



The Effect of Lead in the Water on Birth Outcomes and Fertility in Flint, Michigan vs Surrounding Cities

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What caused the Flint Water Crisis

- April 25, 2014 Flint switched its water supply from Detroit's system to the Flint River.
- The switch was made **as a cost-saving** measure for the struggling, majority-black city.
- In May 2014 residents begin to complain about the water's color, taste and odor, and reported rashes along with assumptions of bacteria in the water.



Corrosive Pipes

- The **Flint River** is naturally high in corrosive chloride.
- Therefore, iron pipes in the water distribution system began **corroding immediately** after the initial switch from Detroit water.
- The iron that was released from the corroding pipes reacted with residual chlorine that is added to kill microorganisms, making it unavailable to function as a disinfectant.



Corrosive Pipes Cont.

- Because **chlorine**, which reacted with the iron pipes, could not act as a disinfectant, bacteria levels spiked.
- When coliform bacteria were detected in the distribution system water samples, water utility managers were obligated by law to increase the levels of chlorine.
- The higher levels of chlorine, while reducing coliform counts, led to the formation of **lead**.



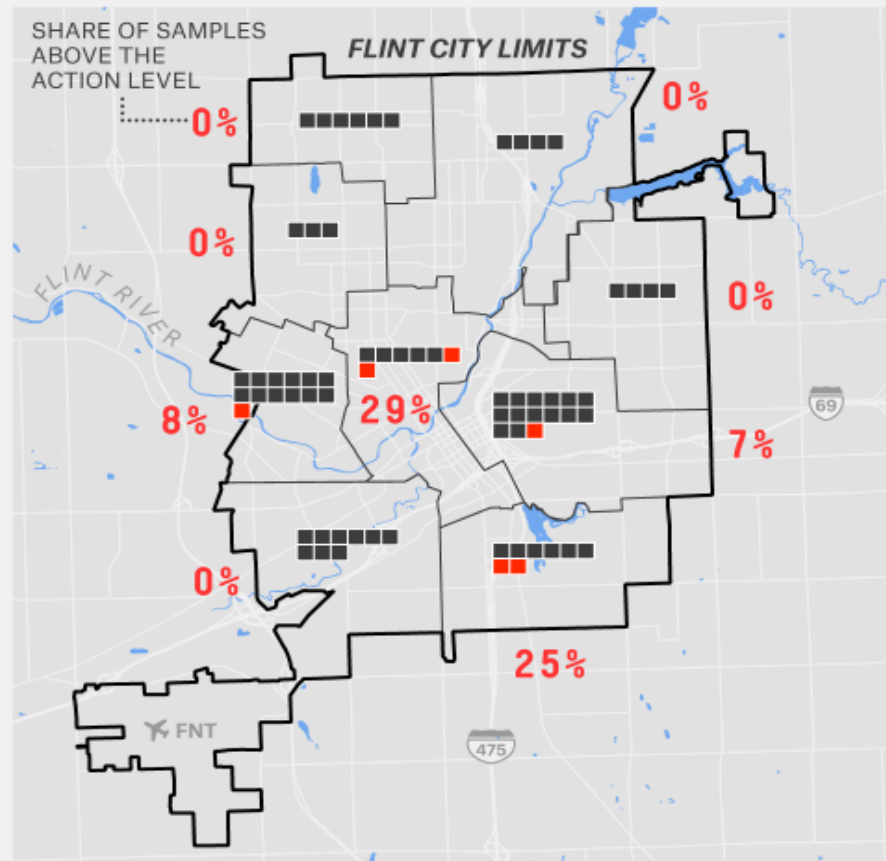
Water sampling in two separate studies

How the sampling and results from city and state testing and the Flint Water Study compare, by ward

