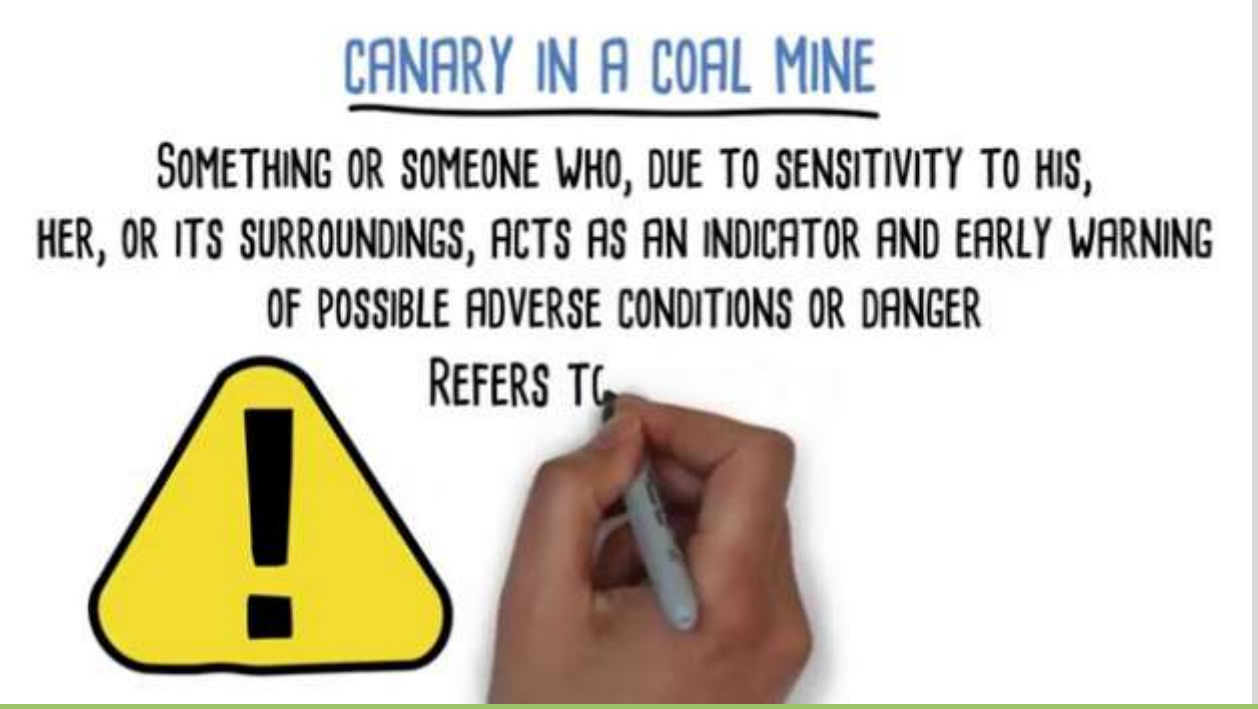

Water for canaries?

Jennifer Lowry, MD, FAAP, FACMT, FAACT
Chair, Section of Toxicology and Environmental Health, Children's Mercy
Director, Mid-America Pediatric Environmental Health Specialty Unit, Region 7
Professor of Pediatrics, University of Missouri-Kansas City,
Kansas City, MO

PEHSU
Pediatric Environmental Health Specialty Units

Section of Toxicology and Environmental Health, Children's Mercy
Mid-America Pediatric Environmental Health Specialty Unit, Region 7

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- The U.S. Environmental Protection Agency (EPA) supports the PEHSU by providing partial funding to ATSDR under Inter-Agency Agreement number DW-75-92301301-9. Neither EPA nor ATSDR endorse the purchase of any commercial products or services mentioned in PEHSU publications.

Objectives

Participants will be able to accomplish as a result of attending this program:

- Describe the adverse effects of elevated blood lead levels in children.

