Lead by the Numbers: School Drinking Water Toxicity

Srishti Boral and Vihitha Kumar

What's the first thing that comes to mind when thinking about water? Is it that it's a fundamental resource for life? Is it that it keeps people healthy? Regardless of what jumped into your mind when thinking about water, one thing is certain. Clean water is necessary for life, and everyone should have equal access to it. Unfortunately, the latter is being challenged all around the nation. Lead and other toxic chemicals in school drinking water have become widespread across the US, including our own state of Washington. This project sets out to explore the equity disparity happening in Washington in relation to water sources being contaminated with this deadly metal. WTN data shows that numerous schools in our state do not serve clean water (a basic necessity), and continue to serve toxic, lead-filled water instead. We looked at several school districts across the state and none could promise schools with zero lead-contaminated water fountains for their students. This may surprise you, and rightfully so. Lead can be deadly when ingested, so the fact that such a large number of schools fail to provide full protection from something that should be a no-brainer to eliminate is worth looking into.

Today, lead is considered (medically) as a neurotoxin, with its presence in human blood having harmful side effects, but lead has its roots in Ancient Rome. Romans used it to build water pipes due to its toughness and slight malleability. However, lead pipes would not make their appearance in America until the 1950s as some cities mandated them for their durability and longevity. As lead became more widespread, it also became more dangerous. One such example is Flint, a city in Michigan. After a piping change for cost efficiency, all the residents' water supply was coming from the Flint River. Unknown to city officials at the time, buildings and companies had been dumping industrial waste into these waters. After the change, in April 2014,

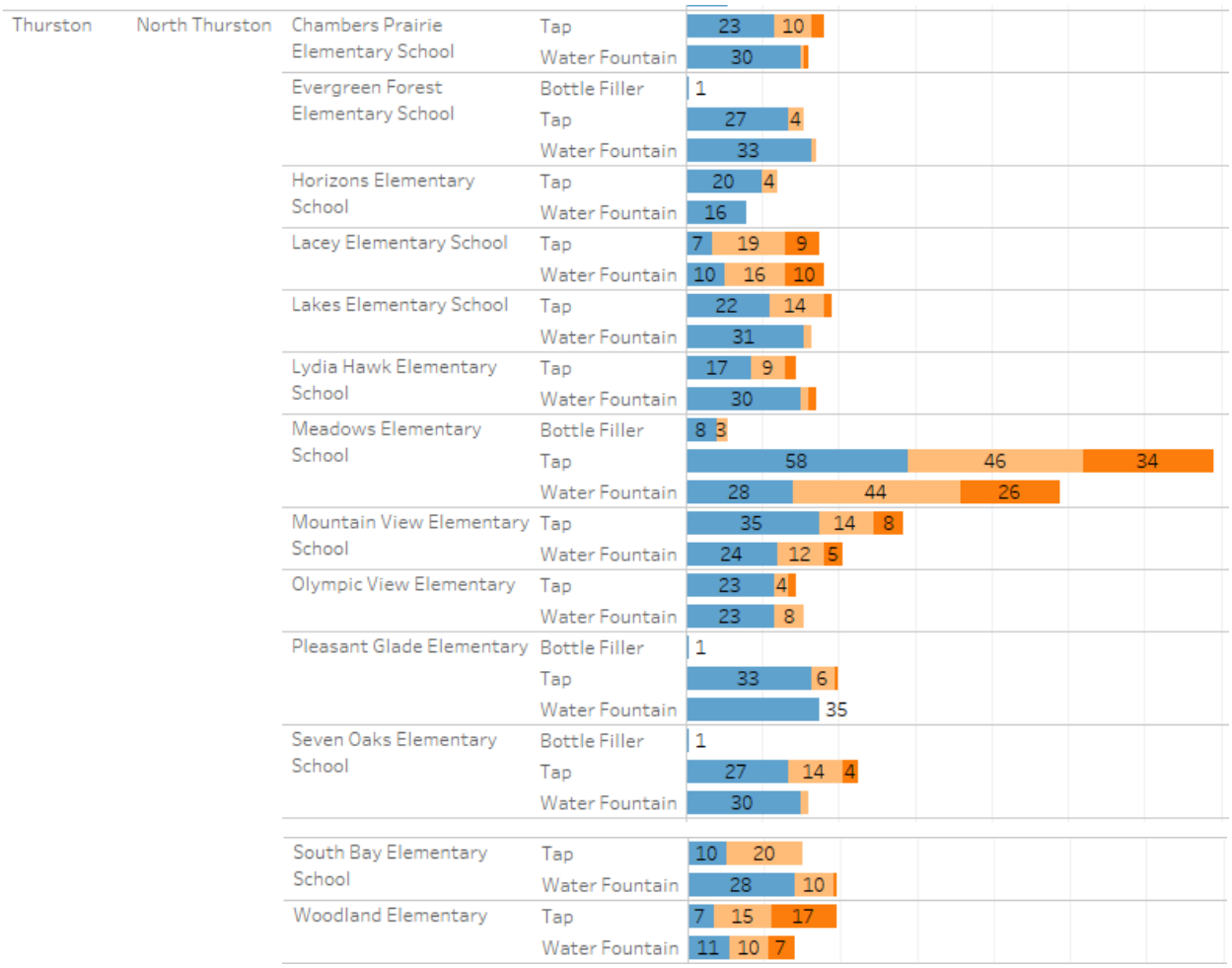
residents began becoming suspicious about the water. They complained the water smelled and tasted foul, and protests started, “by residents lugging jugs of discolored water” (NRDC). Even with these protests showing obviously contaminated water, officials reassured the public that the water was safe for drinking. Needing some form of factual evidence to back up their claim, the public turned to researchers at Virginia Tech. The researchers collected water samples from 252 homes, and the numbers perfectly showed the spike in lead levels across the city. 17% of samples registered above 15 ppb, well above the “federal action level”. “More than 40 percent measured above 5 ppb of lead, which the researchers considered an indication of a “very serious problem” (NRDC). Mona Hana-Attisha, a Flint pediatrician, reported in 2015 that blood-lead levels in children had doubled, and even tripled in some neighborhoods since 2014. This tragic upsurge of lead in Flint came to be known as the Flint Water Crisis.

