# Biomonitoring - Lead

Lead is a naturally occurring metal used in the production of fuels, paints, ceramic products, batteries, solder, and a variety of consumer products. The use of leaded gasoline and lead-based paint was eliminated or restricted in the United States; however, children continue to be exposed to lead due to the widespread distribution of lead in the environment.

On this page:



## Indicators

### Lead in children ages 1 to 5 years: Median and 95th percentile concentrations in blood, 1976–2020* (Indicator B1)

*The data for 2020 only go through March 2020 because the NHANES program suspended field operations due to the COVID-19 pandemic. As a result, data collection for the 2019–2020 cycle was not completed.

*Web update: 2023*

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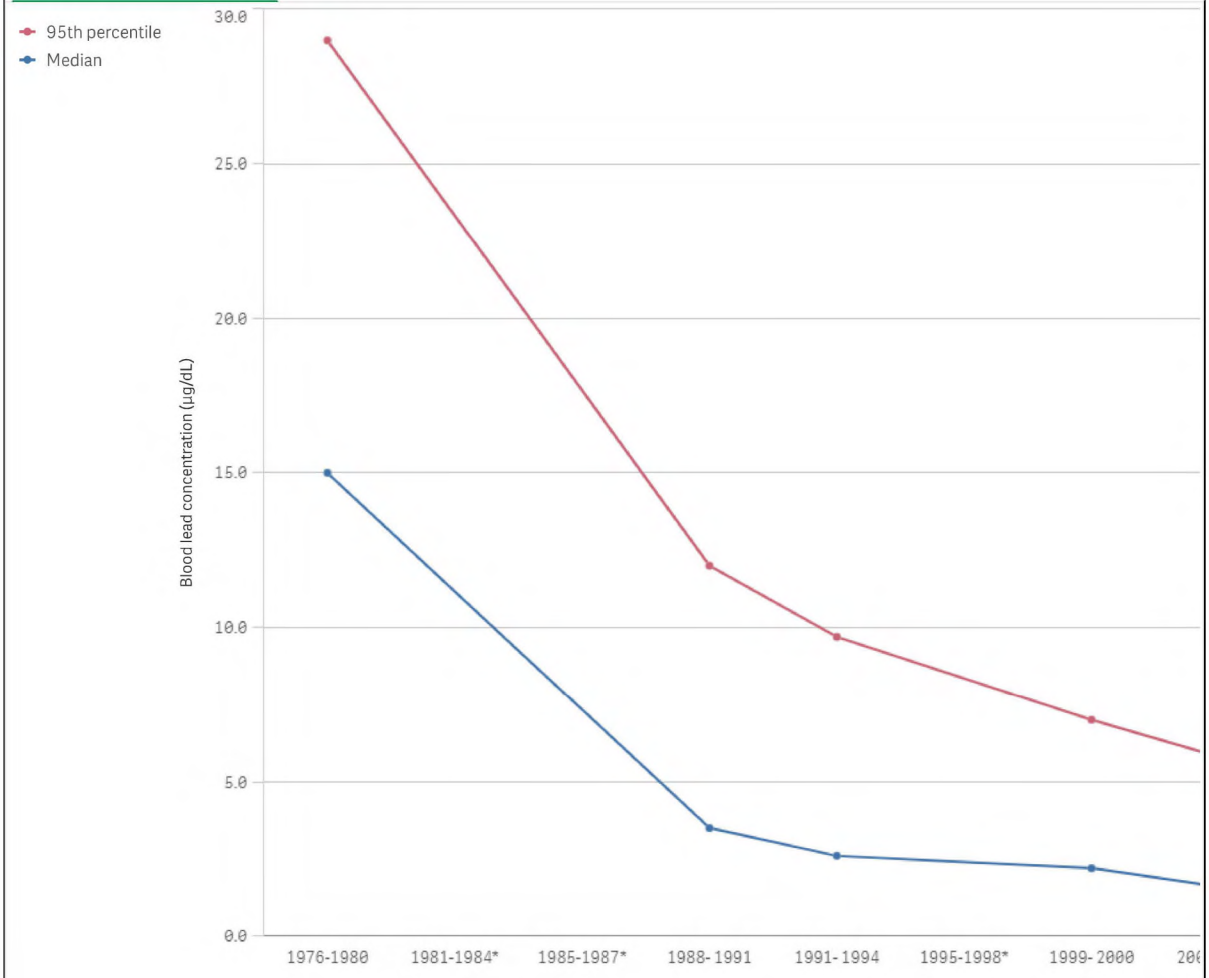
B1. Lead in children ages 1 to 5 years: Median and 95th percentile concentrations in blood, 1976-2020

