



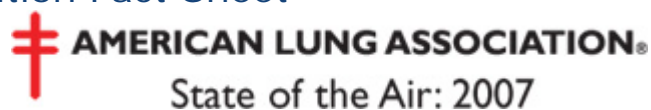
MyLUNG USA | ABOUT | **DONATE** | PROGRAMS & EVENTS | MEDIA | ESPAÑOL | SEARCH

DISEASES A TO Z | RESEARCH | WALL OF REMEMBRANCE | TREATMENT | TOBACCO CONTROL
 ▶ GET INVOLVED | ▶ QUIT SMOKING | ▶ ASTHMA | ▶ ALLERGY | ▶ YOUR LUNGS | ▶ AIR QUALITY



Home > Air Quality > Outdoor Air Quality > Outdoor Air Pollutants > Particle Pollution Fact Sheet

Particle Pollution Fact Sheet



What is particle pollution?

Particle pollution, called particulate matter or PM, is a combination of fine solids and aerosols that are suspended in the air we breathe.

- **Particles are made up of different things.** “A mixture of mixtures” is how the U.S. Environmental Protection Agency (EPA) describes them.¹ PM can be solids, like dust, ash, or soot. PM can also be completely liquid aerosols or solids suspended in liquid mixtures.
- **Particles are different sizes.** The ones of most concern are small enough to lodge deep in the lungs where they can do serious damage. They are measured in microns. The largest of concern are 10 microns in diameter (PM₁₀). The group of most concern is 2.5 microns in diameter or smaller (PM_{2.5}). Some of these are small enough to pass from the lung into the bloodstream just like oxygen molecules. By comparison, the diameter of a human hair is huge—it’s 70 microns.
- **Particles come from different sources.** Burning fuel is a major source of the smallest types of particle pollution—whether from woodstoves to diesel trucks and buses to coal-fired power plants. Larger particles also come from other sources, including agricultural practices or wind-blown soil and dust.

What are the health effects of particulate matter?

Short-term increases (over hours to days) in particle pollution have been linked to:

- death from respiratory and cardiovascular causes, including strokes^{2,3,4}
- increased numbers of heart attacks, especially among the elderly and in people with heart conditions;⁵

Advanced Search | Sitemap

Indoor Air Quality

Outdoor Air Quality

Cars, Trucks, and Drivers

Forest Fires and Respiratory Health Fact Sheet

Protecting Yourself From Air Pollution

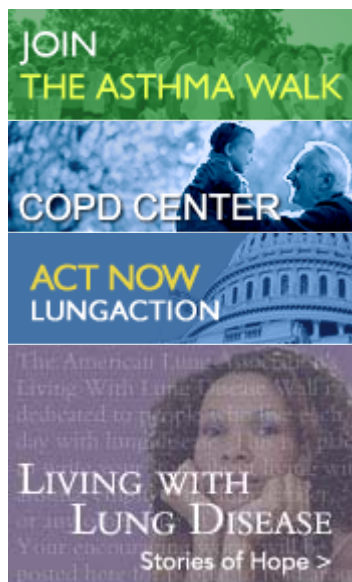
Woodburning

Electric Utilities

Outdoor Air Pollutants

Selected Key Studies on Particulate Matter and Health (1997-2001)

Lung Association of New York State and the Attorney General teamed up to produce 'Stop Backyard Burning'

Special Reports**Hurricane Katrina
Recovery Resources****Health House****Clean Air Standards****Fact Sheets**

- inflammation of lung tissue in young, healthy adults;⁶
- increased hospitalization for cardiovascular disease, including strokes;^{7,8}
- increased emergency room visits for patients suffering from acute respiratory ailments;⁹
- increased hospitalization for asthma among children; and^{10,11,12}
- increased severity of asthma attacks in children.¹³

Year-round exposure to particle pollution has also been linked to:

- increased hospitalization for asthma attacks for children living within 200 meters (218 yards) of roads with heavy truck or trailer traffic;¹⁴
- slowed lung function growth in children and teenagers;^{15,16}
- significant damage to the small airways of the lungs;¹⁷
- increased risk of dying from lung cancer; and¹⁸
- increased risk of death from cardiovascular disease.¹⁹

How serious is the impact?

Here's one example: EPA scientists estimated that over **4,700 premature deaths occur each year in just nine cities** analyzed (Detroit, Los Angeles, Philadelphia, Pittsburgh, St. Louis, Boston, Phoenix, Seattle, and San Jose) even if those cities all met the current PM_{2.5} standard.²⁰ Extrapolating these data would mean many thousands of more deaths nationwide, but EPA has not calculated that total. Other studies have estimated the nationwide death toll to be tens of thousands annually.²¹

Who is at risk?

