

Childhood Lead Exposure

Epidemiology Data Brief
May 2019

SUMMARY

Children exposed to lead can have permanent damage to the brain and nervous system, slowed development, learning and behavior problems and hearing and speech problems. This can cause lower IQ, decreased ability to pay attention and lead to underperformance in school. Lead poisoning has no obvious physical signs. It is the number one environmental disease in children which is entirely preventable.

Lead poisoning in the US is usually caused by exposure to lead in old house paint. Lead poisoning is most common in children who live in homes built prior to 1978, before lead was banned in house paint.

According to the EPA, professional lead-based paint removal for specialized cleaning, encapsulation of lead paint and total abatement costs about \$8 to \$15 per square foot or \$9,600 to \$30,000 for a 1,200- to 2,000-sq.ft. house. Interim controls temporarily reduce human exposure and can be quite effective. Specialized cleaning, repairs, maintenance, painting, temporary containment, ongoing monitoring of lead-based paint hazards or potential hazards, and the establishment and operation of management and resident education programs all aid with reducing lead hazards.

The Cincinnati Health Department receives an average of 300 referrals and conducts an average of 138 lead 5-9 µg/dL in home counseling services and 80 10+ µg/dL risk assessment services annually.

Who should get tested?

- All children at the age of 1 and 2 years of age.
- Children from 3-6 years, if they were not tested earlier.
- Children living in homes built before 1978 are at highest risk.

Lead (Pb) is an environmental hazard. Lead compounds have previously been used as gasoline anti-knock additives, pigment in paints and dyes and lead alloys commonly found in water pipes. Lead exposure can be from inhaling airborne particulates and dust and from swallowing lead-based paint particles in dust and soil. Lead-based paint for housing has been banned by the United States Consumer Product Safety Commission since 1978, yet lead contaminated housing still remains a significant public health problem with at least 38 million lead contaminated homes remaining in the United States today.^{1,2} The most common source of lead exposure among children who have elevated blood lead levels (BLL) is deteriorated lead-based paint in older homes, with approximately 35% of all U.S. homes having hazardous lead-based paint.³ In particular, low income households (29%) are more likely to have lead-based paint than higher income households (18%).^{3,4}

Childhood lead poisoning is the number one environmental disease in children and is entirely preventable. Lead poisoning does not cause symptoms and can only be identified by a blood test. Blood lead levels of children are measured to monitor the lead levels. Children exposed to lead may suffer permanent damage to the brain and nervous system. Lead poisoning is linked to lowered IQ, slowed development, learning delays, and behavioral issues, which may show up in later years as underperforming in school and adult criminal behavior. The socioeconomic costs of childhood lead poisoning are high, and widespread across increased medical, educational and criminal expenditures. A 2009 study shows that one dollar spent on lead paint hazard control today will result in a future savings of \$17 to \$221.⁵

In 1991, the Centers for Disease Control and Prevention (CDC) Advisory Committee on Childhood Lead Poisoning Prevention (ACCLPP) defined blood lead levels (BLL) equal to or greater than 10 µg/dL in children as a blood lead “level of concern” that should prompt public health actions.⁴ However, investigators of a pooled study have found that an increase in average lifetime BLL from < 1 µg/dL to 10 µg/dL was associated with a 6 IQ-point deficit, suggesting a causal association between lead exposure and impaired cognitive functioning even at low levels.^{6,7} In 2012, the CDC ACCLPP reduced the standard blood lead level of high risk in children to be defined as equal to or greater than 5 µg/dL and concluded that there is no safe threshold of lead exposure below, which the adverse effects of lead are absent.^{2,8} The term “level of concern” for blood lead levels has been replaced with an upper reference interval value defined as the 97.5th percentile of BLLs in U.S. children aged 1-5 years from two consecutive cycles of the National Health and Nutrition Examination Survey (NHANES).² This reference level is currently at or above a BLL value of 5 µg/dL.²

Parents who want to have children tested can go to the City of Cincinnati Primary Care Health Center website below for further information:

<https://www.cincinnati-oh.gov/health/city-of-cincinnati-primary-care/>

For more information on lead poisoning, please call 513-357-7420.

