DELAWARE HEALTH AND SOCIAL SERVICES
Division of Public Health
Office of Healthy Environments

Childhood Blood Lead Surveillance in Delaware

2024 Annual Report

March 2025

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Division of Public Health
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Executive Summary

This is the fourth annual childhood blood lead surveillance annual report published by the Delaware Department of Health and Social Services, Division of Public Health (DPH). It was prepared to satisfy the regulatory condition set forth in Delaware House Bill 222. This report presents lead testing data for children up to the age of 18 years in Delaware who were tested and reported during Calendar Year (CY) 2023. The data were extracted from the Delaware Healthy Homes and Lead Poisoning Surveillance System (HHLPSS). The *Childhood Blood Lead Surveillance in Delaware 2024 Annual Report* is provided as a source of information for the public; federal, state, and local agencies; health care providers; and other organizations and individuals interested in lead poisoning prevention in Delaware.

Lead poisoning is a preventable occurrence but continues to be a significant environmental hazard for children in Delaware. Young children up to age 6, whose brains develop rapidly, are at greatest risk of harm from lead exposure. Childhood exposure to lead, through inhalation or ingestion, can cause long-term neurological damage and decreased intelligence that may be associated with learning and behavioral problems.

In CY2023, DPH received a total of 19,023 lead test results for children under 6 years old (0 – 72 months) and 1,631 results for children ages 6 - 17 years. The tests results were comprised of initial tests, second tests, and subsequent follow-up tests. Of these , 13,600 blood lead results were the first (initial) tests for individual children ages 0 - 72 months and 1,171 results for children ages 6 through 17 years. For the ages 0 - 72 months, this equates to a 63% testing rate based on current population estimates.. The testing rate for children required by Delaware law to be tested (ages 12 and 24 months with catch up provisions to- 72 months) was calculated to be 75%. Elevated blood lead level (EBLL), defined as a first (initial) test that was greater than or equal to 3.5 micrograms per deciliter (µg/dL), was found among 842 children 0-72 months of age.

Among the submissions that included race and ethnicity information, those who were identified as White made up the highest portion at 22%, followed by those identified as Black at 12%. Fifty-six percent reported the race as unknown. Over 30% of the reported ethnicity data were indicated as unknown, 50% reported as non-Hispanic and 17% reported Hispanic enthicity.

Testing rate calculations found that 59% of 1-year-old children (9 to 15 months old) received their initial blood test in calendar year 2023. Children receiving their second test at age 2 years (21 to 27 months) was 2,339, or 38% of the children that received an initial test at 1 year old. The number of children receiving their first test at 21 to 27 months was 2,374.

Introduction

This fourth annual report was prepared to satisfy the condition set forth in Delaware House Bill 222 related to Chapter 26, Title 16, §2606. Annual Report: "The Division of Public Health shall annually, on or before January 1, provide a report on elevated blood lead levels to the General Assembly…"

This report presents blood lead testing data for children up to the age of 18 years in Delaware who were tested and reported during Calendar Year (CY) 2023. The data was extracted from Healthy Homes Lead Poisoning Surveillance System (HHLPSS). This document is provided as a source of information for the public; federal, state, and local agencies; health care providers; and other organizations and individuals interested in childhood lead poisoning prevention in Delaware.

Lead poisoning is preventable but remains a significant environmental hazard for Delaware children. Young children up to age 6, whose brains develop rapidly, are at greatest risk of harm from lead exposure. Childhood exposure to lead, through inhalation or ingestion, can cause long-term neurological damage and decreased intelligence that may be associated with learning and behavioral problems,*Risk factors and children*. (n.d.). CDC Childhood Lead Poisoning Prevention. https://www.cdc.gov/lead-prevention/about/index.html.

Data Source

Since 1994, the State of Delaware has required by law that all children be tested for lead at 1 year and 2 years old if the child's environment indicates an increased risk for lead exposure. Being at increased risk for lead exposure is determined by the child's physician and based on a risk screening questionnaire. All lead testing results for children must be reported to the Delaware Department of Health and Social Services, DPH and presented to the schools at kindergarten enrollment. In 2021, this law was revised under House Bill 222. As it mandates universal testing at age 2, the risk screening questionnaire was no longer required. The revised law requires that all lead testing results must be reported to DPH, and that proof of a blood lead test be presented for enrollment into a licensed childcare facility and kindergarten.

