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## Using integrated data to identify and solve housing conditions that harm school readiness

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How city staff and community organizations used integrated data in online tools to assess housing risks and protect children from lead hazards

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## Using integrated data to identify and solve housing conditions that harm school readiness

City workers and community organizations in Cleveland, Ohio, are protecting children from exposure to lead in their homes and nearby buildings through the innovative use of integrated data. Specifically, they are linking information from two data systems — one containing housing and neighborhood data, the other drawing on information about children from numerous service agencies — to develop strategies that can reduce educational risks for children.

Exploring the connection between housing conditions and lead exposure, the prevention efforts build on sophisticated research that used the data to document the devastating effects of Cleveland’s unhealthy housing stock and predatory lending practices on young children’s early educational development.

Researchers at the Center on Urban Poverty and Community Development at Case Western Reserve University (Poverty Center) found that living in or even near substandard housing or housing that was foreclosed, tax delinquent or owned by a speculator — conditions that soared in Cleveland between 2003 and 2009 — increases the likelihood of lead poisoning and lowers kindergarten readiness in young children. Children who live in financially unstable housing are also more likely to be maltreated and to move frequently, additional factors that have been shown to impede school readiness.

About 40 percent of all 13,762 children who entered public kindergarten in Cleveland between 2007 and 2010 tested positive for elevated lead levels at some point before they started school, the study documented.

The findings focused new attention on the need for primary prevention efforts to shield children from to lead exposure in Cleveland. Testing homes for lead hazards only after a child has tested positive for lead — the longstanding practice in Cleveland — comes too late to protect children from harm, the study suggests. Using the data, the researchers were also able to pinpoint multiple housing risk factors that could be

used to target prevention efforts.

City staff and community groups are now pursuing two primary prevention strategies to protect Cleveland’s children from lead hazards in their homes and neighborhoods. Both approaches are informed by the Poverty Center’s study, and both use tools powered by the property database.

- Building and Housing Department staff use web-based technology and data in the housing database to ensure that Cleveland’s huge inventory of rental property is registered with the city and in compliance with safety and health codes, including those relating to lead hazards. In the past two years, they have added more than 10,000 rental units to the city’s rental registry. Staff also use the database to prioritize buildings for demolition.

- A coalition of community groups, local organizations and city departments is developing a web application that will display linked information from the property database to alert prospective renters about potential health risks in specific properties.

This case study describes the analysis researchers at the Poverty Center conducted by merging data from two local systems and what they learned about the housing conditions that affect children’s readiness for school in Cleveland. It then discusses how city staff and community organizations are using tools powered by the data systems to protect Cleveland’s children from lead hazards.<sup>1</sup>

This case study is one of a series of briefs and resources from the Annie E. Casey Foundation designed for researchers and local leaders interested in identifying problems and solutions for children and families through integrated data systems. Find other resources in the collection at [www.aecf.org/IDS](http://www.aecf.org/IDS).

**An integrated data system (IDS)** periodically links individual-level administrative data from multiple public service agencies and contracted service providers, creating a rich picture of individual service needs, participation and outcomes over many years. In some systems, individual records are linked to form comprehensive, longitudinal household and family records. An IDS can be operated at the state, county or city level or by nonprofit or university partners. By offering large sample sizes, longitudinal data and the ability to identify multisystem clients, integrated data systems are valuable tools for policy analysis, program planning and monitoring and evaluation. Due to the confidential and sensitive nature of the data, organizations that house an IDS carefully follow privacy laws, securely store data and maintain rigorous standards for use and access. For additional information, visit [www.aecf.org/IDS](http://www.aecf.org/IDS), [www.aisp.upenn.edu](http://www.aisp.upenn.edu) and [www.neighborhoodindicators.org/resources-integrated-data-systems-ids](http://www.neighborhoodindicators.org/resources-integrated-data-systems-ids).

## Housing crisis in Cleveland

Cleveland is an aging city. More than 90 percent of its rental stock was built before 1978, the year that lead paint was banned by federal mandate. High rates of elevated lead levels among the city's children have been a major concern in Cleveland for decades, and community groups have been fighting the problem for many years.