Reality is somewhat depressing to think about; we live in one of the most developed, advanced nations in the world, and we still cannot guarantee safe drinking water for the public. Adding fuel to fire, there is an economic disparity tied to this case. While researching Flint, we stumbled upon its destitution rate. A whopping 41.2% of the population is in poverty, charting at the top 10% of cities in the US with the highest poverty rates. An article from Haddad states, “About half of all households in Flint earn less than $26,330 a year, and 41.2% of the population lives below the poverty line” (Haddad). Crime rates are also skyrocketing, with 2017 violent crimes per 100,00 people, coming once more at the top 10% most dangerous cities in the US. This directly connects financial hardships and contaminated water.

The water problem leaked out from Flint to all over the country, including Washington. We studied numerous districts, counties, and schools all over the state to determine the severity of the issue. Only a minute number of districts could guarantee a 0% lead contamination rate in

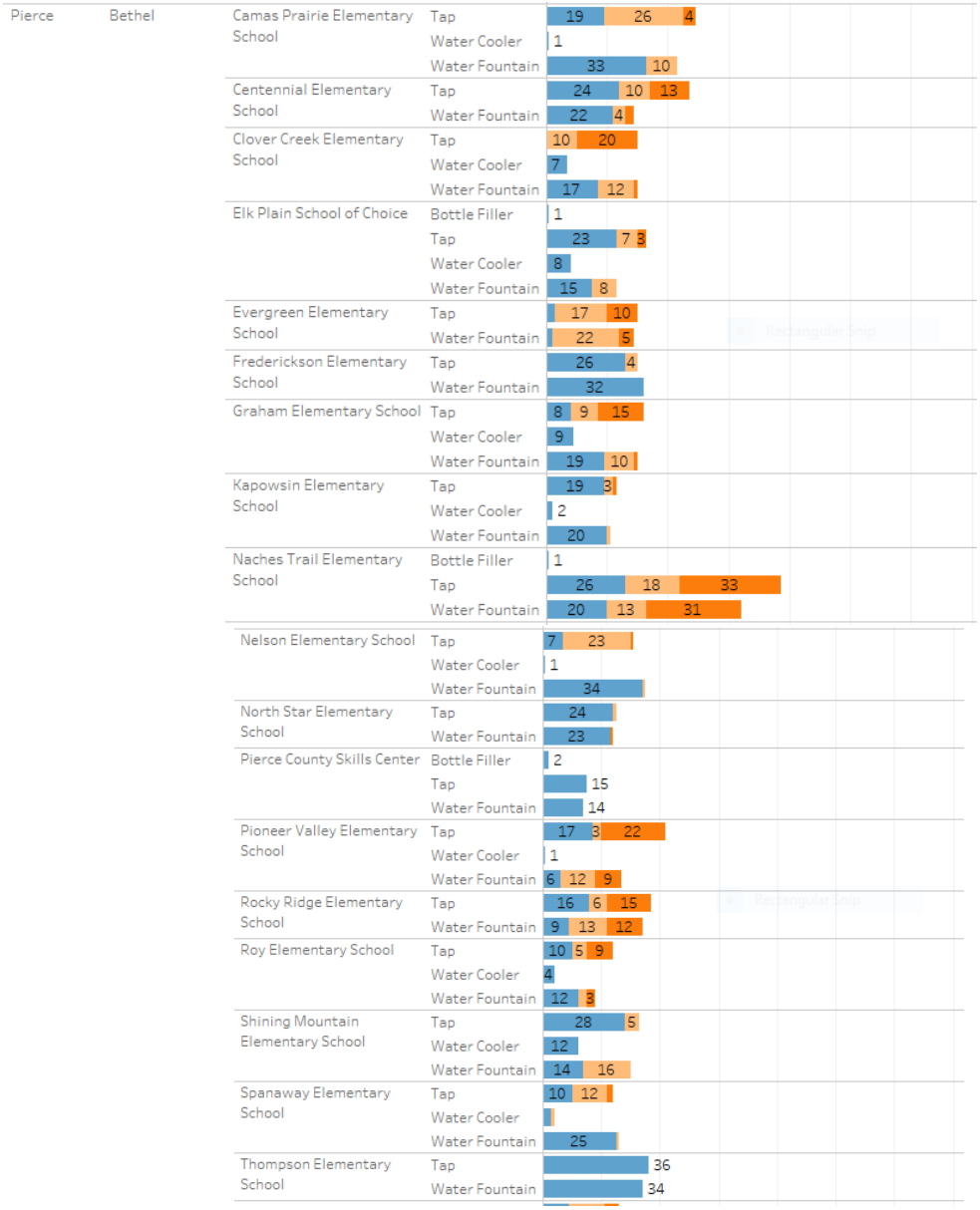
school taps. However, some schools did better than others. For context, “current law defines the actionable lead level as greater than 5ppb” (WTN). Furthermore, the EPA states that no level of lead is safe in drinking water, but that 15ppb is the dangerously high action level. For the sake of our research, we categorized any level of lead higher than 5 ppb as dangerous for human consumption.

Let’s start with a few school districts in our study with low expenditure rates, meaning the money they spend per student is lower than the state average of $18,000. Firstly, we have North Thurston school district, with an average expenditure of $13,968 spent per student. 13 elementary schools were surveyed for lead contamination levels in their drinking taps, fountains, and bottle fillers. Here’s the data we used (straight from WTN):



