

Science Spotlight

October 2015

Improved Air Quality During Beijing Olympics Linked to Higher Birth Weights

By Sara Mishamandani

Short-term decreases in air pollution late in pregnancy are associated with higher birth weight, according to an NIEHS-funded collaborative study that focused on Beijing during the 2008 Summer Olympics. The Chinese government implemented policies to reduce air pollution for about 47 days during the Olympics, providing an opportunity for a natural experiment to evaluate how changes in air pollution during certain pregnancy windows could affect birthweight.

“In natural experiments like this one, you compare the rate or occurrence of a health outcome before or after a policy change or event that reduces pollution. What’s unique here is that the decrease in air pollution is very short and then returns to normal levels, so we can focus on a small window of time,” said David Rich, Sc.D., a professor at the University of Rochester and a lead author on the study. “This study specifically identifies the eighth month of pregnancy as an important window of exposure.”

Analyzing Birth Weight Differences

Researchers led by Rich and Duke University professor Jim Zhang, Ph.D., in collaboration with Capital Medical University and the Chinese Research Academy of Environmental Sciences in Beijing, used two different methods to examine 83,672 birth records from four urban Beijing districts. First, they compared the mean birth weight among term births, defined as 37 weeks or greater gestational age, with different months of pregnancy during the 2008 Olympics, August 8 – September 24, to the mean birth weight among term births with the same month of pregnancy during the same dates in 2007 and 2009. They did a second analysis linking birth weight with levels of air pollution — specifically, particulate matter less than 2.5 micrometers in diameter (PM_{2.5}), carbon monoxide, sulfur dioxide, and nitrogen dioxide — during each month of pregnancy.

Looking at the first analysis, the study found that women who were in their eighth month of pregnancy during the Olympics had babies who were on average 23 grams larger than babies whose eighth month occurred during the same dates in 2007 and 2009. This change coincided with the second analysis, where researchers observed that a decrease in birth weight was associated with increases in



Beijing Olympic Stadium seen during the 2008 Summer Games with clear skies.
(Photo courtesy of Wikimedia)

concentrations of PM_{2.5}, carbon monoxide, sulfur dioxide, and nitrogen dioxide during the eighth month of pregnancy. No associations were seen for the first seven months of pregnancy in either analysis.

“The results of both analyses tell the same story and point to the eighth month of pregnancy as a window where increased air pollution is associated with decreased birth weight,” Rich said. “The eighth month of pregnancy is a period of rapid fetal growth, and we need to investigate what mechanisms associated with fetal growth in late pregnancy may be affected by air pollution.”

Pollution Controls Improve Public Health

“These findings not only illustrate one of the many significant health consequences of pollution, but also demonstrate that this phenomenon can be reversed,” Rich said.

Further, the study illustrates that even short-term controls on pollution can have positive public health benefits in a megacity.

“In China, the spatial and temporal variation in pollution is so great that you can examine health responses that may not be easily observed in other locations where the pollution may not be so high or so variable,” Rich said. “This collaborative research provides an efficient model to evaluate health effects of air pollution.”



The research team included scientists from the University of Rochester, Duke University, Capital Medical University, the Chinese Research Academy of Environmental Sciences in Beijing, and Rutgers University.

(Photo courtesy of David Rich)

Citation: [Rich DQ, Liu K, Zhang J, Thurston SW, Stevens TP, Pan Y, Kane C, Weinberger B, Ohman-Strickland P, Woodruff TJ, Duan X, Assibey-Mensah V, Zhang J. 2015. Differences in Birth Weight Associated with the 2008 Beijing Olympics Air Pollution Reduction: Results from a Natural Experiment. Environ Health Perspect 123\(9\):880-887.](#)