



# Air Pollution and Cardiovascular Disease Basics

Cardiovascular disease is a general term used to describe conditions affecting the health of the heart or blood vessels. Many of the health problems associated with heart disease are related to atherosclerosis or the buildup of plaque in the walls of the arteries. For those with heart disease, the buildup can result in blood clots, which can block the flow of blood and lead to a heart attack or stroke.



The disease is the leading cause of death in the United State with most of the deaths occurring in people over 65 years of age. One in three Americans has heart or blood vessel disease.

Traditional risk factors for cardiovascular disease are: male sex, older age, increased blood pressure, high total cholesterol, low HDL (high density lipoprotein) and smoking. In addition, other risk factors, such as diabetes and air pollution exposure, have been found to contribute to the development of cardiovascular disease.

A large body of science has shown that air pollution can exacerbate existing cardiovascular disease and contribute to the development of the disease. The evidence is particularly strong for outdoor particle pollution exposure. Fine particulate matter

(particulate matter with diameters less than 2.5  $\mu\text{m}$  or  $\text{PM}_{2.5}$ ) can increase the risk of cardiovascular events.

Research by EPA and others has found that exposure to increased concentrations of  $\text{PM}_{2.5}$  over a few hours to weeks can trigger cardiovascular disease-related heart attacks and death. Longer-term exposure can lead to increased risk of cardiovascular mortality and decreases in life expectancy.

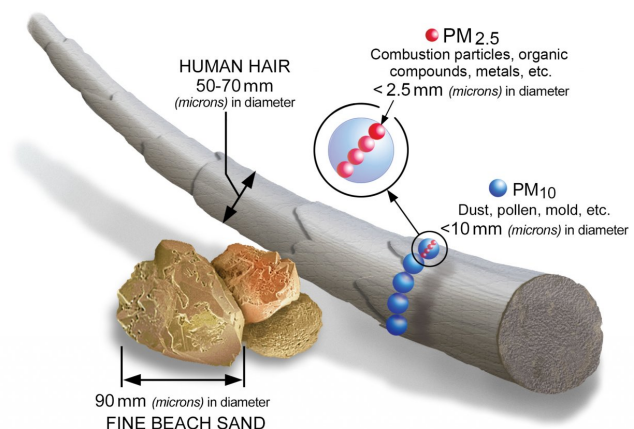
For the individual, the risk of cardiovascular disease from particle pollution is smaller than the risk from many other well-established risk factors that are described above. For the population as a whole, however, short -and long-term exposure has been shown to increase hospitalizations for serious cardiovascular events such as coronary syndrome, arrhythmia, heart failure, stroke, and sudden cardiac death, particularly in people with established heart disease.

People with chronic heart disease may experience one or more of the following symptoms following exposure to fine particulate matter:

- Heart palpitations
- Unusual fatigue
- Lightheadedness
- Shortness of breath
- Chest tightness or pain in the chest, neck or shoulder

## What is $\text{PM}_{2.5}$ ?

PM stands for particulate matter (also called particle pollution <<https://epa.gov/pm-pollution/particulate-matter-pm-basics>>): the term for a mixture of solid particles and liquid droplets found in the air. Some particles, such as dust, dirt, soot, or smoke,



are large or dark enough to be seen with the naked eye. Others are so small they can only be detected using an electron microscope.

Graphic showing comparison of PM<sub>2.5</sub> to hair

Particle pollution includes:

- **PM<sub>10</sub>**: inhalable particles, with diameters that are generally 10 micrometers and smaller; and
- **PM<sub>2.5</sub>**: fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller.
  - How small is 2.5 micrometers? Think about a single hair from your head. The average human hair is about 70 micrometers in diameter – making it 30 times larger than the largest fine particle.

Sources of PM<sub>2.5</sub>:

- These particles come in many sizes and shapes and can be made up of hundreds of different chemicals.
- Some are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks, or fires.
- Most particles form in the atmosphere as a result of complex reactions of chemicals such as sulfur dioxide and nitrogen oxides, which are pollutants emitted from power plants, industries, and automobiles.