- Understand the contribution that lead in water has to children's blood lead levels.

What is lead?

- A metal that occurs naturally in the earth’s crust
- Was once a key ingredient in paint and gasoline
- Still used in batteries, solder, pipes, pottery, roofing materials and some cosmetics.

History of Lead Poisoning

One of first metals used by humans

Descriptions of lead toxicity date back to 2nd century BC

Ancient Rome

- Lead pipes of water and sewage systems
- Found in sapa
- Theorized to have led to the fall of the Roman Empire

Riva MA et al. 2012

Wikipedia.org

History of Lead Poisoning

Renaissance

- Lead poisoning of famous painters Francesca, Goya and Rembrandt

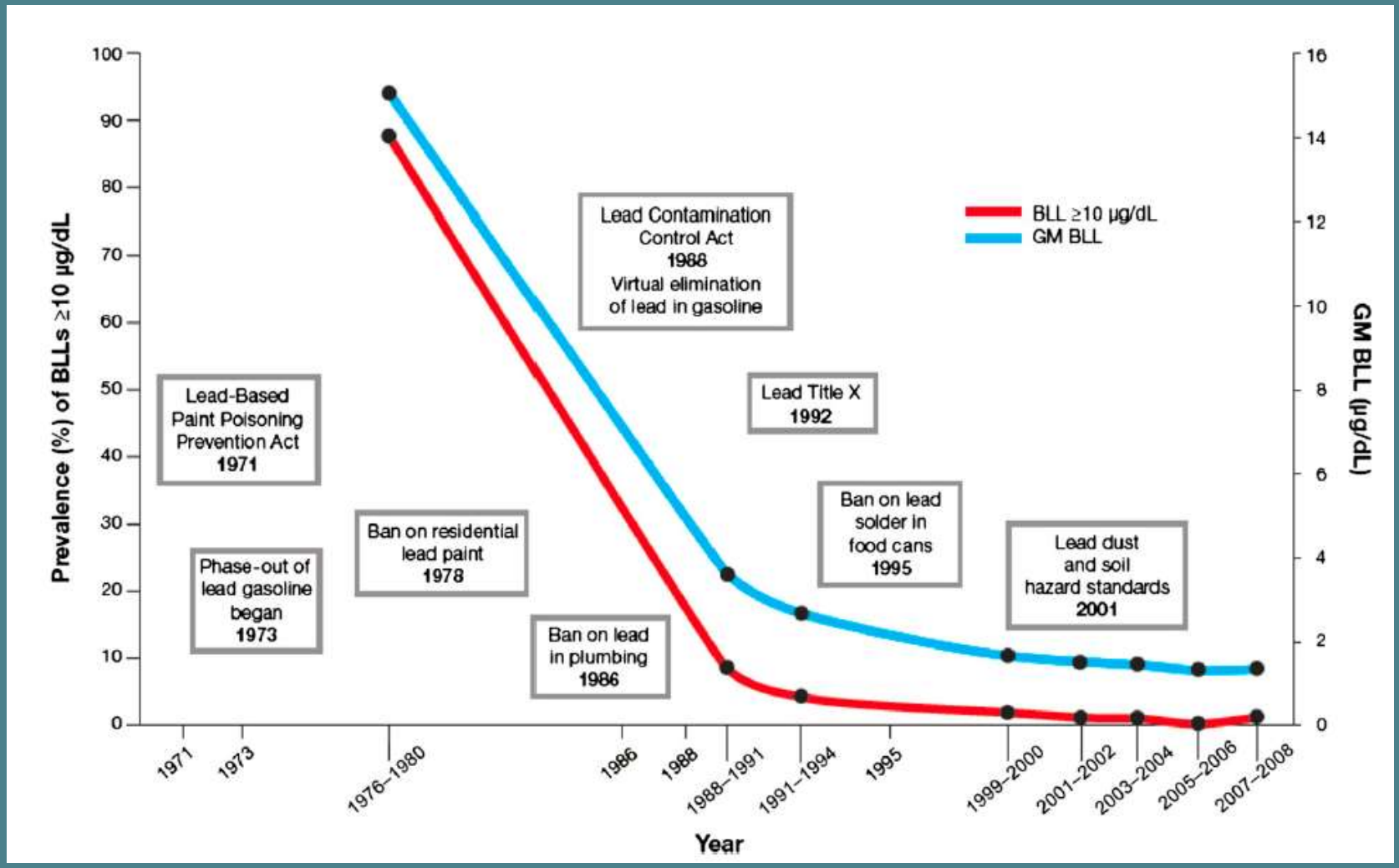
