It was July when 2-year-old Celeste Felder started crying and refusing to eat. At first, her parents thought she was jealous of her baby brother, who had been born June 5. When the crying didn't let up, her parents called the family physician. He diagnosed intestinal grippe, prescribed penicillin, and told them not to worry.

But Celeste got worse. As the weeks went by, her crying turned to screams, and what little food her parents could get her to eat, she couldn't hold down. The doctor insisted she would improve.

By Monday, August 20, her father, William, a 34-year-old subway clerk, was beside himself. He took her to see another doctor, who said that Celeste had a viral infection-nothing to worry about.

On Tuesday, Celeste "went out of her head" before lapsing into unconsciousness. William Felder rushed his daughter to Kings County Hospital, which wasn't far from their home on Macon Street in Bedford-Stuyvesant. The doctor who saw her there said it was an upper respiratory infection. Felder pleaded that she was too sick for that, but the doctor gave him more medicine and told him to take Celeste home.

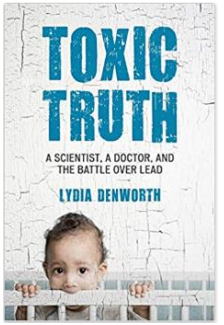
On Wednesday, Celeste began having convulsions--they shook her small body all day. In desperation, Felder called the police, who sent an ambulance that took Celeste to Bushwick Hospital. There, a doctor examined Celeste and said she had a bad case of tonsillitis. Take her home, let her rest, and give her medicine, she advised. "You don't understand," William Felder cried. "My baby's dying." But the doctor told him it "would be foolish and a waste of money" to admit Celeste for further observation. "Take her home," the doctor repeated.

Back home on Macon Street, the convulsions and periods of unconsciousness continued. So Felder, unable to believe what he'd been told, took his daughter to yet another hospital, the third in as many days. At Brooklyn Eye and Ear, the doctor, who was the fifth to see Celeste since she had first gotten sick, agreed with Mr. Felder. Although the little girl did have inflamed tonsils, that didn't explain how sick she was. This doctor had another idea: "It might be lead poisoning."

Felder said that that was possible because his daughter had a habit of eating "anything she could get her hands on," including dirt, plaster, putty, and paint. But Brooklyn Eye and Ear wasn't equipped to treat lead poisoning, so Celeste was transferred to Cumberland Hospital, where doctors agreed with the diagnosis and began treatment to try to rid her body of lead.

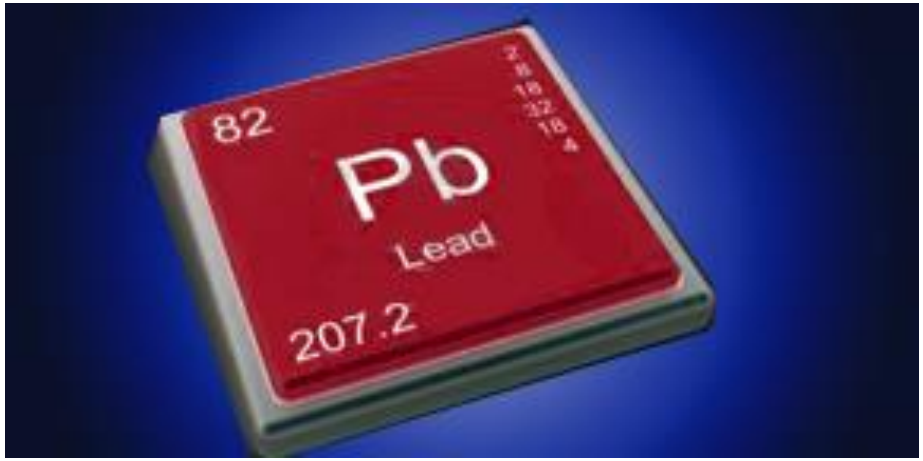
But by then it was too late. Celeste Felder die at 4:15 AM on Thursday, August 23, 1951.

