

Even low levels of air pollution appear to affect children's lung health

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According to new research led by Beth Israel Deaconess Medical Center (BIDMC) pulmonologist and critical care physician Mary B. Rice, MD, MPH, improved air quality in U.S. cities since the 1990s may not be enough to ensure normal lung function in children. The findings were recently published in the *American Journal of Respiratory and Critical Care*, a journal of the American Thoracic Society.

Rice and colleagues found that [children](#) exposed to higher levels of air pollution, including [fine particulate matter](#) (PM2.5) and soot (black carbon), had worse lung function than those living in less polluted areas. By age eight, children living within 100 meters of a major roadway had lung function that was on average 6 percent lower than that of children living 400 meters or more away.

The researchers studied 614 children born to mothers who enrolled in Project Viva, a long-term study of women's and children's health in eastern Massachusetts, between 1999 and 2002. The authors determined the distance from each child's home to the nearest major highway. Using satellite measurements of PM2.5 and a model of black carbon using 148 monitoring stations, they then estimated the children's exposure to both PM2.5 and black carbon in the first year of life, over their lifetime and in the year preceding lung function testing.

"The federal government implemented strict air quality regulations in the 1990s, but we wanted to know if they were enough to protect lung function in children," said Rice, who is also an instructor at Harvard

Medical School. "Fine particulate matter levels in Boston declined more than 30 percent between 1996 and 2006, but we still found that children who were more heavily exposed to PM2.5 had lower lung function on average and higher risk of clinically reduced lung function."

At the age of eight, study participants underwent lung function tests. The researchers found that children living the closest to major highways, and those with higher exposure to PM2.5 or [black carbon](#) had lower lung function than those who were less heavily exposed to pollution. In addition, children who experienced greater improvements in air quality after the first year of life, either due to a move or changes in local pollution, had better lung function compared to those whose air quality did not improve as much.

"These important findings are from a novel study combining modern modeling of exposures to air pollution with robust measurements of lung function, conducted in a community with pollutant levels now under EPA standards," wrote Cora S. Sack, MD, and Joel D. Kaufman, MD, MPH, of the University of Washington in an accompanying editorial in *The American Journal of Respiratory and Critical Care*. "This adds to the urgency for more work to understand the impacts of these low-level exposures on human health."

Rice and her colleagues plan to continue their research and will follow study participants into adolescence. "We plan to evaluate if the benefits of cleaner air endure by investigating whether children with the greatest improvements in [air quality](#) continue to have better [lung function](#) than their peers in the teen years," Rice said.

Provided by Beth Israel Deaconess Medical Center

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