14^{th}-16^{th} century Europe

- Recognition of lead as a “poison”
- Goldsmiths, metalworkers, miners, potters, painters
- Physicians recommend taking preventative measures
- Continued use as a wine preservative

17^{th} and18^{th} centuries

- Industrial revolution led to more acute intoxications

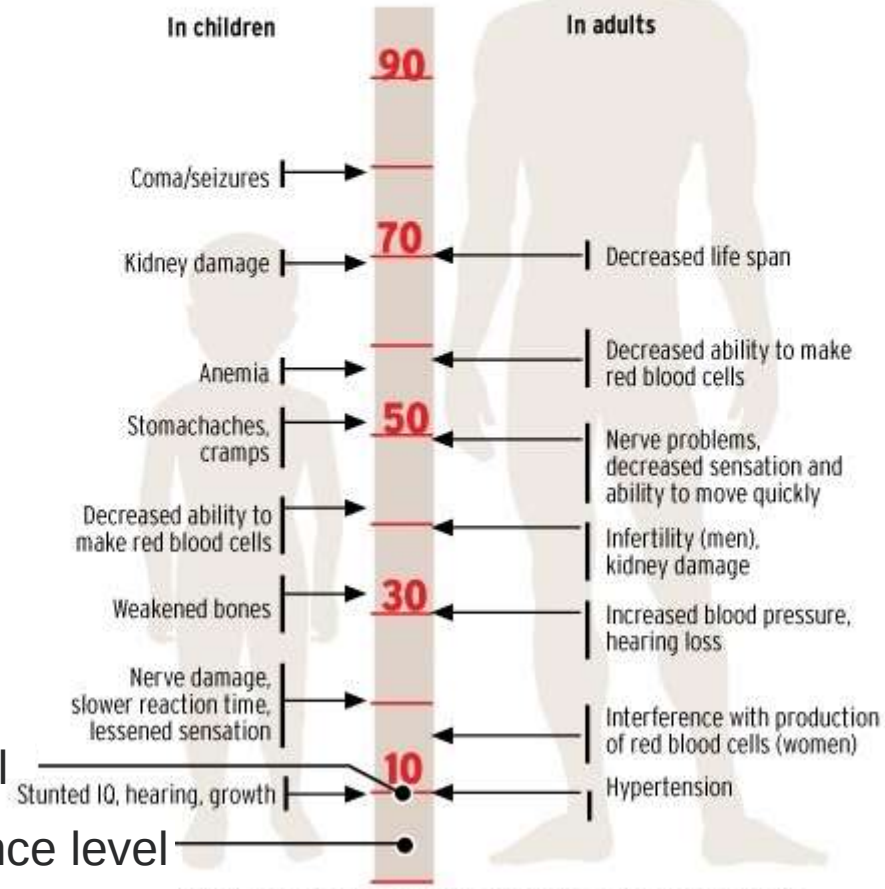
Riva MA et al. 2012



Prevention of Childhood Lead Toxicity, COUNCIL ON ENVIRONMENTAL HEALTH, American Academy of Pediatrics, Pediatrics, June 2016, 138 (1) e20161493

Adverse effects of lead

Studies show that long-term exposure to lead can affect a child's developing nervous system. Health effects range from hypertension to coma and seizures.



