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Smog Harms Children's Lungs for Life, Study Finds

Eight years of research yield the most definitive evidence yet that dirty air stunts lung growth.

By Miguel Bustillo
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Despite decades of cleanup efforts that have greatly reduced smog, the amount of air pollution still found in parts of Southern California and elsewhere in the country can stunt lung growth in children, according to the most comprehensive study ever conducted on children's exposure to air pollution.

The lung damage is serious enough to lead to a lifetime of health problems and, in some cases, premature death, the research found.

Scientists have long known that smog aggravates respiratory conditions such as asthma. But until recently, they were uncertain whether the dirty air caused the problems or simply made pre-existing medical conditions worse.

The study, to be published today in the *New England Journal of Medicine*, provides the most definitive evidence yet that routine exposure to dirty air during childhood actually harms lung development, leading to a permanently reduced ability to breathe. Underpowered lungs are known to cause a wide range of health problems.

The study was conducted by a team of USC researchers that monitored the lungs of 1,759 schoolchildren in 12 Southern California communities from fourth grade until they graduated from high school.

"We were surprised at the magnitude of the effect we witnessed," said W. James Gauderman of USC's Keck School of Medicine, one of the researchers who conducted the eight-year study. "It pushed a lot of kids beyond that critical threshold of low lung function, and that was a surprise."

Children breathing dirty air were nearly five times more likely than children in less polluted communities to grow up with weak lungs, they found. The damage was similar to what is found in children whose parents regularly smoked around them.

In the communities with the dirtiest air, such as Upland in San Bernardino County, almost 10% of the children studied had "clinically significant" reductions in their ability to breathe.

In Long Beach, where air pollution levels were lower but still significant, the number was about 6%. In Lompoc, where air pollution levels were low, it was only 2%.

"There is a perception out there that air pollution has gotten a lot better, and certainly that is the case," Gauderman said. "But these findings indicate that from a health standpoint, a lot of people are still in danger."

The greatest danger appears to come from tiny particles — typically produced in diesel exhaust, by road dust and in animal waste from large-scale farms.

Until recently, such particles have not been regulated as strictly as ozone — the main ingredient in Southern California's smog. Ozone did not show up in the study as a major contributor to childhood lung problems.

While emphasizing risks, the study also pointed to a way to improve public health, according to C. Arden Pope III, an economics professor at Brigham Young University who wrote an editorial that accompanies the findings in the *New England Journal*.

"From at least one perspective, the overall results of research involving air pollution are good news — the control of air pollution represents an important opportunity to prevent disease," Pope said.

According to a policy brief released Wednesday by the USC Urban Initiative, roughly 4 million children currently live in areas of the Greater Los Angeles region where the air remains polluted at least part of the year. Five million more children are expected to be born between now and 2021, the latest deadline set by the U.S. Environmental Protection Agency to clean the area's air.

Strict clean air laws have greatly reduced smog, particularly in coastal areas of Southern California, but serious pollution remains a regular occurrence inland as well as in areas subjected to heavy truck traffic.

Because the findings suggest that the threat to children posed by air pollution may be greater than scientists and health officials had suspected, the research is likely to lead to calls for tougher environmental regulations.

Wednesday, for example, environmental activists concerned about expansion of the ports of Los Angeles and Long Beach said the study's findings provided evidence for greater restrictions.

The ports have become the busiest in the United States. As they have grown, residents near them — as well as people living near the inland rail yards and warehouses that help move goods from the docks — have become increasingly worried about the potential health effects of diesel fumes and other air contaminants.

The activists said they hoped the new study would cause politicians to balance the economic benefits of port expansion against health concerns.

"I don't know what it's going to take to get people to stop and really analyze this," said Penny Newman of Riverside, who has campaigned against increased truck traffic serving port-related warehouses in her area.

To reach their conclusions, the researchers began tracking the children in 1993. As the children passed from adolescence to adulthood, technicians visited their schools to test their lung capacity.

By age 18, girls' lungs are fully formed and boys' lungs are nearly mature, likely making whatever damage occurs in childhood nearly irreversible, the researchers concluded.

The children lived in Atascadero in San Luis Obispo County; Santa Maria and Lompoc in Santa Barbara County; Lancaster, San Dimas and Long Beach in Los Angeles County; Upland and Lake Arrowhead in San Bernardino County; Mira Loma, Riverside and Lake Elsinore in Riverside County; and Alpine in San Diego County.

The researchers also took measurements from pollution-monitoring stations in each of the communities to measure hourly levels of acid vapors, particulate matter, nitrogen dioxide and ground-level ozone.

The pattern of lung damage being worst in communities with more polluted air held true

across racial and economic lines, and applied to children with or without asthma.

Underpowered lungs are a well-known cause of health problems. Reduced lung function ranks second only to smoking as a respiratory risk factor increasing a person's chances of premature death.

It strongly increases a person's chances of developing respiratory ailments such as wheezing during viral infections and can trigger more serious conditions such as cardiopulmonary disease later in adulthood, studies have shown.

The researchers did not pinpoint how air pollution was affecting the children's lungs. They theorized, however, that pollution may reduce the growth of alveoli, the tiny air sacs within lungs where the exchange of oxygen and carbon dioxide takes place.

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Staff writer Deborah Schoch contributed to this report.

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Schoolchildren and smog

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A study that followed Southern California children from fourth grade through high school found that those in communities with higher air pollution were more likely to have underpowered lungs.

Microscopic particles/ communities	Percent of children found to have low lung function
Low levels	
Lancaster	0%
Lompoc	2.0%
Santa Maria	2.0%
Lake Arrowhead	2.8%
Atascadero	2.9%
Alpine	3.4%
Medium levels	
Lake Elsinore	2.0%
San Dimas	4.0%
Long Beach	5.9%
High levels	
Riverside	6.0%
Mira Loma	6.3%
Upland	9.6%

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Source: Department of Preventive Medicine, USC

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