

# Long-term exposure to air pollution increases risk of hospitalization for lung, heart disease

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Older adults may be at increased risk of being hospitalized for lung and heart disease, stroke, and diabetes following long-term exposure to fine-particle air pollution, according to a new study by researchers at Harvard School of Public Health (HSPH). It is the first study to look at the link between long-term effects of exposure to fine particles in the air and rates of hospital admissions.

The study will be published online April 17, 2012 in [PLoS ONE](#).

Prior studies have reported an association between hospitalization and short-term air particle exposure (i.e. exposure to air particles on day of hospital admission or several days before). However, these short-term studies left unclear how many extra admissions occurred in the long run, and only included people who live near air pollution monitors, typically located in cities. No studies of long-term exposure to fine air particles (over the course of a year or two years) and rates of hospitalizations had been done.

"Our study found that long-term rates of admissions for pneumonia, heart attacks, strokes, and diabetes are higher in locations with higher long-term average particle concentrations," said lead author Itai Kloog, a research fellow in the Department of Environmental Health at HSPH.

Kloog and his colleagues, including senior author Joel Schwartz, professor of environmental epidemiology at HSPH and director of the Harvard Center for [Risk Analysis](#), used novel [prediction models](#), based on [satellite observations](#), emissions, traffic, and [weather data](#) to predict levels of fine air particles in the air all over New England, which allowed the researchers to include rural and suburban areas. The researchers

compared their findings with hospital admission records on all [Medicare patients](#), ages 65 and older, admitted to 3,000 hospitals throughout New England from 2000-2006.

The researchers estimated zip code concentrations of fine air particles known as PM2.5 - air matter with a diameter of 2.5 microns or less and more narrow than the width of a human hair. These particles, such as soot from vehicles, and other particles from power plants, wood burning, and certain industrial processes, are a significant health risk when they lodge in the lungs, causing inflammation there and in the rest of the body, and contributing to lung and heart disease.

The results showed an association between long-term exposure to fine air particles for all [hospital admissions](#) examined. For example, for every 10- $\mu\text{g}/\text{m}^3$  increase in long-term PM2.5 exposure, the researchers found a 4.22% increase in respiratory admissions, a 3.12% increase in cardiovascular disease admissions, a 3.49% increase in stroke admissions, and a 6.33% increase in diabetes admissions.

"Particulate air pollution is one of the largest avoidable causes of death and illness in the United States, and unlike diet and exercise, does not require behavioral change. Off-the-shelf technology can be retrofitted onto sources of pollution at modest cost, with a large health benefit. This study shows that in addition to avoiding deaths, such measures will reduce chronic disease and medical care costs," said Schwartz.

Other HSPH researchers in the study included Antonella Zanobetti, senior research scientist in the Department of Environmental Health, Brent Coull, professor of biostatistics, and Petros Koutrakis, professor of environmental sciences.

**More information:** "Acute and Chronic Effects of Particles on Hospital Admissions in New England," Itai Kloog, Brent A. Coull, Antonella Zanobetti, Petros Koutrakis, and Joel D. Schwartz, *PLoS ONE*, online April 17, 2012.

Provided by Harvard School of Public Health

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