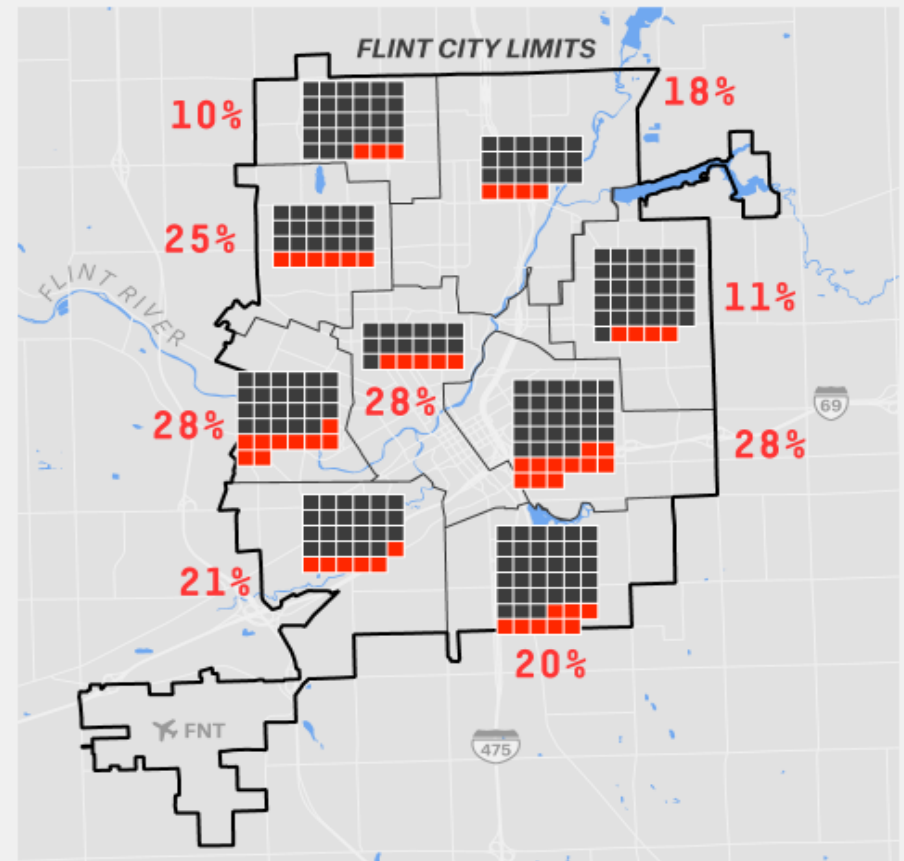
WATER SAMPLES

■ BELOW EPA ACTION LEVEL (15 PPB) ■ ABOVE ACTION LEVEL

Michigan Department of Environmental Quality



Flint Water Study's analysis



FIVETHIRTYEIGHT

SOURCES: MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY, FLINTWATERSTUDY.ORG

Figure 1: Water sampling results between Michigan Dept. of Environmental Quality and Flint Water Study's analysis. (Jester, et al., 2016)