Toxic Truth: A Scientist, a Doctor and the Battle Over Lead
Lydia Denworth, 2009



Children's Environmental Health

Lead basics



2005
Children's Environmental Health
Excellence Award

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Pediatric Environmental Health Specialty Unit

Mark E. Anderson MD FAAP
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Associate Professor of Pediatrics and Epidemiology
University of Colorado Schools of Medicine and Public Health
October 2022

Acknowledgments

The Pediatric Environmental Health Specialty Units (PEHSUs) exist across all Federal regions in the United States and serve to protect the environmental health of children. The PEHSUs typically bring together pediatricians, occupational medicine providers, toxicologists, nurses, and other disciplines such as industrial hygienists to provide an evidence-based approach to children with environmental concerns. Poison Centers often partner with PEHSUs to provide call center services and toxicology expertise. The current PEHSU program is administered by the American Academy of Pediatrics (AAP). Funding for the program is based in the Agency for Toxic Substances and Disease Registry (ATSDR) within the Centers for Disease Control. Each PEHSU must be an academic center and have capacity to provide medical services as needed.

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Objectives

- State some of the effects of lead exposure on children, specifically the effects at lower levels of lead
- Link public health interventions of the last 50 years to average blood lead levels in children – lens of 3 champions
- State the lead screening recommendations
- Understand the basic epidemiology of lead exposure in our area and consider drinking water as a source of lead

- To begin: what does ‘micrograms per deciliter’ mean?

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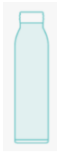
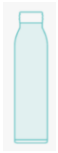


= 500 cc = 5 deciliters

= 2.8 grams = 2.8 µg x 1000

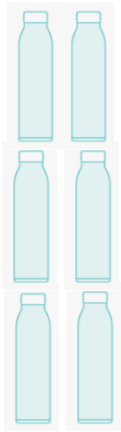
1/100th of the sugar packet is
28 µg in 5 dL = 5.6 µg/dL



6 to 10 months

Younger child

Older child



Adult

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Lead Effects – Why worry?

- Takes ***very*** little lead to poison
- Harm even at 'low' levels
- Effects on multiple systems
- Follows calcium – a 'bank' of lead for a lifetime of exposure
- Treatment is imperfect

FIGURE. Heart-shaped charm bracelet that is the subject of the voluntary recall announced March 23, 2006, by Reebok International Ltd. and the Consumer Product Safety Commission

Photo/Consumer Product Safety Commission

BLLs	Adults	Kids
5 μg/dL (safe level?)	?? (ACOG)	Impairment IQ
10 μg/dL	Hypertension may occur	Crosses placenta Impairment IQ, growth (dose dep.> low BLLs) Partial inhibition of heme synthesis
20 μg/dL	Inhibition of heme synthesis Increased erythrocyte protoporphyrin	Beginning impairment of nerve conduction velocity
30 μg/dL	Systolic hypertension Impaired hearing(↓)	Impaired vitamin D metabolism
40 μg/dL	Infertility in males Kidney & Nerve effects Fatigue, headache, abdominal pain	Hemoglobin synthesis inhibition
50 μg/dL	Anemia, GI sx, headache, tremor	Colicky abd pain, neuropathy
100 μg/dL	Lethargy, seizures, encephalopathy	Encephalopathy, anemia, nephropathy, seizures…death