Studies have shown that lead levels below 10 can cause reduction in IQ.

POLICY STATEMENT Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

Prevention of Childhood Lead Toxicity

COUNCIL ON ENVIRONMENTAL HEALTH

abstract

Blood lead concentrations have decreased dramatically in US children over the past 4 decades, but too many children still live in housing with deteriorated lead-based paint and are at risk for lead exposure with resulting lead-associated cognitive impairment and behavioral problems. Evidence continues to accrue that commonly encountered blood lead concentrations, even those below 5 µg/dL (50 ppb), impair cognition; there is no identified threshold or safe level of lead in blood. From 2007 to 2010, approximately 2.6% of preschool children in the United States had a blood lead concentration ≥5 µg/dL (≥50 ppb), which represents about 535 000 US children 1 to 5 years of age. Evidence-based guidance is available for managing increased lead exposure in children, and reducing sources of lead in the environment, including lead in housing, soil, water, and consumer products, has been shown to be cost-beneficial. Primary prevention should be the focus of policy on childhood lead toxicity.

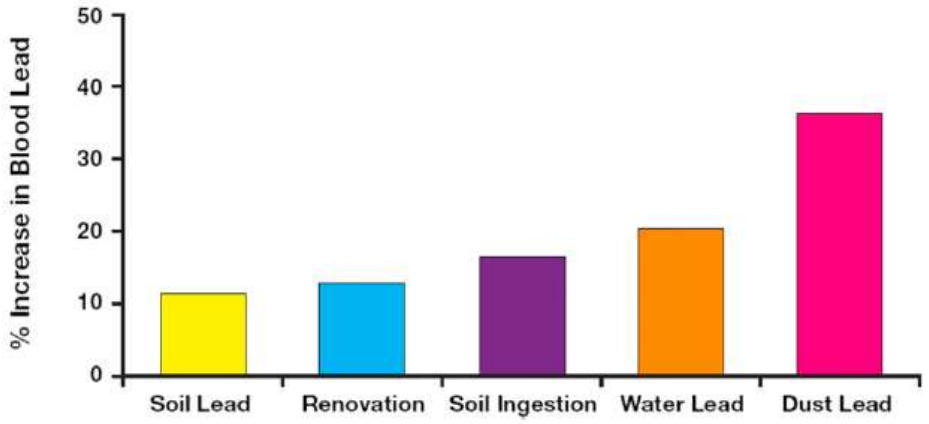


FIGURE 3
Contribution of lead exposure to children's blood lead concentrations. Adapted from Lanphear et al[31] and Spanier et al.[45]

Prevention of Childhood Lead Toxicity, COUNCIL ON ENVIRONMENTAL HEALTH Pediatrics, June 2016, 138 (1) e20161493

Flint, Michigan

AJPH RESEARCH

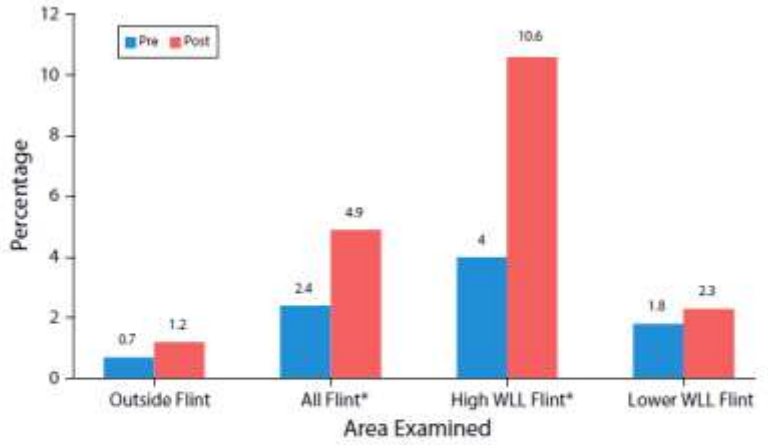
Elevated Blood Lead Levels in Children Associated With the Flint Drinking Water Crisis: A Spatial Analysis of Risk and Public Health Response