Children identified at the BLL reference value level of 5 µg/dL should be closely monitored. As the goal is to eliminate environmental lead, this reference value should be evaluated every four years based on the most recent NHANES report of U.S. children aged 1-5 years. Great strides have been made since the 1978 ban of lead-based paint to eliminate childhood lead poisoning from 88% to 2.2% of U.S. children at risk with BLL ≥ 10 µg/dL as of 2000.⁹ Yet, as of the 2007 to 2010 NHANES report, approximately 535,000 U.S. children 1-5 years have a BLL equal to or greater than 5 µg/dL.¹⁰

Lead exposure in Ohio and the City of Cincinnati

On average, 3.8% of all Cincinnati children who were tested for lead poisoning between 2013 and 2017 had elevated blood lead levels (EBLL) at or above 5 µg/dL (Figure 1). This is consistently higher than the prevalence of children with EBLL in Ohio overall. Table 1 provides information on children tested for lead poisoning and those with EBLL in Cincinnati between 2013 and 2017.

Figure 1. Prevalence (%) of children with elevated blood lead levels (≥5 µg/dL) in Cincinnati and Ohio¹¹

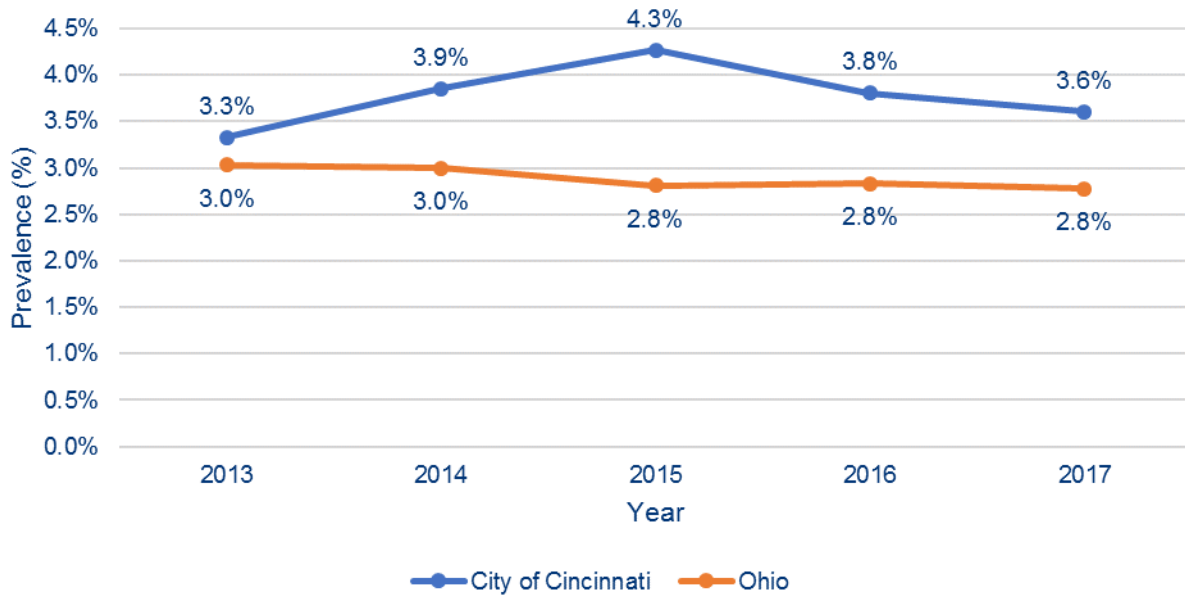


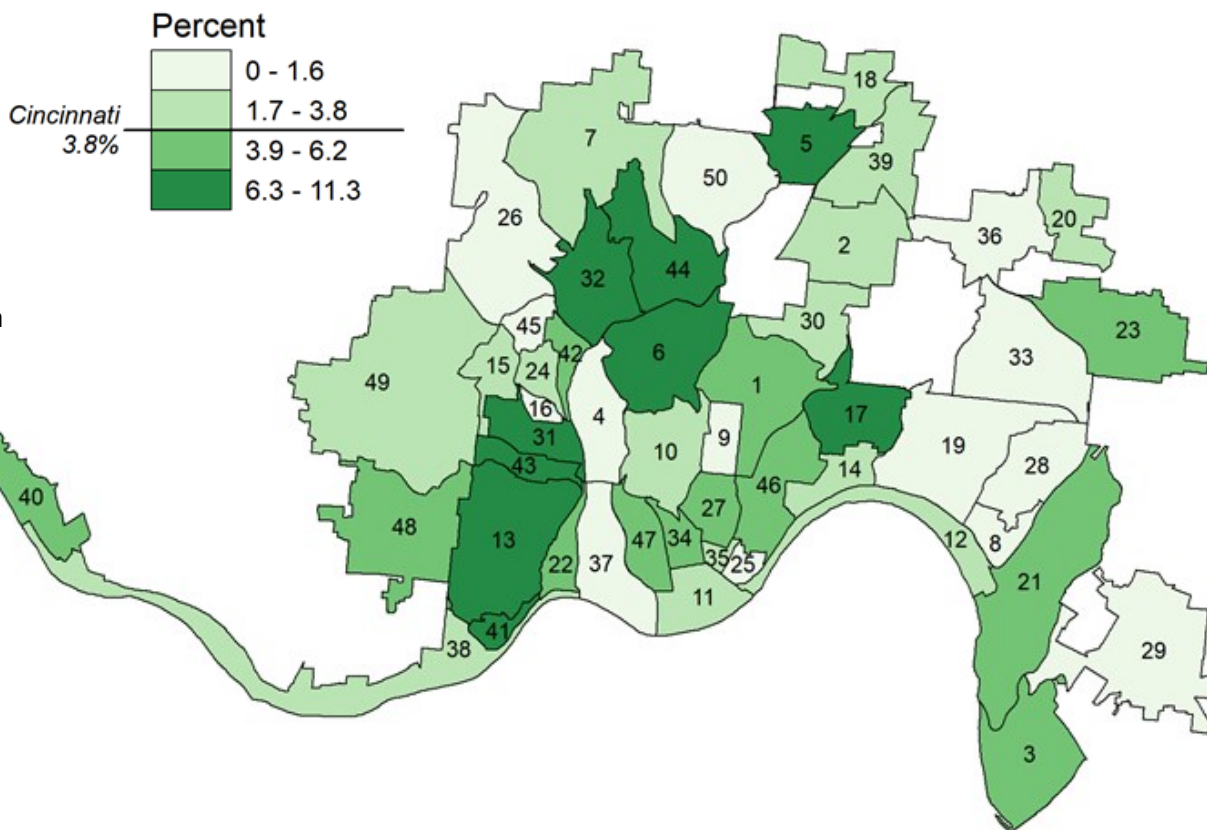