DPH's Childhood Lead Poisoning Prevention Program (CLPPP) performs childhood blood lead surveillance for Delaware. All laboratories, health systems, and medical practices are required by law to transmit all child blood lead test results to the program. DPH's Healthy Homes and Lead Poisoning Surveillance System (HHLPSS) database receives and stores the reported test results. All data in this report are from children ages birth to 18 years.

Overview: The Impact of Childhood Lead Poisoning

Lead poisoning, the process of lead adsorption into the body, is a preventable occurrence but continues to be a significant environmental hazard for children in Delaware. Young children up to age 6, whose brains develop rapidly, are at greatest risk of harm from lead exposure. Childhood exposure to lead, through inhalation or ingestion, can cause long-term neurological damage and decreased intelligence that may be associated with learning and behavioral problems. Even low levels of lead in the body correlate to a lower IQ, reduced attentiveness, and impaired academic achievement. Children with even slightly elevated blood lead levels have a higher risk of developing attention-deficit/hyperactivity disorder. Childhood lead poisoning effects extends across the lifespan, impacting health, higher learning, and the ability to be hired and remain employed. (The Association between Lead and Attention-Deficit/Hyperactive Disorder: A Systematic Review, *Int. J. Environ. Res. Public Health* 2019, *16*(3), 382; https://doi.org/10.3390/ijerph16030382).

There is no safe level of lead in the body. Continuing research has led to a better understanding of poor health outcomes in children due to this environmental toxin at even lower levels than previously understood. Based on this research, on October 28, 2021, the U.S. Centers for Disease Control and Prevention (CDC) lowered its blood lead reference value (BLRV), used to identify children with blood lead levels statistically higher (97.5th percentile) than the majority of children, from 5.0 micrograms per deciliter (µg/dL)to 3.5 µg/dL. Delaware law, 16 Del. Admin. Code § 4459A-2.0 uses the CDC BLRV to identify children with elevated blood lead.

Reducing the risk of childhood lead poisoning is achieved by identifying and removing lead hazards from the environment before a child is exposed. Although children can be exposed to lead from many sources, lead-based paint, and the lead-containing dust it creates, is the most common source of lead exposure. As a result, the federal government banned the production and sale of lead-based paint for residential use in 1978. Many of these older homes still contain lead-based paint that deteriorate and create lead-containing dust as they age. Additional sources of lead exposure include drinking water from lead supply pipes and solder, lead-contaminated soil, toys, traditional health remedies, spices, and medicinal supplements.

In Delaware, the U.S. Census Bureau approximates 42% of dwellings were built before 1979 (American Community Survey 5-Year Data (2009-2023), 2024). As is the case nationally, lead poisoning is a more prevalent problem facing low-income families living in older unmaintained dwellings. Many of these dwellings are rental properties. Even though work in Delaware over the last 25 years has resulted in a significant drop in the number of children with elevated blood lead levels, inequities persist. According to the CDC, those disproportionately affected include children living below the federal poverty level, children living in older housing, non-Hispanic Blacks, Latinos, immigrants, and refugees (People at Increased Risk for Childhood Lead Poisoning, 2024).

Annually from 2016 to 2021, Delaware's Lead Poisoning Prevention Program identified communities with a higher risk of childhood lead poisoning to better target resources and to reduce health inequities associated with lead exposure in those communities. DPH determined risk by examining rates of elevated blood lead levels from first tests, the age of housing, and income levels for each of the state's cities and towns. The program compiled the reported data, which identified Delaware ZIP Codes with the highest numbers of children with elevated blood lead levels of 3.5 µg/dl or higher. The top 10 ZIP Codes with highest risk of childhood lead poisoning are in Wilmington (19805, 19802, 19801), Dover (19901, 19904), Newark (19702), New Castle (19720), Bear (19701), Seaford (19973), and Georgetown (19947). The Childhood Lead Poisoning Prevention Program is cooperating with other DPH programs to include lead testing data into census tract level reports. The project was not completed by the time of publication.

Case Management Plan

During 2023, the DPH CLPPP had a dedicated health coordinator, two case managers, and three investigators who conduct ongoing monitoring of case management activities. They are responsible for reviewing surveillance data, identifying children with high lead levels, and making appropriate referrals. DPH staff provide care coordination with primary care physicians for children with elevated blood lead levels using Case Management Standards, which follow CDC guidelines. Both the Program's Health Coordinator and Case Managers communicated with families and medical offices to assure that children at risk for lead poisoning are tested and that children who are identified with elevated results receive any eligible intervention services for which they may qualify.

