

Michigan Annual Blood Lead Levels

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Abstract

The Michigan Environmental Public Health Tracking Program (MiTracking) has worked with the Michigan Childhood Lead Poisoning Prevention Program (CLPPP) to create a dataset that contains blood lead results by calendar year for Michigan children under six years of age and children ages one and two years enrolled in Medicaid. The data include the following measures:

- Number of children tested for lead.
- Number of children tested with an elevated blood lead level (EBLL).
- Percent of children tested with an EBLL.
- Number of children tested with venous EBLL by BLL range.
- Percent of children tested with venous EBLL by BLL range.

The following measures are included only for children under six years old, for each geographic area:

- Population.
- Percent of children tested for lead.

The data are aggregated and stratified by geography of residence at the time of the test, year tested, test sample type and venous EBLL categories.

This dataset is updated twice yearly.

All users are recommended to read and fully comprehend the metadata prior to data use. To access these data, please visit the [MiTracking Data Portal](#).

Purpose

The dataset provides public health professionals, researchers and the public with summary information on childhood blood lead testing in the state of Michigan. These data can be used to guide interventions and allocation of resources related to blood lead testing and prevention of lead exposure in young children.

Supplemental Information

Blood Lead Testing

The MDHHS CLPPP provides information to help providers and families determine when children should be tested for lead exposure and for understanding lead exposure risks and mitigation strategies.^{1,2} Children under age six are the primary focus of testing since they are most likely to

experience negative health effects from lead exposure. Until 2023, only children enrolled in Michigan Medicaid programs and the WIC program were required to be tested for lead exposure (see [MCL 280.400.111](#)). For more information on identification and reporting of Medicaid enrolled children, please refer to the [CLPPP Annual Report](#). For other children under six years old, the child's family and medical care providers decided if testing was needed. In October 2023, a law was passed ([MCL 333.5474d](#)) that requires all children to be tested for lead exposure at ages 12 and 24 months and at other ages depending on their risk of exposure to lead. The law took effect in January 2024 and will be fully implemented when administrative rules are promulgated.

Surveillance Database

Blood lead testing results are reported to the MDHHS CLPPP, as required by the [Public Health Code MCL 333.5474](#). These test results are stored in the MDHHS data warehouse. Test results are analyzed, and results of analyses are posted on the [MiTracking Data Portal](#).

Population Estimates

Annual population estimates for children less than six years old were obtained from the [American Community Survey \(ACS\) five-year population estimates table B09001 for Population Under 18 Years of Age](#). For example, the 2017 population estimate listed is the 2013-2017 ACS five-year estimate. In cases where the population estimate for the year is not yet available from ACS, the estimate from the latest year available was used. For more information, see the [ACS General Handbook](#).

Keywords

Exposure; Environmental exposure; Childhood lead poisoning; Blood lead levels; Elevated blood lead levels; BLL; Lead; Pb; Capillary blood; Venous blood; Blood lead screening

Bounding Coordinates

Geographically, all cases in this dataset occurred for residents of the state of Michigan. This means that all cases were for Michigan residents within the latitude/longitude coordinates listed below.

- West Bounding Coordinate: -90.41813399999995
- East Bounding Coordinate: -82.418394000000006
- North Bounding Coordinate: 48.189534000000002
- South Bounding Coordinate: 41.696088000000003

Other Information on Data

Level of Geographic Detail: Statewide, County, City of Detroit and ZIP code

Data Current as of: May 31, 2024

Frequency at which the data are updated: Twice per year

Data Status: Complete

Completeness Report

This dataset contains blood lead test results for all Michigan children under age six tested since 2010 using MDHHS surveillance data. Results for Medicaid-enrolled children ages one to two are provided since 2015. Yearly counts are published at least 90 days after the year is finished to allow for late test reports to arrive. In past years, about 90% of all tests are reported within 90 days of the year end. Counts for past years may change if late test reports are received or improvements are made in the analysis.

Data Processing Description

All analysis of data from the MDHHS surveillance database was completed in Statistical Analysis Software (SAS) version 9.4.

Data Source

Blood lead surveillance data were extracted from the MDHHS data warehouse, including the following variables:

- Unique identifier for the person.
- Person's date of birth.
- Unique identifier for the test.
- Specimen date (date blood was drawn).
- Blood lead test result in micrograms per deciliter of blood ($\mu\text{g}/\text{dL}$).
- Blood lead test result sign (indicates results above or below limits of detection).
- Address at the time of the blood lead test.

Inclusion Criteria

Test results were included if:

- A. The child's reported address was in Michigan, based on reported county, city or zip code. Records were excluded if they were missing all three of these parts of the address or had a non-Michigan address.

AND

- B1. Specimen date was in 2010 through 2023.

AND

B2. The child was under six years old at the time of the test (specimen date was before the child's sixth birthday).

OR

C1. The specimen date was in 2015 through 2023.

AND

C2. The child was one to two years old (specimen date was on the date of their first birthday through the day before their third birthday).