Dark orange signifies taps with lead levels of 15 ppb or higher, which the Washington Department of Health requires to be shut off. The peach signifies a lead level between 5 ppb and 15 ppb, the “actionable” lead level by law required for remediation. In North Thurston, of 1074 tested water sources, 290 of them had an actionable level of lead and 164 were required to be shut off. Let that sink in. 42% of these water fixtures had a concerning amount of lead in them. The truth is such that a student going to get water in their school must gamble their chances of getting poisoned 2 out of 5 times.

Initially, we were taken aback and considered this a sampling error since a relatively low number of sources were tested. But, looking at Bethel school district, one of the larger school districts in the state with an average of $13,451 spent per student, we found eerily similar results.



Of the 1214 water fixtures tested in Bethel, 281 had above 5 ppb of lead, and 218 had above 15 ppb of lead. Although Bethel is a larger school district with more students, over 40% of the water fixtures were heavily contaminated with lead. The data all leads to an assumption of a correlation between these schools' expenditure rates and lead contamination rates in their drinking water.

To prove this, we looked at a few schools with higher expenditure rates than the Washington average of $18,000. Lind School District has an average expenditure rate of $22,576 per student and had 66 of their water fixtures tested for lead. Out of those 66, none had levels higher than 5 ppb, which is a 0% contamination level. Next, we examined WTN lead contamination data from Highline School District, a school which spends about $23,667 per student, which had 1802 of their water fixtures tested. Out of them, only 115 had 5-15 ppb of lead, and a mere 69 had to be shut down for having over 15 ppb of lead. This is only about 10% of the water fixtures having a concerning level of lead contamination, much less compared to the schools having lower expenditure rates, thoroughly showing how expenditure rates affect toxicity levels. It seems that schools with high expenditures are the only ones able to greater measures in ensuring safe, clean drinking water for their students. This is known as an "economic disparity", and it's the root cause of many socio-economic problems all over the country, but we propose a solution to this particular disparity.

