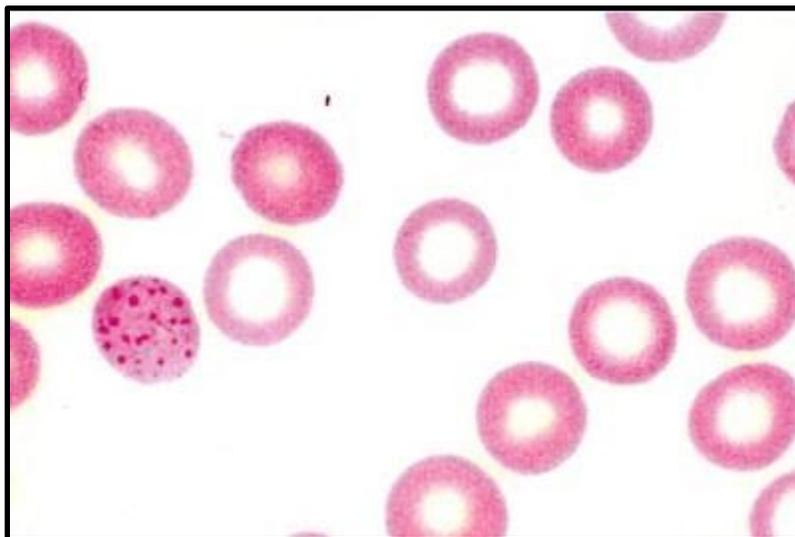




Level 3: Childhood Lead Poisoning Levels and the Connection to Poverty Rates and the Age of Housing

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Blood smear showing basophilic stippling commonly seen in lead poisoning, where red blood cells have small dots at the periphery. Source: <https://step1.medbullets.com/hematology/111016/lead-poisoning>

❖ **Background Information:**

Childhood lead (Pb) poisoning is a serious public health concern. According to the CDC, there are approximately half a million children in the US living with elevated blood lead levels and there are at least 4 million households where the potential for exposure to high levels of lead exists. Exposure to lead is linked to poverty and living in an older home. In 2012, the CDC updated their recommendations for children's blood lead levels. Since then, any blood lead level above 5 micrograms per deciliter (mcg/dL) has been reported as an elevated level. No Blood Lead Level (BLL) is considered safe, and lead significantly affects nervous system function. As shown in the chart below, even low BLLs have been shown to affect cognitive functioning and attention in young children.

The primary source of lead exposure for young children is from lead paint in their homes, although lead can come from a variety of sources. Paint produced until 1978 contained lead, so the chipping of this paint from walls or creation of dust through weathering or construction will increase exposure. However, the age of a home is not the only factor that determines lead exposure; lead exposure is dependent on the maintenance of painted walls and types of plumbing present. Older homes are more likely to use lead parts for plumbing either as solder or lead pipes in very old homes. The level of contamination of drinking water with lead depends not only on the lead in the home but on other factors such as the quality of the water, the amount of time water spends in the pipes before it is dispensed and the temperature of water be used. Lead can



