

Children's Lung Health Improves as Air Pollution Is Reduced, Study Says

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Pollution hangs over Los Angeles in the early 1990s. A new study shows that reducing air pollution leads to improved lung function in children. Credit Steve Starr/Corbis

For the first time, researchers have shown that reducing air pollution leads to improved respiratory function in children ages 11 to 15, a critical period of lung development.

Scientists have long known that air pollution is linked to smaller lung capacity and compromised breathing in children. But it had not been clear whether, and to what extent, a reduction in air pollution over the years might prevent these problems.

Environmentalists have maintained that federal emission standards are not stringent enough to safeguard health, while some conservatives criticize the regulations as overly restrictive and expensive. The new study, conducted in Southern California and published on Wednesday in *The New England Journal of Medicine*, provides evidence that better air quality, a result of [stricter regulation, improved health among children](#), experts said.

Morton Lippmann, a professor of environmental medicine at New York University School of Medicine, said the research would be influential and predicted that within the next few years, when federal emission standards are due for review, “this kind of information will play a major role.”

“It provides confirmation that the work we’ve done to improve air pollution has made a difference in kids’ health,” said Dr. Joel Kaufman, a physician and epidemiologist at the University of Washington, who was not involved in the research. “There are more kids comfortable running around.”

Over 17 years, researchers at the University of Southern California studied air pollution levels as they declined in five regional communities. The scientists also measured breathing capacity in 2,120 schoolchildren from the communities during three periods: 1994-1998, 1997-2001 and 2007-2011.

The communities included the port city of Long Beach, Calif., as well as the inland city of Mira Loma, Calif., where mountains trap pollution blown eastward from the coast and downwind from agricultural production.

During those years, federal and state emission standards lowered the billowing output of California’s automobiles, diesel trucks, refineries, ships and trains. By the study’s conclusion in 2011, fine particulates had fallen by 50 percent and nitrogen dioxide levels by 35 percent in the communities, changes that were representative of declining pollution across the Los Angeles basin.

The children studied were in a period of pubertal growth during which lungs almost finish developing. Using a device called a spirometer, the children exhaled into a tube that measured both how much air they could breathe out in one second and how much air they could blow out completely.

The second measure, capacity, is often used as a surrogate to describe the size of the lungs themselves.

As emission standards tightened and the air became cleaner, the scientists found that lung development in children born in later years was more robust than in those born earlier. Moreover, the percentage of children with significantly impaired lung function declined during the study period, from 8 percent to 3.5 percent.

In 2011, the third wave of 15-year-olds was assessed. Over the four years the children were tested, the growth in their lung capacity had been about 10 percent greater than that of the 15-year-olds measured in 1998. The positive effects were observed in boys and girls, and regardless of race and ethnicity.

The average teenager running around a soccer field might not notice an appreciable difference, said W. James Gauderman, a professor of preventive medicine at the University of Southern California and the lead author of the Children’s Health Study, from which the data was drawn.

The larger implication, he said, was that the latest group of children may have a jump-start on longevity compared with children who grew up breathing more polluted air. Absent factors such as smoking or asthma, normal lung function slowly begins to decrease in early adulthood.

“When they’re done with the teenage years, they’re stuck with the lungs they have for the rest of their lives,” Dr. Gauderman said.

Studies have shown that adults exposed to high levels of air pollution are more susceptible to premature death from pulmonary and cardiovascular disease.

Dr. Kaufman speculated that a 10 percent improvement in lung function might translate into a five- or six-year delay in the onset of clinical lung disease, although such results could only be determined years from now.

During the years of the study, ozone levels declined only modestly. Although ozone has been associated with acute health problems, such as asthma attacks, Dr. Gauderman and his colleagues concluded that its reduction does not have the long-term effects on overall lung function that fine particulates and nitrogen dioxide do.

This study adds to a growing body of research that addresses not only the deleterious effects of air pollution on health, but [restorative possibilities when pollution is reduced](#), including lowered mortality risk of lung cancer and cardiovascular disease.

“Some have argued that the substantial improvements in air quality over the past 40 years are sufficient to protect public health and that there is little evidence to support more stringent standards,” noted Douglas W. Dockery, a professor of environmental epidemiology at the Harvard T.H. Chan School of Public Health, in [an editorial accompanying the new study](#). “However, the current report and other studies suggest that further improvement in air quality may have beneficial public health effects.”

Diane Katz, a research fellow in regulatory policy at the Heritage Foundation, a conservative policy organization, said it was good news that air pollution was reduced and children’s lung function had improved. But, she added, “The study doesn’t say anything about regulation. We don’t know what would have happened if we had had less burdensome regulation,” or whether automobile technology or other sources of emission controls alone “would have been just as effective.”

In an interview, Dr. Dockery said, “Ultimately, it’s a political decision about where we set the standards. There are trade-offs in restrictions in reducing automobile emissions and other industry curbs.”

“But if there is the opportunity to improve air quality,” he said, “we should think about those types of improvements to benefit our kids.”