First, some background: The idea of this topic stemmed from complaints and rumors around the school about the school water tasting suspicious and being allegedly bad for you. None of them were necessarily true at our school, where filters are put into place and constantly monitored, but this piqued our curiosity. After a few minutes of quick research, we stumbled onto our topic for the WTN Youth Science Contest, lead contamination. Both of us have different interests that aligned with this topic as well, making it worthwhile to look into. One of us is more

into health-science related topics and one of us focuses more on ethics and the legal side of things. This topic's questionable ethical background combined with the medical effects was a perfect mixture that would keep us on our toes for the next month as we broke apart the details of this issue.

Within the first few weeks of research, we began noticing patterns in the data. We had previously heard of the Flint Water Crisis and wanted to see if poverty rates and lead contamination rates were interlinked. The closest thing to poverty rates when looking at schools are their expenditure rates, which are a good reflection of the economic and financial status of a district or county. If a district spends more money on their students, it also means they have enough money to do so. Soon enough, we discovered an equity issue: schools with lower expenditure rates being neglected when it came to their water quality. We hadn't really heard about news cases or reports being done in Washington specifically about lead contamination issues, leaving the public unaware of the metals being ingested through their water. Since this issue had already spread to most parts of the state, we chose the communication medium which would reach the most people: social media.

Our target audience for this project was school administrators, legislators who handled school funding at the state level, students, and any staff affiliated with the school's services. We specifically chose Instagram because most school-going teenagers use it. Most schools nowadays also have official Instagram accounts to send out reminders, and so, we created an Instagram account for outreach purposes (shown towards the end of the document). We crafted a handful of posts detailing contamination, how to contact officials to get help, and promoting the practice of advocating for safe school water. These posts often had blue, green and water-themed backgrounds which were chosen specifically to be associated with our account.

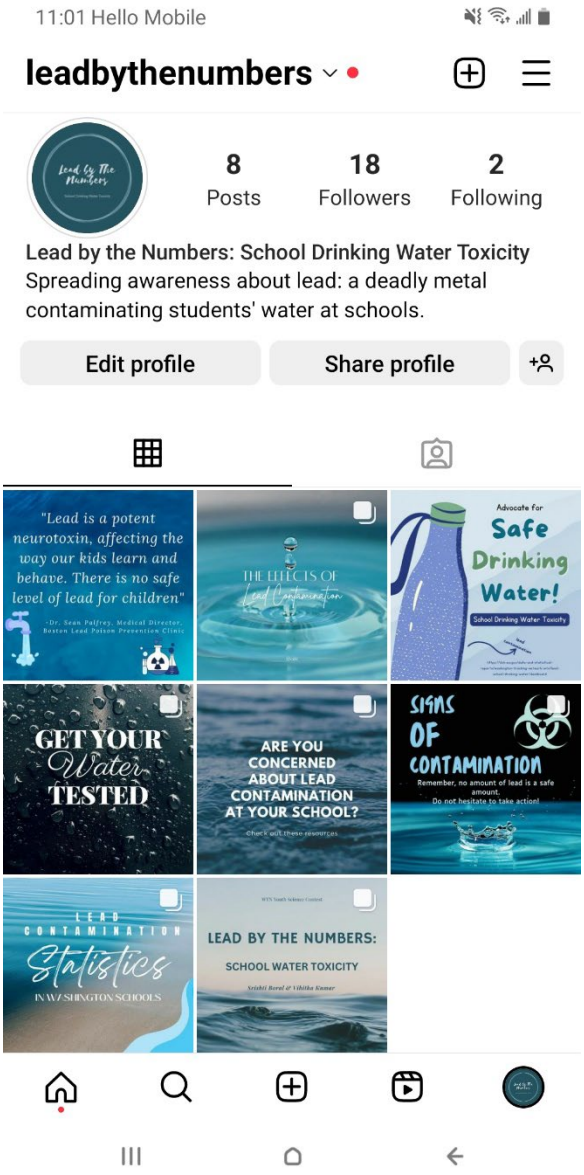
Secondly, we created a news-report style video aimed at school-going students and school boards. Our video was created to engage students with visuals, graphs, and statistics. We also had colorful graphics and an engaging script to make sure to present this issue in an attention-grabbing way. This video also targeted school boards by showing them influential data and suggesting action that they could take regarding this issue. In our video, we proposed a solution to the economic disparity in play. We introduced school boards to the idea of allocating a separate budget for each school specifically going toward water testing and purification. This budget would have a minimum (calculated by the district board) to sustain the smallest school in the district. It would also change depending on the number of staff and students at the school to provide for a population-based funding system in the district, including smaller schools. This system would be the same across all the districts in the state to ensure equality in water purification funding for any school.

