

## FACTS ABOUT

## **Particulate Matter Mortality**

### *New data revealing greater dangers from PM2.5*

Based on reviews of the latest scientific literature, the Air Resources Board staff has concluded that particulate matter smaller than 2.5 microns (PM2.5) is much more toxic than previously estimated. New research suggests that even small increases in exposure increase the potential for earlier deaths.

Every increase of 10 micrograms per cubic meter of PM2.5 creates a ten percent increase in risk of premature death to a person exposed. Annually 14,000 to 24,000 deaths statewide may be associated with exposures to PM2.5. A majority occurs in highly populated areas, including the South Coast, San Joaquin Valley and San Francisco Bay air basins.

ARB staff examined numerous studies from around the world, including those performed in Los Angeles and in six northeastern U.S. and confirmed that even at very low levels of exposure, there exists a strong link between PM2.5 air pollution and many adverse health effects. These include premature death, primarily from heart attacks, strokes and other cardiovascular causes. These conclusions are substantiated by similar work done by the U.S. EPA and the World Health Organization and endorsed by the Health Effects Institute and medical associations.

#### **PM2.5 is different than other particulate matter**

Particulate matter (PM) is a complex mixture of substances ranging from dry solid fragments, solid-cores fragments with liquid coatings, and small droplets of liquid. These particles vary in shape, size and chemical composition and may include metals, soot, soil and dust.

PM is generally classified by size; PM10 for particles less than 10 microns diameter and PM2.5 for those less than 2.5 microns in diameter. Both PM10 and PM2.5 are a health concern, but PM2.5 is of particular concern because these particles are more likely to reach the deeper parts of the lungs.

There are two categories of PM sources. Primary PM is released directly into the atmosphere, such as dust or soot, while secondary PM is formed in the atmosphere by the chemical reactions of gases, such as nitrogen oxides, sulfur oxides, ammonia and volatile organic compounds. Both primary and secondary sources must be controlled in order to reduce ambient PM.

#### **PM2.5 poses more serious health risks**

A large body of evidence has linked outdoor PM2.5 levels with premature deaths, hospitalizations, emergency room and doctor's visits for respiratory illnesses or heart disease. Studies also suggest that PM2.5 may influence the frequency and severity of asthma symptoms, and acute and chronic bronchitis.

#### **Children, elderly and those with preexisting illnesses**

Children, the elderly, and people with pre-existing chronic diseases are most at risk of experiencing adverse health effects of PM2.5 exposure. Children's lungs are developing, and research has shown that pollution may retard development. Reduced lung function is a risk factor for development of chronic lung disease. The elderly are also at risk because they often have chronic health problems which can be worsened by PM2.5 exposure.

#### **Actions you can take to protect yourself and family**

Outdoor particle levels can vary significantly from day to day. Your local air quality forecast can tell you when high particle levels are expected for your area. The USEPA also offers a resource for examining air quality in your region at [www.airnow.gov](http://www.airnow.gov)

You can reduce your exposure to particles by:

- 1) Planning strenuous activity when particle levels are lower;
- 2) Reducing the amount of time spent in vigorous activity; or
- 3) Choosing a less strenuous activity (for example, going for a walk instead of a jog).

Particle levels can also be high indoors. Indoor PM<sub>2.5</sub> can be reduced by eliminating tobacco smoke and limiting use of candles, wood-burning stoves, and fireplaces. Certain filters and room air cleaners can help reduce particles indoors. Information on filters and air cleaners is available at: [www.arb.ca.gov/research/indoor/particles.htm](http://www.arb.ca.gov/research/indoor/particles.htm)

### **PM<sub>2.5</sub> comes from combustion**

Major contributors to PM<sub>2.5</sub> include trucks, passenger cars, off-road equipment, electric power generation and industrial processes, residential wood burning; and forest and agricultural burning. All combustion processes generally produce PM<sub>2.5</sub>.

Dust from paved and unpaved roads, and construction, mining, and agricultural activities also contribute to PM<sub>2.5</sub>.

PM<sub>2.5</sub> can also be produced from ammonia from sources such as livestock operations, fertilizer application and motor vehicles. The Air Resources Board is presently developing strategies to reduce these emissions.

### **Areas in California with the highest levels of PM<sub>2.5</sub>**

Metropolitan areas tend to have the highest levels of PM<sub>2.5</sub> due to both a higher concentration of sources and larger populations. PM<sub>2.5</sub> can concentrate in areas near roadways, and power plants and neighborhoods with many active wood burning fireplaces. The South Coast and San Joaquin Valley air basins have some of the highest PM<sub>2.5</sub> levels in the United States.

### **Public exposures are diminishing**

In coordination with the 35 air districts throughout the state, the ARB develops and implements the strategies of aggressive air pollution control measures. These measures have been so effective for the last two decades that PM exposures have been reduced in California's major populated areas. Since the official year-round monitoring of ambient PM<sub>2.5</sub> began in 1999, concentrations have decreased 30 percent across California, most notably in the South Coast and the San Joaquin Valley regions.

In addition, in 2000 ARB adopted an aggressive diesel risk reduction plan that targets all diesel PM sources in California. As part of the plan, cleaner diesel fuels and new diesel engines (both on-road and off-road) have been developed. In concert with regulations aimed at requiring cleaner new engines, other regulations have been adopted to address diesel engines already on the road, including those in waste collection vehicles, transit fleet, school buses, stationary engines, transport refrigeration units and portable engines.

To further this goal, in 2006, ARB adopted an emission reduction plan for ports and goods movement activities. ARB has adopted regulations to reduce pollution from commercial harbor craft, ship auxiliary engines, cargo handling equipment, port trucks and shore power for at-berth ocean-going vessels.

Emissions from locomotives and rail yard operations are being addressed in agreements with the rail industry. Last year, ARB adopted regulations for already in-use off-road equipment including construction and mining equipment, and agricultural pumps. Later this year, heavy duty diesel trucks will be addressed in a separate regulation. Taken as a whole, these strategies ensure that further progress will be achieved to reduce PM emissions.

### **How will ARB incorporate this new information into future actions?**

State ambient air quality standards are periodically reviewed to assess their adequacy in protecting public health, and this new information will be considered when the PM standards are next reviewed. Nonetheless, the new information indicates the need to continue reducing public exposures to PM<sub>2.5</sub>.