AND

C3. The child had at least one blood lead test while enrolled in Medicaid during any point of the year.

To report the number of children who were tested (instead of the number of tests overall), it is necessary to deduplicate test results so that only one test is counted for each child in each year. If a child had more than one test within the calendar year, the highest BLL from a venous test was kept because it is the most accurate type of test.³ If there was no venous test, the highest BLL from a capillary test was kept. If the only test results were of unknown sample type, then the highest of those results was kept.

Data Calculations

Counts of the number of children tested were grouped by year of specimen date, blood lead level and geographic area of residence at the time of the blood lead test. These geographic areas are the state, county and zip code. Detroit and the rest of Wayne County are treated as two separate counties, listed as city of Detroit and Wayne (without Detroit).

MDHHS considers results at or above the CDC blood lead reference value (BLRV) to be an EBL. In 2021, the CDC changed the BLRV from 5 µg/dL to 3.5 µg/dL.⁴ MDHHS adopted the new BLRV of 3.5 µg/dL in 2022.⁵ Blood lead data in MiTracking are provided for both definitions of an EBL.

All test results were rounded to the nearest whole number before being assigned to a BLL category, with the exception of a value of 3.5 µg/dL. A test result of 4.5 µg/dL was rounded up to 5 µg/dL and included as an elevated result under the CDC's previous blood lead reference value.

This dataset includes the following measures for both children under age six and Medicaid-enrolled children ages one to two for each geography:

- Number tested for lead.
- Number with an EBL (results ≥5 µg/dL and results ≥3.5 µg/dL).
 - Stratified by capillary or venous EBL.
- Percent with an EBL among those tested: $\frac{\text{Number with EBL}}{\text{Total Number tested}} \times 100$.

- Stratified by capillary or venous EBLL among those tested:

$$\frac{\text{Number with capillary or venous EBLL}}{\text{Total Number tested}} \times 100.$$
- Number tested with venous EBLL by BLL range: ≥ 3.5 , ≥ 5 , 5-9, 10-14, 15-19, 20-44 and ≥ 45 $\mu\text{g/dL}$.
- Percent with venous EBLL by BLL range among those tested: ≥ 3.5 , ≥ 5 , 5-9, 10-14, 15-19, 20-44 and ≥ 45 $\mu\text{g/dL}$:
$$\frac{\text{Number with a venous EBLL in category}}{\text{Total Number tested}} \times 100.$$

The following measures are included only for children under six years old, for each geographic area:

- Population.
- Percent tested for lead:
$$\frac{\text{Total Number tested}}{\text{Population}} \times 100.$$

Note that previous versions of these data included BLL ranges 20-39 $\mu\text{g/dL}$ and greater than or equal to 40 $\mu\text{g/dL}$. This was updated to make the last category match national standards for reporting children who may need chelation at greater than or equal to 45 $\mu\text{g/dL}$.

Data Limitations

- When a child has more than one blood lead test, a computer algorithm uses information like name and date of birth to link each test result to the same child. However, the algorithm is not perfect. Errors in spelling of names, dates of birth and other information may cause the linkage to fail. In this way, the number of children can be overcounted because it appears that the tests were for more than one child.
- Laboratories across Michigan do not report race and ethnicity information in a consistent way, so it is unavailable in these data. This is an area that CLPPP is working to improve so that this information can be provided in the future.
- Mailing addresses are reported to CLPPP from the child's caregiver, health provider or testing laboratory. Address processing changed in November 2017 with the addition of automatic verification and geocoding.
 - Prior to November 2017, a child's county of residence was based on the reported address. From November 2017 onward, county of residence has been based on geocoding.
 - Zip code is from the reported address.
 - Between 1997 and 2017, the Michigan Public Health Code required laboratories to report blood lead test results rounded to the nearest whole number. Beginning in 2018, CLPPP was able to collect blood lead test non-rounded results, and the Public Health Code has been changed to take advantage of this feature. In addition, blood lead test

reports now include indicators (< or >) that a given test result was above or below the laboratory limits.

Examples are provided below to illustrate the impact of these changes:

- Before the change, a child with a BLL of 4.5 µg/dL was reported to CLPPP as a rounded value of 5 µg/dL. This child would then be at the action level for services. The result is now stored in the database as the actual value of 4.5 µg/dL. To keep the same level of service as in the past, CLPPP now rounds blood lead levels ≥ 4.5 when reporting results using the BLRV of 5 µg/dL. For example, CLPPP considered a value of 4.5 µg/dL to be an elevated result, but a value of 4.4 µg/dL to be a non-elevated result, prior to the CDC's blood lead reference value change.
- Point-of-care testing by LeadCare II blood lead analyzers has a limit of detection of 3.3 µg/dL. Before the change, a laboratory would have reported a result below the limit of detection as "3 µg/dL" with no less-than sign. This meant that the CLPPP database could not distinguish between a result below 3.3 µg/dL and equal to 3 µg/dL prior to November 2017. Now, the less-than sign (<) is stored with these test results, allowing for identification of results below the limit of detection.