The HHLPSS database enables the Data Management Analysts, Case Managers, and Investigators to frequently review childhood blood lead level results to ensure that children with elevated levels receive confirmatory testing, investigations, and follow-up care as necessary. The Data Management Analyst generates reports weekly to identify test submissions that are at or above the CDC BLRV. The Data Management Analyst and the Health Coordinator work with the Program's administrative staff to mail information to families who have children with reported blood lead levels of 3.5 µg/dL and above, and to identify children whose levels are confirmed to be elevated by venous testing. In 2023, the CLPPP mailed information to 783 families.

Blood lead levels are determined by two types of tests. A capillary screening test is usually the first step to determine if a child has an elevated blood lead level. Capillary testing is pricking a finger, heel, or another part of the body at the surface of the skin to produce drops of blood for testing. A venous blood draw takes blood from a child's vein using a needle. According to the CDC, venous samples are more reliable when analysis occurs at higher complexity methods, and that is why venous blood draws are used to confirm a child's lead level.

All families of children with a capillary (unconfirmed EBLL) or venous test (confirmed EBLL) are mailed information within one week of DPH receiving the results. The mailings included information regarding health concerns of lead exposure, possible sources of lead, how to clean and reduce lead hazards, and the possible eligibility for developmental intervention services offered by DPH through the Birth to Three program.

During 2023, whenever a child with an elevated blood lead level of 7.0 µg/dL or more was identified and confirmed by venous test, the health coordinator notified the child's primary care provider of DPH involvement and followed through with phone calls, emails, and direct mailings of educational materials to the family. A case was closed once two successive blood tests were below 7.0 µg/dL. The child's primary care provider continued monitoring levels until they were below the BLRV.

In 2023, there were 774 elevated results reported to DPH for children ages 0 - 72 months with an initial test at or above 3.5 µg/dL. Of these 774 results, 634 were capillary screenings and 140 were venous tests. No venous confirmations were performed on 410 children. This equates to 64.7% of children with an elevated capillary result not receiving venous confirmation. Venous confirmatory tests of 96 capillary results were found not to confirm an elevated status. Therefore, in 2023 a total of 268 confirmed EBLL children were identified based on the results reported to DPH. A total of 77 cases were closed in 2023 due to reduced blood lead values.

The children with blood level values equal to or greater than 5.0 µg/dL are eligible for developmental intervention services offered through DPH. The case managers make direct referrals to the Birth to Three program and the Data Analysts provide monthly lists to the program for all EBLL children.

Additionally, the case managers communicate with the CLPPP's Investigators, who coordinate investigations to identify the possible source(s) of the lead hazards. The investigator identifies the build date of the home. If the home was built before 1978, then it is considered to have the potential for lead-based paint hazards. The Investigator arranges a Lead Hazard Risk Assessment of the residence by an environmental testing firm. A Lead Hazard Risk Assessment is an on-site investigation to determine the existence, nature, severity, and location of lead-based paint hazards. Following the assessment, the Investigator contacts the property owner to review the findings and discuss options for what must be done to fix any lead-based paint hazards. The number of Lead Risk Assessments performed annually varies. For CY 2023, 29 Lead Hazard Risk Assessments were performed and paid for by DPH. Lead-based paint hazards were found at all 29 properties.

Elevated blood lead levels were found in children living in homes built after 1978. After case management interviews with the families, herb and spice samples were collected for analysis. In both cases, spices obtained outside the United States were found to contain lead were considered to be the source of exposure. The families were instructed to dispose of the items and purchase local spice replacements.

Blood Lead Testing Data Calendar Year 2023

In CY 2023, there was a total of 20,654 blood lead results reported to the CLPPP. For children from 0-72 months , the total was 19,023. The remaining 1,631 results received were for children ages 6-17 years. The total number of tests includes all initial tests and all follow-up tests by both capillary and venous methods. Of the total, 14,771 were for the initial tests, of which 13,600 were for children 0-72 months.

