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Issue Briefing

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Early Childhood Lead Exposure in Cuyahoga County and the Impact on Kindergarten Readiness

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Key points:

- Although rates of children with elevated blood lead levels above the current public health threshold for concern have been on the decline, children in Cuyahoga County still account for 41% of the children in Ohio with elevated lead levels.
- Despite Medicaid rules that mandate testing at ages 1 and 2, only 50% of the children on Medicaid in Cuyahoga County were tested at age 1 and only 34% were tested at age 2.
- Of 11,560 children born in Cuyahoga County in 2012 and screened at least once by age 5, 1,237 children (10.7%) had an elevated blood lead level by age 5. Most of these children lived in Cleveland.
- Children with elevated lead levels are half as likely as their peers to score on track for language and literacy on the kindergarten readiness assessment, even after controlling for a range of background factors.

Note: The birth and lead data used in this report come from the Ohio Department of Health. This should not be considered an endorsement of this study or these conclusions by the Ohio Department of Health.

Lead is an environmental neurotoxin associated with cognitive deficits, even at low levels of exposure. These negative effects have been well documented[1] and include damage to the brain and nervous system, slowed development and decreased IQ, learning and behavior problems, and hearing and speech problems.[2] The importance of screening, prevention and intervention is well documented in the literature. This report contributes by focusing specifically on Cuyahoga County to document the extent to which screening is occurring, the prevalence of exposure, and preliminary local evidence around the detrimental effects of exposure on kindergarten readiness. The aim is to more fully inform local efforts to both prevent further exposure and implement effective interventions for those exposed.

[1] Zhang, N., Baker, H. W., Tufts, M., Raymond, R. E., Salihu, H., & Elliott, M. R. (2013). Early childhood lead exposure and academic achievement: Evidence from Detroit Public Schools, 2008–2010. *American Journal of Public Health, 103*(3), e72-e77.

[2] Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological profile for lead. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services. http://www.atsdr.cdc.gov/toxprofiles/tp13.pdf

Today, the primary source of lead exposure comes from paint dust and chips in homes built prior to 1978,[3] when lead was commonly added to paint. Children can be exposed to lead when lead dust is inhaled or when lead is ingested. For cities with much pre-1978 housing stock[4] like Cleveland and its inner ring suburbs, the risk to children remains a serious concern. Childhood lead exposure is measured against thresholds set by the public health community. Although the federal government established 5 µg/dL (micrograms per deciliter) of lead in children's blood as the threshold for public health concern in 2012, there is no safe level of lead in a child's blood.[5] [6] In Ohio and other states, the Action Level by which a mandatory in-home public health lead investigation is triggered is 10 µg/dL.[7]

It is crucial to screen children for lead at very young ages for several reasons. First, though lead can be ingested in a number of ways including via contaminated water (as was the case in Flint, MI when the water source was switched between April 2014 and October 2015),[8] children living in areas with older housing stock are most at risk of lead exposure, particularly when they begin to explore their environments through crawling. While crawling and pulling themselves up to stand, young children are more likely to come into contact with and subsequently ingest dust and chips from lead-based paint. Second, critical brain development is occurring at this same time and can be significantly negatively affected by the toxin. Therefore, the greatest likelihood of exposure to this environmental neurotoxin occurs at the precise time when it can do the most lasting damage to the child's brain.[9] Third, testing is critical so that appropriate interventions can take place that remove children from the presence of the toxin and trigger a public health response to prevent future exposures to other children.

<u>What is the prevalence of elevated blood lead levels in Cuyahoga County?</u>
In Cuyahoga County, thousands of children have been and continue to be exposed to lead due primarily, to poorly maintained aging and deteriorating housing stock. In fact, in 2016, Cuyahoga County accounted for 14% of Ohio's lead tested children, but 41% of all children found to have an elevated blood lead level (EBLLs) ≥5 µg/dL.[10] The problem of lead exposure is not evenly distributed throughout Ohio. The number of children in just the

