

Lead Exposure in Allegheny County

get ahead
of Lead



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www.achd.net/lead



September 12, 2018

Dear Residents of Allegheny County,

I'm pleased to share with you the Allegheny Health Department's first annual Allegheny County Lead Report. I had the honor of serving as Chair of Chief Executive Fitzgerald's Lead Task Force last year and as recommended, ACHD committed to a regular public assessment of our progress on this issue. Lead is a neurotoxin commonly found in millions of Americans' daily environments, and our aging infrastructure - especially housing - makes Allegheny County residents particularly vulnerable to lead exposure.

There is no safe level of lead exposure in children. Even low levels of lead have been associated with cognitive and behavioral issues. We at the Health Department are committed to preventing lead exposure whenever possible, and to getting families help they need once a lead problem has been identified.

There is good news. I am happy to report that blood lead levels among our county's children are, on average, going down. There are also many more children getting tested. After implementing universal lead screening on January 1 of this year and kicking off the "Get Ahead of Lead" campaign, we are on pace to see more than 23,000 children under 6 tested in Allegheny County by the end of 2018. That's more than double the number of children tested in 2010. We've also added additional capacity in our Housing Program to support home-based lead investigations for any child with a lead level of 5 ug/dL and above and provided community education by working closely with local community based organizations.

Our work, however, is far from done. The number one recommendation of the task force report was to increase the availability of lead-safe rental housing. This is particularly crucial for low-income families who disproportionately rely on rental housing. Although federally-funded housing units should be certified as lead-safe, we can't account for thousands of rental units not administered by one of our Housing Authorities. We are also working hard to continue to increase the numbers and percentages of children being tested, and to make sure that any child who gets her or his finger pricked with a capillary test follows up with confirmatory testing if the screen reveals an elevated level. Finally, we know that some geographic areas in our County are at higher risk than others. We must continue to focus our prevention and outreach efforts there.

Thank you for your interest in the lead issue, and special thanks to my fellow Task Force members and our Epidemiology team, led by Dr. LuAnn Brink, for helping with this report.

Sincerely,

A handwritten signature in black ink, appearing to read "Karen Hacker".

Dr. Karen Hacker



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Introduction

The Allegheny Health Department is pleased to present our first annual report on lead exposure in Allegheny County. This report covers information on the number of children tested, their lead levels, and interventions underway to continue to improve outcomes.

Lead as a neurotoxin

Lead is a known neurotoxin and a serious threat to public health, particularly to young children and pregnant women. The health effects of lead are well known. Lead impairs brain development and children under the age of six are particularly vulnerable to its effects. At extremely high levels of lead exposure, which are rare in the United States and Allegheny County, lead can cause seizures, coma, and even death.

There is no safe lead level in children, with even low levels of blood lead showing an effect on a child's IQ, ability to pay attention, academic achievement, and other behavioral issues. Lead exposure from any source contributes to the lead burden for children. Blood lead levels, a measure of children's exposure, have declined steadily, both nationally and locally, as society has passed major legislation to reduce sources of exposure, including removing lead from gasoline, paint, and plumbing fixtures. However, historical use of lead means that existing sources remain a threat. The greatest source of lead exposure is lead-based paint in older houses that can chip, peel, flake, and become dust. Lead can also be found in water pipes and solder, and in some toys, jewelry, cosmetics, imported candies and other imported consumer products.

Sources of Lead in Allegheny County

A recent Allegheny County Lead Task Force Report provided extensive information on sources of harmful lead exposure in our County --

https://alleghenycounty.us/uploadedFiles/Allegheny_Home/Health_Department/Programs/Special_Initiatives/Lead/Lead-Task-Force-Report-Dec2017.pdf. Those sources of harmful lead exposure include:

Paint

Lead had been used in paint for many years. Adding lead created a highly durable and washable paint, which was desirable for use as both an interior and exterior paint. It was banned from use in residential paint by the Consumer Product Safety Commission in 1978. More than 80% of the Allegheny County homes were built before 1978 and 40% of homes were built before 1950. In Pittsburgh, more than 60% of homes were built prior to 1950, and over 85% were built before 1978. Peeling or flaking lead paint and household dust that contains lead accounts for up to 80% of elevated lead levels in US children. Houses built before 1950 usually contain the most lead paint.

Water

Lead can be present in water when it is transported from water treatment facilities to homes through pipes that contain lead, or when it travels within the home through plumbing fixtures that contain lead. Historically, lead was commonly used in plumbing pipes and fixtures. The federal government included language to the Safe Drinking Water Act in 1986 to reduce the amount of lead used in residential and commercial plumbing.^{a b} Lead is no longer used in plumbing but lead pipes and fixtures can still be found in older homes and many water systems still have lead water pipes.

Soil

Lead is a naturally occurring element. However, it may be present in soil at higher concentrations due to known sources of contamination. Although the phase out of leaded gasoline began in 1975, it was not totally banned in the United

States until 1996. Emissions from vehicles powered by leaded gasoline would often settle in soil around garages, alleys, and busy intersections. Runoff from these areas has transported lead to the edges of properties. Lead was also found in emissions from some industrial sources.

Lead paint can also enter the soil through demolition debris which could be buried or left in abandoned properties. This usually results in higher concentrations of lead-contaminated soil in the center of properties. Lead can also enter soil around the edges of the house due to paint chips falling to the ground and years of unsafe scraping and sanding exterior house paint when preparing to apply new coats of paint. The so-called “drip line” usually extends 2-3 feet out from the foundation wall of the house.