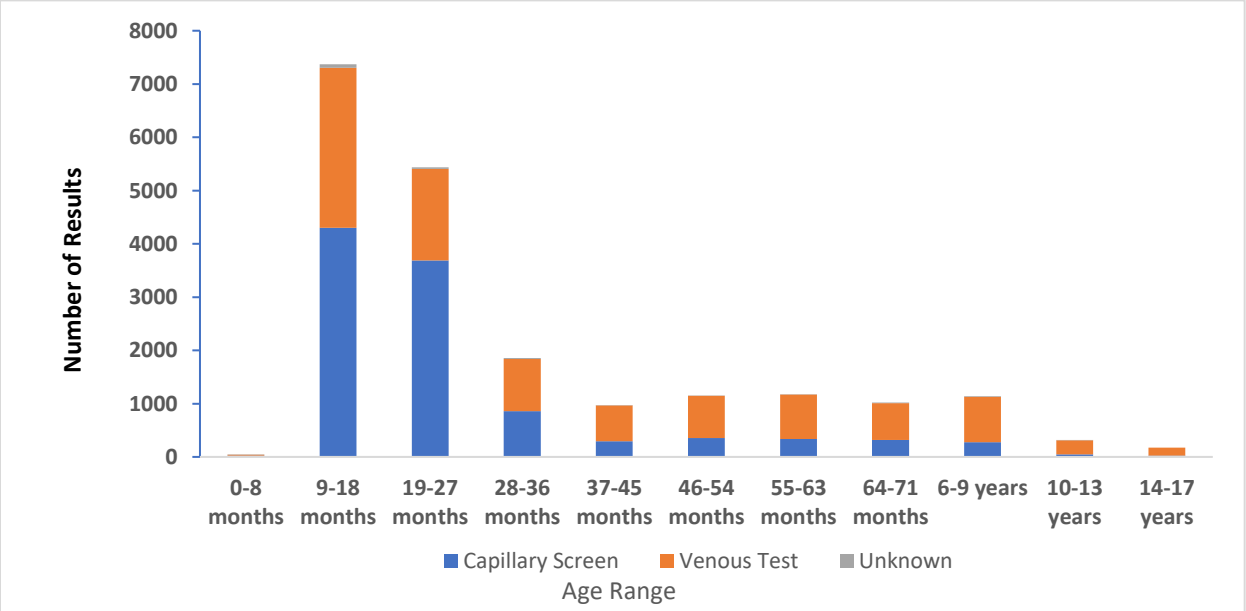
Table 1 summarizes the total results received by age distribution and the method of sampling. The data are shown graphically in Figure 1. It should be noted that136 capillary samples were collected on filter paper and sent to a laboratory for analysis instead of the analyses being performed at the physician's office using a point of care instrument.

Table 1. Number of Lead Test Results Received by Age and Sample Method, Delaware, Calendar Year 2023

Child Age Range	Capillary Screen	Venous Test	Unknown	Total Received
0-8 months	26	14	1	41
9-18 months	4,302	3,003	63	7,368
19-27 months	3,690	1,715	31	5,436
28-36 months	861	975	19	1,855
37-45 months	293	677	6	976
46-54 months	352	794	1	1,147
55-63 months	338	833	9	1,180
64-71 months	318	694	8	1,020
6-9 years	275	856	11	1,142
10-13 years	46	265	6	317
14-17 years	24	148	0	172
Total	**10,525**	**9,974**	**155**	**20,654**

Source: Delaware Department of Health and Social Services, Division of Public Health, Healthy Homes and Lead Poisoning Surveillance System (HHLPSS) Database, March 14, 2025

Figure 1. Number of Lead Results Received by Age and Sample Method, Delaware, Calendar Year 2023



Source: HHLPSS Surveillance Database, March 14, 2025

Delaware regulation 4459A requires testing at ages 1 and 2 years old. In Table 2, both initial and second lead tests are presented within the month ranges that represent 1-year-olds and 2-year-olds as defined in the regulation. Test totals include initial, second, and follow-up tests.

Table 2. Initial and Second Lead Screenings or Tests for children 9-15 months and 21-27 months, Delaware, Calendar Year 2023

Age	Total Screening or Tests	Initial Screenings or Tests	2nd Screenings or Tests
9-15 months	6,373	6,154	201
21-27 months	4,981	2,374	2,339

Source: Delaware Department of Health and Social Services, Division of Public Health, Lead Poisoning Prevention Program, March 2025

The age distribution of all tests – first screenings or tests, second screenings or tests, and number of results ≥3.5 µg/dL – are provided in Table 3. Figure 2 graphically depicts the age distribution of the results. Figure 3 graphically depicts the number of results ≥3.5 µg/dL by age distribution. There were 774 reported initial results equal to or greater than 3.5 µg/dL for children under 6 years of age (72 months).

