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Contact: Colin McEwen | 216.368.4442
colin.mcewen@case.edu

Study of ‘downstream’ effects of childhood lead poisoning reveals racial, economic disparities in adulthood

20-year study involving more than 10,000 children tracks consequences of lead exposure from birth through early adulthood

A new study from Case Western Reserve University shows that numerous negative issues associated with lead poisoning follow children well into adulthood—building on evidence linking elevated blood-lead levels with a host of harmful outcomes in education, behavior and health.

These so-called “downstream” consequences include increased involvement in the juvenile justice system, adult incarceration and homelessness, according to the study conducted by researchers at the university’s [Center on Urban Poverty and Community Development](#) at the Jack, Joseph and Morton Mandel School of Applied Social Sciences.

The findings stem from a research project that—using data over a 20-year period—tracked the life outcomes of more than 10,000 children in Cleveland with elevated blood-lead levels, compared to a control group of students who did not have elevated lead levels. By comparing these carefully matched groups, researchers were able to zero-in on the impact of lead poisoning on both people and public systems.

“With these findings, we now have conclusive evidence that having elevated levels of lead not only presents a host of problems for Cleveland’s children—these issues continue to manifest into adulthood,” said Claudia Coulton, the study’s co-author, a Distinguished University Professor and co-director of the Poverty Center at the Mandel School.

“It’s clear,” she said. “Lead poisoning in early childhood can altogether shift the trajectory of a person’s life at key stages of development and leave lasting long-term consequences.”

Key findings include:

- Children with elevated blood-lead levels had a 27% lower chance of being on-track for kindergarten than children who do not have elevated lead levels.

- Children with elevated lead levels were 25-30% more likely to enter the juvenile justice system; and 34% more likely to be incarcerated as adults (age 18 to 23).
- By age 23, those with elevated lead levels were more likely to have relied on public assistance programs, such as Temporary Assistance for Needy Families (53% more likely), homeless services (40% more likely) and Supplemental Nutrition Assistance Program (17% more likely).
- Black students were more disproportionately affected with lead poisoning than their white counterparts, and lead exposure is concentrated in areas of disinvested neighborhoods—areas historically tied to segregation, redlining and subprime lending.

Researchers examined two main cohorts of children with elevated lead levels: a group of students that were in the 9th grade in 2007-08 and another from 2016-17; data were derived from the university's Child Household Integrated Longitudinal Data ([CHILD](#))—a secure, proprietary system of linked records on children in Cuyahoga County born after 1989—and also drew on thousands of administrative records from educational, judicial, employment and social services systems.

“Documenting the downstream consequences of lead poisoning can help society acknowledge and appreciate the costs of inaction—and to target resources where they are most needed,” said Rob Fischer, an associate professor at the Mandel School and a study co-author. “All of the outcomes examined in this study are costly to the people who experience them, the systems that serve them, and society at-large.”

The study also found large differences in proficiency test results between the groups of those with and without elevated lead levels. For example, in the recent cohort, the rates of passing the third-grade reading and math proficiency tests were 32% and 12% lower, respectively. Repeating the third and ninth grades was also a common theme in those with higher lead levels than their peers.

Not all findings were negative: The number of students testing positive for lead poisoning has declined over time. Nearly half as many children in the later cohort exceeded the public health threshold of lead levels in their blood (45%) compared with the earlier group (82%).

“When we consider the societal costs, the effects of lead grow cumulatively as people move through these various stages and are likely to persist beyond the early adult period covered in this study,” Fischer said. “Eliminating lead poisoning in children will go a long way in reducing these adverse events. It will also improve these children’s chances to succeed as adults.”

“The Lead Safe Cleveland Coalition believes that no child should ever be lead-poisoned,” said Blaine Griffin, City of Cleveland Councilman and Coalition Steering Committee Member. “This research from Case Western Reserve University underscores the painful reality that lead poisoning not only affects a child’s developing body and robs them of their potential but has a

costly impact on our entire community. It doesn't matter where you live or work—whether you're a landlord, caregiver, elected official, or resident—we all have a responsibility to address lead poisoning together.”

Joining Coulton and Fischer in the research were Francisca García-Cobián Richter, Youngmin Cho and Jiho Park from the Mandel School.

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Case Western Reserve University is one of the country's leading private research institutions. Located in Cleveland, we offer a unique combination of forward-thinking educational opportunities in an inspiring cultural setting. Our leading-edge faculty engage in teaching and research in a collaborative, hands-on environment. Our nationally recognized programs include arts and sciences, dental medicine, engineering, law, management, medicine, nursing and social work. About 5,100 undergraduate and 6,200 graduate students comprise our student body. Visit case.edu to see how Case Western Reserve thinks beyond the possible.

The Lead Safe Cleveland Coalition is an inclusive, public-private partnership founded to address lead poisoning through a comprehensive, preventive, and long-term approach. This approach protects Cleveland's children by merging smart, adaptable public policies; knowledgeable agencies willing to collaborate; proven community programs and leaders; and public and private sector accountability. With community voice embedded in all aspects, the Coalition is working on: 1) Supporting and measuring the City of Cleveland's Lead Safe Certificate system, 2) Developing a lead safe workforce, 3) Rolling out a public awareness campaign, 4) Advocating for state and federal lead safe policies and resources, 5) Securing investments into the Lead Safe Home Fund, and 6) Launching the Lead Safe Resource Center and Home Loans and Grants. Initial support for the Lead Safe Cleveland Coalition came from the City of Cleveland, the Mt. Sinai Health Care Foundation, the George Gund Foundation, the Saint Luke's Foundation, The Cleveland Foundation, the Bruening Foundation, the Sisters of Charity Foundation, the Third Federal Foundation, and United Way of Greater Cleveland. Today, the Coalition has over 400 members and six working committees and continues to grow. Website: www.leadSAFEcle.org. Email: info@leadSAFEcle.org. Twitter: @LeadSafeCLE