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Champion # 1

Herb Needleman

1 in 5 > 63µg/dL

↓ 78% 1976 to 1991

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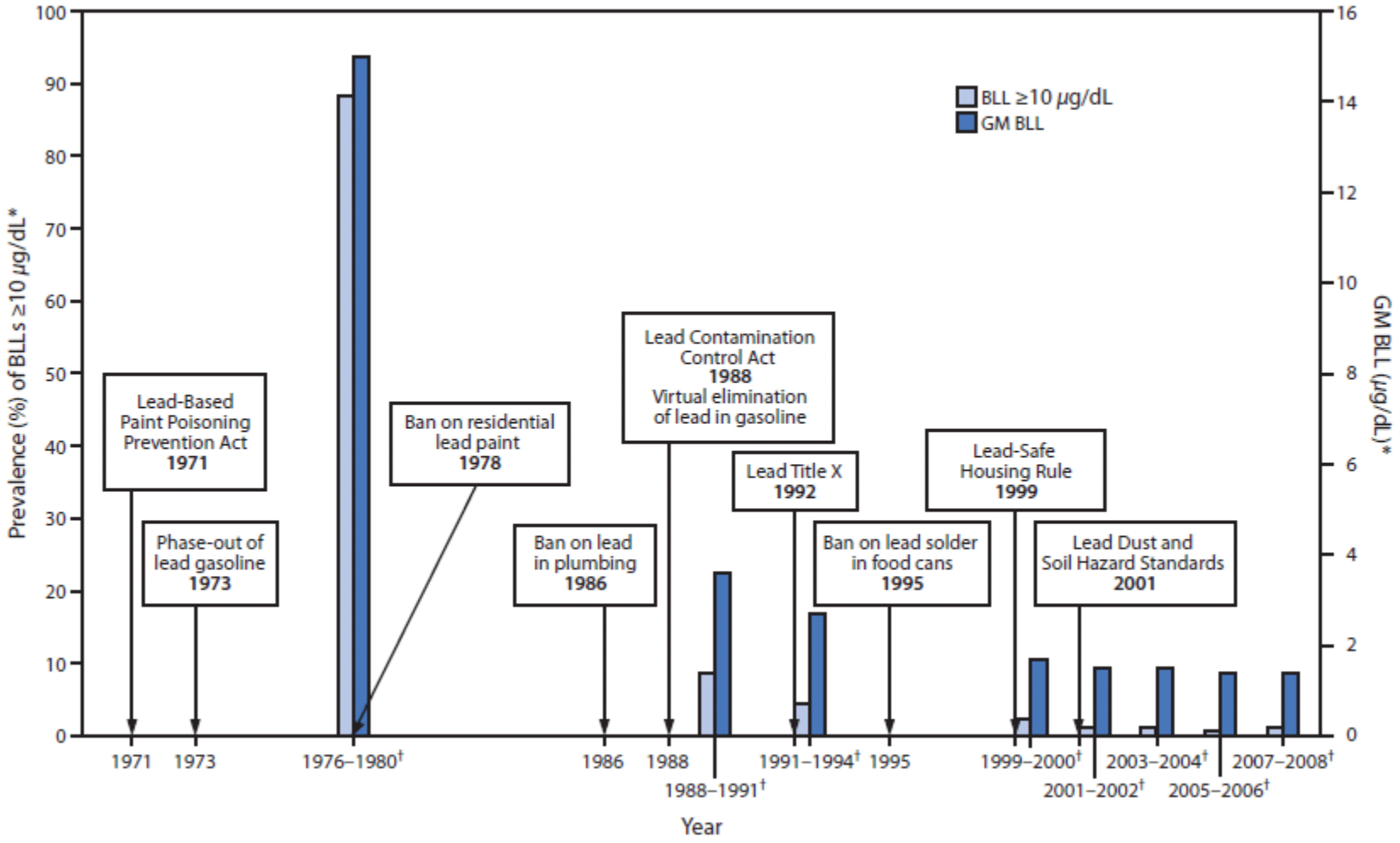
FIGURE. Timeline of lead poisoning prevention policies and blood lead levels in children aged 1–5 years, by year — National Health and Nutrition Examination Survey, United States, 1971–2008



MMWR Supplements
August 10, 2012 / 61(04);1-9

“Low” lead levels – Action Level was 10 µg/dL

- 4853 children aged 6 to 16 years between 1988 and 1994 in NHANES III
- lead tests known on population
  - 2386 (36.5%) 2.5µg/dL or greater
  - 810 (9.7%) 5 µg/dL or greater
  - 327 (3.8%) 7.5µg/dL or greater
  - ***172 (2.1%) 10 µg/dL or greater***
  - multiple linear regression – controlled for gender, racial/ethnic background, iron status, serum cotinine level, region of U.S., marital status, educational level, poverty, others
- For every ***1 µg/dL increase*** in blood lead:
  - 0.7-point decrement in mean arithmetic scores
  - ***1-point decrement in mean reading scores***
  - 0.1-point decrement in non-verbal reasoning
  - 0.5-point decrement in short-term memory scores

“Deficits in cognitive and academic skills associated with lead exposure occur at blood lead concentrations lower than 5 µg/dL”

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Lanphear, et al. *Public Health Reports* 2000 (115); 521-5*29.*

Criticisms (teaser: Environmental Justice)

- Secondary data set (NHANES)
- Prospective
  - 172 children < 60 months
  - Each 10 µcg increase saw a 4.6 point IQ decrease (p=0.004)
  - For children increasing from ***1 µcg to 10 µcg***, average ***IQ decrease = 7.4*** (p=0.003)
- Biologic threshold

https://www.youtube.com/watch?v=E6KoMAbz1Bw

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Canfield, et al. *New England Journal of Medicine.* 348 (16): 1517-1526.

