

## Health Risks of Particle Pollution

**Particle pollution comes from a diverse mix of solid particles and liquid droplets suspended in the air which are harmful when inhaled.**

They include particles of various shapes and sizes<sup>1</sup>:

- smoke and soot (e.g. aromatic hydrocarbons, elemental carbon)
- soil and dust particles
- biological materials (e.g. pollen, mold spores)
- acid droplets (e.g. sulfuric & nitric acids)
- chemicals (e.g. inorganic salts - ammonium sulfate, ammonium nitrate, sodium chloride; organic compounds)
- metallic compounds

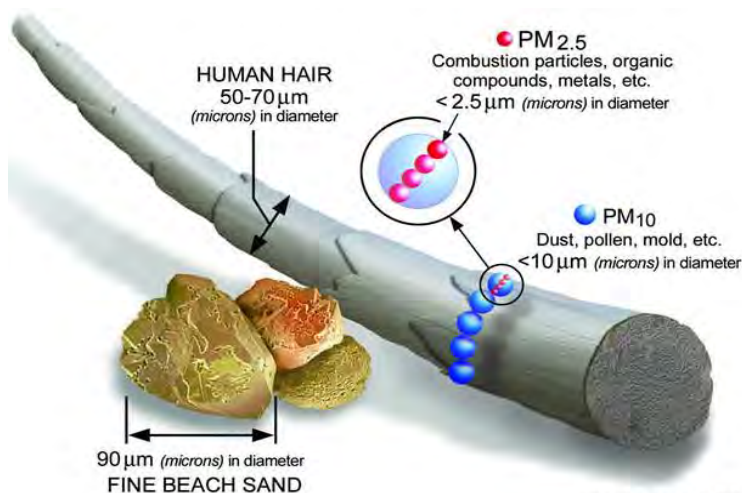


Image courtesy of the U.S. EPA

Some of these pollutants are coarse and visible to the naked eye while others are so fine that they can be seen only under a microscope.<sup>2</sup>

**Particle pollution is generated by numerous anthropogenic sources.** Primary particles are emitted directly from sources such as industrial and power plant smokestacks, fuel combusting vehicles and equipment, wood-burning stoves, construction activities, unpaved roads, prescribed burns, etc. Secondary particles (e.g. acid rain droplets) are produced through complicated chemical reactions in the atmosphere of emissions from power plants, mobile sources, consumer products, etc. Natural events like wildfires, drought, and desertification, made more intense and frequent by climate change, augment atmospheric particle pollution. Both outdoor and indoor air contain particle pollutants.

**Exposure to particle pollution even at low levels can be deadly.** Particles of all sizes are harmful to health when inhaled. In recent large studies, scientists found that older adults faced a higher risk of dying from long-term exposure to low level particle pollution.<sup>3,4</sup> Particles penetrate deep into the lungs and even into the bloodstream, leading to:

- eye, throat, and airway irritation<sup>5</sup>
- breathing trouble from lung damage<sup>7</sup>
- asthma attacks<sup>9</sup>
- lung cancer<sup>12</sup>
- cognitive decline such as dementia<sup>18</sup>
- adverse pregnancy and birth outcomes, such as preterm birth, low birth weight<sup>19</sup>
- increased risk of heart attacks and strokes<sup>6</sup>
- increased mortality of elderly<sup>8</sup>
- increased fetal and infant mortality<sup>10,11</sup>
- increased hospital admissions and emergency room visits for: cardiovascular disease (e.g. heart attack, stroke<sup>13,14</sup>), respiratory issues (e.g. chronic obstructive pulmonary disease (COPD)),<sup>15</sup> asthma in children<sup>16,17</sup>

**Someone in every family is especially vulnerable to harm from particle pollution,** including:

- Children and teens
- People with low incomes
- People of color
- Current and former smokers
- Elderly people
- People living with chronic lung disease such as asthma, COPD, heart disease, high blood pressure, coronary artery disease, congestive heart failure, lung cancer, diabetes, and obesity.<sup>20</sup>

