News Release

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Session B15: Mini Symposium: Air Pollution In Women, Children, and Elderly: Risk
Susceptibility And Reduction
Monday, May 19, 2014, 8:15 a.m. – 10:45 a.m.
Location: Room 11 A-B (Upper Level), San Diego Convention Center

Exposure to Air Pollution During the Second Trimester of Pregnancy May Be Associated with Increased Asthma Risk in Children

ATS 2014, SAN DIEGO ─ Children who are exposed *in utero* to high levels of particulate air pollution during the second trimester of pregnancy may be at greater risk of developing asthma in early childhood, according to a new study presented at the 2014 American Thoracic Society International Conference.

"We know that mothers' exposure to air pollution during pregnancy can affect lung development of their babies and lead to subsequent respiratory disorders, including asthma, although little is known about whether timing of the exposure is important to consider," said lead author Yueh-Hsiu Mathilda Chiu, ScD, from the Department of Pediatrics at Icahn School of Medicine at Mount Sinai in New York. "In our study, we assessed whether higher exposure to particulate air pollution at more specific time windows in pregnancy were particularly linked to higher asthma risk in urban children."

The study included 430 full-term children followed to age 7 years and their mothers. Daily exposure to air pollution from sources including traffic, power plants, and other industrial sources consisting of fine particles in the prenatal period was estimated based on where these mothers lived. These fine particles, which are more likely to be inhaled deep into the lungs, have been linked to the greatest health risk and previous studies have suggested that effects on pregnant women can be transferred to the growing baby.

The researchers found that exposure to higher levels of fine particles in the second trimester was most strongly associated with increased asthma onset among the children, particularly for those born to non-obese mothers. "It is possible that the effect of maternal obesity, another known risk

factor of childhood asthma onset, may be so strong that it was difficult to determine additional effects of air pollution among children born to obese mothers in this setting." .

"While we should continue to improve air quality and minimize exposure to pregnant women throughout the entire pregnancy for a host of health reasons," said Dr. Rosalind Wright, MD MPH, senior investigator from the Department of Pediatrics at Icahn School of Medicine at Mount Sinai, "pinpointing the gestational period during which air pollution has the greatest effects on the developing lung may add to our understanding of the mechanisms underlying this relationship."

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* Please note that numbers in this release may differ slightly from those in the abstract. Many of these investigations are ongoing; the release represents the most up-to-date data available at press time.

Abstract 53288

Identifying Prenatal Windows Of Susceptibility To Particulate Air Pollution On Childhood Asthma Onset In A Prospective Urban Birth Cohort

Type: Scientific Abstract

Category: 06.01 - Air Pollution: Epidemiology and Mechanisms (EOH)

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Abstract Body

Rationale: The influence of particulate air pollution on childhood respiratory health starts *in utero*. Fetal lung growth and structural development occurs in stages, thus timing of exposure may have differential effects on postnatal disease risk. We assessed the windows of susceptibility to particulate air pollution exposure during pregnancy on childhood asthma onset in a prospective urban birth cohort.

Methods: Analyses included 430 full-term ($\geq$37 weeks gestation at birth) children and their mothers recruited prenatally. Daily exposure level of particulate matter with a diameter less than 2.5μm ($PM_{2.5}$) in the prenatal period was estimated for each participant using a satellite-based spatio-temporal resolved model, based on address during pregnancy. Children's physician-diagnosed asthma was ascertained by maternal reports up to age 7 years. We examined associations between weekly averaged prenatal $PM_{2.5}$ levels and children's asthma using distributed lag models. This modeling framework describes delayed effects between predictors and an outcome and estimates associations at each week while adjusting for exposures at other weeks, assuming that the associations varying smoothly over time during gestation. Effect modification by gender and maternal pre-pregnancy obesity (body mass index [weight divided by height squared] $\geq$30 kg/m^2) was also examined.

Results: Mothers were mostly ethnic minority (55% Hispanic, 27% black) with ≤12 years of education (66%); 18.3% of children had asthma. Figure 1 demonstrates the OR and 95% pointwise confidence intervals of asthma associated with a $10\mu g/m^3$ increase in weekly $PM_{2.5}$, estimated from distributed lag models adjusting for child's gender, season of birth, and maternal education, race/ethnicity, atopy, smoking and stress. Associations were significant between $PM_{2.5}$ levels at 13-27 weeks gestation and asthma for children born to non-obese mothers, but not for children born to obese mothers. In multivariable-adjusted logistic regression models, the association between averaged $PM_{2.5}$ over the identified vulnerable period (13-27 weeks gestation) and asthma was again only significant in children born to non-obese mothers (OR=1.35, 95% CI: 1.04-1.74; *p* for interaction=0.02). The three-way interaction among averaged $PM_{2.5}$ level at 13-27 weeks gestation, gender, and obesity was also significant (p<0.01).

Conclusions: Children exposed to increased levels of particulate matter in the second trimester may be at greatest risk of developing asthma in early childhood. Methods to better characterize vulnerable windows may provide insight into underlying mechanisms when coupled with our understanding of lung growth and structural development of the airways during this gestational period. Effect modification by gender and maternal obesity should be explored in future research.

Figure 1. Association between weekly averaged PM2.5 during pregnancy and asthma in children born to non-obese women