B1a. Lead in children ages 1 to 17 years: Blood lead concentrations by age group, 2017-2020**

Line Chart | Data Table




*Hover over data points to view values; Right click on visualization to download an image or data*

## Data characterization

- Data for this indicator are obtained from an ongoing continuous survey conducted by the National Center for Health Statistics.
- Survey data are representative of the U.S. civilian noninstitutionalized population.
- Lead is measured in blood samples obtained from individual survey participants.

- The median concentration of lead in the blood of children between the ages of 1 and 5 years dropped from 15 µg/dL in 1976–1980 to 0.6 µg/dL in 2017–March 2020, a decrease of 96%.
- The concentration of lead in blood at the 95th percentile in children ages 1 to 5 years dropped from 29 µg/dL in 1976–1980 to 2.1 µg/dL in 2017–March 2020, a decrease of 93%.
- The largest declines in blood lead levels occurred from the 1970s to the 1990s, following the elimination of lead in gasoline. The data show continuing declines in blood lead levels from 1999–2000 through 2017–March 2020, when the primary focus of lead reduction efforts was on lead-based paint in homes.
- These decreasing trends were all statistically significant, including the trend in both the median and 95th percentile from 1999–2000 to 2017–March 2020.
- In 2017-March 2020, median blood levels by age group were highest among young children ages 1 and 2 years (0.7 µg/dL) and decreased by age group through ages 16 to 17 years (0.4 µg/dL). The 95th percentile blood lead levels were also highest among young children ages 1 and 2 years (2.4 µg/dL) and decreased by age group through ages 16 and 17 years (1.1 µg/dL). The differences among age groups in median and 95th percentile blood lead levels were statistically significant. (See Indicator B1a.)

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## Lead in children ages 1 to 5 years: Median and 95th percentile concentrations in blood, by race/ethnicity and family income, 2015-2020* (Indicator B2)

*The data for 2020 only go through March 2020 because the NHANES program suspended field operations due to the COVID-19 pandemic. As a result, data collection for the 2019–2020 cycle was not completed.

*Web update: 2023*

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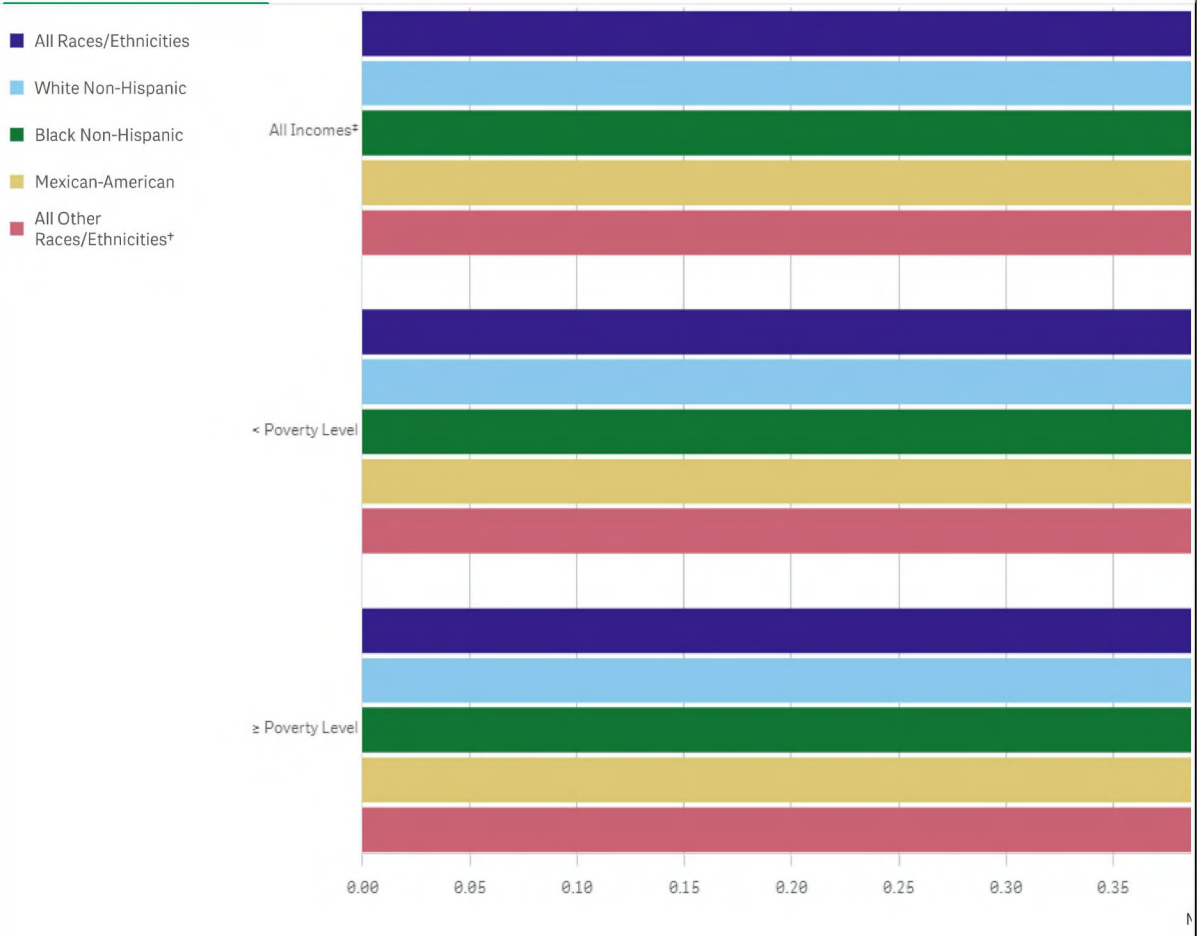
Selections