Airborne

Federal standards control air emissions of lead from industrial facilities. In the past they were less stringent than today, resulting in areas with higher concentrations of lead in soil surrounding specific facilities. Due to the unique topography of Allegheny County, both industrial emissions and gasoline emissions tended to settle near the points of emission, rather than blowing further away. Industrial sources in valleys, for example, could be expected to have higher concentrations of lead in the soil than sources in higher elevations and more open areas. Today, the Federal Clean Air Standards include lead as one of the six criteria pollutants that is monitored by the ACHD Air Quality Program.

Other Sources

Some occupations and hobbies may increase a person’s risk to lead exposure. Lead dust can linger on clothing, hair, and hands, so it is important for parents to use caution so that lead is not accidentally brought into the home. Home contractors, painters, and people working on home remodeling projects are at an increased risk to encounter lead, as are people repairing vehicles, performing metal work, and welding. Working on electronics repair and jewelry repair may also expose a person to lead. Alternative sources such as candy, jewelry, ceramics, some herbs and medicinal remedies, cosmetics, and other consumer products from foreign countries where lead content is not regulated can make their way to the United States. These alternative sources are important to identify and report to the Consumer Product Safety Commission.

Definitions

Venous Blood Test

Venous blood tests draw blood from the child’s vein to test for the presence of lead. The results for venous lead tests are considered the most accurate method for confirming a child’s blood lead levels.

Capillary Blood Test

Capillary, or “finger prick”, tests are preliminary tests that can accurately identify if a child does not have an elevated blood lead level. However, since capillary tests can include trace amounts of lead from the exterior surface of the child’s finger in the results, this test may overestimate the amount of lead absorbed by the child. If a capillary test returns an elevated level, the child must also have a follow-up venous blood test to confirm the result within 1 to 84 days of the capillary test.

Confirmed Blood Lead Level

The Allegheny County Health Department considers blood lead level results from all venous blood tests as confirmed and considers blood lead level results less than 5 µg/dL from capillary blood tests as confirmed. Capillary blood tests can register lead levels higher than, but not lower than, actual blood lead levels; therefore, capillary blood tests can be used to confirm a low blood lead level.

Elevated Blood Lead Levels

The Allegheny County Health Department currently treats confirmed blood lead level tests with 5 µg/dL or more of lead as elevated. This measurement is based on the Centers for Disease Control and Prevention’s reference level for public health action, established in May 2012.

Population of Interest

Children under six years of age are both at the highest risk for absorbing lead from their environment and most susceptible to the long-term harm caused by lead absorption.

Hand to mouth behavior

Young children explore their environments in ways that make them more susceptible to lead absorption. By putting objects in their mouths, touching surfaces and then placing their fingers in the mouths, etc., young children in environments with lead present are at risk for ingesting lead.

Brain development

A person’s brain rapidly develops during childhood, with their brain reaching approximately 90% of adult size by six years of age. Lead absorption effects cognitive development, putting children less than six years of age at risk for permanent changes in their brain’s growth.

Allegheny County Testing

Number of children less than six years of age tested over time

The Allegheny County Council approved a regulation in July 2017 to require county-wide universal childhood blood lead testing for children under six years of age. The regulation was publicly discussed in the summer and fall before going into effect on January 1, 2018. This period coincided with a sizable increase in the number of children less than six years of age being tested for blood lead in Allegheny County, surpassing 2016’s tested count by almost 3,000 children. The blood lead testing rate for children under six years of age continued to increase in the first quarter of 2018 (5,848 children tested between January 1 and March 31), putting the county on pace for more than 23,000 unique children being tested for the year.

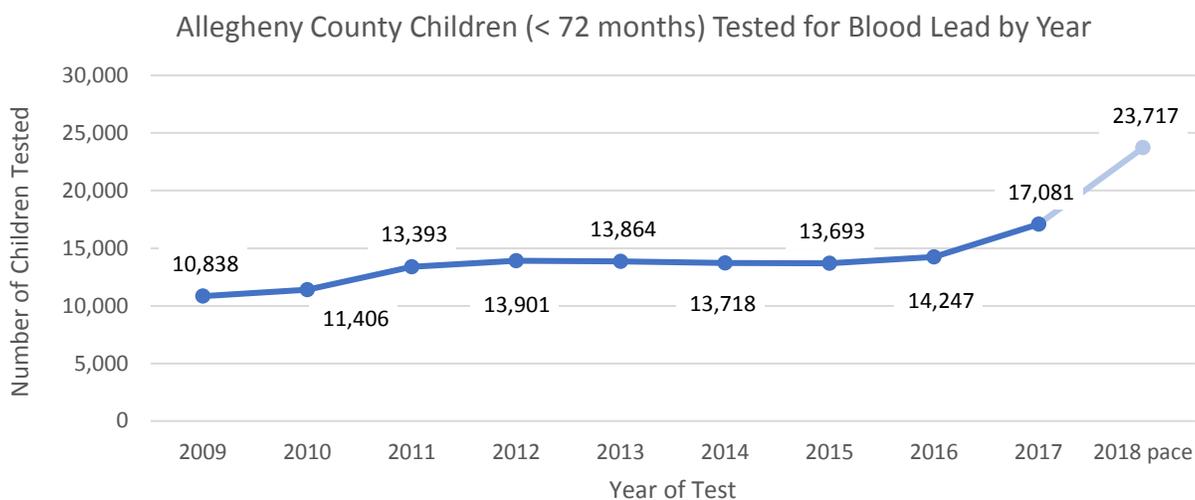


Figure 1: The number of unique Allegheny County children under six years of age tested for blood lead levels by year. Testing numbers did not fluctuate a lot between 2011 and 2016 but increased by almost 3,000 between 2016 and 2017—the same time that the universal childhood blood lead testing regulation came into effect and was publicly discussed. This growth in testing has continued through the first three months of 2018.