**We must clean up the emission sources of particle pollution and address climate change.**

Demand-side voluntary efforts

- Walk, ride-share, or use public transportation, whenever possible
- Limit the use of electricity and natural gas
- If you can, choose non-combustion electricity like wind or solar
- If purchasing a vehicle, consider electric

Supply-side policy efforts

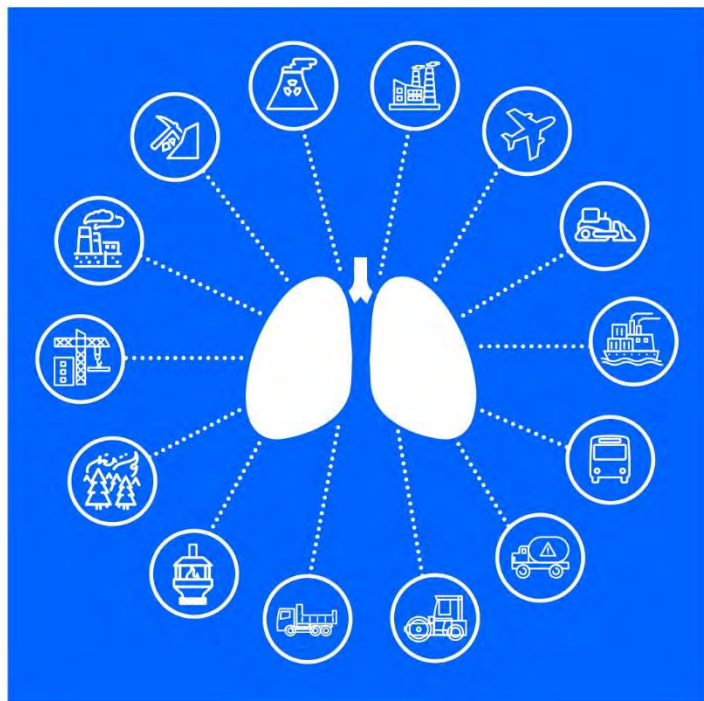
- Support stringent NAAQS<sup>21</sup> for particulate matter, nitrogen dioxide & sulfur dioxide
- Support policies requiring non-combustion sources for electricity generation
- Support regulations to reduce emissions from power plants and vehicles
- Support transition to zero emission electric transportation

**Reducing particle pollution protects public health and saves lives.**

To learn more about levels of particle pollution in your community and steps you can take to protect yourself, visit the American Lung Association's "State of the Air" report at [Lung.org/SOTA](http://Lung.org/SOTA).

## Particle Pollution

Industries  
Power Plants  
Construction  
Indoor Appliances  
Fires  
Non-road Traffic  
Off-road Equipment  
On-road Traffic  
Road Dust