Anyone may be affected by particle pollution, but several groups are most at risk:

- Children under 18
- Adults 65 and older
- Anyone with chronic lung diseases, such as asthma, chronic bronchitis, or emphysema
- Anyone with a cardiovascular disease, such as a coronary artery disease or who has suffered a stroke or heart attack
- Anyone with diabetes

How can you protect yourself and your family?

- **Check daily air quality levels and air pollution forecasts in your area.** Sources include local radio and TV weather reports, newspapers and online at www.epa.gov/airnow/. You can even have the information email or sent to your cellphone.
- **Don't burn wood or trash.** Burning firewood and trash are among the major sources of particle pollution in many parts of the country. If you must use a fireplace or stove for heat, convert your woodstoves to natural gas, which produces far fewer



emissions.

- **Avoid exercising outdoors when pollution levels are high.** Walk indoors in a shopping mall or gym or use an exercise machine. Always avoid exercising near high traffic areas. Limit the amount of time your child spends playing outdoors if the air quality is unhealthy.
- **Encourage your child's school to reduce school bus emissions.** Most buses use heavily polluting diesel engines; newer fuels and engines are cleaner. Many school systems are using the EPA's Clean School Bus Campaign to clean up these dirty emissions. Schools are also not allowing school buses to idle at the building, to keep exhaust levels down.
- **Don't smoke or allow anyone to smoke indoors.** Cigarette smoke produces large amounts of particle pollution among its many toxic components.

What should be done to protect the public from particle pollution?

- **EPA needs to require old, dirty coal-fired power plants to become cleaner, sooner.** EPA needs to tell these large plants that they must reduce their emissions that help form the smallest particles. Some states are considering stronger requirements that could reduce emissions even more.
- **EPA needs to make final proposed rules that would clean up locomotive and marine diesel engines.** EPA proposed tighter standards for trains and ships in March 2007, but these need to be made final to take effect.²²
- **EPA needs to set more protective national air quality standards for particle pollution.** The national air quality standards are the clean air goals that the states and counties must reach. They drive all the federal, state, and local measures to clean up air pollution. Although EPA issued new standards in September 2006, these new standards fail to protect public health as much as the science showed was needed. The American Lung Association and other public health and medical societies supported lower levels.²³

-
1. U.S. Environmental Protection Agency. *Air Quality Criteria for Particulate Matter*. 2004. At www.epa.gov/ttn/naaqs/standards/pm/s_pm_cr_cd.html
 2. Dominici F, McDermott A, Zeger SL, Samet JM. On the Use of Generalized Additive Models in Time-Series Studies of Air Pollution and Health. *Am. J. Epidemiol* 2002; 156:193-203.
 3. Hong, Y.-C., Lee J.-T., Kim, H., Ha, E.-H., Schwartz, J., and Christiani, D.C. Effects of Air Pollutants on Acute Stroke Mortality. *Environ. Health Perspect.* Vol. 110, pp. 187-191, 2002.
 4. Tsai SS, Goggins WB, Chiu HF, Yang CY. Evidence for an Association Between Air Pollution and Daily Stroke Admissions in Kaohsiung, Taiwan. *Stroke*. 2003; 34: 2612-6. Epub 2003 Oct 09.
 5. D'Ippoliti D, Forastiere F, Ancona C, Agabity N, Fusco D, Michelozzi P, Perucci CA. Air Pollution and Myocardial Infarction in Rome: a case-crossover analysis. *Epidemiology* 2003;14:528-535.
 6. Ghio AJ, Kim C, Devlin RB. Concentrated Ambient Air Particles Induce Mild Pulmonary Inflammation in Healthy Human Volunteers. *Am J Respir Crit Care Med* 2000; 162(3 Pt 1):981-8.
 7. Metzger KB, Tolbert PE, Klein M, Peel JL, Flanders WD, Todd K, Mulholland JA, Ryan PB, Frumkin H. Ambient Air Pollution and Cardiovascular Emergency Department Visits in Atlanta, Georgia, 1993-2000. *Epidemiology* 2004;15: 46-56.
 8. Tsai SS, Goggins WB, Chiu HF, Yang CY. Evidence for an Association Between Air Pollution and Daily Stroke