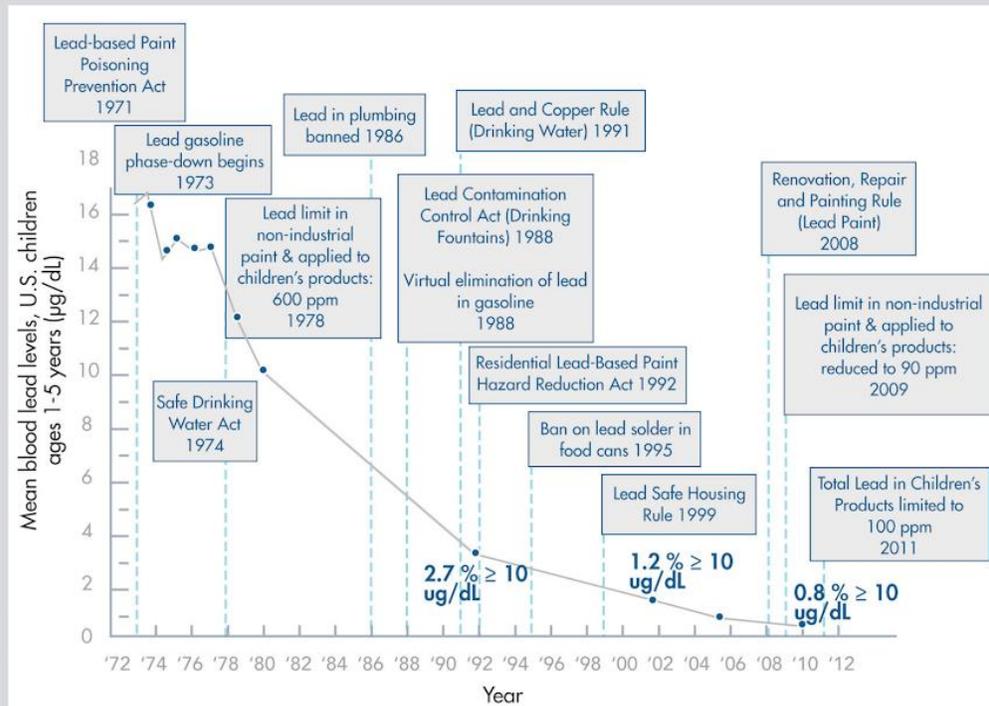
also be present in pottery glazes, make-up and imported candies. Children are at particular risk of lead poisoning due to their small body size and behaviors that increase ingestion of paint, dust and dirt. Although there have been efforts to remediate lead contaminants in homes, they persist as evidenced by the recent Flint, MI water crisis and the controversy surrounding lead paint in New York City public housing (see additional resources below).

Blood Lead Level	Sufficient Evidence or Causal Determination of Children’s Health Effects
Below 5 µg/dL	Nervous System Effects: <ul style="list-style-type: none"> Cognitive function: Decreases in IQ, academic achievement, specific cognitive measures Externalizing behaviors: Increased incidence of attention-related and problem behaviors
Below 10 µg/dL	Effects listed above PLUS Nervous System Effects: <ul style="list-style-type: none"> Auditory function: decreased hearing Reproductive and Developmental Effects: <ul style="list-style-type: none"> Reduced postnatal growth Delayed puberty for girls and boys
10-40 µg/dL	Effects listed above PLUS Nervous System Effects: <ul style="list-style-type: none"> Nerve function: slower nerve conduction Blood Effects: <ul style="list-style-type: none"> Decreased hemoglobin, anemia
40-80 µg/dL	Effects listed above PLUS Gastrointestinal Effects: <ul style="list-style-type: none"> Abdominal pain, constipation, colic, anorexia and vomiting
Above 80 µg/dL	Effects listed above PLUS Nervous System Effects: <ul style="list-style-type: none"> Severe neural effects: convulsions, coma, loss of voluntary muscle control and death

Source: Key Federal Programs to Reduce Childhood Lead Exposure, 2018

Since the passage of the Lead Contamination Control Act of 1988, the Centers for Disease Control and Prevention (CDC) were authorized to initiate programmatic efforts to eliminate childhood lead poisoning in the United States. The programs include increased testing, monitoring of the results and educational programs. Pediatricians must test all children at one and two years of age. These measures have resulted in increased amounts of children being tested and a decrease in elevated lead levels over the past two decades. As the graphic below indicates, policies have a significant impact of BLLS in children.

Lead poisoning prevention policies have reduced population blood levels



Source: Brown MJ and Falk H. Toolkit for establishing laws to control the use of lead paint. Module C.iii. Conducting blood lead prevalence studies. Global Alliance to Eliminate Lead Paint (2016).

❖ Dataset Variables:

Sheet: BLL by County 2000-2014

- **Year:** Year the lead test was collected
- **County:** The county of residence
- **Number of Tests:** The number of tests for BLLs
- **Number of Elevated Blood Levels:** The number of tests with a BLL value equal to or greater than 5 micrograms/deciliter of blood.
- **Percent Elevated Blood Levels:** The number of test results that were elevated (above 5 micrograms/deciliter) divided by the number of tests multiplied by 100%.
- **Percent Children in Poverty:** The percentage of people age 18 and under that live in poverty as determined by the federal poverty guidelines.