To complement our news-report themed video, we created a presentation to be shown at school assemblies and science classes around the state. This presentation had eye-catching graphics meant to keep students engaged as teachers present it to them. We tried to implement bright colors into this aspect of our project to grab the attention of larger-scale audiences. We also simplified all the data from our paper and campaign for less confusion.

We faced technical and general challenges alike while making this project. While creating our outreach campaign, we disagreed on what format and what platform we should post our information on. Since teens nowadays are active on many platforms, we had to consider all the data and perspectives before selecting Instagram. Furthermore, during the entire process, it was hard to find times to work that suited both of our schedules, so we had to learn to divide up small tasks to make sure we contributed equally and in a cohesive manner.

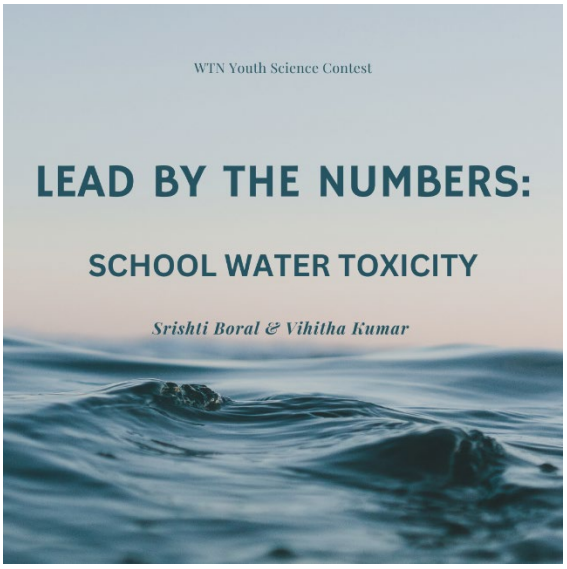
Inspiration from our project initially came from rumors about foul-tasting water from students at our school, Eastlake High School, which we give them credit for. We mainly used WTN data to prove the hypothesized disparity between economic conditions and lead contamination levels. To research the history of the inequity surrounding water contamination, we used the NRDC website, which had excellent articles providing information about the Flint Water Crisis. For research about the medical side effects of contamination we used the CDC, EPA, and Henry Ford Health. Lastly, our resources for testing for contamination came from CNN and CDC. We also owe huge thanks to everyone who decided to help share awareness about our social media campaign online. Lastly, we would like to give credit to Saanvi Kadam, a student at Eastlake High School (and a good friend) who spent her Sunday helping us film our news video. Thank you again, everyone.