- Admissions in Kaohsiung, Taiwan. *Stroke*. 2003; 34:2612-6. Epub 2003 Oct 09.
9. Van Den Eeden SK, Quesenberry CP Jr, Shan J, Lurmann F. Particulate Air Pollution and Morbidity in the California Central Valley: a high particulate pollution region. Final Report to the California Air Resources Board, Contract 97-303, July 12, 2002.
 10. Lin M, Chen Y, Burnett RT, Villeneuve PJ, Kerwski D. The Influence of Ambient Coarse Particulate Matter on Asthma Hospitalization in Children: case-crossover and time-series analyses. *Environ. Health Perspect* 2002; 110:575-581.
 11. Norris G, YoungPong SN, Koenig JQ, Larson TV, Sheppard L, Stout JW. An Association Between Fine Particles and Asthma Emergency Department Visits for Children in Seattle. *Environ Health Perspect* 1999; 107:489-493
 12. Tolbert PE, Mulholland JA, MacIntosh DD, Xu F, Daniels D, Devine OJ, Carlin BP, Klein M, Dorley J, Butler AJ, Nordenberg DF, Frumkin H, Ryan PB, White MC. Air Quality and Pediatric Emergency Room Visits for Asthma in Atlanta, Georgia. *Am J Epidemiol* 2000; 151:798-810.
 13. Slaughter JC, Lumley T, Sheppard L, Koenig JQ, Shapiro, GG. Effects of Ambient Air Pollution on Symptom Severity and Medication Use in Children with Asthma. *Ann Allergy Asthma Immunol* 2003; 91:346-53.
 14. Lin S, Munsie JP, Hwang SA, Fitzgerald E, Cayo MR. Childhood Asthma Hospitalization and Residential Exposure to State Route Traffic. *Environ Res* 2002; 88:73-81.
 15. Gauderman WJ, Gilliland GF, Vora H, Avol E, Stram D, McConnell R, Thomas D, Lurmann F, Margolis HG, Rappaport EB, Berhane K, Peters JM. Association between Air Pollution and Lung Function Growth in Southern California Children: results from a second cohort. *Am J Respir Crit Care Med* 2002; 166:76-84.
 16. Gauderman WJ, Avol E, Gilliland F, Vora H, Thomas D, Berhane K, McConnell R, Kuenzli N, Lurmann F, Rappaport E, Margolis H, Bates D, Peters J. The effect of air pollution on lung development from 10 to 18 years of age. *NEJM* 2004; 351:1057-67
 17. Churg, A Brauer, M, Avila-Casado, MdC, Fortoul TI, Wright JL. Chronic Exposure to High Levels of Particulate Air Pollution and Small Airway Remodeling. *Environ Health Perspect* 2003; 111: 714-718.
 18. Pope CA, Burnett RT, Thun MJ, Calle EE, Krewski D, Ito K, Thurston GD. Lung Cancer, Cardiopulmonary Mortality, and Long-Term Exposure to Fine Particulate Air Pollution, *JAMA* 2002; 287: 9.
 19. Pope CA III, Burnett RT, Thurston GD, Thun MJ, Calle EE, Krewski D, Godleski JJ. Cardiovascular Mortality and Year-round Exposure to Particulate Air Pollution: epidemiological evidence of general pathophysiological pathways of disease. *Circulation*. 2004; 109:71-77.
 20. U.S. Environmental Protection Agency. Particulate Matter Health Risk Assessment for Selected Urban Areas. December 2005.
 21. Abt Associates. *The Particulate-Related Health Benefits of Reducing Power Plant Emissions*. October 2000. Available at <http://www.catf.us/publications/view/4>. ; U. S. Environmental Protection Agency. Fact Sheet: Clean Air Interstate Rule, March 10 2005. Available at http://www.epa.gov/air/interstateairquality/pdfs/cair_final_fact.pdf.
 22. U.S. EPA. Regulatory Announcement: *EPA Proposal for More Stringent Standards for Locomotives and Marine Compression-Ignition Engines*. March 2, 2007. At <http://www.epa.gov/otaq/regs/nonroad/420f07015.htm>.
 23. See more information on the American Lung Association recommendations at <http://www.cleanairstandards.org/>.

The mission of the American Lung Association is to prevent lung disease and promote lung health.
[Click here to contact a Local Lung Association in your area or call 1-800-LUNGUSA.](#)

[Home](#) | [MyLungUSA](#) | [About](#) | [Contact Us](#) | [Donate](#) | [Programs & Events](#) | [Media](#) | [Español](#) | [Web Store](#)

[Diseases A to Z](#) | [Research](#) | [Wall of Remembrance](#) | [Treatment Options & Support](#)
[Get Involved](#) | [Quit Smoking](#) | [Asthma & Allergy](#) | [Your Lungs](#) | [Air Quality](#)

The information contained in this American Lung Association® web site is not a substitute for medical advice or treatment, and the American Lung Association recommends consultation with your doctor or health care professional.

© 2007 American Lung Association®. All rights reserved. [Privacy Policy](#) and [Terms of Use](#).





