Pollution particles found to have large impact on infant health

Tiny particles in the air probably have a greater impact on infant health than has previously been realized, according to new research published by a University of Chicago economist specializing in environmental regulation and his colleague at the University of California, Berkeley.

Their work examines a sharp reduction in manufacturing and, in turn, particulate air pollution during the 1981–1982 recession. Their research suggests that approximately 2,500 infants survived to at least one year of age who would not have without the improvement in air quality.

After the 1981–1982 recession, the ambient concentration of particulate air pollution rose modestly but has not reached the same level it was before that recession. Thus, the 1980–82 recession may have permanently reduced the national infant mortality rate. While the economic hardships imposed by recessions are well documented, this research appears to document a silver lining, said the studies authors, Kenneth Chay, Associate Professor of Economics at the University of California, Berkeley, and Michael Greenstone, Assistant Professor of Economics at the University of Chicago.

They report their findings in a paper, “The Impact of Air Pollution on Infant Mortality: Evidence from Geographic Variation in Pollution Shocks Induced by a Recession,” being published in the August issue of the Quarterly Journal of Economics.

The two examined data from the recession and found a striking reduction in infant deaths in counties in which the particulates fell drastically when compared to counties that were similar demographically but did not experience a big drop in the particles. The particles, called total suspended particulates (TSPs), range in size from barely visible dust specks to particles much smaller. They include both road dust and other suspended toxic and nontoxic material.

As part of the federal government’s efforts to promote clean air, the Environmental Protection Agency has set strict standards for TSPs in the air and measures them accordingly. The TSPs figures, coupled with other data, were the source of the study undertaken by Chay and Greenstone. Theirs is the largest, most comprehensive study ever conducted of the connection between infant mortality and pollution.

“We decided to look at infants rather than adults because at this vulnerable stage of life, pollution may have substantial effects on life expectancy. Further, it is possible to construct approximately complete histories of infants’ exposure to pollution, because mothers are unlikely to move after becoming pregnant,” Greenstone said. “In contrast, pollution exposure may only slightly hasten the death of already sick adults and the elderly. Further, adults and the elderly may move several times during their lifetime so their lifetime exposure to pollution is unknown, which undermines the credibility of any link between measures of current pollution and current health.”

For their study, the scholars looked at death records from 1,050 of the nation’s most populous counties from 1978 through 1984. They then created matches of counties where 1980–1982 changes in income and other factors were similar and compared the 1980 – 1982 changes in infant mortality in counties that had large drops in TSPs concentrations reported by the EPA with those that had small changes in TSPs.

They found that even a small drop in TSPs reduced infant mortality. A decline of 1 microgram (one millionth of a gram) per cubic meter resulted in roughly five more children surviving for every 100,000 births. For example, Chay and Greenstone’s results suggest that in Chicago, where TSPs dropped 16 micrograms per cubic meter between 1980 and 1982, 70 extra infants survived to the age of one in 1982. This reduced the number of infant deaths by about 5 percent.
“The counties that had the largest TSPs reductions also had the biggest declines in infant mortality within one-year of birth in the 1980–1982 period,” the researchers write. In contrast up until 1980, infant mortality was declining at about the same rate in counties with and without large reductions in TSPs during the recession, indicating that the paper’s findings are not due to differences in trends in infant mortality that predate the sharp 1980 – 1982 reduction in TSPs. “Taken together, the data provide suggestive evidence of a direct link between particulate pollution and infant mortality,” the paper reported.

Medical researchers have been unable to determine what aspects of air pollution cause adverse health impacts on mothers and their children. Chay and Greenstone’s research may provide some insights on the mechanism. They find that 60 to 70 percent of the reduced mortality is due to reductions in mortality 24 hours after birth and 80 percent to lower mortality at 28 days. They take this as evidence that maternal exposure to particulates while the baby is in utero may affect the fetus’s development. But they did determine that the peril is unlikely to be due to low birth weight.

In the last 15 years, the EPA has changed its priorities to more heavily restrict the smallest TSPs. Separate data on small particles was unavailable in the early 1980s, so Chay and Greenstone’s research does not establish if the size of particles makes any difference.