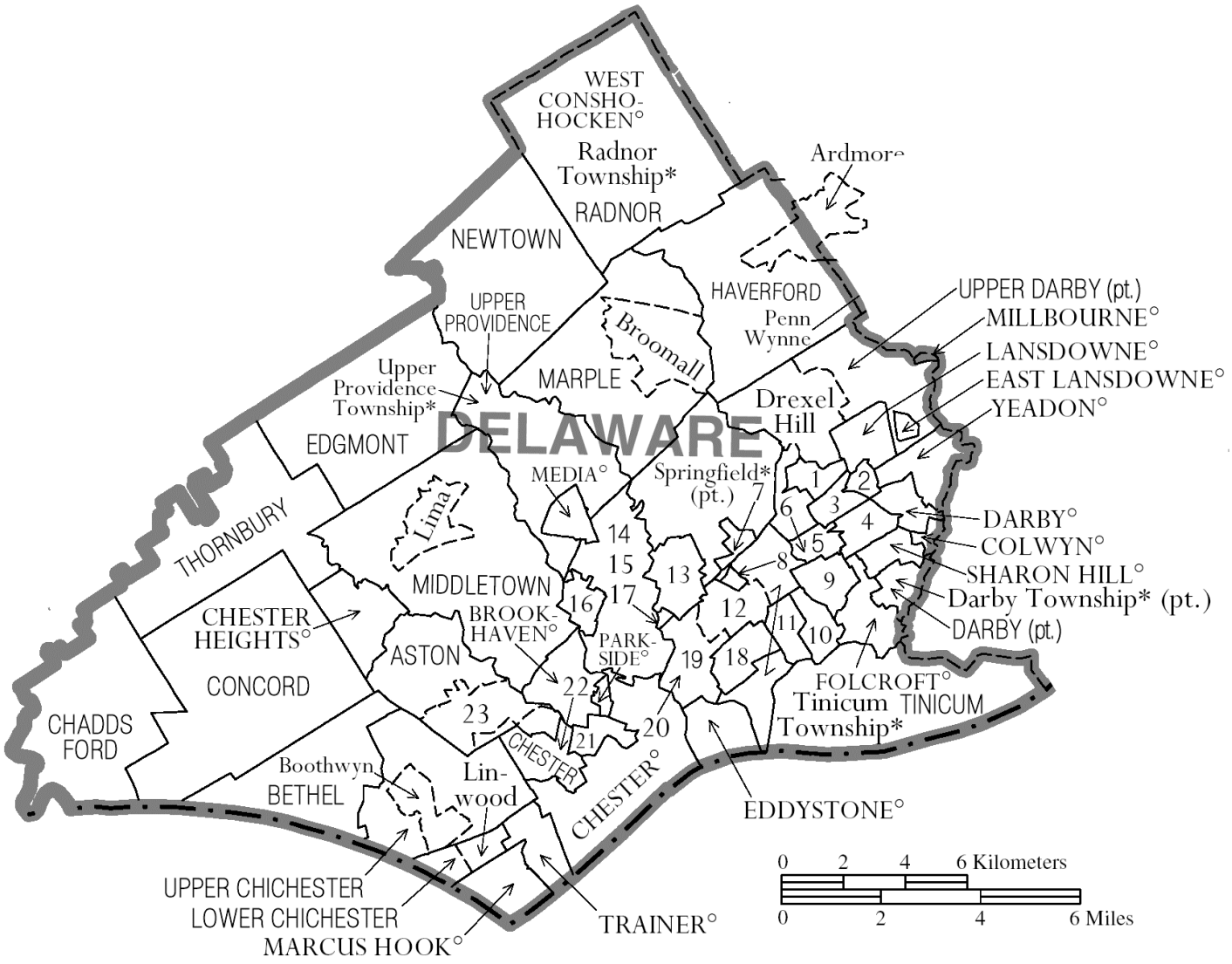

Delaware County Child Lead Report, 2021

DCHD
DELAWARE COUNTY HEALTH DEPARTMENT

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Executive Summary

This is the Delaware County Health Department (DCHD)'s first childhood lead surveillance report. This report is provided as a source of information for the public, healthcare providers, and other organizations and individuals interested in childhood lead poisoning burden and prevention in Delaware County, Pennsylvania.

This report includes information for children tested for blood lead in Delaware County during calendar year 2021. DCHD staff extracted and analyzed data from the state's electronic reportable disease surveillance system (Pennsylvania National Electronic Disease Surveillance System or PA-NEDSS). The report provides information about blood lead testing for children under 2 years of age, under 6 years of age, and under 16 years of age, as well as method of testing, municipality, race and ethnicity, and sex. DCHD collaborated with the Delaware County Office of Sustainability, Mapping and Data Services to map this information across the county.

Exposure to lead, even at low levels, can cause serious harm to a child. Health effects include damage to the brain and nervous system, slowed growth and development, learning and behavior problems, and hearing and speech problems.[1] A common pathway for children to be exposed to lead is when they breathe in or ingest lead dust from lead-painted surfaces. Lead-based paints were banned for residential use in 1978. Any homes built in the U.S. before 1978 are likely to have lead-based paint. The median year of houses built in Delaware County is 1956. Soil contaminated from emissions from leaded fuel or lead paint can also be an exposure pathway.

