ECHO
Environmental influences on Child Health Outcomes
A program supported by the NIH

Study Summary

Exposure to Fine Particulate Air Pollution in Early Pregnancy Linked to Lower Birth Weight, ECHO Study Finds

Authors: Whitney Cowell, et al.

Who sponsored this study?

The Environmental influences on Child Health Outcomes (ECHO) Program, Office of the Director, National Institutes of Health supported this research.

Why was this study needed?

Babies born with low birth weight are at a higher risk for health problems both at birth and later in life. Prior research has shown that exposure to fine particulate matter ($PM_{2.5}$)—very small inhalable particles found in air pollution—during pregnancy can negatively affect birth weight. Many past studies examined average exposure over pregnancy, which may miss specific windows when the baby is most sensitive. The goal of this study was to identify the specific weeks in pregnancy when babies are most vulnerable to $PM_{2.5}$ exposure.

What were the study results?

Exposure to $PM_{2.5}$ during pregnancy was associated with lower birth weight for gestational age, particularly when exposure occurred in the early weeks of pregnancy (weeks 1–5). Male newborns appeared more sensitive to exposure than females. The study also found regional differences, with stronger associations observed in the Northeast, South, and Midwest. This may relate to differences in the types of particles found in the air in these regions.

What was the study's impact?

This study gives us a clearer picture of when during pregnancy air pollution may be most harmful to a baby's growth. Understanding these sensitive time periods can inform future research on what's happening in the body during those weeks and why pollution may have a bigger impact during those times.

Who was involved?

The study included 16,868 pregnant participants from the ECHO Cohort, spanning 50 sites across the United States.

What happened during the study?

Researchers applied computer models to estimate pregnant participants' weekly exposure to $PM_{2.5}$ throughout their pregnancies. Birth weight was recorded at the time of delivery and then standardized

using national growth charts to account for variations in gestational age (length of pregnancy). Analysts used statistical methods to identify how overall and week-specific $PM_{2.5}$ exposure related to birthweight. These methods also tested whether the impact of $PM_{2.5}$ differed by the baby's sex, race or ethnicity of the parents, or the region of the country the mother lived in during pregnancy.

Footnote: Results reported here are for a single study. Other or future studies may provide new information or different results. You should not make changes to your health without first consulting your healthcare professional.

What happens next?

Future studies could help explain how different types and sizes of pollution particles affect baby's growth. Additional research could also help identify the periods of pregnancy when reducing exposure would have the greatest impact.

Where can I learn more?

Access the full journal article, titled "$PM_{2.5}$ in relation to birth weight: exploring windows of susceptibility in the ECHO Cohort," in *JAMA Network Open*.

The content is the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.