Sheet: 2000 Census poverty housing

- **County:** The county of residence
- **Children in poverty (%):** Percent of children under age 5 living in poverty according to the US Census in 2000
- **Pre-1950 housing (%):** Percentage of housing built before 1950 in the year 2000
- **Positive lead tests (%):** Percentage of blood lead tests showing a level equal to or higher than 5mg/dL during the year 2000



❖ **Dataset Timeframe:** 2000-2014

❖ **Data Collection Methods:**

A simple blood test can detect lead poisoning. A small blood sample is taken from a finger prick or from a vein. Lead levels in the blood are measured in micrograms per deciliter (mcg/dL). Testing for BLLs is done by health care providers and reported to local agencies. In New York State, the state health department aggregates the data from all counties excluding those in New York City. For NYC counties, the city health department collects the data.

❖ **Dataset Sources:**

- Childhood Blood Lead Testing and Elevated Incidence by Zip Code: Beginning 2000 from the New York State Health Department
(<https://health.data.ny.gov/Health/Childhood-Blood-Lead-Testing-and-Elevated-Incidenc/d54z-enu8>)
- US Census Bureau, Small Area Income and Poverty Estimates.
https://www.census.gov/data-tools/demo/saibe/saibe.html?s_appName=saibe&menu=map_proxy&s_USStOnly=y&map_yearSelector=2016&map_geoSelector=aa_c&s_year=2016

❖ **Inquiry Idea Starters:**

Here are some sample questions you could ask using these data. These are just suggestions, and we hope you'll come up with many interesting questions of your own!

- How has the percentage of elevated childhood BLL changed over time?
- Is there are relationship between childhood poverty rates and the percentage of older housing?
- Do counties differ in the number of children with elevated BLL?
- Is there a correlation between the percentage of older housing and BLL? Between poverty and BLL?

Additional Resources:

Childhood Lead Exposure, Environmental Health Tracker, July 2018.

https://apps.health.ny.gov/statistics/environmental/public_health_tracking/tracker/index.html#/childhoodEBLLevels

This interactive website shows trends over time in BLLs, the amount of children being tested and the test results. There is an interactive map feature that allows students to look at NYS maps by county showing poverty rates, the age of housing stock and the percentage of elevated BLLs. Data shown for all New York State Counties excluding New York City.



FerrÉ-sadurn Í, L. (2018, July 01). **820 Children Under 6 in Public Housing Tested High for Lead.** Retrieved from <https://www.nytimes.com/2018/07/01/nyregion/nycha-lead-paint-children.html>

This article highlights a recent controversy involving the New York City Housing Authority's (NYCHA) response to elevated blood lead levels among children living in public housing.

Kennedy, Merrit. (2016, April 20) **“Lead-Laced Water in Flint: A Step-By-Step Look At The Makings Of A Crisis.”** *NPR* www.npr.org/sections/thetwo-way/2016/04/20/465545378/lead-laced-water-in-flint-a-step-by-step-look-at-the-makings-of-a-crisis.

This article follows the timeline of the Flint water crisis from the government decision to switch water sources, the discovery of the problem, and the public and government response to crisis.

Key Federal Programs to Reduce Childhood Lead Exposure, 2016.

ptfceph.niehs.nih.gov/features/assets/files/key_federal_programs_to_reduce_childhood_lead_exposures_and_eliminate_associated_health_impactspresidents_508.pdf

This is a comprehensive booklet documenting the history of childhood lead poisoning in the United States and the changes in policy.

References:

About Childhood Lead Exposure. (2018, July). Retrieved July 25, 2018, from https://apps.health.ny.gov/statistics/environmental/public_health_tracking/tracker/index.html#/aboutChildhoodLead

New York State Department of Health's page on the sociological and environmental causes of lead poisoning and the health effects.

Basic Information about Lead in Drinking Water. (2018, March 23). Retrieved July 25th, 2018, from <https://www.epa.gov/ground-water-and-drinking-water/basic-information-about-lead-drinking-water>

This webpage gives detailed information on how lead enters drinking water and the regulations governing the use of lead in home fixtures.

Lead. (2018, July 18). Retrieved from <https://www.cdc.gov/nceh/lead/>

This webpage goes over the lead blood levels in various groups including children and discusses the health impacts.