Number of children between nine and 14 months of age tested over time

The universal childhood blood lead testing regulation required all county children to have their first blood lead test between nine months of age and their first birthday (measured specifically between 270 days and 412 days of age consistent with Early Periodic Screening Diagnosis and Treatment measurement standards). The proportion of children born in Allegheny County that were tested in this age range increased each year since 2009, surpassing 50% of children born in the year 2016. Most children born in 2016 reached this age range in 2017, which is when public discussion of childhood lead exposure was a popular local topic and the universal childhood blood lead testing regulation was passed. Allegheny County Health Department's goal is to have as many children as possible tested by their first birthday, and then tested again near the date of their second birthday.

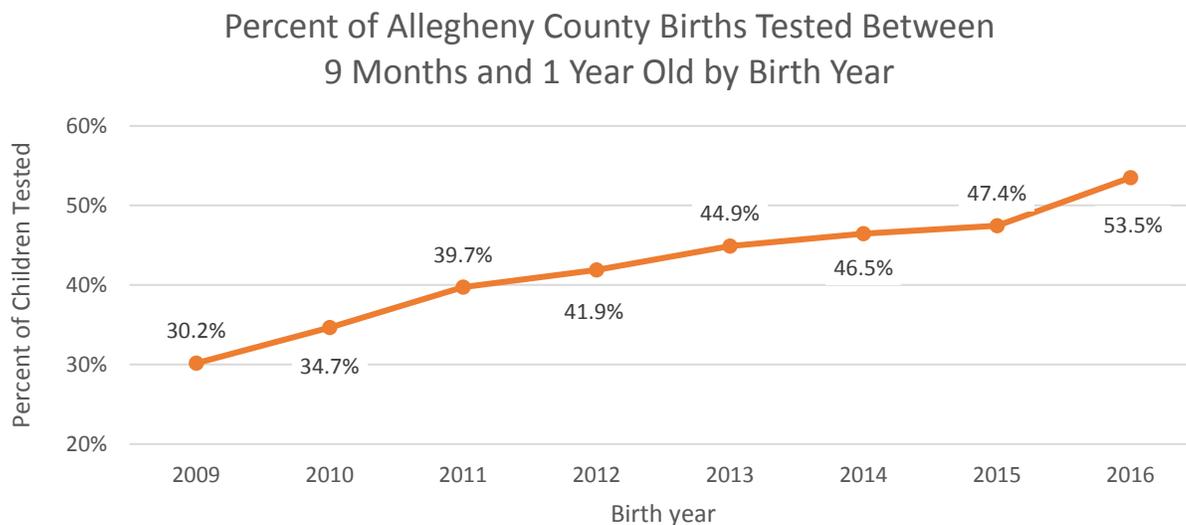


Figure 2: The percent of Allegheny County children tested for blood lead between the ages of 270 days and 412 days (corresponding to 9 months and 12 months of age) by birth year. This period in a child's life is the first blood lead testing requirement established in the County's universal testing regulation.

Blood lead levels over time

The geometric mean blood lead level—which represents the average concentration of lead in blood, for children less than 6 years of age in Allegheny County decreased each year from 2009 to 2014 but then increased in 2015 and again in 2016. However, coinciding with increased testing of children, 2017 saw a significant decrease in the geometric BLL for county children and continued to decrease in the first quarter of 2018. The values used to compute the annual geometric means were all venous and all confirmed capillary blood lead tests (either an unelevated capillary test or a capillary test administered between 1 and 84 days following an elevated capillary test) for all Allegheny County children less than six years old. Blood test results below detection limits were treated as having a result equal to one-half of the specified detection limit. Most test reports for Allegheny County children with undetectable blood lead had a detection limit of 3 or 3.3 $\mu\text{g}/\text{dL}$.