Mona Hanna-Attisha, MD, MPH, Jenny LaChance, MS, Richard Casey Sadler, PhD, and Allison Champney Schnepp, MD

Objectives. We analyzed differences in pediatric elevated blood lead level incidence before and after Flint, Michigan, introduced a more corrosive water source into an aging water system without adequate corrosion control.

Methods. We reviewed blood lead levels for children younger than 5 years before (2013) and after (2015) water source change in Greater Flint, Michigan. We assessed the percentage of elevated blood lead levels in both time periods, and identified geographical locations through spatial analysis.

Results. Incidence of elevated blood lead levels increased from 2.4% to 4.9% ($P < .05$) after water source change, and neighborhoods with the highest water lead levels experienced a 6.6% increase. No significant change was seen outside the city. Geospatial analysis identified disadvantaged neighborhoods as having the greatest elevated blood lead level increases and informed response prioritization during the now-declared public health emergency.



Note. WLL = water lead level.
*$P < .05$.

FIGURE 1—Comparison of Elevated Blood Lead Level Percentage, Before (Pre) and After (Post) Water Source Change From Detroit-Supplied Lake Huron Water to the Flint River: Flint, MI, 2013 and 2015

Flint is the tip of the iceberg. It's not whether it will happen again; it's a matter of opening eyes to how extensive it is already.

Norma Kreilein, MD FAAP
Daviess County, Indiana

Association between children's blood lead levels, lead service lines, and water disinfection, Washington, DC, 1998–2006

Mary Jean Brown [a,*], Jaime Raymond [a], David Homa [a], Chinaro Kennedy [a], Thomas Sinks [b]

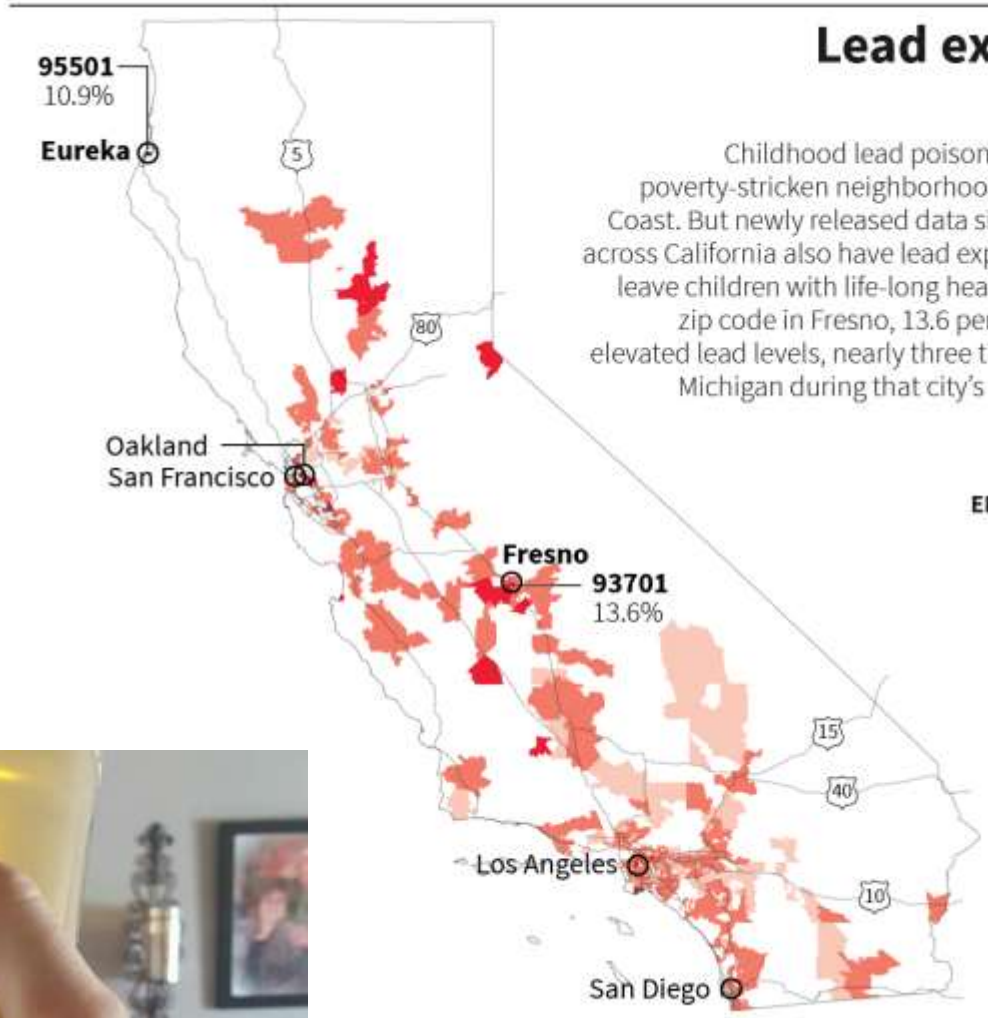
[a] Lead Poisoning Prevention Branch, National Center for Environmental Health, Centers for Disease Control and Prevention, 4770 Buford Highway NE, Atlanta, GA 30348, USA
[b] National Center for Environmental Health/Agency for Toxic Substances and Disease Registry, Centers for Disease Control and Prevention, Atlanta, GA, USA