B2. Lead in children ages 1 to 5 years: Median concentrations in blood, by race/ethnicity and family income, 2015-2020*

B2a. Lead in children ages 1 to 5 years: 95th percentile concentrations in blood, by race/ethnicity and family income, 2015-2020*

Bar Chart | Data Table

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**DATA: Centers for Disease Control and Prevention, National Center for Health Statistics and National Center for Environ...**

## Data characterization

- Data for this indicator are obtained from an ongoing continuous survey conducted by the National Center for Health Statistics.
- Survey data are representative of the U.S. civilian noninstitutionalized population.
- Lead is measured in blood samples obtained from individual survey participants.

- The median blood lead level in Black non-Hispanic children ages 1 to 5 years in 2015–March 2020 was 0.8 µg/dL, higher than the level of 0.6 µg/dL in White non-Hispanic children, 0.7 µg/dL in Mexican-American children, and 0.6 µg/dL in children of "All Other Races/Ethnicities." These differences were statistically significant.
- The median blood lead level for children living in families with incomes below the poverty level was 0.8 µg/dL, and for children living in families at or above the poverty level it was 0.6 µg/dL, a difference that was statistically significant.
- The median blood lead levels in children ages 1 to 5 years were higher for those in families with incomes below the poverty level compared with those at or above the poverty level within each race/ethnicity group. The differences in median blood lead levels between income groups were statistically significant for White non-Hispanic and Black non-Hispanic children, after accounting for differences by age and sex.
- The 95th percentile blood lead level among all children ages 1 to 5 years was 2.4 µg/dL in 2015-March 2020. The 95th percentile blood lead level in Black non-Hispanic children ages 1 to 5 years was 2.8 µg/dL, compared with 2.5 µg/dL for White non-Hispanic children, 1.8 µg/dL for Mexican-American children, and 2.4 µg/dL for children of "All Other Races/Ethnicities." Except for the difference between White non-Hispanic and Black non-Hispanic children, the differences in 95th percentile blood lead levels between race/ethnicity groups were all statistically significant, after accounting for differences by age, sex, and income. (See Indicator B2a.)
- Among children ages 1 to 5 years in families with incomes below poverty level, the 95th percentile blood lead was 2.8 µg/dL, and among those in families at or above the poverty level, it was 2.2 µg/dL, a difference that was statistically significant, after accounting for differences by age, sex, and race/ethnicity. (See Indicator B2a.)
- Between 1991–1994 and 2015–March 2020, median blood lead levels among Black non-Hispanic children ages 1 to 5 years declined 81%: from 4.3 µg/dL to 0.8 µg/dL. Over the same period, median blood lead levels among Mexican-American children ages 1 to 5 years declined 77%: from 3.1 µg/dL to 0.7 µg/dL, and median blood lead levels among White non-Hispanic children ages 1 to 5 years declined 74%: from 2.3 µg/dL to 0.6 µg/dL. The differences over time were statistically significant for each race/ethnicity. (See Table B2b.)