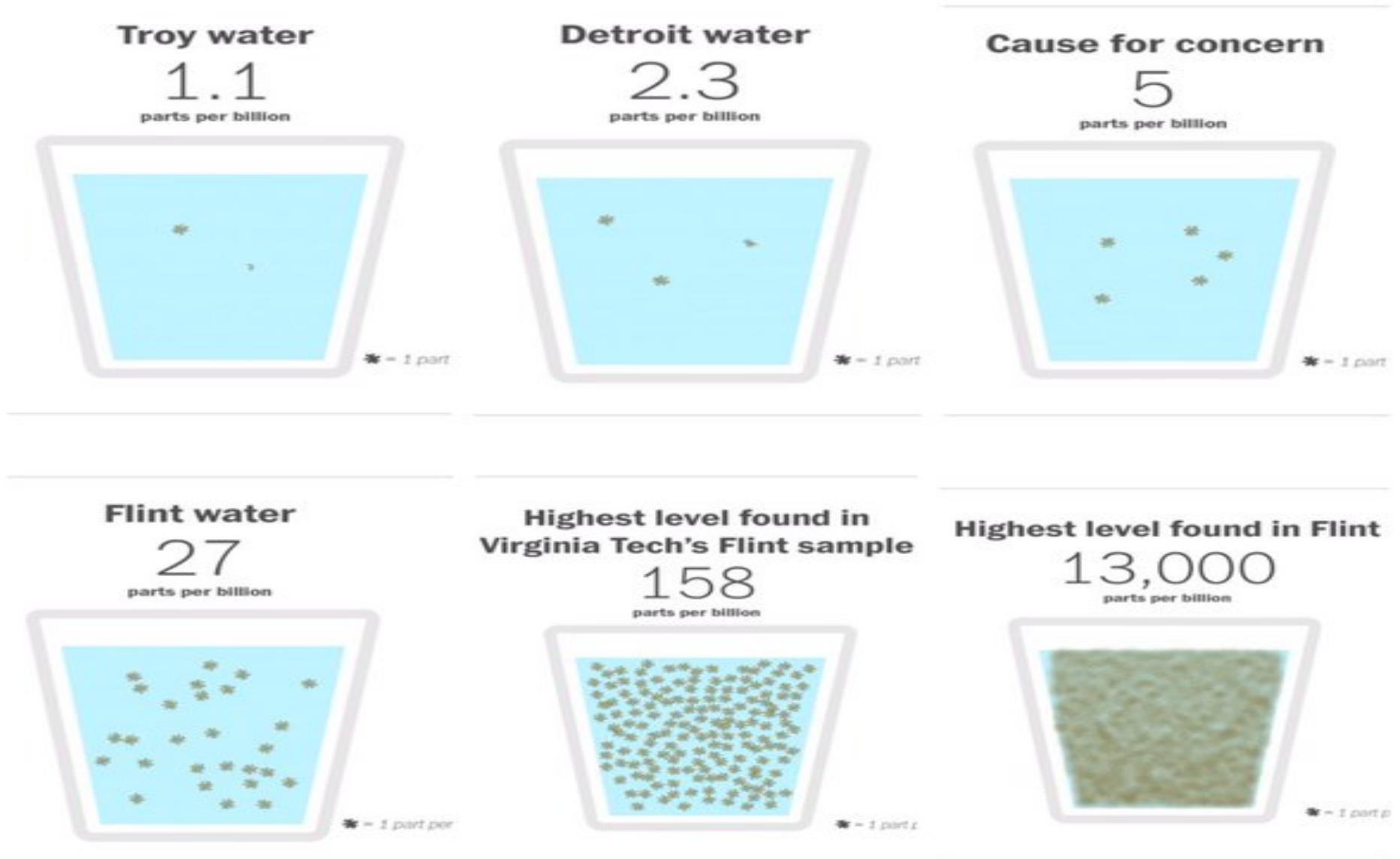


Figure 2: Levels of lead found in other Michigan cities vs Flint
Source: Ingraham, 2016 (Washington Post)

Who is to blame?

- **Governor Rick Snyder** bears a significant share of the responsibility.
- His fiscal approach helped set the stage for the water switch that led to the poisoning, and it was his hand-picked emergency managers who implemented the changes.
- **Snyder** also oversaw the state environmental and health departments that have come in for sharp criticism for their failures to act quickly and forcefully when the first indications of a problem occurred.
- **EPA Administrator Gina McCarthy** is also sharing a form of blame due to slow responses to warning signs of the crisis.

