



Ambient PM_{2.5} and NO₂ concentrations are associated with lower birth weight among term births to mothers residing in New York City

Since 2008, the New York City Community Air Survey (NYCCAS), a PlaNYC initiative, has monitored levels of air pollutants harmful to public health throughout New York City. The results have been used to inform the public on levels of air pollutants in different neighborhoods and in developing the City's air quality improvement initiatives. This unique air monitoring study has also provided an important database for conducting research on the health effects of air pollution exposure among New York City residents. Since 2011, the Health Department Scientists have been part of an NIH-sponsored research project with investigators from Brown University, Harvard University and University of Pittsburgh to examine the effects of exposures to air pollutants on pregnancy and births in New York City.

Two common air pollutants with known adverse health effects are fine particulate matter (PM_{2.5}) and nitrogen dioxide (NO₂). It is well-documented that exposure to these pollutants is linked to a number of health problems, including respiratory and cardiovascular effects.^{1,2} More recently, a growing number of studies of air pollution on pregnancy and birth have linked exposures to preterm birth and low birth weight.³ Low birth weight is linked to neonatal and post-neonatal deaths as well as increased risk for a number of health problems throughout that infant's life, including respiratory and neurodevelopmental problems.⁴

Using NYCCAS air monitoring data, the research team examined to the associations of PM_{2.5} and NO₂ in ambient air with birth weights of 252,967 babies born to New York City mothers at full term from 2008-2010. Researchers used birth certificates from the NYC Department of Health and Mental Hygiene's Office of Vital Records, NYCCAS data and regulatory monitoring data to estimated air pollution exposure for each pregnancy based on where the mother lived and when the pregnancy occurred.⁵ The results of this study, published in the [American Journal of Epidemiology](#), showed that for every of 10- $\mu\text{g}/\text{m}^3$ increase in PM_{2.5} exposure over the entire pregnancy, birth weight was reduced by 48.4 g. Similarly, results show that for every 10-ppb increase in NO₂ exposure over the entire pregnancy, birth weights were reduced by 18.0 g. For individual babies, such small differences in birth weight are not clinically meaningful. But because of the associations of birth weight and infant health and development, air pollution effects could have meaningful public health impacts at a population level, especially for those living in neighborhoods with the highest levels of air pollution.

Many prior studies have reported that PM_{2.5} and NO₂ exposure during pregnancy are associated with a decrease in birth weight. However, this study demonstrated even greater reductions in birth weight

¹ <http://www.epa.gov/airquality/particlepollution/health.html>

² <http://www.epa.gov/airquality/nitrogenoxides/health.html>

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[http://yosemite.epa.gov/ochnp/ochpweb.nsf/content/OCHP_Prenatal_FS_7_10.htm/\\$File/OCHP_Prenatal_FS_7_10.pdf](http://yosemite.epa.gov/ochnp/ochpweb.nsf/content/OCHP_Prenatal_FS_7_10.htm/$File/OCHP_Prenatal_FS_7_10.pdf)

⁴ http://www.cdc.gov/pednss/how_to/interpret_data/case_studies/low_birthweight/what.htm

⁵ <http://www.nyc.gov/html/doh/html/environmental/community-air-survey.shtml>



due to $PM_{2.5}$ and NO_2 exposure during pregnancy among New York City mothers. This could be due to the fact that this study utilized precise exposure measures available through a highly resolved NYCCAS monitoring network that are not routinely available in other cities. Another possible explanation of the strong findings could be the composition of $PM_{2.5}$; it is possible that $PM_{2.5}$ in New York City is composed of different and more harmful constituents than in other regions and cities.

Limitations of this study include the measure of maternal residence, which reflects the maternal residence at the time of birth and not necessarily for the whole pregnancy since it was obtained from the birth certificate. However, this is a commonly accepted method for determining maternal exposure to environmental pollution in studies of pregnancy and birth, and the researchers expect that a relatively small percentage of the mothers in the study have moved during their pregnancy. Another limitation is that only air pollution near the home, and not in other neighborhoods away from the home frequently visited by mothers, such as for work, could be analyzed. Finally, other exposures that might affect birth weight, such as smoking and noise, were not considered.

Despite the study's limitations, its findings add to evidence that exposures to common, harmful air pollutants during pregnancy can have a negative effect on the developing fetus. Continuing and expanding measures to improve NYC air quality will help protect our most sensitive residents, including those with heart or lung conditions, the very old, young children, and pregnant women.