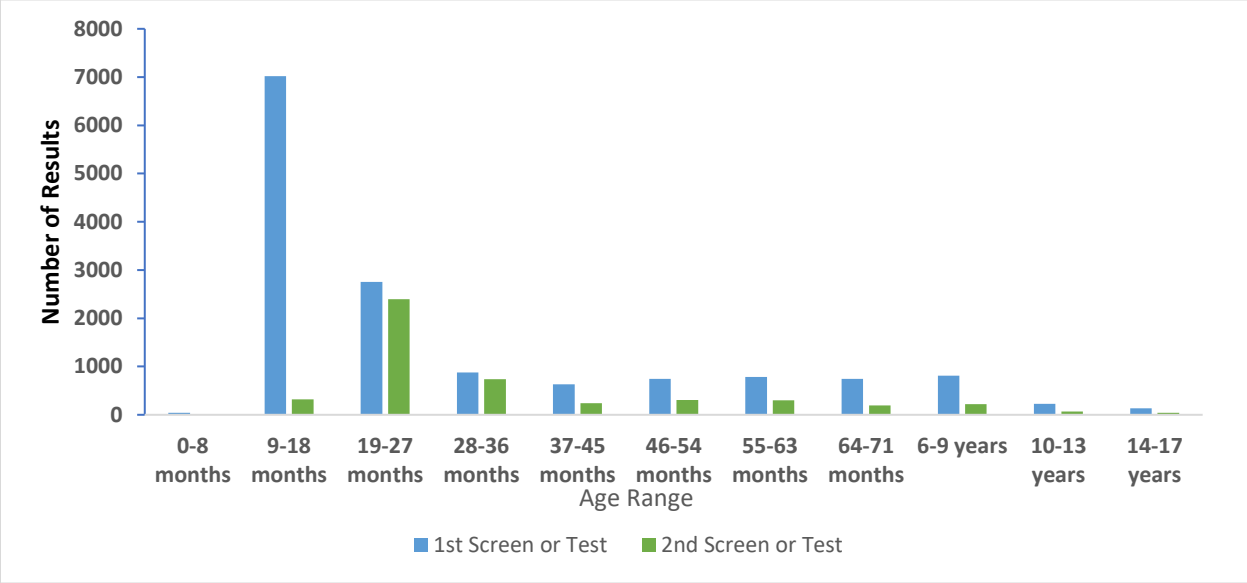
Table 3. Number of Total, First and Second Lead Tests and Numbers at or above 3.5 µg/dL, Delaware, Calendar Year 2023

Child Age Range	Total Received Screen or Test	1st Screen or Test	2nd Screen or Test	Screen or Test >= 3.5 ug/dL	1st Screen or Test >= 3.5 ug/dL
0-8 months	41	41	--	--	--
9-18 months	7,368	7,016	317	467	381
19-27 months	5,436	2,757	2,397	500	195
28-36 months	1,855	880	736	241	66
37-45 months	976	634	241	82	32
46-54 months	1,147	744	309	88	38
55-63 months	1,180	784	301	84	33
64-71 months	1,020	744	195	57	27
6-9 years	1,142	814	222	90	53
10-13 years	317	225	65	15	9
14-17 years	172	132	40	--	--
Total	**20,654**	**14,771**	**4,823**	**1,637**	**842**

"--" denotes the data was suppressed due to being less than 11 as per DPH privacy guidelines.