Allegheny County Geometric Mean BLL Levels for Children (< 72 months) by Year

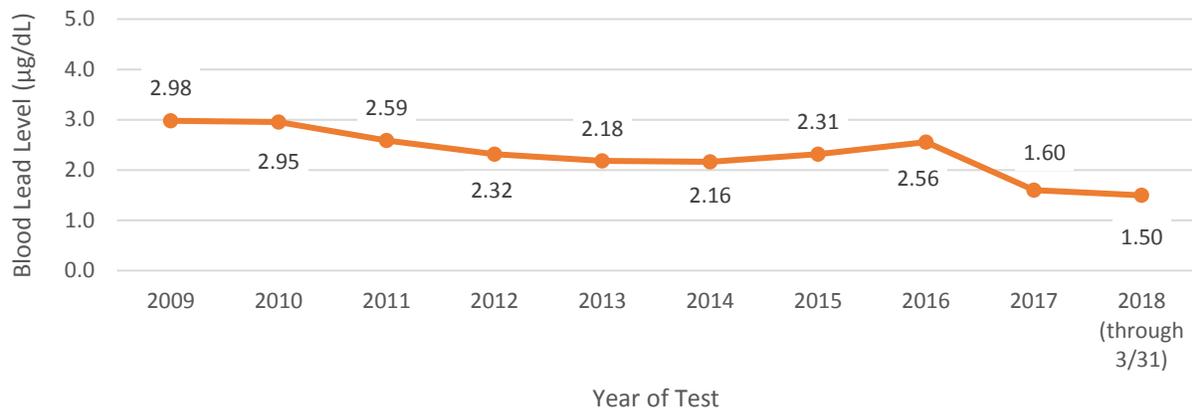


Figure 3: The geometric mean blood lead level for each year uses only confirmed blood lead tests for children six years of age and younger. Confirmed tests include all venous blood lead tests and capillary tests that are either less than the elevated level (5 µg/dL) or considered a confirmation test for an elevated capillary test—a second capillary test that must occur between 1 and 84 days following an elevated capillary test.

The confirmed rate of elevated blood lead level for children under six in Allegheny County decreased from ≥ 6% in 2009 and 2010 to 2.1% in 2016 and 2017. This reflects the county trend for lower average childhood blood lead levels. Confirmed tests are venous blood draws, capillary blood tests below the elevated level (5 µg/dL), or a second capillary blood test (elevated or not) within 84 days of an elevated capillary blood test but not on the same day as the first test.

Allegheny County Percent of Tested Children (< 72 months) with Confirmed Blood Lead ≥ 5 µg/dL

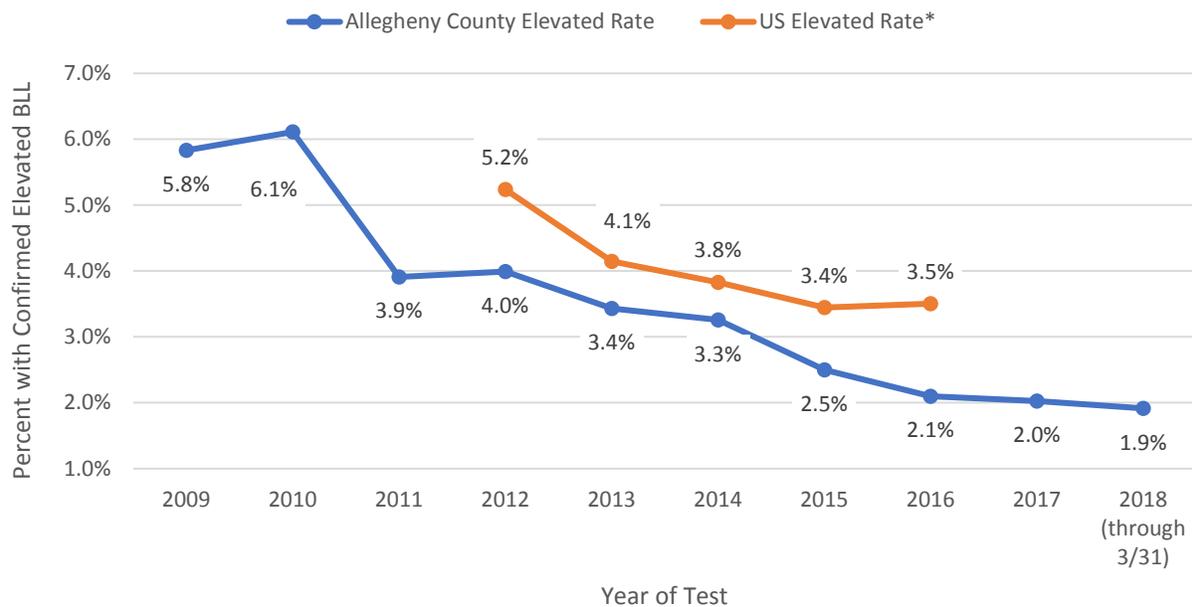


Figure 4: The proportion of children (less than six years of age) tested for blood lead with results greater than 5 µg/dL by year. The CDC action level for blood lead was defined as 5 µg/dL in 2012.

*Rates for entire United States, provided by the CDC, added for reference in available years (2012-2016).

The Allegheny County regions with the highest rates of children tested with elevated blood lead levels between 2013 and 2017 were in the Northeast corner of the county, the Mon Valley, the Southern tip of the county, and neighborhoods directly North, South, and West of downtown Pittsburgh.

Allegheny County Percent of Individuals Tested with Elevated Blood Lead Levels ($\geq 5 \mu\text{g/dL}$) 2013-2017, < 6 years of age