The amount of lead in blood is referred to as the blood lead level, which is measured in micrograms of lead per deciliter of blood (µg/dL). The Centers for Disease Control and Prevention (CDC) currently uses a blood lead reference value of 3.5 µg/dL to identify children with blood lead levels that are higher than most children's levels.[2] This value is used to identify children that require further testing and case management to reduce exposure and protect the child's health.

This report will be used by the DCHD to 1) identify locations that may be at higher risk for lead exposure and higher need for outreach and information; 2) identify disparities in lead exposure distribution; and 3) locate areas of potential under-testing.

The Department received 9,749 blood lead test results representing 9,283 unique children ages 0-15 years in 2021. A total of 294 children (3.2% of those tested) met the case definition for confirmed elevated blood lead level (EBLL) ≥3.5 µg/dL. Of the elevated children in 2021, 264 (89.8% of confirmed tests) children were 0-71 months of age and 89 children were 0-23 months of age (30.3% of confirmed tests). Only 1 child had a confirmed EBLL ≥3.5 µg/dL via a capillary test method, the rest of the elevated cases were via venous blood draw. African American/Black children accounted for 28% of those tested and 48% of confirmed cases with an EBLL ≥3.5 µg/dL. Females ages 0-23 months had a higher percentage of elevated blood lead results (57%) versus males 43%. However, among children aged 0-71 months, females accounted for 42.7% of elevated blood lead tests and males 57.3%. Eastern Delaware County has the highest number of children with an EBLL ≥3.5 µg/dL.

[1] CDC Prevent Children's Exposure to Lead: https://www.cdc.gov/nceh/features/leadpoisoning/index.html#:~:text=during%20the%20following%3A-,Exposure%20to%20lead%20can%20seriously%20harm%20a%20child's%20health%2C%20including,and%20hearing%20and%20speech%20problems.&text=Lead%20paint%20or%20dust%20are,exposure%20can%20occur%20in%20children.

[2] CDC Blood Lead Levels in Children: https://www.cdc.gov/nceh/lead/data/blood-lead-reference-value.htm

Key Findings from Delaware County's 2021 Child Lead Report

- There were 9,749 blood lead test results representing 9,283 unique children ages 0-15 years in 2021.
    - 4,882 children under age 2 were tested and 8,907 children under age 6 were tested.

- A total of 294 children (3.2%) had an Elevated Blood Lead Level (EBLL), as defined as one venous test ≥3.5 µg/dL or two capillary test ≥3.5 µg/dL within 12 weeks of each other.
    - Delaware County's EBLL results in 2021 ranged from 3.5 to 59 µg/dL.

- Eastern Delaware County has the highest childhood blood lead poisoning burden.
    - The cities reporting 10 or more children with EBLLs in 2021 included Upper Darby (101), Lansdowne (35), Chester (32), Darby (29), and Drexel Hill (14).

- Racial disparities were present:
    - African American/Black children accounted for 28.25% of those tested and 47.51% of confirmed elevated cases.
    - White children accounted for 31.24% of those tested and 14.63% of confirmed elevated cases.
    - Asian children accounted for 4.18% of those tested and 6.46% of elevated confirmed cases.

Data Methods and Case Definitions

Methodology

All blood lead level (BLL) test data on children less than 16 years of age in 2021 was extracted from the PA-NEDSS database using SAS EG. Analyses were performed on a per-test or per-child basis noted in the tables below.

Most of the analyses in this report are limited to children under 2 years of age (0-23 months) and under 6 years of age (0-71 months). Age was defined at the time of the specimen collection date.

Duplicate tests were removed using concatenation during data analysis.

Information on race and ethnicity is inconsistently reported within PA-NEDSS. For example, 24% of cases had race classified as unknown and 12% had race classified as other. Many cases had multiple race categories chosen as well. Fractional assignment was used to properly account for multiracial cases. Furthermore, 77.4% of children did not have ethnicity information recorded in the PA-NEDSS system. Therefore, DCHD's ability to draw conclusions regarding childhood blood lead information and race and/or ethnicity in Delaware County with this dataset is limited.

Limitations

Readers of the 2021 Delaware County Child Lead Report should be aware that public health surveillance data for childhood blood lead has inherent limitations that may influence the interpretation of data. For this data set, race and ethnicity data are unconsistently reported. Many cases had one race choice selected as well as race unknown or race other while other cases have multiple races checked. As described in the Methods section, fractional assignment was used to account for these discrepancies in data.

Data exported from PA-NEDSS can be unclear as a data dictionary is not available. For example, six different date columns for lead tests are included, none of which produce uniformly exact counts. To account for this issue, the collection date column titled 'COLL' was utilized for all cases.

Another limitation to this report is the underreporting of cases. Children on Medicaid/CHIP are required to receive blood lead screening tests at age 12 months and 24 months. Also, children between 24 months and 72 months with no record of a previous blood lead screening test are required to receive one. Children covered under private insurance do not typically get tested unless a parent or guardian requests one. Even so, testing is primarily based on risk and it is difficult to receive a test if the risk factors are not present. Capillary point of care testing may not be reported as consistently as venous testing.

Definitions

Data sources: Pennsylvania Department of Health, PA-NEDSS.