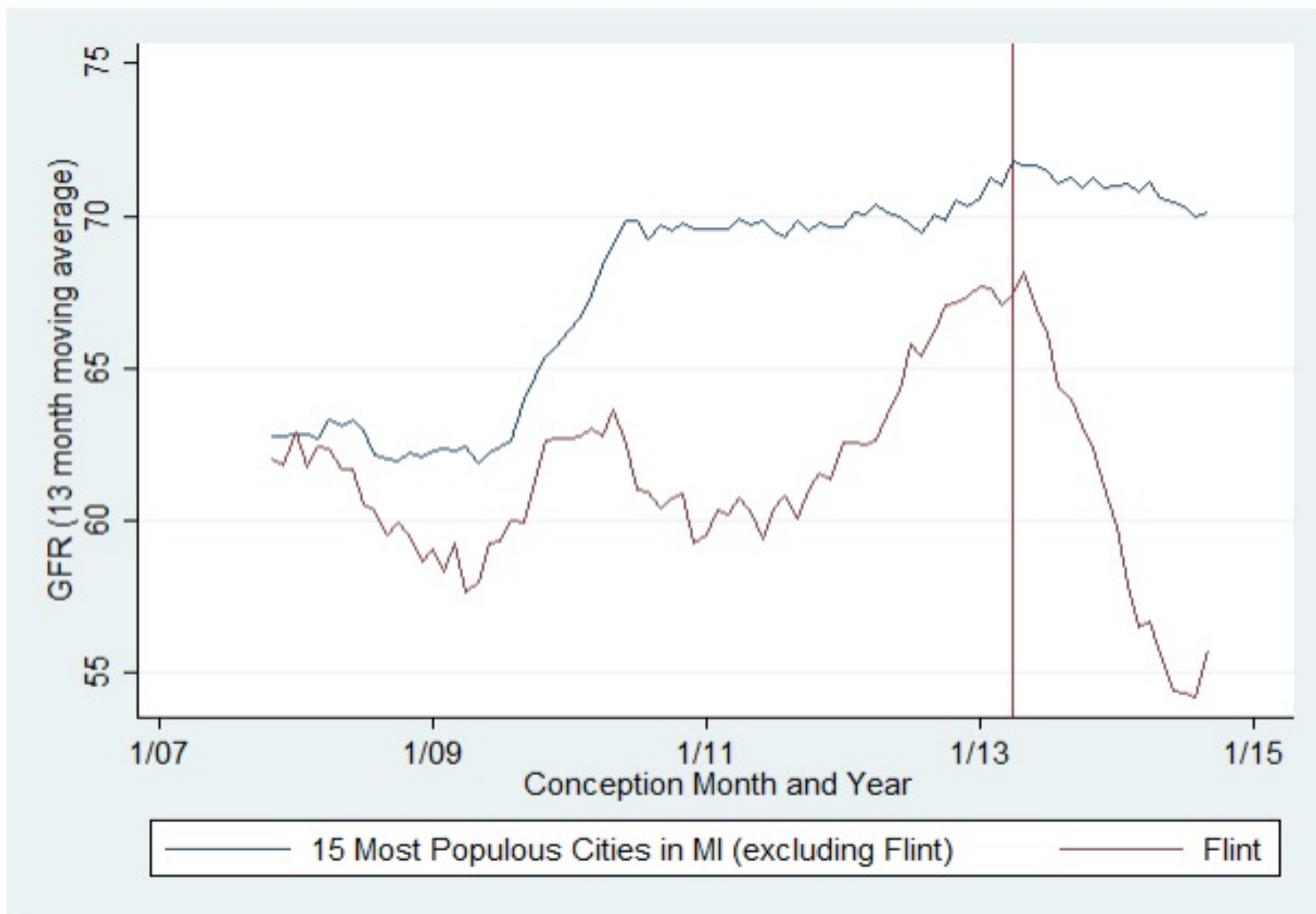


Who is Affected Most by the Crisis?

- **Underprivileged children and pregnant women** of Flint are at a high risk of long-term health issues due to the great intake of lead in Flint's drinking water
- **Some affects consist of :**
 - lack of developing brains and nervous system
 - decreased bone and muscle growth
 - lower intelligence
 - behavioral problems
 - lack of fertility