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# About the Lead Indicators

Indicators B1 and B2 present information about lead levels measured in children. The data are from a national survey that collects blood specimens from a representative sample of the population every two years, and then measures the concentration of various contaminants in the blood. Note that the data for 2020 only go through March 2020 because the NHANES program suspended field operations due to the COVID-19 pandemic. As a result, data collection for the 2019–2020 cycle was not completed.

Lead is a naturally occurring metal used in the production of fuels, paints, ceramic products, batteries, solder, and a variety of consumer products. The use of leaded gasoline and lead-based paint was eliminated or restricted in the United States beginning in the 1970s, resulting in substantial reductions in exposure to lead. However, children continue to be exposed to lead due to the widespread distribution of lead in the environment. Currently in the United States, the major source of early childhood lead exposure is lead-contaminated house dust. A major contributor to lead in house dust is deteriorated or disrupted lead-based paint. Current sources of lead in ambient air in the United States include smelters, ore mining and processing, lead acid battery manufacturing, and coal combustion activities such as electricity generation.

The National Toxicology Program (NTP) has concluded that childhood lead exposure is associated with reduced cognitive function. Children with higher blood lead levels generally have lower scores on IQ tests and reduced academic achievement. In addition to the effects on IQ and school performance, research has increasingly focused on the effects of lead on behavior. The NTP concluded that

childhood lead exposure is associated with attention-related behavioral problems (such as inattention, hyperactivity, or attention-deficit/hyperactivity disorder) and increased incidence of problem behaviors (including delinquent, criminal, or antisocial behavior). No level of lead exposure has been identified that is without risk of deleterious health effects.

Indicators B1 and B2 present lead levels measured in blood of children from the National Health and Nutrition Examination Survey (NHANES).

More information about lead and Indicators B1 and B2 is provided in the Lead section of America's Children and the Environment, Third Edition (pdf) <https://www.epa.gov/system/files/documents/2022-04/ace3-lead-updates.pdf> (1.36 MB) .

# Methods - Lead

The National Center for Health Statistics, a division of the Centers for Disease Control and Prevention, conducts the National Health and Nutrition Examination Surveys (NHANES), a series of U.S. national surveys of the health and nutrition status of the noninstitutionalized civilian population. Interviews and physical examinations are conducted with approximately 10,000 people in each two-year survey cycle. The survey measures lead levels in blood samples collected from NHANES participants.

Indicator B1 uses the NHANES data to present median and 95$^{th}$ percentile concentrations of lead measured in blood of children ages 1 to 5 years. Indicator B2 uses the NHANES data to present median concentrations of lead measured in blood of children ages 1 to 5 years, stratified by race/ethnicity and family income.

- Detailed Methods for Indicators B1 and B2 (pdf) <https://www.epa.gov/system/files/documents/2023-07/biomonitoring-methods-lead.1976-2020.pdf> (415.21 KB)
- Metadata for National Health and Nutrition Examination Surveys (NHANES) <https://epa.gov/americaschildrenenvironment/national-health-and-nutrition-examination-survey-nhanes>

# Supplemental Data Tables

The following data tables are available to view and export for analysis and visualization. Right click the table for exporting options.

B2b. Lead in children ages 1 to 5 years: Median concentrations in blood, by race/ethnicity and family income, 1991-1994

# Related Links

- Agency for Toxic Substances and Disease Registry (ATSDR): Lead
- Centers for Disease Control and Prevention (CDC): Lead <https://www.cdc.gov/nceh/lead/>
- Centers for Disease Control and Prevention (CDC): National Report on Human Exposure to Environmental Chemicals <https://www.cdc.gov/exposurereport/>
- Centers for Disease Control and Prevention (CDC): Blood Lead Reference Value <https://www.cdc.gov/lead-prevention/php/data/blood-lead-surveillance.html#:~:text=cdc%20uses%20a%20blood%20lead,2016%20and%202017%2d2018%20cycles.>
- National Toxicology Program (NTP): Health Effects of Low-Level Lead Evaluation <https://ntp.niehs.nih.gov/whatwestudy/assessments/noncancer/completed/lead/index.html>
- U.S. Department of Housing and Urban Development (HUD): Office of Lead Hazard Control and Healthy Homes <https://www.hud.gov/program_offices/healthy_homes>
- U.S. EPA: Lead <https://epa.gov/lead>

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