- Case definition[3]

[3] CDC: https://www.cdc.gov/nceh/lead/data/blood-lead-reference-value.htm

- On May 14, 2021, the Lead Exposure and Prevention Advisory Committee (LEPAC) voted to lower the childhood blood lead reference value from 5 µg/dL to 3.5 µg/dL.
- Laboratory criteria for diagnosis
  - Blood lead concentration, as determined by a Clinical Laboratory Improvement Amendments (CLIA)-certified facility, of ≥3.5 µg/dL in a child (person <16 years of age).
- Case classification[4]
  - Confirmed lead poisoning
    - One venous blood specimen with elevated lead concentration (≥3.5 µg/dL), or two capillary blood specimens, drawn within 12 weeks of each other, both with ≥3.5 µg/dL.
  - Unconfirmed
    - A capillary blood lead test ≥ 3.5 µg/dL with no other blood lead test done in the next 12 weeks.

- Testing requirements
  - All children enrolled in Medicaid, regardless of whether coverage is funded through title XIX or XXI, are required to receive blood lead screening tests at ages 12 months and 24 months. In addition, any child between 24 and 72 months with no record of a previous blood lead screening test must receive one. Completion of a risk assessment questionnaire does not meet the Medicaid requirement. The Medicaid requirement is met only when the two blood lead screening tests identified above (or a catch-up blood lead screening test) are conducted.[5]
  - In Pennsylvania, clinical laboratories are required to report all BLL results from both venous and capillary specimens for persons under 16 years of age to the Pennsylvania Department of Health (28 Pa. Code § 27.34). In addition, clinicians are required to report cases of lead poisoning for children under 16 and for pregnant women (28 Pa. Code § 27.34). Reports are submitted electronically (either through electronic laboratory reporting or online key entry) to the Department through NEDSS).[6]

- Blood Lead Level (BLL)
  - The numeric result of a blood lead test, expressed in micrograms per deciliter (µg/dL).

- Capillary
  - A blood lead test with blood drawn from a finger stick.

- Confirmed EBLL
  - ≥3.5 µg/dL or two capillary blood lead tests ≥3.5 µg/dL drawn within 12 weeks of each other.

- Elevated Blood Lead Level (EBLL)
  - A BLL ≥3.5 µg/dL.

[4] PADOH 2020 Childhood Lead Surveillance Annual Report: https://delcogov.sharepoint.com/sites/EpidemiologyUnit/Shared%20Documents/Lead%20Project/2020%20Childhood%20Lead%20Surveillance%20Annual%20Report.pdf?CT=1664213085670&OR=ItemsView

[5] Medicaid: https://www.medicaid.gov/medicaid/benefits/early-and-periodic-screening-diagnostic-and-treatment/lead-screening/index.html

[6] PADOH 2020 Childhood Lead Surveillance Annual Report: https://delcogov.sharepoint.com/sites/EpidemiologyUnit/Shared%20Documents/Lead%20Project/2020%20Childhood%20Lead%20Surveillance%20Annual%20Report.pdf?CT=1664213085670&OR=ItemsView

- Municipality
    - A political subdivision of a state within which a municipal corporation has been established to provide general local government for a specific population concentration in a defined area.

- Race
    - White, Black, Asian, American Indian, Pacific Islander, Other, and/or Unknown.

- Ethnicity
    - Non-Hispanic White, Non-Hispanic Black, Hispanic, and/or Unknown.

DCHD in Action

Addressing childhood lead poisoning in Delaware County is a collaborative effort involving the work of many partners. DCHD, in conjunction with Delaware County Office of Housing and Community Development, Community Action Agency of Delaware (CAADC) the Women, Infant, and Children (WIC) program, the Foundation for Delaware County, Children First, health professionals, local housing and code officials, landlords and families all work together to identify children exposed to lead and mitigate those exposures.

DCHD plays a key role in this complex system through case management of children identified with EBLLs and through evaluation of surveillance data to support public health action.

A DCHD Maternal & Child Health Nurse (MCH nurse) monitors and follows up on elevated blood lead levels (≥3.5 µg/dL) in children under the age of 16 years living in Delaware County. Upon confirmation of an EBLL, DCHD will send out a letter to families that includes educational materials and steps to take to prevent/decrease exposure to lead. When a child has an EBLL ≥15 µg/dL, the MCH nurse will contact the parent/guardian to facilitate follow-up testing between the child and their pediatrician, in addition to providing continued guidance and education on potential sources of exposure, how to limit exposure, and any other guidance families may need. Referrals to the Pennsylvania Special Supplemental Nutritional Program for Women, Infants, and Children (WIC) and remediation programs are provided as appropriate. DCHD's Epidemiology team supports the MCH nurse in case management and evaluates surveillance data.

Overall, this system links lead poisoning case investigations with case management and lead mitigation services in a multidisciplinary, coordinated program. This approach supports real-time monitoring of lead levels among children identified with lead poisoning.

Findings

- **A total of 9,749 tests were conducted among 9,283 children.**
- There were **4,882** children under age 2 tested and **8,907** children under age 6 tested in 2021.
- There were **89** children under age 2 with confirmed EBLL ≥3.5 µg/dL
- There were **0** children under age 2 with EBLL ≥3.5 µg/dL from capillary tests
- There were **89** children under age 2 with EBLL ≥3.5 µg/dL from venous tests
- There were **264** children under age 6 with confirmed EBLL ≥3.5 µg/dL
- There was **1** child under age 6 with EBLL ≥3.5 µg/dL from capillary tests
- There were **263** children under age 6 with EBLL ≥3.5 µg/dL from venous tests
- **A total of 294 children (3.3% of those tested) met the case definition for confirmed EBLL** (one venous blood lead test ≥3.5 µg/dL or two capillary blood lead tests ≥3.5 µg/dL drawn within 12 weeks of each other).

