, over the long term, particle air pollution could stunt lung function growth in children.^{xiv}
- Some studies suggest that pregnant women may be another sensitive group. A limited number of studies report that high particle concentrations are associated with low birth weight in infants, pre-term delivery, and increased risk of infant mortality.^{xv}
- The current federal standard for PM_{2.5} is 65 µg/m³ measured over a 24-hour period, and 15 µg/m³ on an annual average basis. California has established a more stringent annual average standard of 12 µg/m³. Many areas of the United States have unhealthy concentrations of fine particle pollution.
- Areas where fine particle concentrations exceed the National Ambient Air Quality Standards must be designated as “nonattainment areas” under the Clean Air Act. States must develop “State Implementation Plans” with enforceable strategies to reduce air pollution in order to attain the health standards.
- To limit exposure to fine particle air pollution, the American Lung Association offers the following tips:
 - Avoid exercising near high-traffic areas
 - Do not exercise outdoors when particle levels are high, or substitute an activity that requires less exertion
 - Eliminate indoor smoking
 - Reduce use of fireplaces and wood-burning stoves

ⁱ U.S. EPA, Office of Air Quality Planning and Standards. Air Quality Criteria for Particulate Matter, 2004

ⁱⁱ U.S. EPA, Office of Air Quality Planning and Standards. Latest Findings on National Air Quality: 2001 Status and Trends. EPA 454/K-02-001, September 2002.

ⁱⁱⁱ U.S. EPA. Air Quality Criteria for Particulate Matter, October 2004

^{iv} California Air Resources Board and the Office of Environmental Health Hazard Assessment. Staff Report: Public Hearing to Consider Amendments to the Ambient Air Quality Standards for Particulate Matter and Sulfates. May 3, 2002.

^v Peters A, Liu E, Verrier RL, Schwartz J, Gold DR, Mittleman M, Baliff J, Oh JA, Allen G, Monahan K, and Dockery DW. Air pollution and incidence of cardiac arrhythmia. *Epidemiology* 2000 Jan; 11(1):11-7; and Peters A, Dockery DW, Muller JE, and Mittleman MA. Increased particulate air pollution and the triggering of myocardial infarction. *Circulation* 2001 Jun 12; 103(23):2810-5.

^{vi} Krewski, D. et al. Reanalysis of the Harvard six cities study and the American Cancer Society study of particulate air pollution and mortality. Health Effects Institute, July 2000.

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