Interpretation of Results

Michigan historically has used a targeted testing approach, where blood lead testing has been required for children enrolled in Medicaid⁶ and WIC* and testing for other children has been done based on the judgement of the child's health care provider. In January 2024, the Michigan legislature adopted universal blood lead testing requirements for all children at 12 months and 24 months of age. The universal testing requirements will be fully implemented in late 2024 or early 2025 when administrative rules will be promulgated.

The following limitations apply to 2010-2023 data.

- Since not all children are tested, it is likely that not all children with EBLL are tested.
- The true proportion of Michigan children with an EBLL might be lower than reported due to targeted testing.
- Results are not representative of all children in the state, counties or Detroit. Children who are tested may have different characteristics (like age, race and ethnicity, or Medicaid status) and may have been exposed to different risk factors (like poverty and living in older housing), than children who are not tested.

* MCL 400.111| <http://legislature.mi.gov/doc.aspx?mcl-400-111>

- For example: 66% of tested children under six years old in 2017 were enrolled in Medicaid, while 50% of all Michigan children under six years old were enrolled in Medicaid.⁶
- Capillary blood lead tests are known to produce false positives, where a test result indicates that the lead level is higher than it truly is.⁷ Many EBLLs are from these types of tests. For example, in 2017, 44.6% of all EBLLs in Michigan children under six years old were from capillary tests that had not been confirmed with a venous test.⁷
- Year-to-year comparisons of the percent of children with EBLL should be interpreted with caution. Changes may be due to real change in elevated blood lead levels, but changes can also be driven by differences in testing rates and the underlying risk factors of children that are tested. Factors influencing the testing rate may include changes in blood lead testing rules and practices, changes in confirmatory testing practices, how well physicians are following these guidelines, and public awareness, access and demand for blood lead testing.

Comparing Findings with Other Lead Reports

- Other agencies periodically obtain CLPPP data for their own analyses. Their results may not be the same as those reported by MDHHS. This may be because they use different methods to determine the population, total number of children tested, which test is chosen for each child for the year (deduplication) and the definition of an EBLL. These inconsistencies can make it problematic to compare results between agency reports.
 - Please Note: The CDC Tracking Program Childhood Lead Poisoning Content Workgroup designed a classification system to select one test per child per calendar year that differs from the MDHHS CLPPP's methodology described above. Thus, the data presented on the MiTracking Data Portal will differ from the Michigan data on the CDC's data explorer.
- The CLPPP dataset is constantly updated to reflect new information. Analysis methods are continually being improved. This means that information about past years presented in these data may not exactly match the information from past updates. The most complete information is always contained in the most recent update.

Access Constraints

There are no access constraints for data available through the MiTracking Data Portal. To access these data, please visit the [MiTracking Data Portal](#).

Use Constraints

It is recommended that all users read and fully comprehend the metadata prior to data use. For a more thorough description of the data and methods for analysis, see the [CLPPP Annual Blood Lead Reports](#).

These data cannot be used for commercial purposes and shall not be used to engage in any method, act or practice to conduct the solicitation or advertisement of goods, services or real estate to Michigan consumers.

To protect privacy, counts between one and five are suppressed (not reported); other counts are not reported if they can be used to calculate the suppressed counts. This is called [complementary \(or secondary\) suppression](#).

Security Handling Description

If data are distributed, the use constraints specified in this metadata apply to all recipients of the data.

Confidentiality of all data is required by law and strictly maintained by MDHHS staff. Section 2631 of the Public Health Code regulates procedures protecting confidentiality and regulating disclosure of data and records.

Distribution Liability

The MiTracking Program is maintained, managed and operated by the Division of Environmental Health within MDHHS. In preparation of these data, every effort has been made to offer the most current, correct, complete and clearly expressed information possible. Nevertheless, some errors in the data may exist. In particular, MDHHS disclaims any responsibility for source data, compilation and typographical errors and accuracy of the information that may be contained in these data.

These data do not represent the official legal version of source documents or data used to compile these data. MDHHS further reserves the right to make changes to these data at any time without notice.

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The sale or resale of the data, or any portions thereof, is prohibited unless with the express written permission of MDHHS and CLPPP. These data may not be used for commercial purposes without first obtaining written permission from CLPPP.

If errors or otherwise inappropriate information is brought to our attention, a reasonable effort will be made to fix or remove it. Such concerns should be addressed to the MiTracking Program.

Custom Order Process

For more information or access to unrestricted or public use Michigan-specific data, please contact CLPPP. Most of the information needed is in the annual reports or supplemental documents, available on the [CLPPP website](#), on the [Lead Data and Reports webpage](#). However, if other information is needed, please email MDHHS-CLPPP@michigan.gov. The CLPPP team can provide non-identifiable summary data (counts and percentages); they may ask you to fill out a data request form to better understand your needs. If the information needed is not summary-level (not aggregated, with information about individual tests or children) or is needed for research purposes, a Data Use Agreement and/or Institutional Review Board approval may be required.

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