- Of those, **1 child had two blood capillary tests ≥3.5 µg/dL drawn within 12 weeks of each other** and **293 children had one venous blood lead test ≥3.5 µg/dL**. Of the 293 children who had one venous blood lead test ≥3.5 µg/dL, there were a total of 419 tests conducted.

There were 360 children aged 0-15 with an initial capillary test ≥3.5 µg/dL. Of those, 135 (38%) were re-tested appropriately.

Age Category	Total # of Tests	Capillary Test		Venous Test		Blank
		N	%	N	%	N
0-23 months (under 2 years)	5,050	3,695	73.17%	1,332	26.38%	23
0-71 months (under 6 years)	9,354	6,574	70.28%	2,731	29.20%	49
0-15 years	9,749	6,653	68.24%	3,042	31.20%	54

Age Category	Total Unique Patients	Capillary Test		Venous Test	
		N	%	N	%
0-23 months (under 2 years)	4,882*	3,650	74.76%	1,277	26.16%
0-71 months (under 6 years)	8,907*	6,455	72.47%	2,559	28.73%
0-15 years	9,283*	6,534	70.39%	2,855	30.76%

*Capillary and venous unique tests will not equal total unique patients as some children received both tests.

Age Category	CONFIRMED Unique Pts (≥3.5 µg/dL)	Capillary Test		Venous Test	
		N	%	N	%
0-23 months (under 2 years)	89	0	0%	89	100%
0-71 months (under 6 years)	264	1	0.38%	263	99.62%
0-15 years	294	1	0.34%	293	99.66%

Frequency Distribution of EBLLs in Delaware County

- The distribution of confirmed cases for 2021 is unimodal and skewed right with a long tail. The majority of EBLLs in Delaware County are closest to 6 µg/dL.
- The center (average) confirmed EBLL is 6.81 µg/dL.
- EBLLs range from 3.5 µg/dL to 59 µg/dL.
- There are 10 blood lead tests greater than 25 µg/dL.

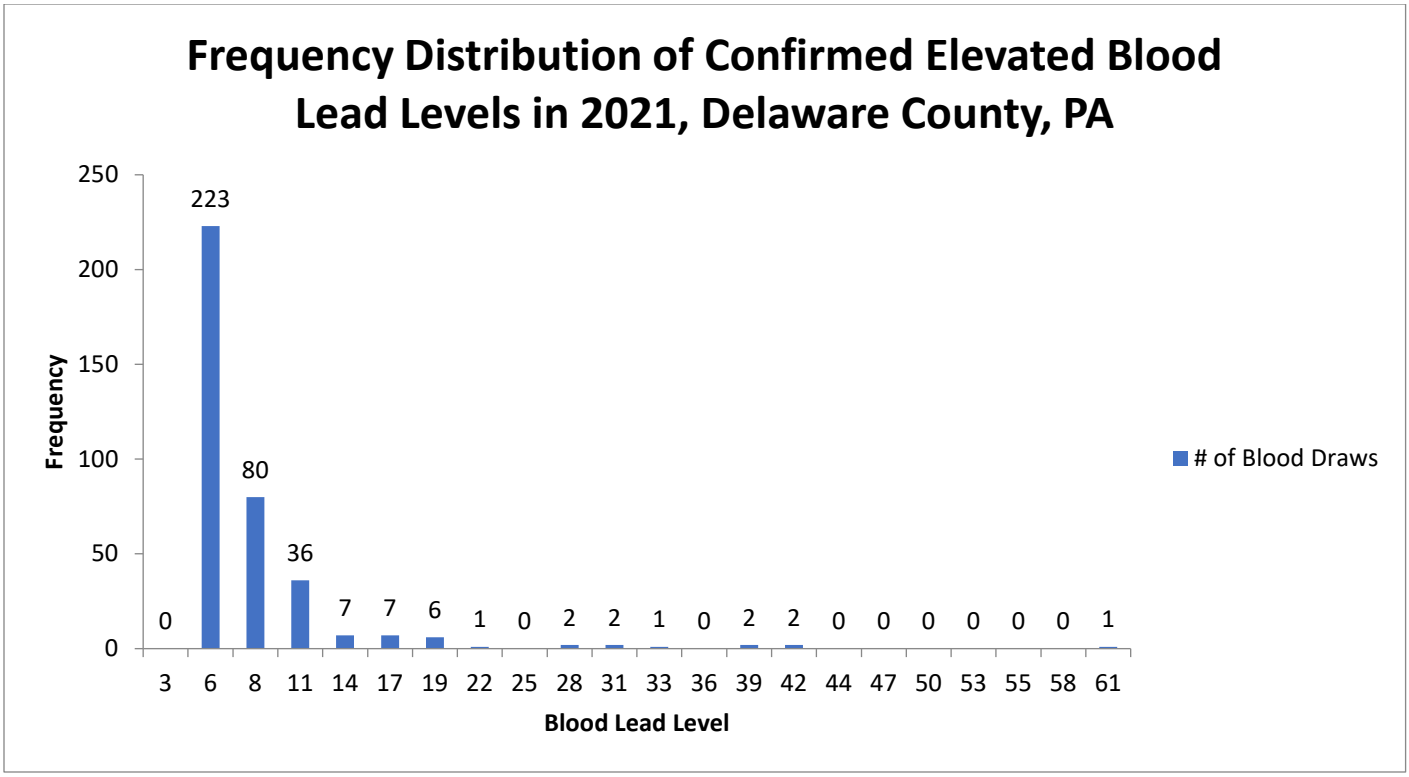

Frequency Distribution of Confirmed Elevated Blood Lead Levels in 2021, Delaware County, PA
Frequency
250
200
150
100
50
0
223
80
36
7
7
6
1
0
2
2
1
0
2
2
0
0
0
0
0
0
1
3 6 8 11 14 17 19 22 25 28 31 33 36 39 42 44 47 50 53 55 58 61
Blood Lead Level
# of Blood Draws