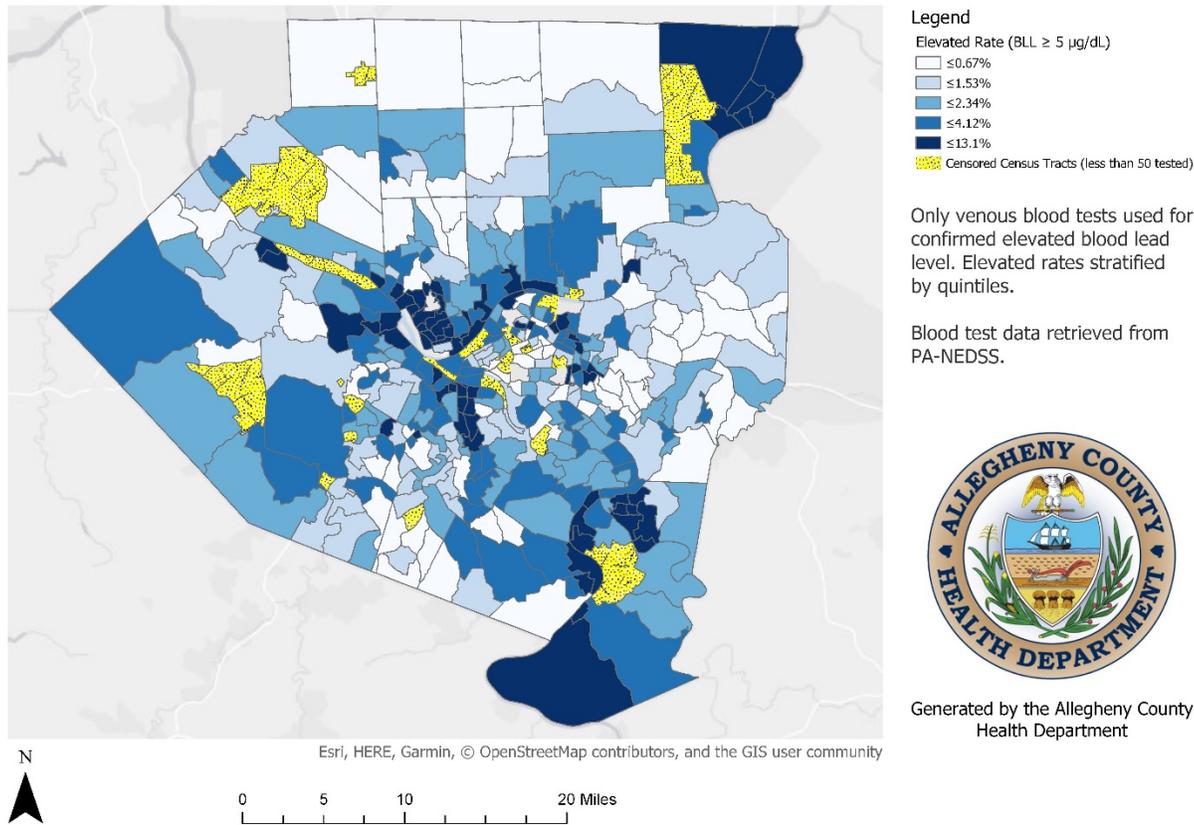


Figure 5: Percent of tested children (less than six years of age) in 2013-2017 with blood lead levels $\geq 5 \mu\text{g/dL}$ by Allegheny County census tract. Census tracts with less than 50 tested kids over that period are censored.

Changes in unconfirmed capillary tests

A child with a capillary lead test $\geq 5 \mu\text{g/dL}$ must have their blood lead level confirmed with a venous blood test within 84 days but not on the same day as the elevated capillary test. The level of concern was previously $10 \mu\text{g/dL}$ but the CDC changed this number in 2012. The proportion of Allegheny County children with capillary tests $\geq 5 \mu\text{g/dL}$ that did not have a venous confirmation test in the specified time frame decreased from nearly 9% in 2009 to 2.4% in 2015, while it has stabilized ever since. Until 2012, CDC considered $10 \mu\text{g/dL}$ the level of concern; those with blood lead levels between 5 and 9 in the years 2009 – 2011 reflect children that were not considered as having an unconfirmed elevated capillary test at the time.

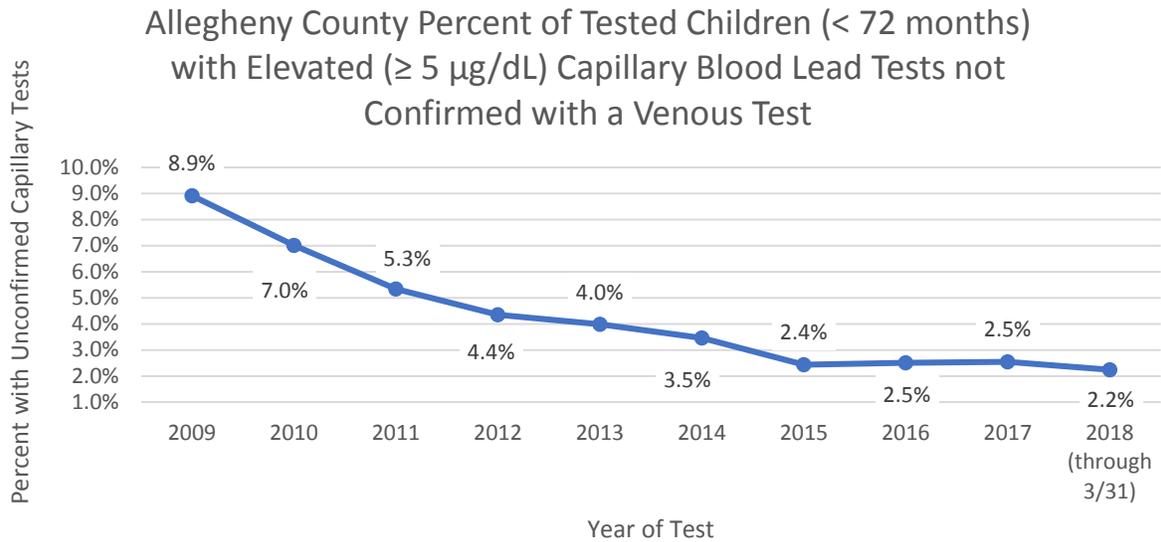


Figure 6: Percent of Allegheny County children tested for blood lead that had a capillary blood lead test with a result $\geq 5 \mu\text{g/dL}$ that was not confirmed with a venous blood lead test. The venous test must occur within 84 days of the elevated capillary test but not on the same day as the capillary test to be considered a confirmation test.