AMERICAN LUNG ASSOCIATION®
State of the Air: 2007

State of the Air: 2007 Home
Outdoor Air Basics
The Full Report
Health Effects
Tips to Protect Yourself
Best and Worst Cities
Protect the Air You Breathe
Reel Advocacy
Tell a Friend
How You Can Help
For the Press

Outdoor Air Basics

> [Outdoor Air Basics](#)
> [Ozone \(Smog\)](#)
> [Particle Pollution \(Soot\)](#)

Outdoor Air Basics

Two types of air pollution are especially dangerous to breathe—[ozone \(smog\)](#) and [particle pollution \(soot\)](#). The *American Lung Association State of the Air 2007* report grades communities across the nation based on the number of days they have unhealthy levels of air pollution. The grades come from the color-coded alert system called the [Air Quality Index](#), which may be familiar from newspaper, radio, television and on-line weather forecasts. Everybody should look for the air quality forecasts in your community and know [how to protect yourself and your family](#) from air pollution. You can also [take steps to help clean up the air](#) you breathe.

In Depth

[Health Effects of Ozone and Particle Pollution](#)

Read more about the health harm from ozone and particle pollution including discussion of current research.

[Clean Air Standards](#)

Search our annotated files on published research on ozone and particle pollution and the need for more protective air pollution standards.



www.lungusa.org



Ozone (Smog)

What is smog? Where does it come from? And how unhealthy is it?

- Ozone (O3), or smog, is an irritating, invisible gas that is formed most often by a reaction of sunlight and vapors emitted when fuel is burned by cars and trucks, factories, power plants and other sources.
- Smog usually peaks in the summer months, from May through October, when temperatures are highest and sunlight is strongest.
- Ozone reacts chemically (“oxidizes”) with internal body tissues that it comes in contact with, such as those in the lung. It is especially irritates the respiratory tract, like getting a sunburn or rubbing sandpaper on a wound.
- Smog can cause health problems the day you breathe in high levels of smog, or after long-term exposure. It’s particularly dangerous for people with asthma and other chronic lung diseases, senior citizens, and children and teens.
- Smog can cause asthma attacks, coughing and wheezing, shortness of breath, chest pain when inhaling deeply, and even premature death. Breathing high levels of smog repeatedly over the long term may also lead to reduced lung function, inflamed lung lining, and increased breathing problems.

In Depth

[Fact Sheet on Ozone](#)

Download a longer fact sheet on the health effects of this dangerous pollutant.

[Health Effects of Ozone and Particle Pollution](#)

Read more about the health harm from ozone and particle pollution including discussion of current research.

[Clean Air Standards](#)

Search our annotated files on published research on ozone and particle pollution and the need for more protective air pollution standards.

Particle Pollution (Soot)

What is particle pollution? Where does it come from? And how unhealthy is it?

- Particle pollution is the most dangerous, and deadly, of the widespread outdoor air pollutants. Soot is an old name for particle pollution.
- Particle pollution is too small to really see—you can see the haze it creates when the sunlight hits it. Particles can be so microscopic that they’re one-seventh to one-thirtieth the diameter of a single human hair—or smaller.
- Particle pollution comes from many sources. The particles are usually a complex mixture that can include ash, soot, diesel exhaust, chemicals, metals, and aerosols. In the eastern U.S., many particles come from power plants that burn coal to produce electricity. In the western U.S., many come from diesel buses, trucks, and heavy equipment, as well as agriculture and wood burning.
- 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, and they get lodged deep in the lungs, where they stay and can cause major damage. Some of the particles are so tiny that they can pass through the lungs into the blood stream and travel throughout your body like oxygen.
- First and foremost, breathing particle pollution can kill. Deaths can occur on the very day that particle levels are high, or within one to two months afterward. Breathing particle pollution year-round can shorten life by one to three years. It causes many other health effects, premature births to serious respiratory disorders, even when the particle levels are very low. It makes asthma worse and causes wheezing, coughing and respiratory irritation in anyone with sensitive airways. It also triggers heart attacks, strokes, irregular heartbeat, and premature death.

[How do I protect myself?](#)

[How do I help fight particle pollution?](#)

In Depth

[Fact Sheet on Particle Pollution](#)

Download a longer fact sheet on the health effects of this dangerous pollutant.

[Health Effects of Ozone and Particle Pollution](#)

Read more about the health harm from ozone and particle pollution including a discussion of current research.

[Clean Air Standards](#)

Search our annotated files on published research on ozone and particle pollution and the need for more protective air pollution standards.

[Home](#) | [Take Action](#) | [Air Quality Info & Events](#) | [Diseases A - Z](#) | [Donate](#) | [Local Support](#) | [Contact Us](#)

The information contained in this American Lung Association® website is not a substitute for medical advice or treatment, and the Lung Association recommends consultation with your doctor or health care professional.

© 2007 American Lung Association. All rights reserved. [Privacy Policy](#), [Ethics Policy](#) and [Terms of Use](#).