In addition, Cleveland's housing market was hit hard by the predatory lending and housing market crisis of 2008, and recovery has been slow. Between 2003 and 2008, the number of properties affected by foreclosures and tax delinquency soared, and the number of houses bought by speculators climbed. In some Cleveland neighborhoods, up to half the housing was in foreclosure in late 2009, and much of the housing stock was abandoned or in disrepair.<sup>2</sup>

Concerned about the toll these developments took on children and families, Poverty Center researchers used integrated data to explore how increased housing instability and worsening housing quality affected children's readiness for kindergarten in Cleveland.<sup>3</sup> The linked data enabled them to conduct an innovative and rigorous analysis and to investigate more deeply the role that housing problems play in elevated lead levels in young children.

The findings revealed new information about the housing risk factors that affect kindergarten readiness in Cleveland and suggested new areas for action to reduce lead hazards.

## Using integrated data systems to study people and place

All the data used in the study are routinely collected by separate public agencies. But without an IDS, they are rarely put together.

The Poverty Center has developed two data systems for Cuyahoga County over the past 20 years, linking administrative data from multiple city, county and state departments. One system contains information about the children in the county; the other has information about every property in the county. Merging the data gave the Poverty Center researchers a rare opportunity to study people and

The Childhood Integrated Longitudinal Data (CHILD) system, developed in 1999, is a secure system containing data from some 35 separate administrative agencies in Cuyahoga County, Ohio, including public assistance, housing, child and family services, health and mental health and education. Developed, housed and maintained by the Center on Urban Poverty and Community Development at Case Western Reserve University, CHILD has records on more than 750,000 children who were born in or have lived in Cuyahoga County since 1989. The system is used for planning, monitoring and evaluating services to county families and is primarily funded by Cuyahoga County and The George Gund Foundation. For details, visit <http://povertycenter.case.edu>.

place over time and allowed them to answer questions about housing and neighborhood effects more definitively than in many other studies.

Supported by organizations like the members of the National Neighborhood Indicators Partnership (NNIP), communities increasingly use data to study the interactions of families and neighborhoods.<sup>4</sup> Growing numbers of states and localities are investing in integrated data systems and using them to guide decision making. The Poverty Center, a founding member of NNIP and the developer of one of the earliest examples of an IDS, has built a particularly advanced database that can link residents not just to neighborhoods, but to individual houses.

The ability to link individual-level information about children's early development and experiences with property-based information about the condition and stability of the specific homes they lived in before they started kindergarten increased the scope, power and rigor of the Poverty Center's analysis. Researchers could identify the specific housing features and conditions that put young children at educational risk in Cleveland and map the areas where children were at greatest risk of testing positive for lead.

From the **Childhood Integrated Longitudinal Data (CHILD) System**, which follows children from birth, researchers had information about all 13,762 children who entered kindergarten in the Cleveland Metropolitan School District during the 2007–2010 academic years.<sup>5</sup> They used information about child and maternal characteristics, reports from child maltreatment

investigations, results of blood lead screening tests and kindergarten readiness assessments in their analysis. The IDS also includes the addresses where the children were living when they had contact with public agencies.

From the property database, Northeast Ohio Community and Neighborhood Data for Organizing (NEOCANDO), researchers had information about the conditions of the residences the children lived in from birth until they entered kindergarten. They developed multiple measures of housing quality from administrative records on tax assessments, condition ratings, tax delinquencies, foreclosures, demolitions and housing code violations. Poverty Center staff could access information about the housing status and conditions of the properties where the children actually lived, as well as nearby properties.