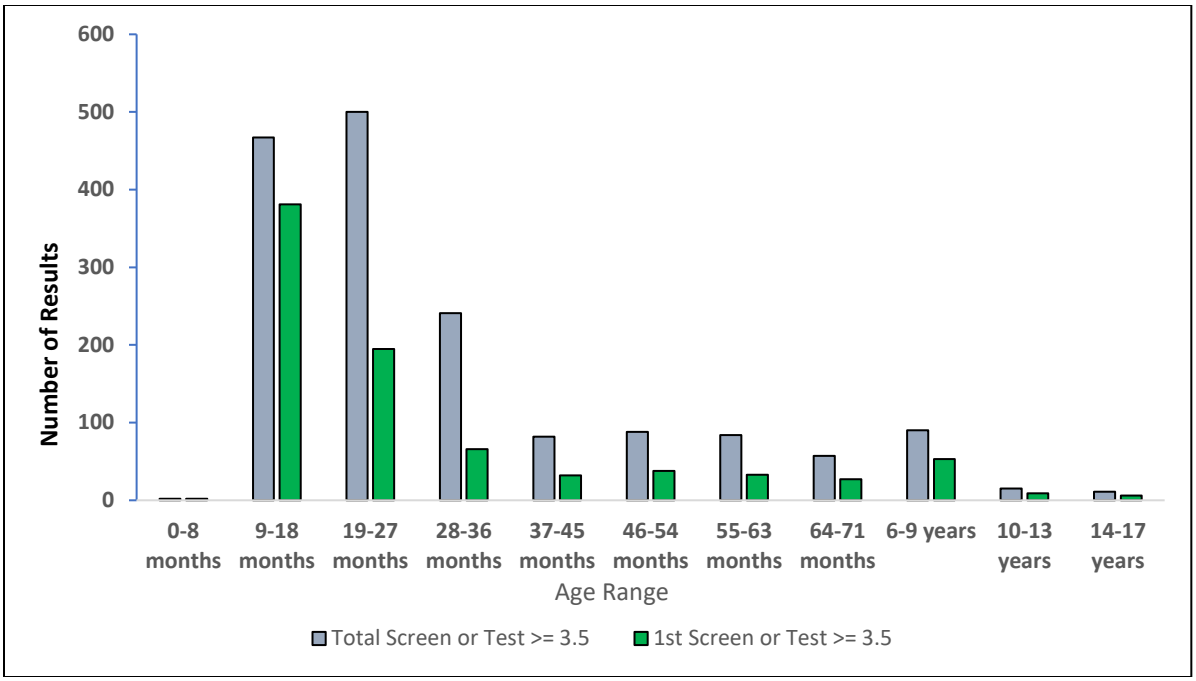
Source: Healthy Homes and Lead Poisoning Surveillance System Database, March 14, 2025

Figure 2. Age Distribution of Children Receiving Second Lead Test, Delaware, Calendar Year 2023



Source: Delaware Department of Health and Social Services, Division of Public Health, Lead Poisoning Prevention Program, March 2025

Figure 3. Age Distribution of Results ≥ 3.5 µg/dL for Total and First Lead Screen or Test, Delaware, Calendar Year 2023



Source: Delaware Department of Health and Social Services, Division of Public Health, Lead Poisoning Prevention Program, March 2025

The ranges of blood lead levels for the initial tests by age range are provided in Table 4. The maximum value for 2023 was 70 µg/dL for a child in the 19 to 27 months age range.

Table 4. Age Distribution of Lead Level Ranges for Results ≥ 3.5 µg/dL for the Initial Screen or Test Delaware, Calendar Year 2023

Child Age Range	≥ 3.5 µg/dL	3.5-4.9 µg/dL	5-9.9 µg/dL	10-14.9 µg/dL	15-19.9 µg/dL	20-29.9 µg/dL	30 µg/dL and above
0-8 months	2	2	0	0	0	0	0
9-18 months	381	266	95	11	6	3	0
19-27 months	195	119	57	10	6	2	2
28-36 months	66	37	20	3	0	6	0
37-45 months	32	17	14	0	0	0	1
46-54 months	38	25	13	0	0	0	0
55-63 months	33	19	10	2	1	1	0
64-71 months	27	17	3	6	0	0	1
6-9 years	53	33	16	2	2	0	0
10-13 years	9	4	2	1	1	0	0
14-17 years	6	4	2	0	0	0	0
Total	**842**	**543**	**232**	**35**	**16**	**12**	**4**

Source: Healthy Homes and Lead Poisoning Surveillance System Database, March 14, 2025

An evaluation was performed for the completeness of child information being submitted to DPH in the calendar year 2023. This evaluation will aid in determining what information is not

routinely provided but is needed to assist in case management and aid in determining any demographics that may be underserved. Table 5 summarizes the findings.

Table 5. Completeness of Child Information Submitted to Delaware Division of Public Health, Calendar Year 2023

Item	Percent Complete
Child's name	100
Date of Birth	100
Sex/Gender	94
Race	60
Ethnicity	69
Guardian's name	8
Sample type	100
Test date	100
Blood lead level	100
Address	99
Telephone number	53

Source: Healthy Homes and Lead Poisoning Surveillance System Database, March 14, 2025

Demographic data as reported to DPH is provided in Tables 6 and 7.