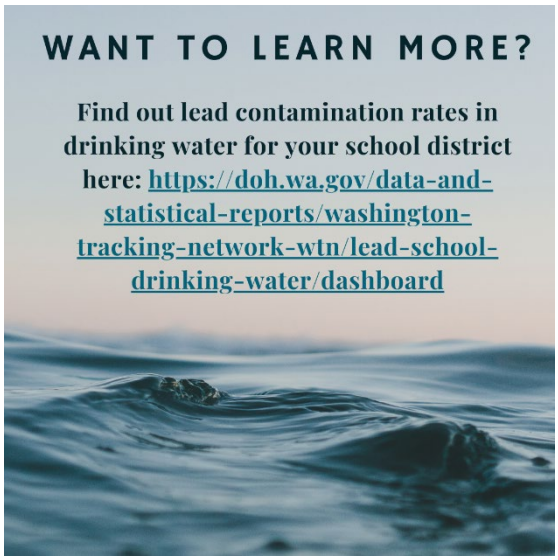
Instagram Campaign: @leadbythenumbers



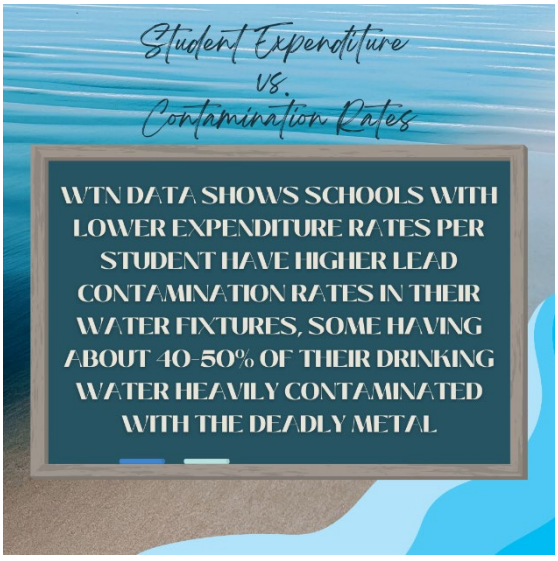
Campaign Logo

Introduction to the issue



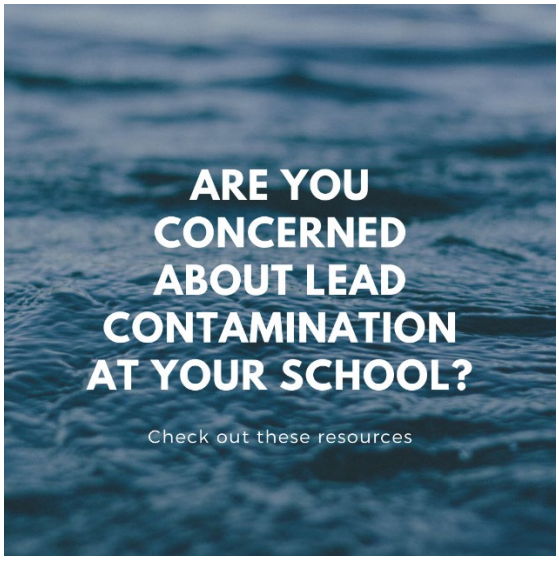


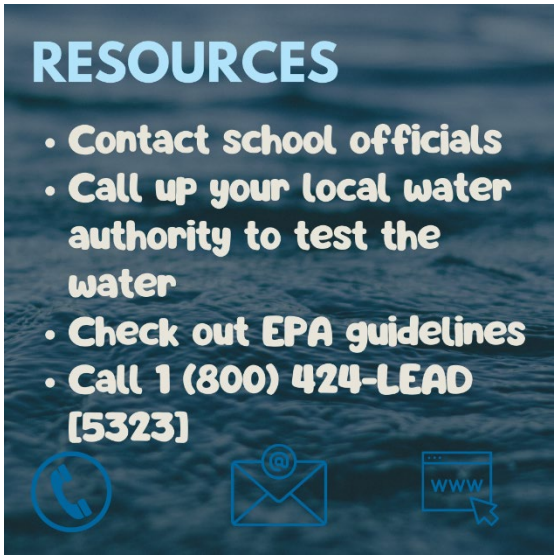
The Statistics



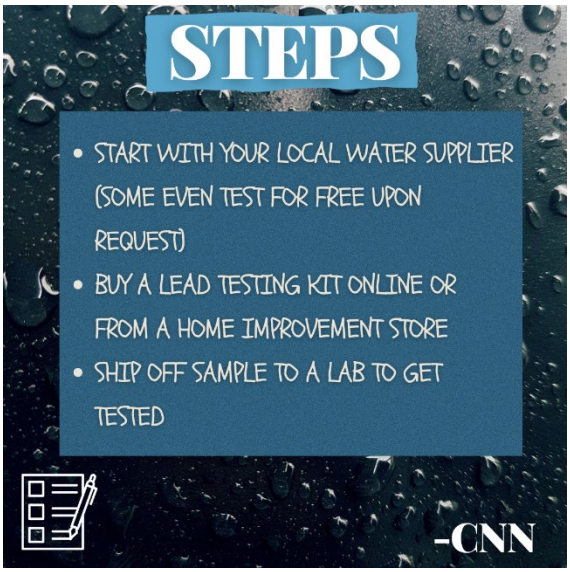
Signs of Contamination

Resources

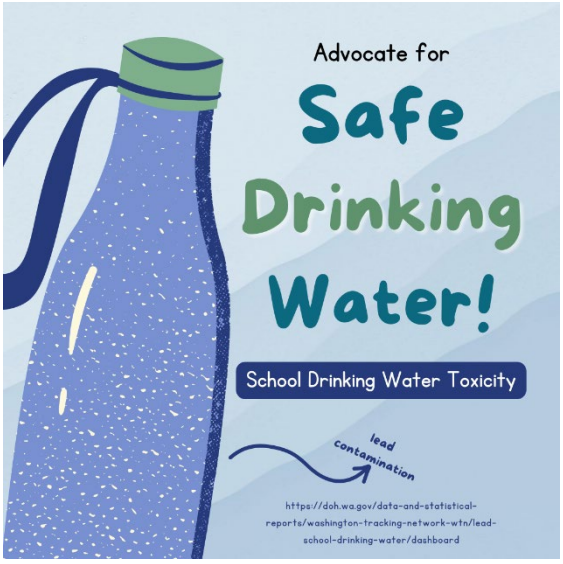




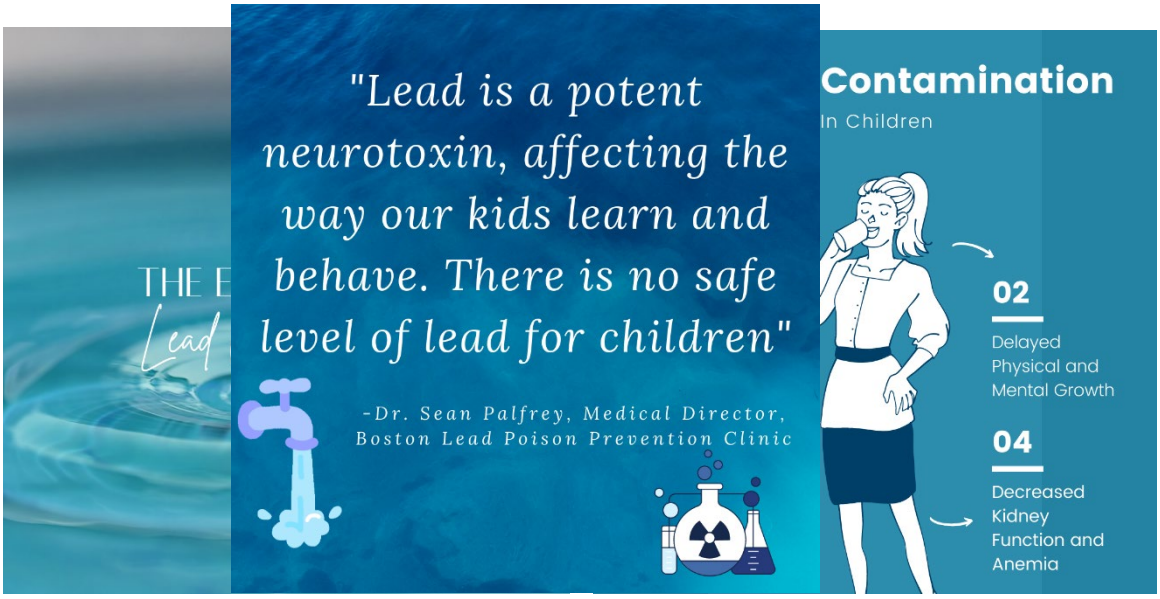
Steps to test your water



Advocate for Safe Drinking Water



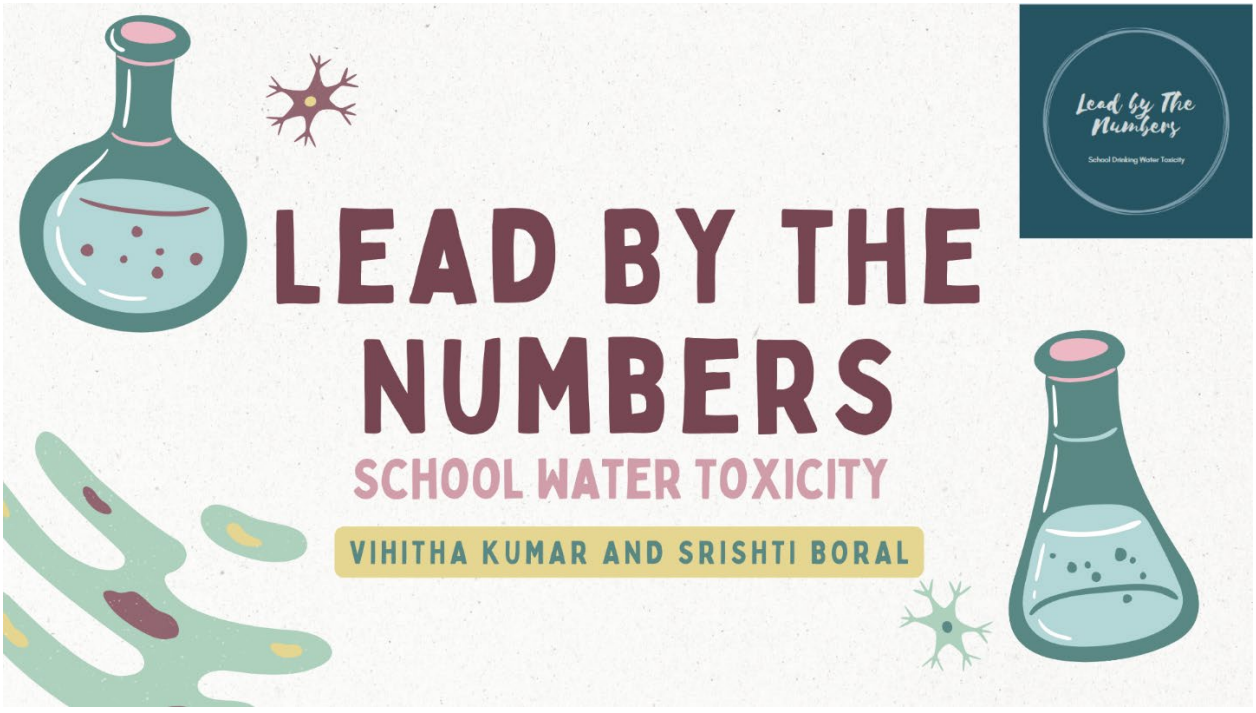
Effects of Lead Contamination



Dr. Sean Palfrey’s words on lead

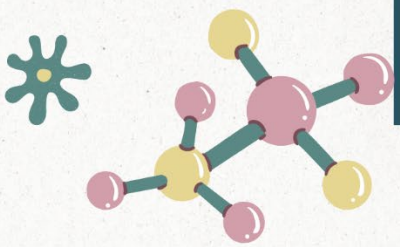
Presentation link:

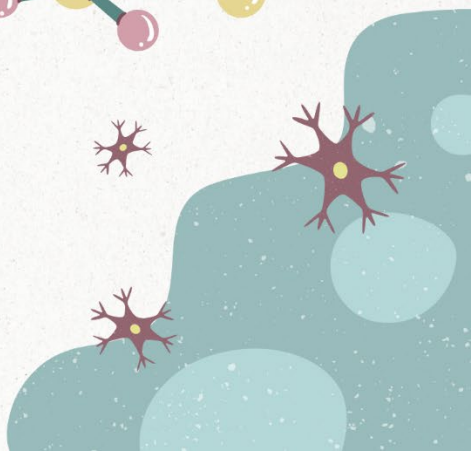