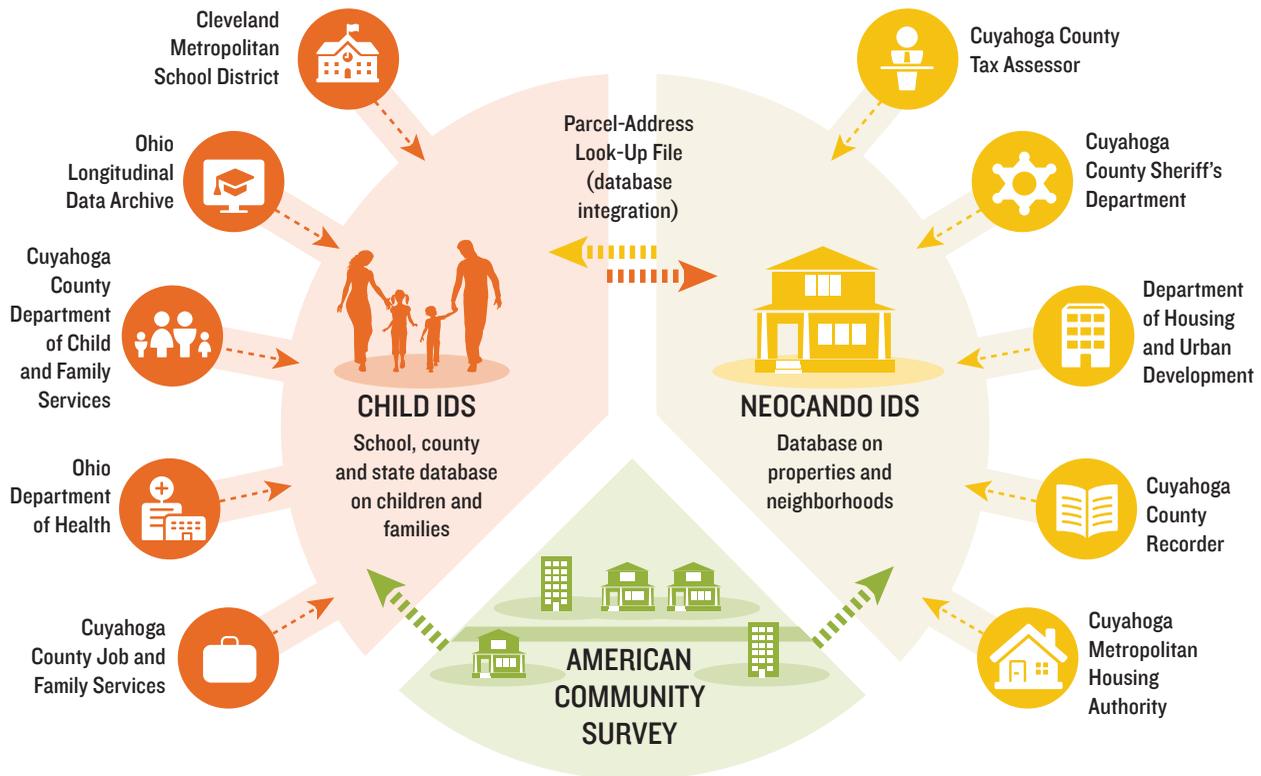
Researchers linked the child-level information and the property-level information by creating monthly address histories for the children and converting the street addresses in the CHILD system to the parcel numbers in NEOCANDO.

Because the combined data contain multiple years of information about the children and their housing histories, Poverty Center staff were able to construct a detailed and dynamic picture of the children's lives over time. They could estimate the cumulative effect of living in substandard housing or financially distressed housing, and they could control for compounding factors like family income and family education levels. This allowed them to tease out cause and effect relationships, rather than just showing associations or correlations between families, housing and neighborhoods.

**NEOCANDO** is a property database that links housing and neighborhood attributes at the parcel or neighborhood level over time. Built and maintained since 1992 by the Center on Urban Poverty and Community Development at Case Western Reserve University, NEOCANDO links data from multiple public sources — including tax records, foreclosure filings and property sales and ownership information — for all residential and non-residential parcels in Cuyahoga County. NEOCANDO puts data in the hands of the local community, allowing academic researchers, community organizations, public officials, neighborhood activists and others to use a suite of four data tools: a neighborhood data warehouse, a property data portal, a mapping portal and a parcel-based platform, the Neighborhood Strategies Technology (NST). For details, visit <http://neocando.case.edu>.

## BRINGING THE DATA TOGETHER

How researchers combined data in Cleveland to tell a story about the interaction between housing conditions and school readiness.



### Housing risk factors that affect kindergarten readiness

The study showed that children’s housing conditions during their early years, as well as nearby housing conditions, affect school readiness. About 40 percent of kindergartners who entered public school in Cleveland between 2007 and 2010 tested positive for elevated lead levels at some point before they entered kindergarten.<sup>6</sup> Greater exposure to lead was the primary reason for lower kindergarten readiness, but not the only factor. The financial stability of the housing also affected children’s readiness for kindergarten, the data showed. Researchers identified a number of housing-related risk factors for lead exposure and lower kindergarten readiness:

- **Substandard housing.** Children who lived in substandard housing — housing that is in physical disrepair — were more likely than other children to have elevated lead levels and do poorly on kindergarten readiness assessments, after controlling for potentially

compounding differences like family income and education levels.

