

Clean air for our future

November 10 2016



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Preterm birth is the leading cause of infant death and long-term neurological disease, and 1 in 10 infants born in the United States is affected by preterm birth according to the Centers for Disease Control and Prevention. The increasing public health threat of air pollution may be correlated to an increased risk of preterm birth. Researchers at Texas A&M University, including Dr. Qi Ying, associate professor in the Zachry Department of Civil Engineering, are in collaboration with the National Institute of Child Health and Human Development (NICHD),

seeking to improve the understanding of the connection between air pollution exposure and the health of pregnant women and their newborns.

By developing an advanced air quality model providing solid statistical analyses that clarifies and quantifies this relationship, this research is removing a major obstacle for environmental epidemiologists studying this field.

Epidemiologists had been attempting to define this issue using insufficiently representative [air pollution data](#) that lacked time and spatial resolution. Most of their studies on the matter relied on inadequate data from central monitors that could neither sufficiently represent the spatial and temporal variation of air pollutants nor monitor a wide enough range of species.

To solve this problem, a team of researchers at Texas A&M has developed state-of-the-art improvements to the existing EPA air quality models to predict the concentrations of a large number of gaseous and particulate pollutants at a very high spatial and temporal resolution. That is, models with improved visual clarity and precision in regards to time. The specific model used for this project predicts a wide range of pollutants based on their estimated emission rates from the hundreds of different emission sources and the physical and chemical processes of [air pollutants](#) in the atmosphere.

Ying is a major contributor to this research and serves as the principal investigator (PI) of the air quality modeling aspect of the "Air Quality and Reproductive Health," project with Dr. Pauline Mendola of the NICHD, who oversees the project as primary PI.

"A unique feature of many of our models is the capability to quantitatively determine the contributions of different sources to overall

pollutant concentrations," says Ying. "We applied our model to simulate the concentrations of particulate matter, ozone, nitrogen oxides, sulfur dioxide and carbon monoxide at ground level over the entire continental United States from 2001 to 2009."

These simulated concentration levels were used to approximate the exposure of about 200,000 women to these pollutants during the full course of their pregnancy. The major conclusion of this study was that mothers with asthma may experience a higher risk for [preterm birth](#) after being exposed to traffic related pollutants like carbon monoxide and nitrous oxides during their pregnancy. The risk is particularly associated with exposure in the early months of pregnancy and just before conception.

"These findings set the stage for further studies designed to help prevent preterm birth in this at-risk group," says Mendola

It has long been suspected that air pollution could increase preterm birth risk, however the high temporal and spatial resolution of the data produced by this new model allowed researchers to more accurately determine the most critical window of time when exposure can influence the risk of preterm birth.

These models produced by researchers and executed by the supercomputers at Texas A&M will be highly influential in the understanding of the effect of air pollution on public health. The results from these studies, as well as studies that will be made possible with this model, will allow the public, as well as policy makers, to understand and make informed decisions on emissions control. Public policy limiting air pollution through emission control could potentially protect the health of people worldwide in areas of unsatisfactory [air quality](#). The results of this study were published and can be found in the *Journal of Allergy and Clinical Immunology*.

More information: Pauline Mendola et al. Preterm birth and air pollution: Critical windows of exposure for women with asthma, *Journal of Allergy and Clinical Immunology* (2016). [DOI: 10.1016/j.jaci.2015.12.1309](https://doi.org/10.1016/j.jaci.2015.12.1309)

Provided by Texas A&M University

Citation: Clean air for our future (2016, November 10) retrieved 18 April 2024 from <https://medicalxpress.com/news/2016-11-air-future.html>

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