Table 1. Selected information on Cincinnati children tested for lead poisoning and found to have EBLL¹¹

	2013	2014	2015	2016	2017
Median age of children <72 months at 1st test	23 mo (1.9 yrs)	21 mo (1.8 yrs)	19 mo (1.6 yrs)	20 mo (1.7 yrs)	24 mo (2.0 yrs)
Median age of children <72 months with EBLL (≥ 5 µg/dL)	25 mo (2.1 yrs)	26 mo (2.2 yrs)	27 mo (2.3 yrs)	26 mo (2.2 yrs)	27 mo (2.3 yrs)
# of children <72 months tested	9,046	8,647	8,372	8,566	8,904
% of children <72 months tested	35%	34%	33%	33%	35%
# of children with confirmed EBLL	301	333	357	326	321
Males <72 months	169	181	202	183	170
Females <72 months	132	150	152	137	147

By Cincinnati neighborhood, the average percentage of children who had blood lead levels at or above 5 µg/dL ranged from 0.0 to 11.3% between 2013 and 2017 (Figure 2). Neighborhoods with the greatest percentage of children with EBLL were Evanston (11.4%), Northside (8.7%), North Fairmount (8.7%), East Price Hill (8.3%) and Spring Grove Village (7.6%). While the average percentage of children with EBLL in about half of Cincinnati's neighborhoods was at or below the statewide level between 2013 and 2017, 10 neighborhoods had average percentages more than twice the state level for that period.