Table 1: Characteristics of Children Tested for Lead by Age Category, 2021

	Children aged 0-23 Months (Under 2)		Children aged 0-71 Months (Under 6)		Children aged 0-15	
	N	% of total	N	% of total	N	% of total
Total # of children tested†	4,882	52.59%	8,907	95.95%	9,283	100%
Sex						
Female	2,444	50.06%	4,385	49.23%	4,544	48.95%
Male	2,429	49.75%	4,499	50.51%	4,715	50.79%
Unknown	9	0.18 %	23	0.26%	24	0.26%
Race						
Asian	191	3.91%	364	4.09%	388	4.18%
Black or African American	1,262	25.85%	2,487	27.92%	2,622	28.25%
White	1,656	33.92%	2,832	31.80%	2,900	31.24%
American Indian	17	0.35%	36	0.40%	40	0.43%
Islander	1	0.02%	5	0.06%	5	0.05%
Other	535	10.96%	1,072	12.04%	1,122	12.09%
Unknown	1,219	24.97%	2,112	23.71%	2,206	23.76%
Blank	1	0.02%				
Ethnicity						
Hispanic	287	5.88%	553	6.21%	585	6.30%
Non-Hispanic	797	16.33%	1,455	16.34%	1,513	16.30%
Unknown	3,258	66.73%	6,000	67.36%	6,239	67.21%
Blank	540	11.06%	899	10.09%	946	10.19%
Maximum BLL (µg/dL)*						
< 3.5	4,675	95.76%	8,357	93.83%	8,692	93.63%
3.5-4.9	90	1.84%	235	2.64%	249	2.68%
5-9.9	82	1.68%	219	2.46%	232	2.50%
10-19.9	28	0.57%	73	0.82%	84	0.90%
20-44.9	5	0.10%	20	0.22%	23	0.25%
45-59.9	2	0.04%	1	0.01%	1	0.01%
60-69.9	-	-	1	0.01%	1	0.01%
≥ 70	-	-	1	0.01%	1	0.01%

†Number of Pennsylvania children within the age category who had at least one blood lead test done with a specimen collection date in 2020
*Highest venous blood lead level (BLL) obtained per child in 2020, or highest BLL from a capillary or unknown specimen source, if no venous test was performed
Data sources: Pennsylvania Department of Health, PA-NEDSS

Table 2: Characteristics of Confirmed Elevated BLL (≥3.5) of Children Tested for Lead by Race and Age Category, 2021

	Children aged 0-23 Months (Under 2)		Children aged 0-71 Months (Under 6)		Children aged 0-15	
	N	% of total	N	% of total	N	% of total
Total # of confirmed cases	**89**	**30.27%**	**264**	**89.80%**	**294**	**100%**
Sex						
Female	**51**	**57.30%**	**112**	**42.42%**	**121**	**41.16%**
Male	**38**	**42.70%**	**150**	**56.82%**	**171**	**58.16%**
Unknown	**0**	**0.00%**	**2**	**0.76%**	**2**	**0.68%**
Race						
Asian	**4**	**4.49%**	**18**	**6.82%**	**19**	**6.46%**
Black or African American	**39**	**43.82%**	**124**	**46.97%**	**140**	**47.51%**
White	**21**	**23.60%**	**36**	**13.64%**	**43**	**14.63%**
American Indian	**0**	**0.00%**	**3**	**1.14%**	**3**	**0.85%**
Islander	**0**	**0.00%**	**0**	**0.00%**	**0**	**0.11%**
Other	**15**	**16.85%**	**48**	**18.18%**	**52**	**17.63%**
Unknown	**10**	**11.24%**	**33**	**12.50%**	**38**	**12.13%**
Blank	**-**	**-**	**2**	**0.76%**	**2**	**0.68%**
Ethnicity						
Hispanic	**13**	**14.61%**	**31**	**11.74%**	**32**	**10.88%**
Non-Hispanic	**12**	**13.48%**	**36**	**13.64%**	**45**	**15.31%**
Unknown	**54**	**60.67%**	**160**	**60.61%**	**176**	**59.86%**
Blank	**10**	**11.24%**	**37**	**14.02%**	**41**	**13.95%**

Table 3: Elevated Blood Lead Confirmation Status per Case Definition by Age Category, 2021

	Children aged 0-23 Months		Children aged 0-71 Months	
	N	% of total	N	% of total
Total # of children tested	**4,882**	**100%**	**9,283**	**100%**
Confirmation Status				
Not elevated (< 3.5 µg/dL)**	**4,706**	**96.39%**	**8,441**	**90.93%**
Unconfirmed elevated†	**4,710**	**96.48%**	**8,441**	**90.93%**
Confirmed 3.5-9.9 µg/dL	**74**	**1.52%**	**224**	**2.41%**
Confirmed ≥ 10 µg/dL	**37**	**0.76%**	**96**	**1.03%**