[3] Centers for Disease Control and Prevention. Sources of Lead. http://www.cdc.gov/nceh/lead/tips/sources.htm
[4] Centers for Disease Control and Prevention. Lead Prevention Tips. http://www.cdc.gov/nceh/lead/tips.htm
[5] D. Bellinger. (2008). Very low lead exposures and children's neurodevelopment. *Current Opinion in Pediatrics,* 20, 172-177.
[6] C. Cole, A. Winsler (2010), "Protecting Children from Exposure to Lead: Old Problem, New Data, and New Policy Needs." *Social Policy Report* 24(1).
[7] Ohio public health lead investigations include visual assessment of the environment where exposure occurred, x-ray fluorescence analysis of deteriorated paint, and analysis of other items that may contain lead (e.g., ceramic cookware, toys), and in some cases analysis of dust and soil samples. Retrieved from http://codes.ohio.gov/oac/3701-30-07
[8] Gomez, H. F., Borgialli, D. A., Sharman, M., Shah, K. K., Scolpino, A. J., Oleske, J. M., & Bogden, J. D. (2018). Blood lead levels of children in Flint, Michigan: 2006-2016. *The Journal of Pediatrics, 197.* 158-164. https://www.jpeds.com/article/S0022-3476(17)31758-4/fulltext
[9] World Health Organization. 2010. "Childhood Lead Poisoning." Geneva, Switzerland: World Health Organization. http://www.who.int/ceh/publications/leadguidance.pdf.
[10] Ohio Department of Health, Public Health Data Warehouse. http://publicapps.odh.ohio.gov/EDW/DataBrowser/Browse/LeadData

knowing less about letters, numbers, colors, sizes and shapes than their peers without an EBLL ≥5 μg/dL knew when they entered preschool.[28]

It is important to note that in the retrospective analysis, a minority of children with EBLLs ≥5 μg/dL did score "On-track" according to the KRA language and literacy subscale, despite their elevated lead exposure. There was no statistically significant mean difference in the highest confirmed blood lead test result between this group of children and their peers who also had an EBLL ≥5 μg/dL, but did not score "On-track." That is, the actual amount of lead in the children's blood at the highest confirmed test does not explain why some children scored "On-track" and others did not. The fact that these children scored "On-track," however, does not mean that lead exposure had no impact on their kindergarten readiness. It is possible that their scores would have been even higher without the lead exposure; the "On-track" designation simply tells us that their underlying score was high enough to meet this benchmark.

Differences between the two groups of children with EBLLs were found in areas that suggest children who are not kindergarten-ready are more likely to face other adversities in the early childhood period in addition to lead exposure. For example, proportionately fewer lead exposed children who scored "On-track" were born prematurely, at a low birth weight, or spent more than half their life prior to kindergarten in poverty. These children were also less likely to have moved residences in the preschool years. These differences suggest that it may be possible for children with EBLLs to be ready for kindergarten if other life experiences do not exacerbate the impact of elevated lead. Furthermore, for those "On-track" lead exposed children, it may be possible that high quality preschool did play a role in helping them be prepared for kindergarten, although we cannot make that claim with assurance. In order to have more conclusive evidence, we would need to compare this "On-track" group to a group who also had EBLLs but attended a low-quality preschool setting for at least 18 months. There are so few children who received this high dose of low-quality preschool that we are unable to make that comparison.

Discussion

In both number and proportion, children in Cleveland and Cuyahoga County are more at risk for lead exposure than children almost anywhere else in Ohio. Statistics show that the proportion of children with EBLLs has declined over time, yet the number of children facing the detrimental impacts of lead exposure is still significant. Moreover, we may not fully see the extent of the problem, given that one-fifth of the most recent birth cohort were never tested for lead exposure by age 5 and a very large percentage of Cuyahoga County children receiving Medicaid are not tested at mandated, high-risk ages.

The seriousness of this problem cannot be overstated, especially when we understand the consequences of lead exposure for a child's well-being and success in later years. The retrospective analysis of kindergarten readiness shows that, even among children receiving a high dose of high-quality preschool, children with EBLLs remain at a significant disadvantage on school readiness assessments when they enter kindergarten. It is possible

[28] https://assets.documentcloud.org/documents/2475227/upkleadbracken.pdf

that the detrimental impact of lead exposure on school readiness is even larger among children who attend preschool in a low-quality setting. We were unable to examine that comparison here, but the larger picture suggests that high-quality preschool alone cannot reverse the impact of early lead exposure. The goal should be primary prevention of lead exposure to ensure children are never at risk.