- **Financially distressed housing.** Children who lived in financially distressed housing — properties that were involved in a foreclosure process, had prolonged tax delinquency or were owned by speculators — were also more likely to have lower kindergarten readiness scores and elevated lead levels, compared with children who lived in more stable housing. Children who lived in financially distressed housing were more likely to be involved in child maltreatment incidents and to move more frequently — situations that are known to lower kindergarten readiness.
- **Proximity to substandard or financially distressed housing.** Living within 500 feet of substandard or financially distressed housing also lowered children’s school readiness scores, compared with children who lived farther away from such housing.

## Moving from remediation to prevention

The Poverty Center findings, which came out in 2016, helped to galvanize local officials and community-based organizations into taking proactive and targeted action to prevent elevated lead levels in Cleveland’s children. The region’s major newspaper, *The Plain Dealer*, reported on the findings as part of its ongoing investigation into the lead crisis in Cleveland.<sup>7</sup> The Federal Reserve Bank of Cleveland featured the study at a conference that brought together researchers, city staff and activists and advocates from both the housing and health sectors to discuss more effective ways to combat the lead poisoning epidemic.<sup>8</sup>

Unpacking the connections between housing, child development and early education helped local groups to break through traditional policy silos.

“Having an IDS that linked the pieces together and showed the impact housing conditions in Cleveland neighborhoods had on young children in Cleveland public schools was critically important,” says Lisa Nelson, the organizer of the Federal Reserve Bank of Cleveland conference and the bank’s community development research manager. “The research documents that bad housing conditions do negatively impact a child’s readiness for kindergarten in Cleveland. It’s not just a housing problem, but a housing problem that affects a child’s ability to learn and advance. Investing in housing is investing in children’s lives.”

The discovery that living in or close to financially distressed housing lowers literacy rates in young children was especially powerful, Nelson says.

The study also called attention to the need for more intensive prevention efforts. Lead inspection and cleanup efforts are most likely to happen after a child tests positive for lead. This after-the-fact response makes it very difficult to overcome the cognitive damage caused by lead

exposure, as Claudia Coulton, co-director of the Poverty Center and the principal author of the study, points out. Further, Coulton notes, the home where a child is living when the lead testing is done might not be the residence where the lead exposure occurred.

Multiple studies document that children who test positive for elevated lead levels continue to show educational deficits and behavioral problems later in life, and emerging research suggests they are more likely than other children to be involved in criminal activity as teenagers.<sup>9</sup> Other research confirms that children who are behind when they enter kindergarten have great difficulty overcoming their early deficits.

Using information in the CHLD system, Poverty Center researchers showed that the cognitive deficits suffered by children with elevated lead levels in Cleveland persist, even if they are enrolled in high-quality preschool programs before starting kindergarten.<sup>10</sup>

The researchers point out that since so much of Cleveland’s rental housing stock is physically or financially distressed, and resources are limited, it’s especially important to target and prioritize code enforcement and demolition efforts where they can be most effective in eradicating lead hazards. The study’s findings and the property database can help in these efforts.

## Using integrated data systems as a tool to fight lead hazards

In late 2018, city staff and community groups were working to implement two prevention strategies to protect Cleveland’s children from the effects of lead. The approaches — identifying and registering rental properties and alerting prospective renters about risky properties — are informed by the Poverty Center’s study, and both use tools powered by the property database.

*“Having an IDS that linked the pieces together and showed the impact housing conditions in Cleveland neighborhoods had on young children in Cleveland public schools was critically important.”*

– Lisa Nelson, Community Development Research Manager,  
Federal Reserve Bank of Cleveland

**The Neighborhood Strategy Technology (NST)** is a multipurpose, online tool that enables government and community agencies to access, search and share linked information in NEOCANDO, the property database. These linked data include parcel-based information on ownership, occupancy, foreclosures, sales, tax status and code enforcement as well as other public records data. Launched in 2010, NST allows registered users to search for properties with shared characteristics as well as to retrieve information about individual properties and create customized maps. NST also serves as an interactive communication platform: Users can add comments and notes about specific properties, see information added by other practitioners and create customized reports that can be shared with other users. In keeping with the strict privacy rules that govern the use of personal information in NEOCANDO, no individual-level information is included in NST; only information related to the properties is viewable. For details, visit <http://neocando.case.edu>.