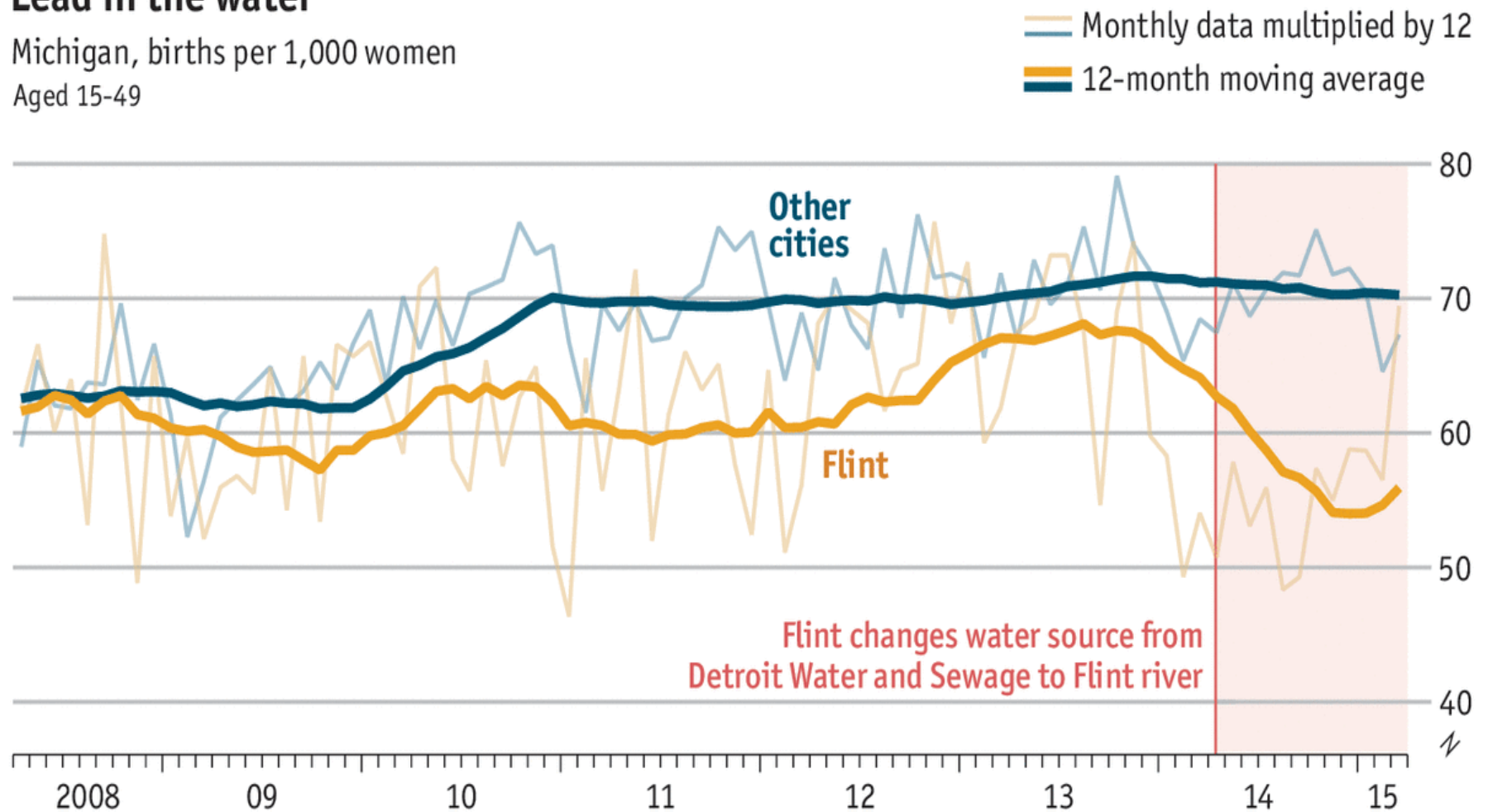
Figure 3: Moving Average Fertility Rate Over Time in Flint and Comparison Cities



“The Effect of an Increase in Lead in the Water System on Fertility and Birth Outcomes: The Case of Flint, MI” by (D. Grossman et.al., 2017)

Lead in the water

Michigan, births per 1,000 women
Aged 15-49



Source: "The Effect of an Increase in Lead in the Water System on Fertility and Birth Outcomes: The Case of Flint, Michigan" by D. Grossman and D. Slusky

Economist.com

Figure 4: Birth rates drop about 15% in Flint, Michigan after water system switch