Lead Testing Result – Denver Health

- 13,805 unique values (2016 to 2019)
- 340 or 2.5% at 5 µg/dL or greater
- 257 or 1.9% at 5 µg/dL up to 10 µg/dL “level of concern”
- 83 or 0.6% at or greater than 10 µg/dL “classic elevated”

- Argument to screen?

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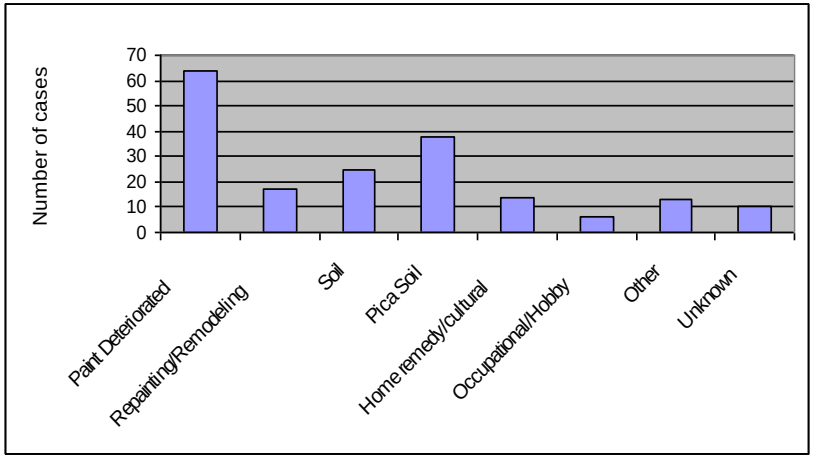
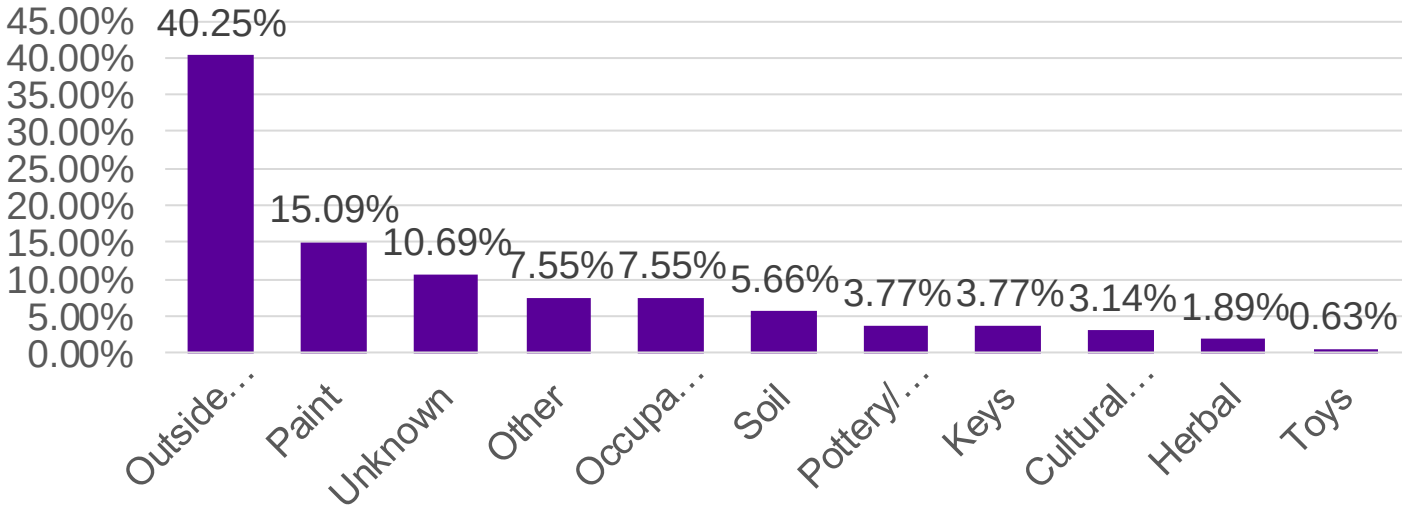
Changing Epidemiology