Figure 2. Five-year average percentage of children with EBLL in Cincinnati neighborhoods, 2013-2017¹¹

1. Avondale
2. Bond Hill
3. CUF
4. California
5. Camp Washington
6. Carthage
7. Clifton
8. College Hill
9. Columbia Tusculum
10. Corryville
11. Downtown
12. East End
13. East Price Hill
14. East Walnut Hills
15. East Westwood
16. English Woods
17. Evanston
18. Hartwell
19. Hyde Park
20. Kennedy Heights
21. Linwood
22. Lower Price Hill
23. Madisonville
24. Millvale
25. Mt. Adams
26. Mt. Airy
27. Mt. Auburn
28. Mt. Lookout
29. Mt. Washington
30. North Avondale/
Paddock Hills
31. North Fairmount
32. Northside
33. Oakley
34. Over-the-Rhine
35. Pendleton
36. Pleasant Ridge
37. Queensgate
38. Riverside
39. Roselawn
40. Sayer Park
41. Sedamsville
42. South Cumminsville
43. South Fairmount
44. Spring Grove Village
45. Villages at Roll Hill
46. Walnut Hills
47. West End
48. West Price Hill
49. Westwood
50. Winton Hills



Cincinnati Health Department's Response

Lead poisoning prevention is multi-pronged. It is important that our community is made aware of potential sources of lead poisoning and how to avoid them. Essential knowledge includes proper maintenance and repair of older homes; specialized cleaning techniques; being mindful of lead sources including paint, contaminated soil and dust, water and food sources; as well as possible lead exposure from occupations and hobbies. All children in the City of Cincinnati live in high-risk zip-codes and should be tested at ages one and two. Children under the age of six who have not been tested should receive a blood test. The Cincinnati Health Department Childhood Lead Poisoning Prevention Program (CHD CLPPP) annually receives an average of 300 cases of children with lead levels above the reference level; however, only 34% of Cincinnati children are being tested. This means that some children with EBLs are likely not identified.

The CHD CLPPP was formed in 1974, four years before lead based paint was banned for residential use. Continuing its proactive tradition, CHD CLPPP was the first program in the nation in 2007 to institute a primary prevention program for children with elevated blood lead levels of 5 µg/dL, five years before the CDC lowered the reference value from 10 µg/dL to 5 µg/dL. Currently, the CHD CLPPP provides case management to all children referred with a lead level of 5 µg/dL and higher (an average of 300 children per year since 2013). Each family receives a home visit from a public health nurse providing assessment of the child, education to the family, and necessary referrals to other agencies. Children with lead levels of 10 µg/dL and above, averaging 80 children per year since 2013, receive an environmental risk assessment of their home, which includes x-ray testing of painted surfaces and dust and soil testing. Board of Health Orders are issued to the property owner to correct lead hazards. When owners do not comply, legal cases are filed in housing court to enforce the orders.

Since 2007, CHD CLPPP has received over \$11 million in competitive grant awards from the US Department of Housing and Urban Development to create lead-safe housing for low-income families with young children. Over 700 lead-safe housing units have been created to date. Currently, CHD CLPPP is partnering with the City of Cincinnati Department of Community and Economic Development to administer a similar grant in the amount of \$3.4 million.

CHD CLPPP operates a loaner program for commercial grade HEPA vacuums for citizens to perform specialized cleaning in their homes. CHD CLPPP provides free, walk-in testing of paint-chips, toys, and other household items; as well as soil testing for community garden plots. CHD CLPPP partners with the Greater Cincinnati Water Works by sending educational materials and child testing information to residents whose drinking water tests over 15 ppb lead. Through a state grant, CHD CLPPP maintains an active voice on social media providing lead poisoning awareness, lead hazard recognition and mitigation, and local resources available.

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