### Identifying and registering rental properties

The Department of Building and Housing is intensifying efforts to ensure that Cleveland's huge inventory of rental housing is registered with the city and complies with city safety and health codes, including those regarding lead hazards. The city is also increasing its efforts to demolish abandoned and condemned properties, which the study identified as another source of lead exposure.

This work is informed, in part, by an innovative web application in the NEOCANDO. Known as the Neighborhood Strategy Technology (NST), this tool helps the city to deploy its resources more strategically and, ultimately, to improve the lives of more of Cleveland's children. Over the past two years, the city's more aggressive outreach and enforcement efforts — aided by the NST and information in the property database — have added more than 10,000 housing units to the rental registry, a listing of all the rental units in the city.

According to Coulton, updating Cleveland's rental registry is a critical first step in preventing elevated lead levels in children because so many of the properties that contain lead are rentals.

Previously, the city relied on landlords to comply with the law and register their units. In 2016 — after public attention focused on the extent of lead poisoning in Cleveland and its harmful effects on children's schooling, and after it became clear that there was a huge inventory of unregistered rental units — the Department of Building and Housing became more proactive about identifying rental properties and enforcing the rental registration requirement. It also implemented a regular cycle of inspections to make sure that properties on the registry comply with housing and safety codes.

Accessing linked information through NST speeds up the process of identifying rental units, contacting landlords, adding properties to the rental registry and getting properties inspected, explains Timothy Kobie, a building process analyst with the department who uses NST daily.

Under its data-sharing agreement with the Poverty Center, the Department of Building and Housing shares the administrative records it collects on housing complaints, inspections, code violations and permits on a weekly basis. It also shares the rental registry.

After these records are merged with administrative records collected by other city and county departments and made available to department staff and other public users through the NST search function, they are even more useful to the department, Kobie says. He uses the linked data to identify rental units that should be in the registry, get up-to-date contact information on landlords and determine whether buildings are vacant, abandoned or condemned.

Using the database, city staff can retrieve information about the number of rental units in a building and identify vacant or abandoned properties through tax records and postal vacancies. The department's internal information system allows users to look up only one property at a time, but the NST search function allows them to display information about multiple properties at the same time, search for properties that have common characteristics and find other properties owned by the same landlord.

The NST search function also powers the department's efforts to identify abandoned and condemned buildings, track down and fine current and previous owners and prioritize demolition efforts.

Improving safety and maximizing investment are key concerns, Kobie notes. Because the city has limited funding for demolition, resources must be stretched as far as possible, and the data enable the department to better target its efforts. Demolishing structures near schools is a priority. Identifying buildings with a bank in the chain of title (identifiable through the data) is another, as the city has a higher rate of success collecting settlements from banks than from other types of owners. Maximizing collections adds money to the city coffers, making more demolitions possible.

Community organizations and community development corporations, as well as city and county workers, can use NST to view the linked public data. (All users are vetted by Poverty Center staff.) The technology includes an interactive platform that allows users to add comments and notes in specific fields. Community groups and city staff use this feature to share information about health and safety hazards; the status of foreclosures, repairs and clean-up efforts; and plans for action on specific properties. This information exchange helps them to pursue joint strategies and avoid duplicating efforts.

### **Alerting prospective renters about potentially risky housing**

In another effort to protect Cleveland's children from lead hazards, Cleveland's Healthy Homes Data Collaborative, a coalition of 12 local organizations, is developing a mobile-friendly website that will make information about the health-related conditions of specific properties accessible to individuals. The two-year project, started in fall 2017, is funded by a grant from a national program known as the BUILD Health Challenge 2.0, which works closely with communities and focuses on the connection between housing and health to improve health outcomes.

Led by the Environmental Health Watch (EHW), an environmental justice organization with a long history of working for safer and healthier housing in Cleveland, the coalition brings together community-based organizations, advocacy groups, the Cleveland Department of Public Health, the Cleveland Department of Building and Housing and two local hospitals. The Poverty Center is the data intermediary for Cleveland's BUILD effort.