THEN



NOW



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A Modern Champion

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

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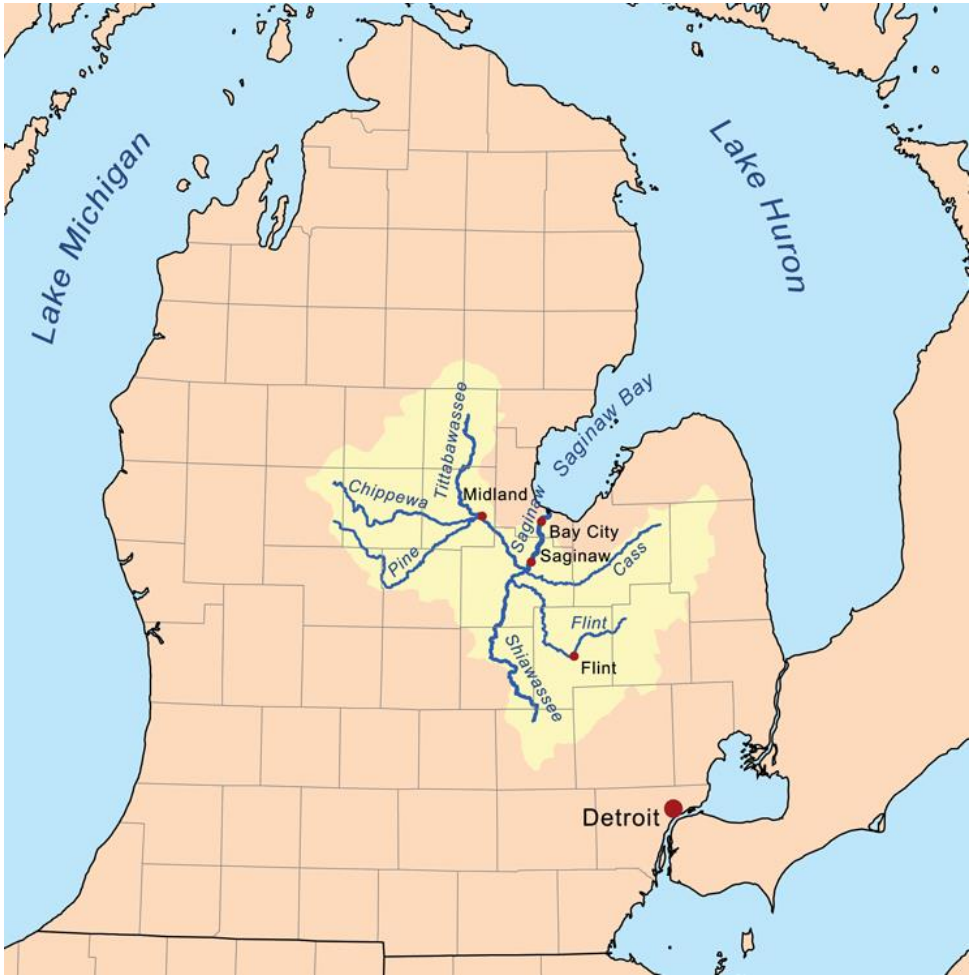

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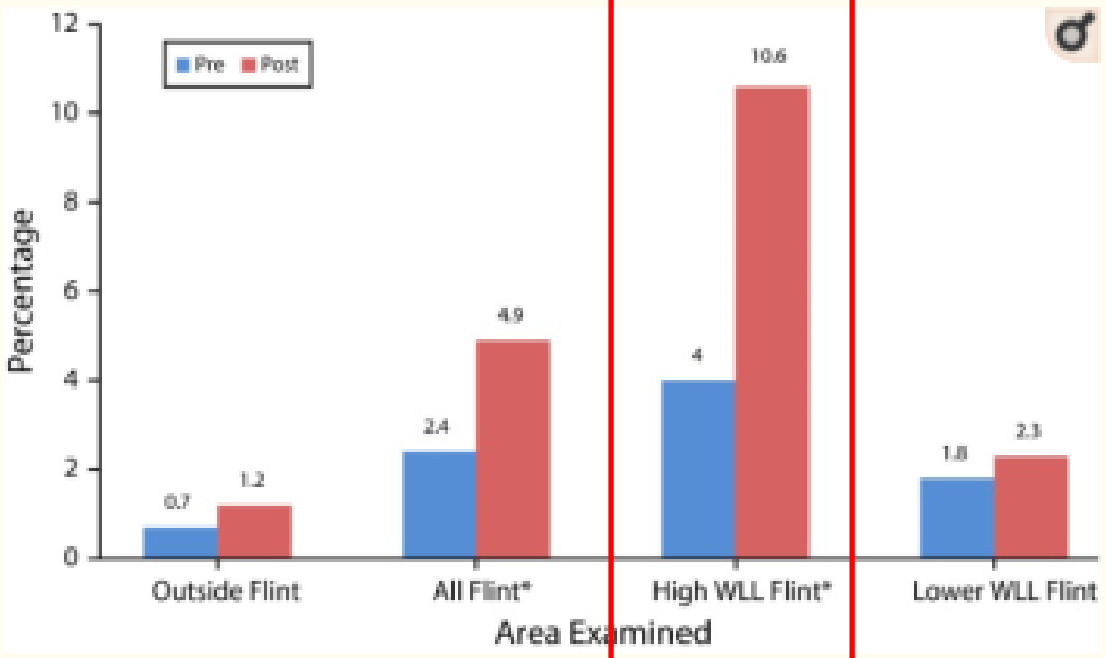