Table 6. Number of Initial Results by Ethnicity, Delaware, Calendar Year 2023

Ethnicity	Number Tested	Percent of Total
Hispanic	2,443	16.5%
Non-Hispanic	7,350	49.8%
Unknown	4,978	33.7%
Total	**14,771**	**100%**

Source: Delaware Department of Health and Social Services, Division of Public Health, Lead Poisoning Prevention Program, March 2025

Concluding Statements

The calendar year 2023 data has provided DPH with insight into several specific areas of the surveillance program.

Continued efforts, including educating healthcare providers of required testing and reporting, improving completeness of testing reports, and educating parents, can be expected to improve

blood lead testing and test reporting. If such efforts continue to be successful, the testing data will reflect continued increases in testing rates and completeness of information. Over the next several years upward trends are expected in the number of reported tests for the initial 1-year-old tests; and the 2-year-old second test.

Table 7. Number of Initial Results by Race, Delaware, Calendar Year 2023

Race	Number Tested	Percent of Total
American Indian	--	--
Asian/Pacific	332	2.2%
Black	1,820	12.3%
White	3,217	21.8%
Other	1,116	7.9%
Unknown	8,221	55.7%
Refused to Answer	--	--
Total	**14,771**	**100%**

"--" denotes the data was suppressed due to being less than 11 as per DPH privacy guidelines.

Source: Delaware Department of Health and Social Services, Division of Public Health, Lead Poisoning Prevention Program, March 2025

Testing Rate Calculations

The childhood lead testing rates were calculated both as a percentage of the population for ages 0-72 months and also for the population required to be tested by Delaware law, which does not occur until age 12 months. The number and percent of reported second tests were also calculated. The testing rates were calculated for the following.

Table 8 includes the information and calculation for testing rates 2023.

Table 8. Testing Rate for children receiving One and Two Lead Tests, Delaware, Calendar Year 2023

	Age 0-72 months	Age 12-72 months
Delaware population	63,206	52,799
Children who have received at least one blood lead screening or test on or before 12/31/2023	39,708	39,594

Children who have received at least two blood lead screenings or tests on or before 12/31/2023	9,158	9,155
Percent of children who have received at least one blood lead screening or test on or before 12/31/2023	63%	75%
Percent of children who have received at least two blood lead screenings or tests on or before 12/31/2023	14%	17%

Source: Delaware Department of Health and Social Services, Division of Public Health, March 2025

The CLPPP was provided testing information for children receiving Medicaid. For Calendar Year 2023, the number and testing percentages are provided in Table 9. The percentage is based on the number of children receiving at least one lead test or screening by the age of 2 years old.

Table 9. Testing Rate for children receiving Medicaid, Delaware, Calendar Year 2023

County	Number Tested	Percent Tested
New Castle	3,200	62.5%
Kent	1,098	60.3%
Sussex	1,350	71.7%

Source: Delaware Department of Health and Social Services, Division of Public Health, October 2024

Concluding Statements

The 2023 childhood blood lead data has provided DPH with measures and clarity on several areas of the surveillance program. These include:

- The total number of test/screening records (20,654) and initial tests (14,771) received were the highest DPH has received in a 12-month period.
- Sixty-three percent (63%) of children ages 0 – 72 months received at least one screening or test. For children between 12 – 72 months 75% received at least one test or screening.
- Fourteen percent (14%) of children ages 0 – 72 months received a second screening or test. For children between 12 – 72 months 17% received a second test or screening
- Capillary screening made up 51% of all records received.
- There were 643 initial capillary tests received indicating elevated blood lead levels that required confirmatory venous testing. Only 224 (35%) confirmation tests were received.

- Of the 224 venous confirmation samples received, 128 (57%) confirmed an elevated blood lead level and 96 (43%) were non-detected results and did not confirm an elevated blood lead level.

From the data DPH has determined that efforts by DPH and stakeholders has increased the number of child blood tests occurring. However, the percentage of unconfirmed elevated capillary results is high and that collaboration with healthcare providers and outreach to families is needed to increase confirmation testing. Changing the regulatory requirement of venous confirmation to allow capillary confirmation will also aid in increasing confirmatory follow-up.

The requirement for testing at 24 months of age was enacted in August 2021, with 2022 being the first full year of the requirement. Therefore, 2024 will be the first full calendar year when all children are required to have a 24 month test. The 2023 data can be used as a baseline for comparison of future 2 year old compliance. Outreach and collaborative efforts with healthcare providers and stakeholders are needed to ensure compliance with this testing requirement.