Environmental Research 111 (2011) 67–74

- In Washington, DC, between November 2000 and December 2006, children living in homes with an LSL were at increased risk of having higher BLLs than children living in homes without an LSL.
- Children living in housing where an LSL was partially replaced after 2003, were more likely to have BLLs 5–9 or ≥10 mg/dL than children living in housing without an LSL.
- But children are exposed to multiple lead exposure sources–including water–and evidence suggests that, particularly for children with BLLs 5–10 mg/dL, no exposure source may dominate.
- Continued exposure to lead in water, lead from other sources, or a combination of factors may explain these risks. However, partial LSL replacement was not effective in decreasing risk for BLL 5–9 mg/dL or ≥ 10 mg/dL.

Lead exposure in the Golden State

Childhood lead poisoning is often associated with poverty-stricken neighborhoods in the Rust Belt and East Coast. But newly released data shows many neighborhoods across California also have lead exposure problems which can leave children with life-long health impacts. In the worst hit zip code in Fresno, 13.6 percent of children tested had elevated lead levels, nearly three times the rate found in Flint, Michigan during that city's water contamination crisis.



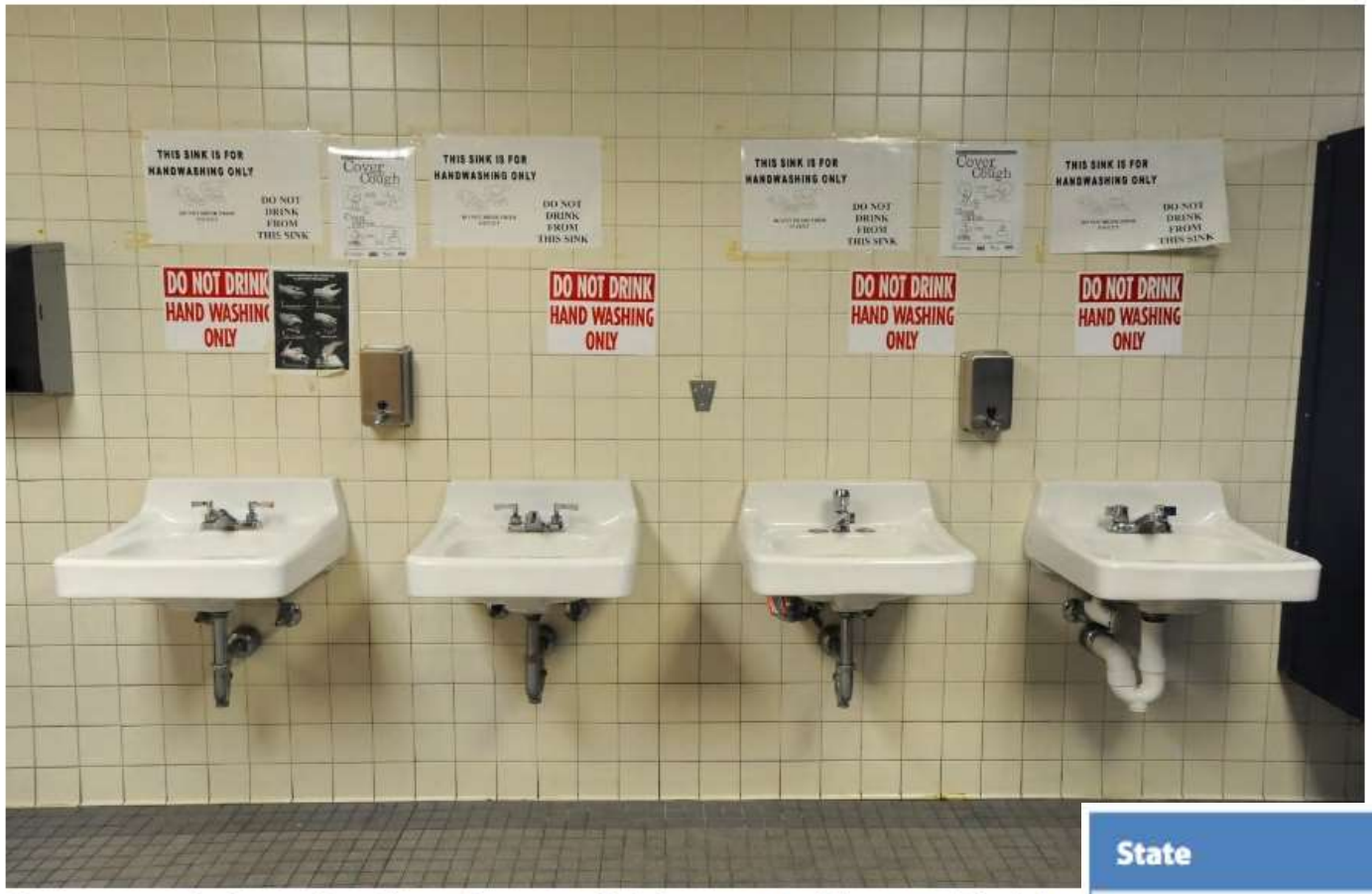
PERCENTAGE OF CHILDREN UNDER AGE 6 TESTED WITH ELEVATED BLOOD LEAD LEVELS BY ZIPCODE, 2012

- None/data not available
- Less than 1.0%
- 1.1-5.0%
- 5.1-10.0%
- More than 10.0%

Note: An elevated blood lead level is 5 micrograms per deciliter or higher. A test result of 4.5 or higher is rounded up to 5.

Source: California Department of Public Health

REUTERS



Signs appear over bathroom sinks telling students not to drink the water at Cecil Elementary School. Long water became a national issue, Baltimore city schools discovered lead contamination in some of its buildi For nearly the past decade, kids have been drinking bottled water. (Lloyd Fox/Baltimore Sun)

State	Grade
Washington, DC (proposed)	B
New York	C
New Jersey	C-
Illinois, Massachusetts	D
CA, CT, GA, FL, MD, ME, PA, OH, OR, TX, WA, WI	F

Who is at risk?

Questions?