FIGURE 1—

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

Note. WLL = water lead level.

*$P < .05$.

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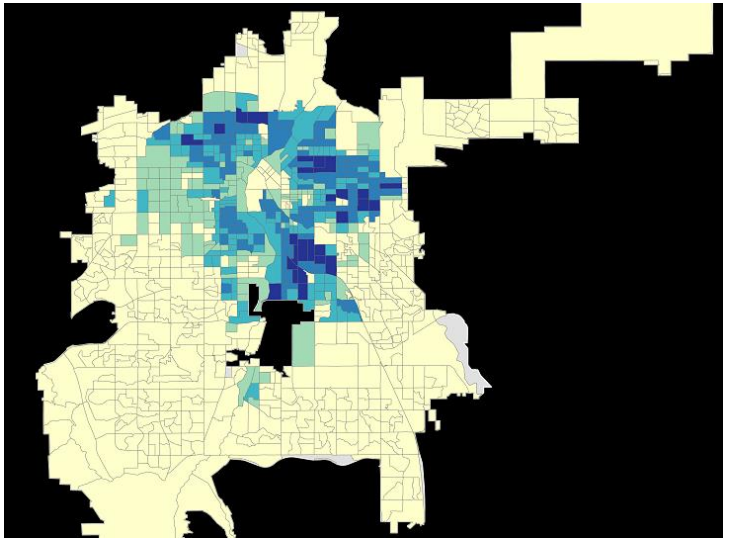
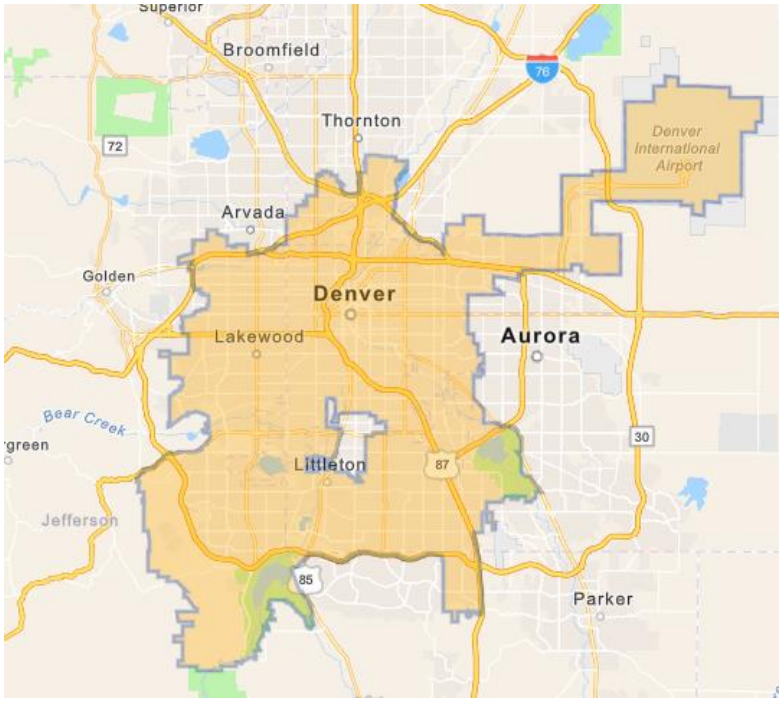
ZIP code	Est. # of Homes (>1000/ZIP)
80203	1,182
80204	4,114
80205	6,306
80206	3,832
80207	5,491
80209	5,263
80210	8,119
80211	7,636
80212	3,975
80216	2,039
80218	2,340
80219	7,207
80220	8,589
80221	1,733
80222	1,480
80223	2,928