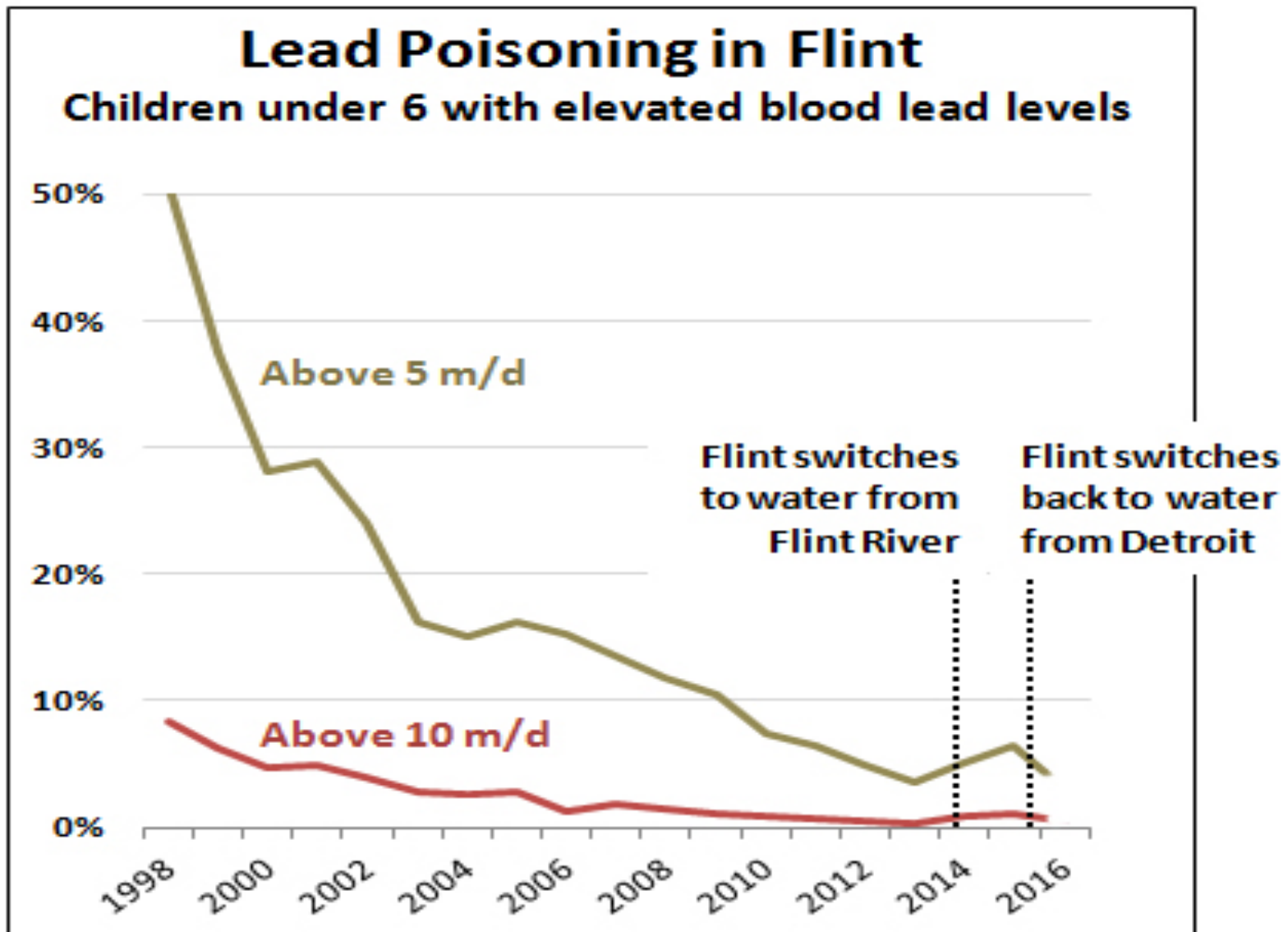


Figure 5: Lead poisoning in Flint children under age 6 with elevated blood lead levels increased between 2014-2016. (D. Grossman et. al., 2017)

How lead affects children's health

Brain

Any exposure is linked to lowered **IQ, ADHD, hearing loss, and damaged nerves**. Acute exposures can cause convulsions, **loss of body movement, coma, stupor, hyperirritability, & death**.

Hormones

Lead disrupts levels of vitamin D, which can **impair cell growth, maturation, and tooth and bone development**.

Stomach

Severe lead exposure can create intense **abdominal pain and cramping**.

Reproductive System

A moderate exposure can not only **lower sperm count**, but also **damage them**. Chronic exposures can diminish the concentration, total count, and motility of sperm, though it's unclear how long these effects last after the exposure ends.

Heart

Studies suggest that adults who endured lead poisoning as children had significantly higher risks of **high blood pressure** 50 years later.

Blood

Lead inhibits the body's ability to make hemoglobin, which can lead to anemia. This reduces oxygen flow to organs, causing **fatigue, lightheadedness, rapid heartbeat, dizziness, & shortness of breath**.

