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AMERICAN LUNG ASSOCIATION® State of the Air: 2006

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

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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

- o Eliminate indoor smoking
- o Reduce use of fireplaces and wood-burning stoves

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Beginning our second century, the American Lung Association is the leading organization working to prevent lung disease and promote lung health. Lung disease death rates continue to increase while other leading causes of death have declined. The American Lung Association funds vital research on the causes of and treatments for lung disease. With the generous support of the public, the American Lung Association is "*Improving life, one breath at a time.*" For more information about the American Lung Association or to support the work it does, call 1-800-LUNG-USA (1-800-586-4872) or log on to www.lungusa.org.

- 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.
- vii** Pope CA 3rd, Burnett RT, Thun MJ, Calle EE, Krewski D, Ito K, and Thurston GD. Lung cancer, cardiopulmonary mortality, and long-term

exposure to fine particulate air pollution. JAMA 2002 Mar 6; 287(9):1132-41.

viii Brunekreef B. Air pollution and life expectancy: is there a relation? Occup Environ Med 1997; 54: 781-84.

ix Zanobetti A, Schwartz J, Gold D. Are there sensitive subgroups for the effects of airborne particles? Environ Health Perspect 2000 Sep; 108(9):841-5; and Sunyer J, and Basagana X. Particles, and not gases, are associated with the risk of death in patients with chronic obstructive pulmonary disease. Int J Epidemiol 2001 Oct; 30(5):1138-40.

x Ostro B, Lipsett M, Mann J, Braxton-Owens H, White M. Air pollution and exacerbation of asthma in African-American children in Los Angeles. Epidemiology 2001 Mar; 12(2):200-8; and Norris G, YoungPong SN, Koenig JQ, Larson TV, Sheppard L, and Stout JW. An association between fine particles and asthma emergency department visits for children in Seattle. Environ Health Perspect 1999; 107:489-493.

xi Goldberg MS, Bailar JC 3rd, Burnett RT, Brook JR, Tamblin R, Bonvalot Y, Ernst P, Flegel KM, Singh RK, Valois MF. Identifying subgroups of the general population that may be susceptible to short-term increases in particulate air pollution: a time-series study in Montreal, Quebec. Res Rep Health Eff Inst 2000 Oct;(97): 7-113; discussion 115-20; and Zanobetti A, Schwartz J. Cardiovascular damage by airborne particles: are diabetics more susceptible? Epidemiology 2002 Sep; 13(5):588-92.

xii Pope CA 3rd. Epidemiology of fine particulate air pollution and human health: biologic mechanisms and who's at risk? Environ Health Perspect 2000 Aug; 108 Suppl 4:713-23; and Samet JM, Zeger SL, Dominici F, Curriero F, Coursac I, Dockery DW, Schwartz J, and Zanobetti A. The National Morbidity, Mortality, and Air Pollution Study. Part II: Morbidity, Mortality and Air Pollution in the United States. Health Effects Institute Research Report 94, Part II, June 2000.

xiii Bates DV. The effects of air pollution on children. Environ Health Perspect 1995 Sep; 103 Suppl 6:49-53.

xiv Gauderman WJ, Gilliland GF, Vora H, Avol E, Stram D, McConnell R, Thomas D, Lurmann F, Margolis HG, Rappaport EB, Berhane K, and 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 Jul 1; 166(1):76-84;

and Horak F Jr, Studnicka M, Gartner C, Spengler JD, Tauber E, Urbanek R, Veiter A, and Frischer T.. Particulate matter and lung function growth in children: A 3-yr Follow-up Study in Austrian Schoolchildren. Eur Respir J 2002 May; 19(5):838-45.

xv Ritz B, Yu F, Chapa G, and Fruin, S. Effect of air pollution on preterm birth among children born in Southern California between 1989 and 1993. Epidemiology 2000 Sep; 11(5):502-11; and Woodruff TJ, Grillo J, Schoendorf KC. The relationship between selected causes of postneonatal infant mortality and particulate air pollution in the United States. Environ Health Perspect 1997 Jun; 105(6):608-12.



The mission of the American Lung Association is to prevent lung disease and promote lung health.

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