Approx 72,000 homes; mostly in the Cty/Cty
Total Denver Water service lines is about 312,000



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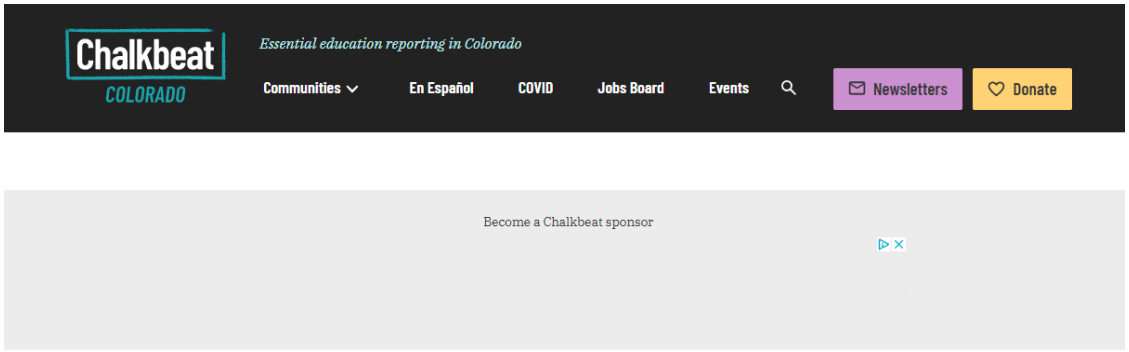
Considerations with water and schools

- Has the water been tested?
- What barriers exist to remediation?
  - Do schools become 'responsible' and at what cost?
  - What local resources exist?
- Most vulnerable population
- What do parents want for their children?



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HEALTHY SCHOOLS POLITICS & POLICY EARLY CHILDHOOD

Colorado schools, child care centers must test water for lead, make fixes

By Ann Schimke | Aug 11, 2022, 2:56pm MDT

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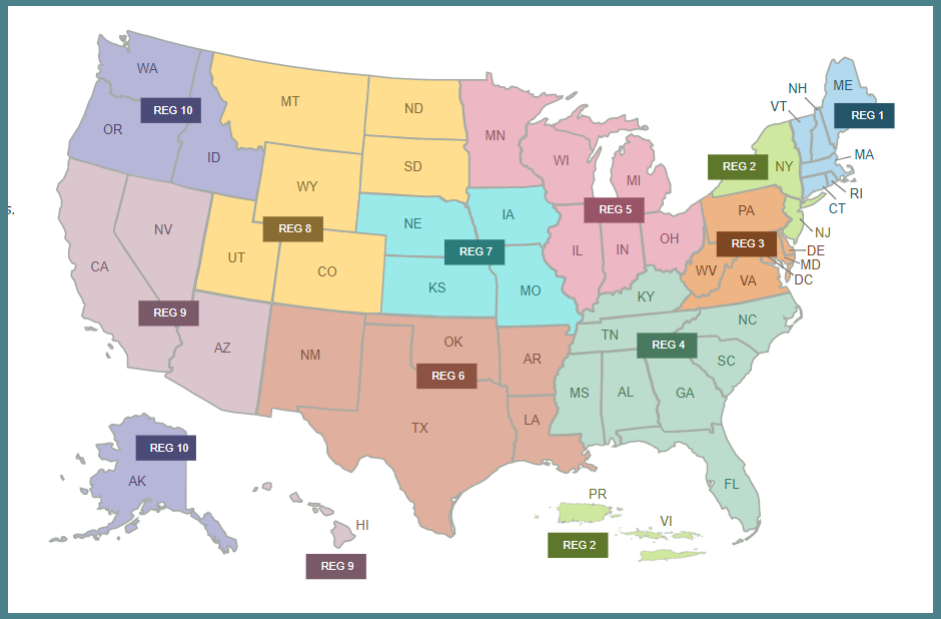

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