Kidneys

Chronic exposures can cause chronic inflammation, which can lead to **kidney failure, bloody urine, fever, nausea, vomiting, drowsiness, coma, weight gain, confusion, rash, and urinary changes**.

Bones

Lead may impair development and the health of bones, which can **slow growth in children**.

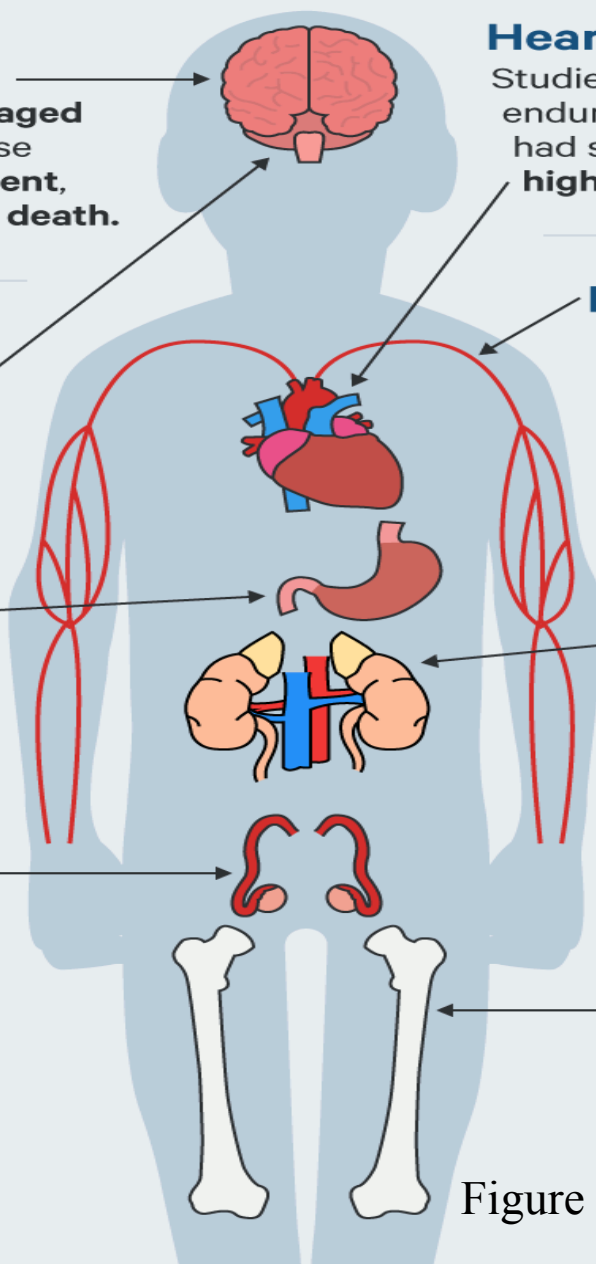


Figure 6: SOURCES: Centers for Disease Control; World Health Organization

What was Done to Help Flint and its Citizens?