The regions with highest rates of unconfirmed elevated blood lead capillary tests were in the neighborhoods directly North and South of Downtown Pittsburgh, the Mon Valley, and several isolated pockets throughout the county.

Allegheny County Percent of Individuals Tested with Unconfirmed Elevated Lead Capillary Tests 2013-2017, < 6 years of age

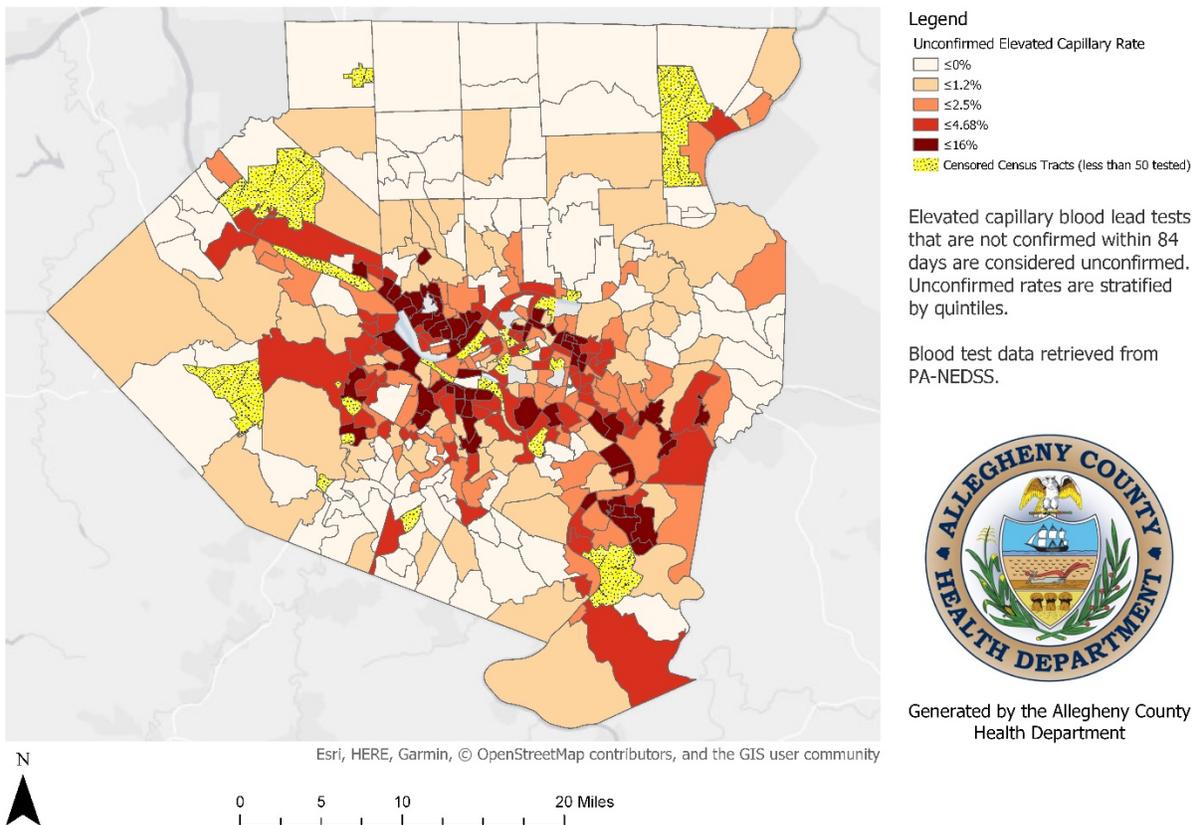


Figure 7: Percent of tested children (less than six years of age) in 2013-2017 with capillary blood lead test results $\geq 5 \mu\text{g/dL}$ that were not confirmed by a second blood lead test within 1 to 84 days by Allegheny County census tract. Census tracts with less than 50 tested kids over that period are censored.

Prior to the Allegheny County regulation requiring childhood lead testing at ages 9-12 months and 24 months, elevated capillary tests were considered confirmed with a venous test or a second capillary test in the aforementioned time frame (1-84 days after the first test) according to the Council for State and Territorial Epidemiologist (CSTE) definition. Using 5 µg/dL as the elevated reference value and either a capillary or venous test as sufficient for confirmation yields a decline from 8.6% unconfirmed in 2009 to 1.9% in 2017.