- <sup>1</sup> U.S. EPA. Particle Pollution. <https://www.epa.gov/pmcourse/what-particle-pollution>
- <sup>2</sup> U.S. EPA. [Particle Pollution](#). Particles of concern can be grouped into two main categories: Coarse particles (also known as PM<sub>10-2.5</sub>): particles with diameters generally >2.5 µm and ≤10 µm in diameter. Fine particles (also known as PM<sub>2.5</sub>): particles generally 2.5 µm in diameter or smaller. This group of particles also encompasses ultrafine and nanoparticles which are generally classified as having diameters <0.1 µm. PM<sub>10</sub> and PM<sub>2.5</sub> are regulated as Criteria Air Pollutants under the Clean Air Act through the [National Ambient Air Quality Standards \(NAAQS\)](#)
- <sup>3</sup> Dominici, F., Zanobetti, A., Schwartz, J., Braun, D., Sabath, B., & Wu, X. (2022, Jan). Assessing Adverse Health Effects of Long-Term Exposure to Low Levels of Ambient Air Pollution: Implementation of Causal Inference Methods. *Health Effects Institute*, Research Report 211.
- <sup>4</sup> Yazdi, M. D., et al. (2021). [Long-term effect of exposure to lower concentrations of air pollution on mortality among US Medicare participants and vulnerable subgroups: a doubly-robust approach](#). *The Lancet Planetary Health*, 5(10),E689-E697.
- <sup>5</sup> Centers for Disease Control and Prevention. (2019, Sep). [Particle Pollution - Particle Pollution and Your Health](#).
- <sup>6</sup> U.S. EPA. (2019, Dec). [Integrated Science Assessment for Particulate Matter](#). EPA/600/R-19/188.
- <sup>7</sup> U.S. EPA. (2019, Dec). [Integrated Science Assessment for Particulate Matter](#). EPA/600/R-19/188.
- <sup>8</sup> Di, Q., Dai, L., Yun, W., Zanobetti, A., Choirat, C., Schwartz, J. D., & Dominici, F. (2017). [Association of Short-Term Exposure to Air Pollution with Mortality in Older Adults](#). *Journal of American Medical Association*, 318(24):2446-2456; Di, Q., et al. (2017). [Air Pollution and Mortality in the Medicare Population](#). *New England Journal of Medicine*, 376,2513-2522.
- <sup>9</sup> U.S. EPA. (2019, Dec). Integrated Science Assessment for Particulate Matter. EPA/600/R-19/188.
- <sup>10</sup> U.S. EPA. (2019, Dec). [Integrated Science Assessment for Particulate Matter](#). EPA/600/R-19/188, Section 9.1.2.6.
- <sup>11</sup> Liang, Z., et al. (2019). Ambient PM<sub>2.5</sub> and birth outcomes: [Estimating the association and attributable risk using a birth cohort study in nine Chinese cities](#). *Environment International*, 126,329-335.
- <sup>12</sup> Loomis, D., et al. (2013). [The carcinogenicity of outdoor air pollution](#). *The Lancet Oncology*, 14,1262-3; Hamra, G. B., et al. (2014). [Outdoor Particulate Matter Exposure and Lung Cancer: A Systematic Review and Meta-Analysis](#). *Environ Health Perspect.*,122,906-911.
- <sup>13</sup> U.S. EPA. (2019, Dec). [Integrated Science Assessment for Particulate Matter](#). EPA/600/R-19/188, Section 6.1.2.
- <sup>14</sup> U.S. EPA. (2019, Dec). [Integrated Science Assessment for Particulate Matter](#). EPA/600/R-19/188.
- <sup>15</sup> U.S. EPA. (2019, Dec). [Integrated Science Assessment for Particulate Matter](#). EPA/600/R-19/188, Section 5.1.2.1.1.
- <sup>16</sup> U.S. EPA. (2019, Dec). [Integrated Science Assessment for Particulate Matter](#). EPA/600/R-19/188, Section 5.1.2.1.
- <sup>17</sup> U.S. EPA. (2019, Dec). [Integrated Science Assessment for Particulate Matter](#). EPA/600/R-19/188, Section 5.1.2.2.1.
- <sup>18</sup> Peters, R., Ee, N., Peters, J., Booth, A., Mudway, I., & Anstey, K. J. (2019). [Air Pollution and Dementia: A Systematic Review](#). *J Alzheimers Dis.*,70(s1),S145-S163.
- <sup>19</sup> Bekkar, B., Pacheco, S., Basu, R., & DeNicola, N. (2020, Jun). [Association of Air Pollution and Heat Exposure With Preterm Birth, Low Birth Weight, and Stillbirth in the US: A Systematic Review](#). *JAMA Network Open*,3(6),e208243.
- <sup>20</sup> U.S. EPA. (2019, Dec). [Integrated Science Assessment for Particulate Matter](#). EPA/600/R-19/188.
- <sup>21</sup> EPA. Particulate Matter (PM) Pollution: [National Ambient Air Quality Standards \(NAAQS\) for Particulate Matter](#).