The website, Housing.Health, will display information about the lead hazards, code violations and repair histories of specific housing units. Individuals can easily access the information when they are standing in front of a building

or when they type in a street address. Without the linked data, and the data capacity and relationships that the Poverty Center has developed over the years, Housing.Health could not be built.

The Cleveland Healthy Homes Data Collaborative expects that families who are looking for rental housing will use Housing.Health to inform their housing choices, potentially avoiding units that put children at risk of lead exposure or asthma hazards. Prospective renters will have the ability to view health-focused information about multiple properties and compare them directly. Community organizations and service providers can use the website to more easily access information about inspections and cleanup efforts, which can help inform their advocacy efforts, outreach work and the assistance they give individual clients.

Using shared data as a basis for collaborative decision making is central to BUILD Health's mission, EHW's executive director Kim Foreman explains. She says the Poverty Center was a "natural fit" as the initiative's data intermediary because it had demonstrated expertise and capacity and the ability to maintain and use data safely.

DigitalC, a civic tech company that is a member of the collaborative, conducted discussions with groups of community residents to learn how they select housing, the information they would like to know and how it might be usefully presented.

In its role as the collaborative's data intermediary for BUILD Health 2.0, the Poverty Center is responding to community residents' desire to include information about landlord responsiveness as well as environmental hazards on the Housing.Health website. Poverty Center staff are developing new data-sharing agreements and new partners and obtaining administrative records, such as eviction records from court dockets, that will be added to the database. They are also working on reconfiguring and presenting multiple years of property-based records so the information is meaningful and helpful to potential users of the website.

Cleveland's lead status inventory, maintained by the Department of Public Health, provides information about properties where lead tests have been conducted, the results of the testing and the status of cleanup efforts. These data will be added to the database and become a core part of the Housing.Health website. Administrative records already in the database will provide information about housing code violation complaints, investigations



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and responses. (Because these are public data that relate to properties rather than individuals, these administrative records are not subject to the same stringent privacy protections as the information in CHILD.) The Housing Health website will also use the mapping technology in NEOCANDO.

Coalition members will conduct an outreach campaign to inform service providers, health practitioners and neighborhood groups about the Housing Health website and encourage them to use it and help their clients use it, Foreman says. The coalition's data committee is exploring ways to get feedback about who uses the website and for what purposes.

As Poverty Center research associate April Urban notes, the property database serves as an important “backbone” for community groups that want to cross traditional organizational boundaries (such as housing and health) and work together to further community goals. Shared and linked data help the groups to strategize their responses, be proactive and focus on prevention together.

## **Conclusion**

An IDS can be an engine for innovation as well as a flexible, practical resource for local policymakers and practitioners, as Cleveland's experience shows. Poverty Center researchers used linked administrative records from numerous city, county and state offices to identify the housing conditions that lower young children's readiness for school. The findings helped city staff, community groups and other practitioners to break through traditional policy silos and work together to find intersecting approaches to protect children from lead. The integrated systems were crucial in diagnosing the conditions that put the city's young children at educational risk, and they are proving to be just as critical in implementing the solutions.

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## Endnotes

- 1 Case study 1 discusses another example from Cuyahoga County, highlighting how the county government is using the CHLD IDS to improve services for homeless mothers and their children and implement a pioneering public-private funding partnership. For more information, visit [www.aecf.org/IDS](http://www.aecf.org/IDS).
- 2 Coulton, C., Fischer, R., Richter, F., Kim, S. J., & Cho, Y. (n.d.). And, Coulton, C., Richter, F., Kim, S. J., Fischer, R., & Cho, Y. (2016, April). Nationwide, 2 million children are estimated to have been affected by the foreclosure crisis of the early 2000s.
- 3 The study was funded by a grant from the John D. and Catherine T. MacArthur Foundation.
- 4 NNIP comprises independent data intermediaries in 30 cities that have a shared mission to help community stakeholders use data for better decision making. A number of NNIP partners maintain or work with an IDS. For more information, visit [www.neighborhoodindicators.org](http://www.neighborhoodindicators.org).
- 5 Children who entered kindergarten in Catholic or charter schools were not included in the study.
- 6 Young children are tested for lead at a variety of ages in Cleveland because different social service programs follow different mandates about lead screenings.
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