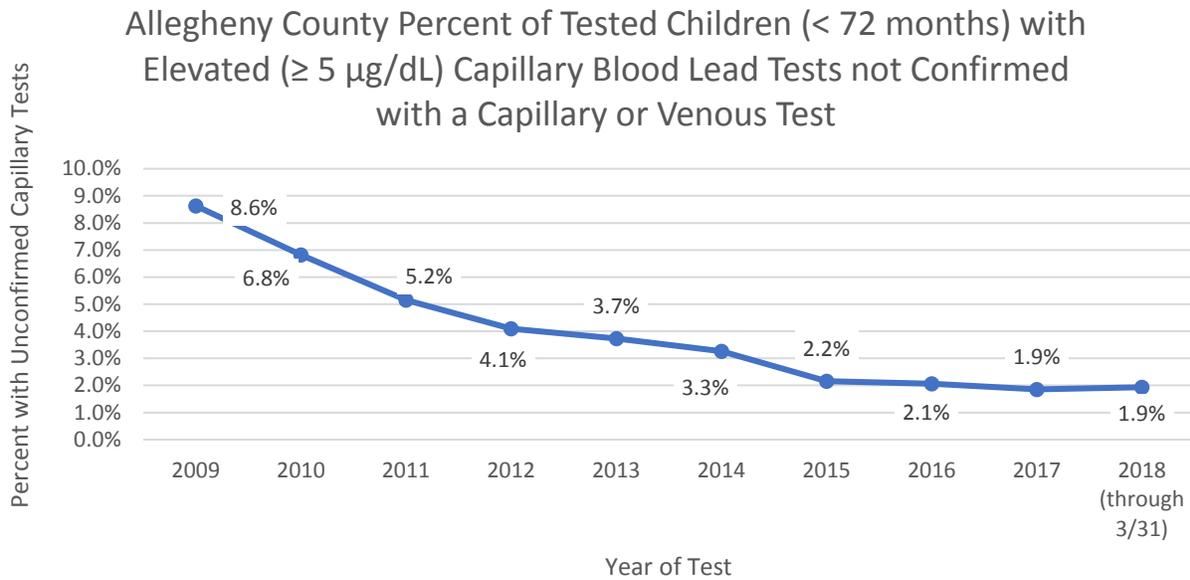


Figure 8: Percent of Allegheny County children tested for blood lead that had a capillary blood lead test with a result $\geq 5 \mu\text{g/dL}$ that was not confirmed with a second capillary blood lead test or a venous blood lead test. The second test must occur within 84 days of the initial elevated capillary test but not on the same day as the initial capillary test to be considered a confirmation test.

The rates of children with unconfirmed elevated capillary blood lead tests stayed relatively stable from 2010-2016. Since 2016, the number of elevated capillary blood lead tests that were confirmed has steadily increased. This indicates that there has been a recent increase in awareness of childhood blood lead among both our medical providers and the community.

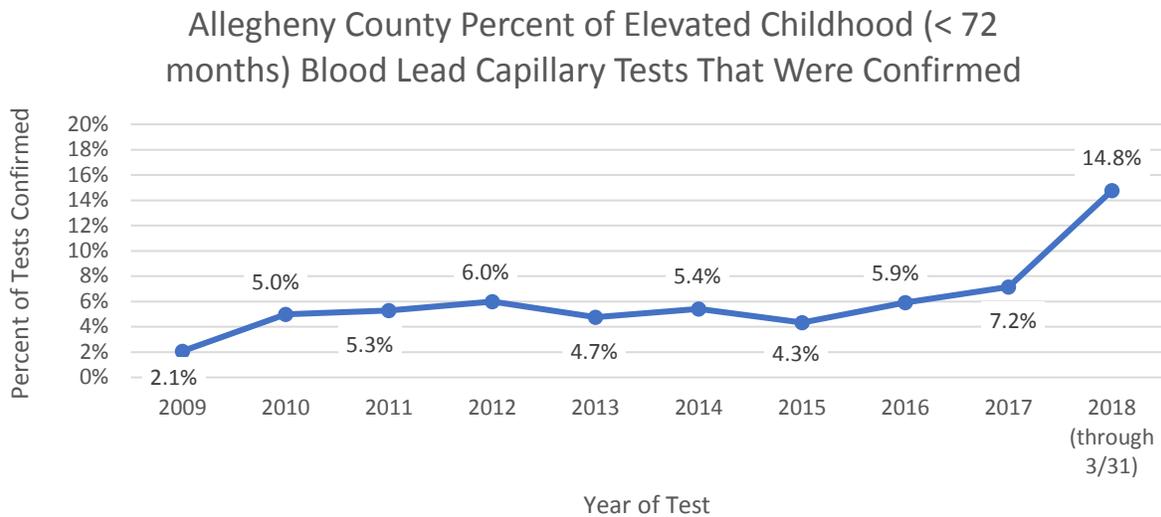


Figure 9: Percent of Allegheny County children tested for blood lead that had a capillary blood lead test with a result $\geq 5 \mu\text{g/dL}$ that was confirmed with a second capillary blood lead test or a venous blood lead test. The second test occurred within 84 days of the initial elevated capillary test but not on the same day as the initial capillary test to be considered a confirmation test.

Validity of capillary tests

Capillary lead tests are a screening test for elevated blood lead. If the reported concentration is less than 5 ug/dL, the child does not have an elevated level of lead in their blood. However, if the capillary test result is 5 and over, it may indicate elevated lead. However, there is a good chance that it is falsely high, sometimes called a “false positive.” Locally the Allegheny County Health Department compared the percentage of elevated capillary blood lead tests with the percentage of elevated venous blood lead tests that were used as a confirmation. These venous tests occurred between 1 and 84 days after the elevated capillary test and are required to confirm that a child’s actual blood lead level is elevated. Venous confirmation tests only revealed an elevated blood lead level about 40% of the time; demonstrating a 60% falsely elevated blood lead level with a capillary test. This rate is consistent with literature on the subject.