## Where and When is Particle Pollution a Problem?

Sources of fine particle pollution include power plants, factories, automobiles, and wildfire smoke. These tiny particles can be found year-round and contribute to air quality problems in many major cities and other areas of the United States.

Some particles can remain in the atmosphere for days to weeks. Consequently, particle pollution generated in one area can travel hundreds or thousands of miles and influence the air quality of regions far from the original source.

Research has determined that particle pollution levels can be especially high in the following circumstances:

- Near busy roads, in urban areas (especially during rush hour), and in industrial areas.
- When there is smoke in the air from wood stoves, fireplaces, campfires, wildfires, or prescribed burns.
- When the weather is calm, allowing air pollution to build up. For example, hot humid days with stagnant air have much higher particle concentrations than days with air partially “scrubbed” by rain or snow.

Because of their small size, fine particles outdoors can penetrate into homes and buildings. Therefore, high outdoor particle pollution levels can elevate indoor particle pollution concentrations.

## **Who is at increased risk of PM<sub>2.5</sub> exposure?**

Scientific evidence indicates that some populations may be at increased risk of PM<sub>2.5</sub>-related health effects, which may include clinical cardiovascular outcomes. These include:

- People with underlying cardiovascular conditions (e.g., ischemic heart disease, heart failure) or who previously experienced cardiovascular events (e.g., myocardial infarction, stroke)
- People with diabetes
- People with elevated cholesterol levels
- Non-white populations
- People who are obese
- People of low socioeconomic status
- Older adults

**People Who Live in Areas With Air Pollution**— While the United States has experienced improved air quality and reductions in PM<sub>2.5</sub>, there are still many people who are exposed to high levels of the pollutant because of where they live and/or their vulnerability due to their health conditions. Individuals who live or work near roadways, railyards, seaports, or industrial areas may be exposed to higher levels of PM<sub>2.5</sub>.

**People Exposed to Smoke from Wildland Fires**— Smoke from wildland fires, which includes wildfires and prescribed fires, consists of a complex mixture of pollutants, including PM<sub>2.5</sub>, which is a main component of smoke. Studies have shown that wildland fire smoke exposure can lead to a variety of health effects, especially for those with pre-existing lung and heart conditions.

**People Who Smoke Tobacco Products Or Are Exposed to Secondhand Smoke**— Smoking tobacco products is a main cause of lung cancer, heart disease and stroke, among other diseases. In addition, the health effects of secondhand smoke on nonsmoking adults and children are harmful and numerous. Secondhand smoke causes cardiovascular disease (heart disease and stroke), lung cancer, sudden infant death syndrome, more frequent and severe asthma attacks, and other serious health problems.

Learn more about secondhand smoke and smoke-free homes <<https://epa.gov/indoor-air-quality-iaq/secondhand-smoke-and-smoke-free-homes>>

Learn more about the health effects of smoking [🔗](https://www.cdc.gov/tobacco/basic_information/health_effects/index.htm)  
<[https://www.cdc.gov/tobacco/basic\\_information/health\\_effects/index.htm](https://www.cdc.gov/tobacco/basic_information/health_effects/index.htm)>

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## Related Links

- Particulate Matter (PM) Pollution <<https://epa.gov/pm-pollution>>
- Particle Pollution and Your Patients' Health Course for Medical Professionals <<https://epa.gov/pmcourse>>
- Healthy Heart Toolkit <<https://epa.gov/air-research/healthy-heart-toolkit-and-research>>
- Check pollution forecasts at AirNow <<https://airnow.gov/>>
- Get free air pollution alerts by email [🔗](http://www.enviroflash.info/) <<http://www.enviroflash.info/>>
- Fires and Your Health <<https://www.airnow.gov/fires/>>

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[Health Effects from Air Pollution <https://epa.gov/air-research/research-health-effects-air-pollution>](https://epa.gov/air-research/research-health-effects-air-pollution)

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