



ECHO

Environmental influences
on Child Health Outcomes

A program supported by the NIH

Study Summary

ECHO Research Suggests Airborne Lead Exposure Affects Children's Cognitive Development, Impacting Males More Than Females

Authors: Amii Kress, Lisa Gatzke-Kopp, et al.

Who sponsored this study?

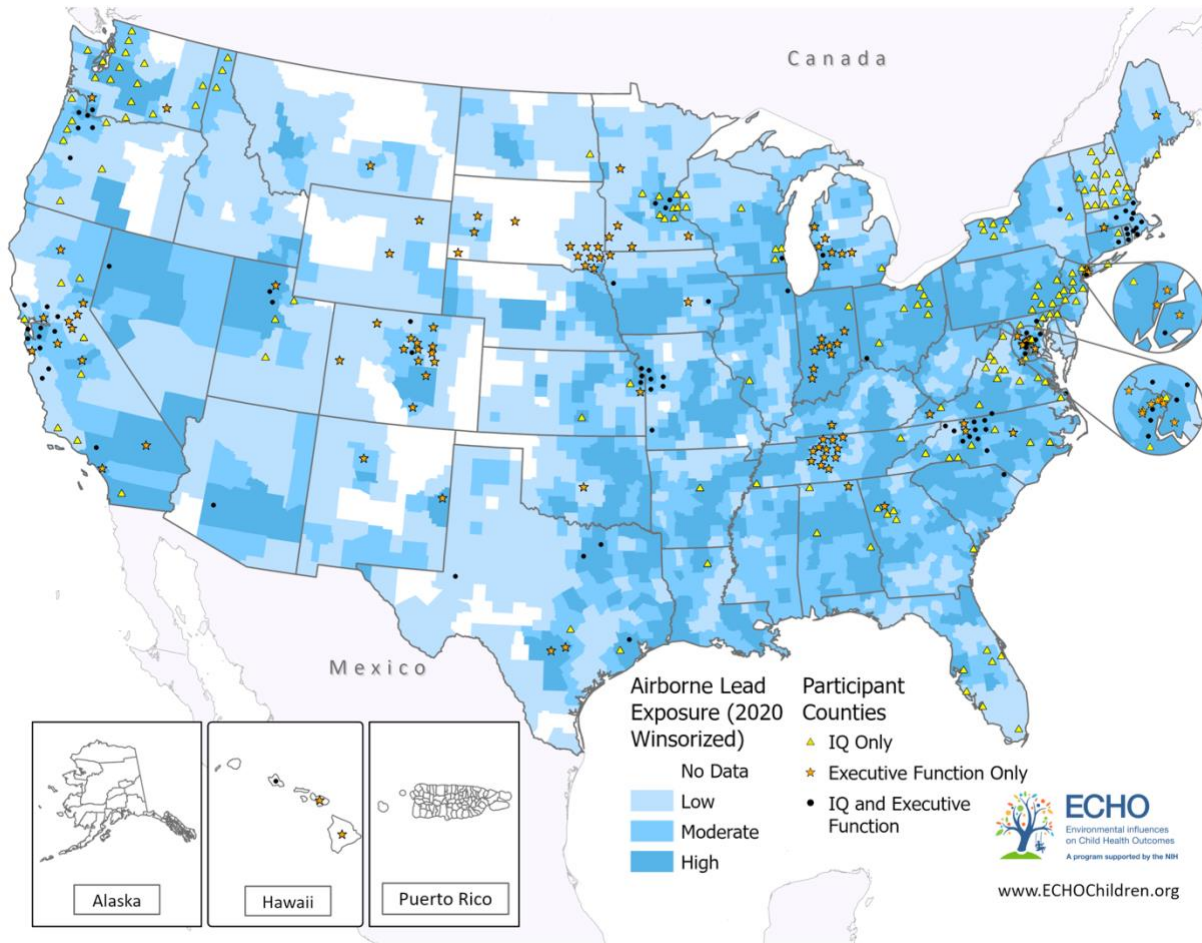
The Environmental influences on Child Health Outcomes (ECHO) Program, Office of the Director, National Institutes of Health supported this research.

Why was this study needed?

Chemicals used in manufacturing, such as lead, are often released into the air and water. The government sets limits on the amount of pollution that is allowed based on what scientists believe are safe levels for humans. Studies suggest that there is no safe level of lead exposure for children. Despite a substantial decrease in children's blood lead levels in recent decades, significant disparities in lead exposure still exist. Houses with old lead paint and areas with older and poorly kept housing or corroded pipes pose a higher risk of lead exposure. However, there is limited research on how airborne lead from industrial emissions affects children. This study tested whether lead pollution in the air, even at very low levels, is related to children's intelligence and executive functioning.

What were the study results?

Children who lived in areas with relatively more lead pollution in the air in the early years of their lives exhibited less impulse control and had slightly lower IQ scores when they reached preschool and school age. Each increase in the level of airborne lead exposure was linked to an average decrease of 0.74 points in children's IQ scores. The association between lead exposure and executive function was less straightforward in this study, with the influence changing noticeably only at higher levels. This was especially true for boys, who were more sensitive to the effects of airborne lead. Cognitive flexibility, or the ability to adapt to changing situations, and memory did not appear to be affected.



Note: Results reported here are for a single study. Other or future studies may provide new information or different results. You should always consult with a qualified healthcare provider for diagnosis and for answers to your personal questions.

What was the study's impact?

These results suggest that the amount of lead in the air during early childhood may affect children's brain development. These findings could contribute to a broader approach to children's health by considering all of the ways that a child's environment could pose invisible risks. This study suggests that, in addition to efforts to reduce environmental pollution in general, attention to factors like nutrition that may mitigate the impact of exposure on children's development could reduce health disparities of lead exposure for vulnerable individuals.

Who was involved?

This study looked at over 3,000 children from across the United States who were part of a research study that contributed to the ECHO Cohort.

What happened during the study?

Researchers used children's home addresses to create a timeline of all the places that they lived from the time they were born until they were 5 years old. They then matched those locations to a database provided by the Environmental Protection Agency (EPA) that estimates the relative amount of lead pollution in the air for every half-square mile yearly. Researchers determined the average amount of exposure over the course of five years for each individual child and then examined whether the level of exposure was related to how the children performed on cognitive and IQ tests when they were between 3 and 8 years old.

What happens next?

Future studies are needed to examine whether other factors in the child's environment make the effects of lead pollution better or worse. For instance, children with a healthy diet may be less likely to suffer from the effects of air pollution. Furthermore, previous work has suggested that males are more vulnerable to the effects of adverse conditions during neurodevelopment generally. These findings, along with evidence that lead exposure may affect male and female children differently, warrant additional research.

Where can I learn more?

Learn more about the additional data supporting this study through the EPA's Toxic Release Inventory program. The program offers a [Toxics Tracker website](#) that people can use to learn more about the sources of air pollution in their communities.

Access the full journal article titled "Airborne Lead Exposure and Childhood Cognition: The Environmental Influence on Child Health Outcomes (ECHO) Cohort (2003-2022)" in the [American Journal of Public Health](#).

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