*CDC case definition defines a confirmed elevated BLL as one venous blood lead test ≥3.5 µg/dL, or 2 capillary blood lead tests ≥3.5 µg/dL drawn within 12 weeks of each other.
**The child had either no BLL ≥3.5 µg/dL or had an initially elevated capillary BLL that was found to be <3.5 µg/dL on either venous or capillary retest.
†The initial capillary test was ≥3.5 µg/dL, but the test result was not confirmed by a venous or capillary retest within 12 weeks.
Data sources: Pennsylvania Department of Health, PA-NEDSS.

Table 4: Details of Elevated Blood Lead Confirmation Status by Age Category, 2021

		Children aged 0-23 Months		Children aged 0-71 Months	
		N	% of total	N	% of total
# of Children Tested		4,882	100%	9,283	100%
Confirmation Status	Outcome				
Not elevated (< 3.5 µg/dL)	BLL < 3.5 µg/dL	4,706	96.39%	8,441	90.93%
	Repeat capillary test did not confirm the initial elevated capillary test	6	0.12%	11	0.12%
	The venous test did not confirm the initial elevated capillary test	24	0.49%	55	0.59%
Unconfirmed elevated (< 3.5 µg/dL)†	Not retested appropriately	87	1.78%	216	2.33%
Confirmed 3.5-9.9 µg/dL	Capillary confirmed by repeat capillary test	0	0.00%	1	0.01%
	Capillary confirmed by venous test	20	0.41%	34	0.37%
	Venous test	74	1.52%	223	2.40%
Confirmed ≥ 10 µg/dL	Capillary confirmed by repeat capillary test	0	0.00%	1	0.01%
	Capillary confirmed by venous test	6	0.12%	14	0.15%
	Venous test	37	0.76%	96	1.03%

*CDC case definition defines a confirmed elevated BLL as one venous blood lead test ≥3.5 µg/dL, or 2 capillary blood lead tests ≥3.5 µg/dL drawn within 12 weeks of each other.
**The child had either no BLL ≥3.5 µg/dL or had an initially elevated capillary BLL that was found to be <3.5 µg/dL on either venous or capillary retest.
†The initial capillary test was ≥3.5 µg/dL, but the test result was not confirmed by a venous or capillary retest within 12 weeks.

Maps

Delaware County's Office of Sustainability, Mapping and Data Services collaborated with DCHD to provide invaluable support in developing the maps in this report.

Map 1 summarizes all of the blood lead tests by census tract reported for children 0-15 years of age in Delaware County in 2021.

Map 2 summarizes the number of blood lead tests ≥3.5 µg/dL by census tract reported for children 0-15 years of age in Delaware County in 2021.

Map 3 summarizes the average blood lead levels ≥3.5 µg/dL by census tract reported for children 0-15 years of age in Delaware County in 2021.

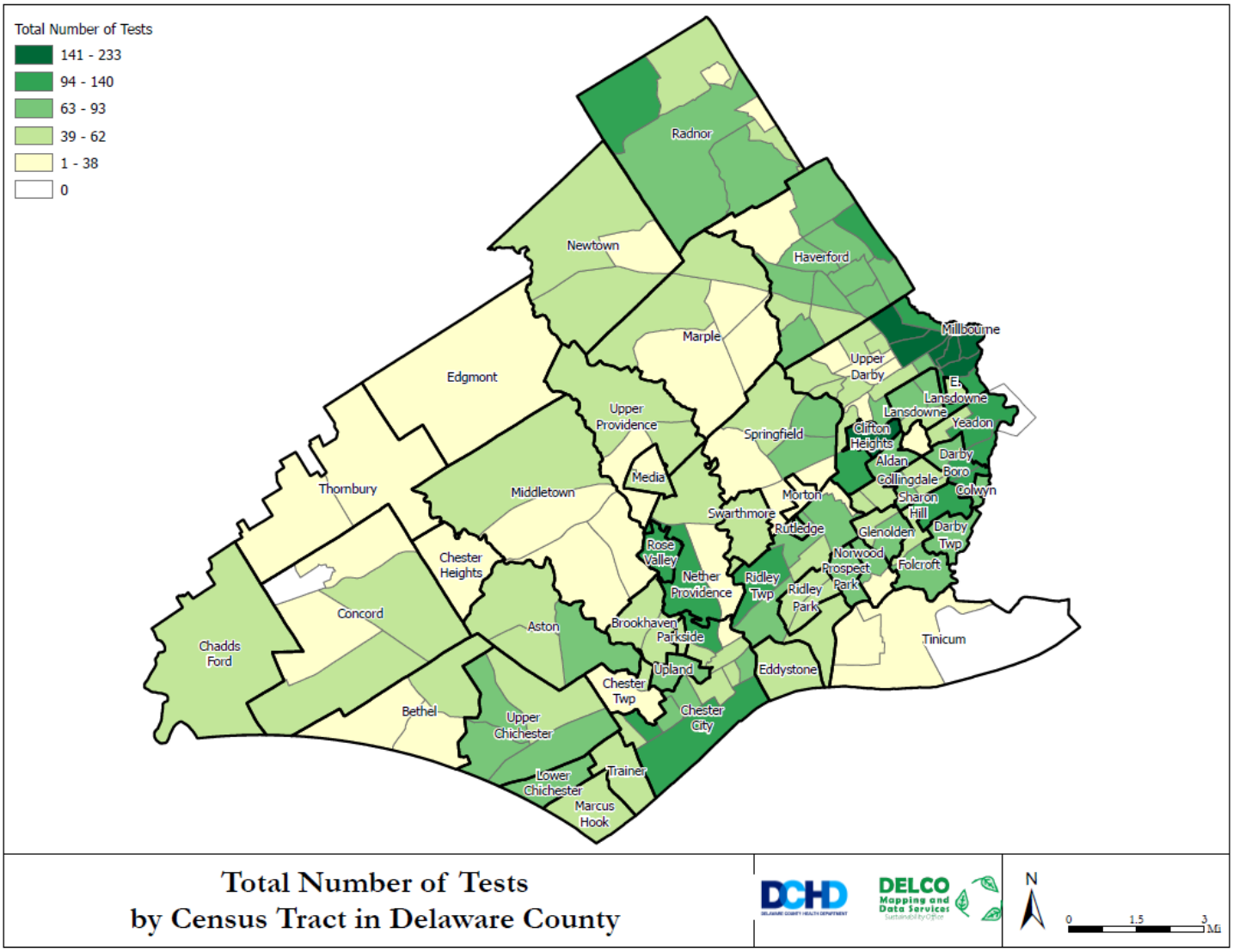
Map 4 summarizes the American Community Survey (ACS) 2016-2020 housing units by year built by census tract in Delaware County.