Table 1: Capillary versus venous testing

Year	Initial Capillary Tests \geq 5 μ g/dL	Venous Confirmation	Venous Confirmation Elevated	Venous Confirmation Elevated Rate
2012	812	166	81	48.8%
2013	750	167	70	41.9%
2014	680	179	79	44.1%
2015	521	153	76	49.7%
2016	524	125	52	41.6%
2017	652	186	74	39.8%

Number of investigations done, number of families that refused

For children identified with a confirmed elevated blood lead level and documented in the Pennsylvania National Electronic Disease Surveillance System (PA-NEDSS) the ACHD Bureau of Environmental Health, Housing Division performs outreach with a home investigation to find and help mitigate sources of lead. These investigations include the use of X-ray fluorescence technology, dust and soil analysis, and water tests to determine sources of lead in the environment during the inspection. The childhood lead level that triggers a home inspection has decreased over time, in part due to resources and more recently to conform with CDC reference levels. Two new inspectors were added to the Division in March 2018 which allowed home inspections to begin for children with blood lead levels of \geq 5ug/dL. Owner Occupants are educated to mitigate and eliminate the identified lead hazards. For tenant occupied properties, landlords are required to eliminate hazards. A notice of violation with a specified compliance time to correct violations is sent to the landlord. The number of home inspections conducted since 2010, and the threshold for inspection follows in Table 2.

Table 2: Threshold for Inspection

Year	Total Children with confirmed elevated lead levels	ACHD Home Inspections	Level for inspection	No Response N%	Refusal rates N%
2010	65	61	≥15 µg/dL	unknown	unknown
2011	38	39	≥15 µg/dL	unknown	unknown
2012	55	51	≥15 µg/dL	unknown	unknown
2013	35	35	≥15 µg/dL	unknown	unknown
2014	28	24	≥15 µg/dL	unknown	unknown
2015	35	24	≥15 µg/dL	unknown	unknown
2016	40	27	≥10 µg/dL Starting November 1, 2016	unknown	unknown
2017	95*	53	≥10 µg/dL	16% n=14	24% n=21
2018 (to July 31)	79*	35	≥ 5 µg/dL starting June 18, 2018	21% n= 16	21% n=16

*2017 = 89 households and as of July 31, 2018 = 77 households. These numbers were used to calculate no response and refusal rates.

Lead in Water

The Pennsylvania Department of Environmental Protection (DEP) is the regulatory authority for the federal lead and copper rule (LCR), and only DEP has the authority to require corrective action or to issue penalties due to exceedance or violations of the rule. The federal LCR rule requires the public water system itself to test water for lead every three years by requesting that homeowners and tenants voluntarily obtain samples in their homes. If its results exceed the federally-established action level, the system must then implement measures to decrease those levels. These actions include revisiting its corrosion control methodology, providing public education, increasing the lead testing intervals, and replacing a percentage of lead services lines. Currently, that LCR action level is at 15 ppb. Some systems have also voluntarily taken additional actions such as providing filters, ceasing partial line replacements and replacing the private side of the line (owned by the homeowner).

Prevention and Education

ACHD launched its “Get Ahead of Lead Campaign” last year with information available to families in multiple languages. Information such as the “lead prevention brochure” is also available for pediatric providers, parents, day care providers, school nurses and others who interface with children and families. ACHD also funded ten community organizations to help in this education effort especially in higher risk communities, including Circles of Greater Pittsburgh – Mon Valley, Clairton Cares, Inc., Consumer Health Coalition, Environmental Occupational & Public Health Consultants Inc. – EOPHC, Homewood Children’s Village, Perry Hilltop Citizens Council, Pittsburgh Learning Commons, United Somali Bantu Community of Greater Pittsburgh, Women for a Healthy Environment and Youth Enrichment Services.

ACHD’s Safe and Healthy Homes Program (SHHP) is available to anyone who meets income requirements and has either a child under 22 years of age or a pregnant woman residing in the home. The SHHP Program provides free in-home health and safety assessments to qualified participants in Allegheny County as well as Beaver, Washington, and Westmoreland counties, including a visual assessment of potential lead-based paint hazards.

Intervention

For children under 6 years of age with a confirmed blood lead level of 5 µg/dl and above, ACHD offers a free home inspection. The goal of this inspection, along with XRF readings, sampling of dust, soil, and water, is to help identify any sources of lead exposure in the home. The inspection includes identifying possible alternative sources of lead exposure from jewelry, toys, cosmetics, parent occupations and/or hobbies. Inspectors also educate the family about how good nutrition can mitigate absorption of lead and immediate steps the family can take to reduce lead exposure in the home.

ACHD also offers free lead testing for the uninsured or underinsured at its Immunization clinic site <https://alleghenycounty.us/Health-Department/Health-Services/Infectious-Disease-Immunization-Program/Immunization-Clinic.aspx> and its McKeesport WIC sites.

Resources for Remediation

For homes built before 1978 and undergoing renovation work that will disturb painted surfaces, it is important that the work be performed by an EPA-certified renovator to reduce the risk of exposing the occupants to lead dust.

The [Allegheny Lead Safe Homes Program](#) currently provides free home repairs to keep families safe from lead paint. This program will test for lead-based paint in the home and will aid with repairs and prevention education to Allegheny County homeowners or renters who meet income requirements and whose home is built before 1978. All work is done in a lead-safe manner. Eligible residents must either have a child under 6 years or a pregnant woman in the household.

^a Rabin R. The lead industry and lead water pipes "A Modest Campaign". Am J Public Health. 2008; 98 (9):1584-1592.

^b Troesken W. The Great Lead Water Pipe Disaster. Cambridge, MA: MIT Press; 2004