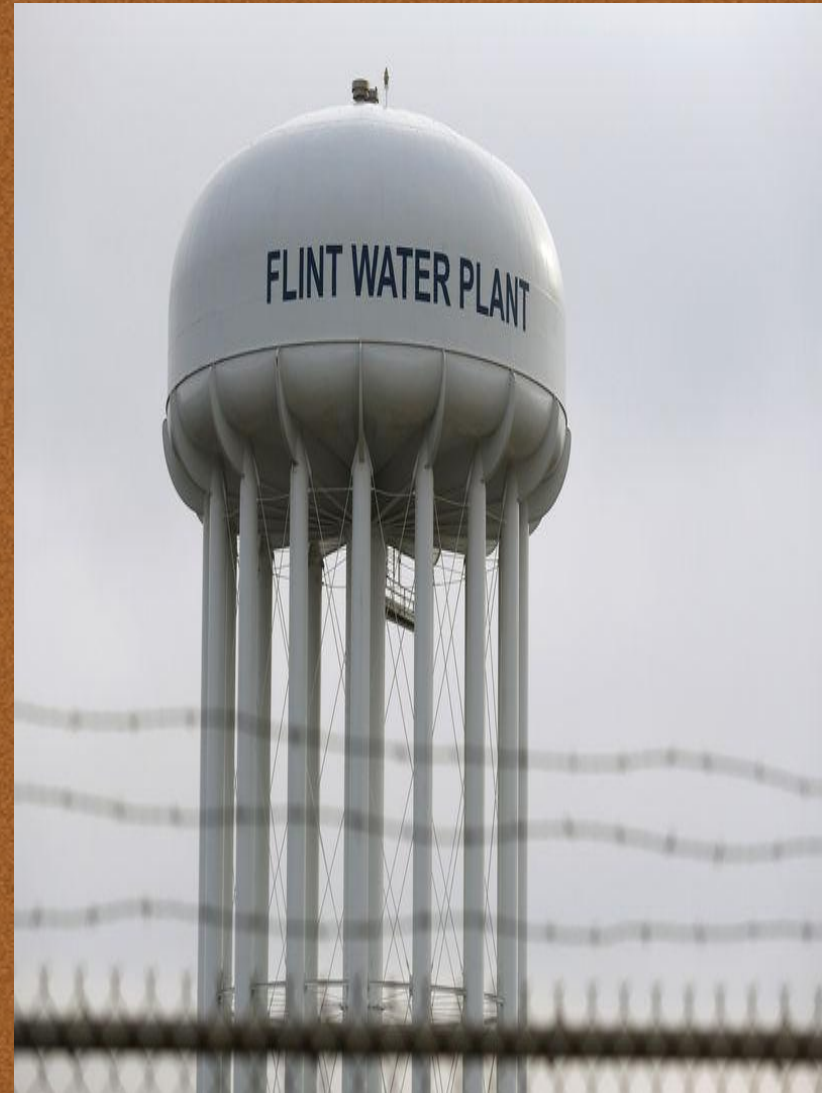
Ensuring Access to Safe Water

- Federal officials have worked with state and local partners to improve access to bottled water and water filters.
- **The Federal Emergency Management Agency has provided over 9.3 million liters of water to the state for distribution, over 50,000 water and pitcher filters, and over 243,000 filter replacement cartridges.**



What was Done to Help Flint and its Citizens? Cont.

- The United States Department of Housing and Urban Development (HUD) has worked with the Flint Housing Commission to ensure 100% installation, the future upkeep of water filters in every unit of public housing, and HUD's Federally-assisted and HUD-insured properties.
- In addition, HUD also worked with local partners to ensure that seniors and disabled residents in public housing received and have continuous access to clean water.



Restoring Flint's Water System

The Environmental Protection Agency conducted water testing to monitor restoration of the city's water system. Results show the system is recovering. Many are listed below :

Diagnostic Lead Sampling
Lead and Copper Rule Sampling
Testing Lead Filters in Homes
Overall Water Quality Testing
Flush for Flint Initiative



Economic Recovery

- **The Federal Government provided economic development assistance to help Flint recover from the crisis and continue to grow its economy.**
- **The U.S. Department of Labor provided a National Dislocated Worker Grant for up to \$15 million to assist with humanitarian and recovery efforts resulting from the water crisis in Flint.**



Economic Recovery Cont.

- The \$7.5 million released initially provided temporary employment for eligible individuals to assist with recovery work, as well as offered career and training services to help them find permanent work.
- The U.S. Small Business Administration provided approximately \$400,000 in additional funding through a number of programs,





Flint 2018 Update

- Several local and state officials, including former emergency managers and water plant employees have been charged with felonies. Some were linked to a Legionnaires' outbreak that killed 12 people during the Flint water crisis.
- By comparing the fertility rates of women in Flint during the crisis to those of women in other cities in Michigan, who to all other extents had similar environments, researchers found that the lead had a horrific and lasting impact on the residents.
- Although Flint has come a long way over the last four years the community and their children still suffer from the affects of lead exposure and lost loved ones



How Can We Help Flint?

1. **Send water to Flint Families**
2. **Support The Researchers who are keeping the Public Informed**
3. **Fund The Organizations Supporting Critical Public Health Services**



Works Cited

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Acknowledgements

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Thank You