

Exposing exposure: Finding the connections between air pollution and health

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Credit: AI-generated image ([disclaimer](#))

For years, research has suggested a connection between air pollution and human health issues. Penn State researcher Jeff D. Yanosky searches for those connections.

"I think many people understand that routine tobacco smoking is going

to increase their cardiovascular mortality," said Yanosky, a faculty member in the Institutes of Energy and the Environment. "I don't think most people appreciate that the quality of the air they breathe is also affecting their cardiovascular mortality—not to the same extent, but it is still a factor."

In April 2019, the American Lung Association reported that nearly half of Americans, 141.1 million people, lived in areas with unhealthy amounts of [air pollution](#), an increase of more than 7.2 million people since 2018. This includes both [ozone pollution](#) and particle [pollution](#).

Ozone pollution, also known as "smog," is the result of combustion-related pollutants—such as automobile exhaust—chemically reacting with heat and sunlight. This pollution can cause [health issues](#) such as respiratory system irritation, reduced lung function or permanent lung damage.

Particle pollution, also known as "soot" or [particulate matter](#), is primarily what Yanosky studies. It comprises extremely small particles, which are about 1/20 of the width of a human hair. Health issues from [particle pollution](#) include respiratory system illnesses such as emphysema, asthma and cancer, as well as cardiovascular illnesses such as heart disease and strokes.



In about eight days, an individual breathing in the air at the standard set by the EPA is exposed to approximately as much particulate matter as one cigarette.
Credit: Brenna Buck

"I work with environmental data sets, mostly on particulate matter, which is the filterable component of air pollution," said the College of Medicine associate professor of epidemiology. "It is essentially a metric of how smoky the air is."

According to Yanosky, the sources of most air pollution are typically combustion related. These sources can be as large as coal-fueled power plants and as small as automobiles and home heating appliances.

"The U.S. government operates a nationwide network of air quality monitors and makes that data available publicly," Yanosky said.

"Researchers like myself download and process that data and link it with health studies of various outcomes."

Yanosky generally performs air pollution modeling for large epidemiologic studies. That data is used to examine a defined population in order to estimate air pollution exposure levels over a certain time period. This can be done retrospectively, learning how past exposures have affected people's health, or prospectively, estimating current and future health burdens and trends according to existing data.

"One of the principal things I have been pleased with as I have developed these models, and one of the things that continues to motivate me to do so, is that by comparing health effect estimates using modeled exposures with previous methods of matching to the nearest air pollution monitor, you get a clearer picture of what is going on with health impacts," he said. "Sometimes you see health impacts that you couldn't previously see."



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For example, within the past decade, there have been numerous studies that suggest a connection between air pollution and cognitive decline. Additionally, Yanosky has been involved with research that suggests connections between pregnancy outcomes and air pollution, such as low birth weight.

"Essentially from before birth to death, the quality of the air you breathe is impacting your health," he said. "People have hypothesized that air pollution affects multiple processes in the body that affect inflammation and oxidative stress, which is an imbalance in the body's protection against oxidation that can lead to high-blood pressure, diabetes and many other health endpoints."

Yanosky said there is plenty of research that suggests the air-quality

levels in the United States, even at their current levels, are affecting people's health.

"When these studies are properly designed, we find evidence that the quality of environment and the quality of our air affects our long-term [health](#) in many ways," he said.

Provided by Pennsylvania State University

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