Locations of homes remediated under Delaware County Office of Housing & Community Development's lead hazard reduction program in 2020-2021 are also indicated on Maps 2-4.

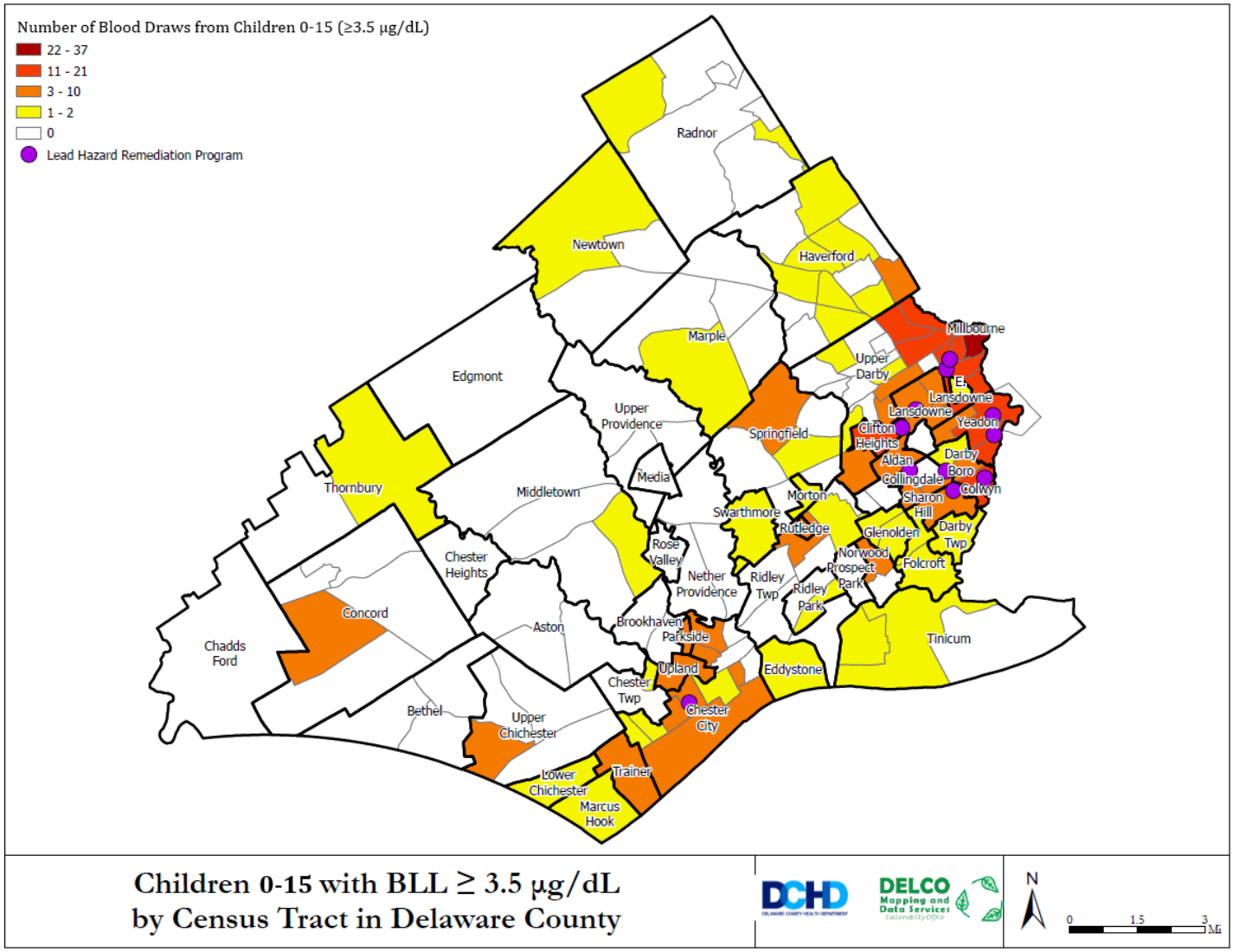
As depicted on the maps, eastern Delaware County has the highest childhood blood lead poisoning burden. Specifically:

- By municipality, the jurisdictions reporting 10 or more children with EBLLs include Upper Darby (101), Lansdowne (35), Chester (32), Darby (29), and Drexel Hill (14).
- By census tract, Census Tract 4020 in Lansdowne (37), Census Tract 4004.01 and in Upper Darby (21), and Census Tract 4003.01 in Upper Darby (20) had the highest number of blood lead tests ≥3.5 µg/dL.
- By census tract, Census Tract 4021 in Yeadon (24 µg/dL), followed by Census Tract 4011.03 in Drexel Hill (21 µg/dL µg/dL) and Census Tract 4061 in Parkside (20 µg/dL) had the highest average elevated blood lead levels.

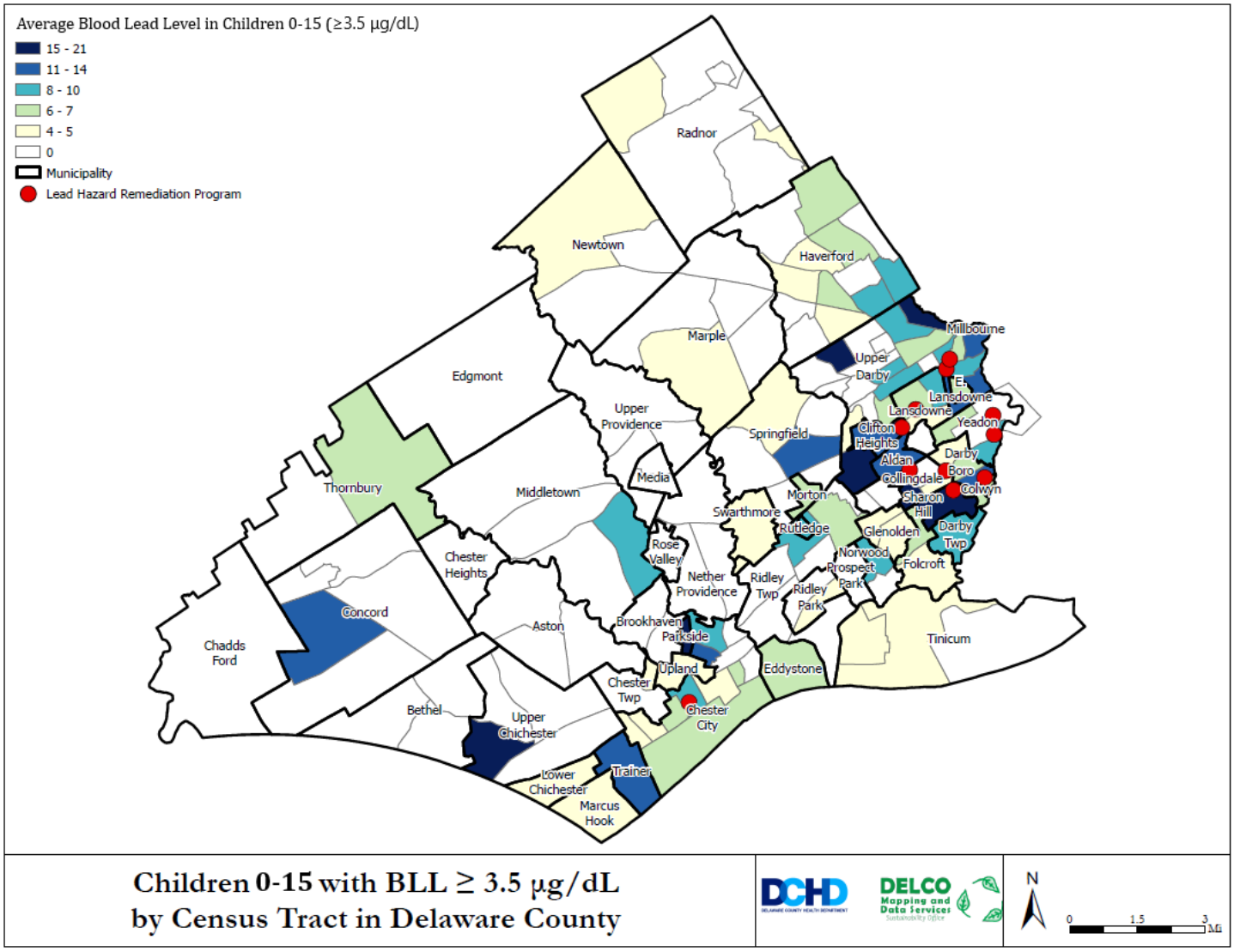
Map 1. All Blood Lead Tests Reported from Children 0-15 in Delaware County in 2021.



Map 2. Number of Blood Lead Tests ≥3.5 µg/dL Reported from Children 0-15 in Delaware County in 2021.



Map 3. Average Blood Lead Levels (≥3.5 µg/dL) Reported from Children 0-15 in Delaware County in 2021.



Map 4. Housing Units by Year Built Predominance by Census Tract in Delaware County.