https://www.canva.com/design/DAFfKCHmAz8/YYYRLRsv5Do7YvXONboh9g/edit?utm_content=DAFfKCHmAz8&utm_campaign=designshare&utm_medium=link2&utm_source=sharebutton



01

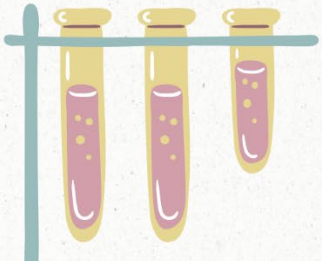
THE BASICS

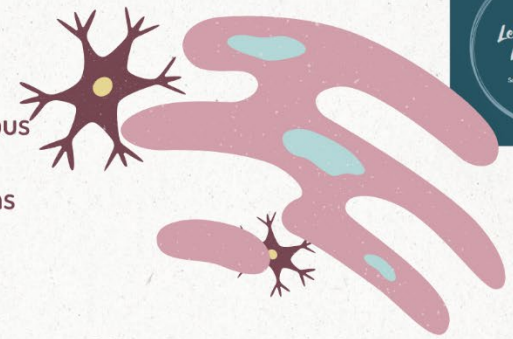




WHAT IS LEAD?

- Lead is a toxic metal that's really dangerous when ingested, especially for children.
- Children take in 4-5 times as much lead as adults, which is why it's so dangerous for them.
- Lead is extremely harmful, regardless of how much one is exposed to.





HOW DOES IT GET INTO WATER?

- Lead gets into water when pipes wear away (or "corrode") and a chemical reaction occurs, contaminating the water.

EFFECTS OF LEAD ON THE BODY

Lead by The Numbers
School Drinking Water Toxicity

Anemia and Hypertension

Vomiting and Constipation

Appetite Loss

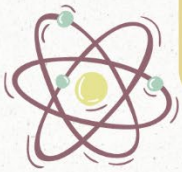
EFFECTS OF LEAD ON THE MIND

Lead by The Numbers
School Drinking Water Toxicity

Learning Issues and Developmental Delays

Attention Span Reduced

Antisocial Behaviour Increased



02

THE TREATMENT

HOW DO YOU TREAT LEAD POISONING?

MILD

- Figure out the source of the lead and remove it
- Could require oral chelation therapy, which acts as a binding agent to make the process of getting rid of lead smoother.

SEVERE

- Immediate hospitalization
- Maintenance of airways
- Coma and Seizure management
- IV drip
- Could require catheter irrigation

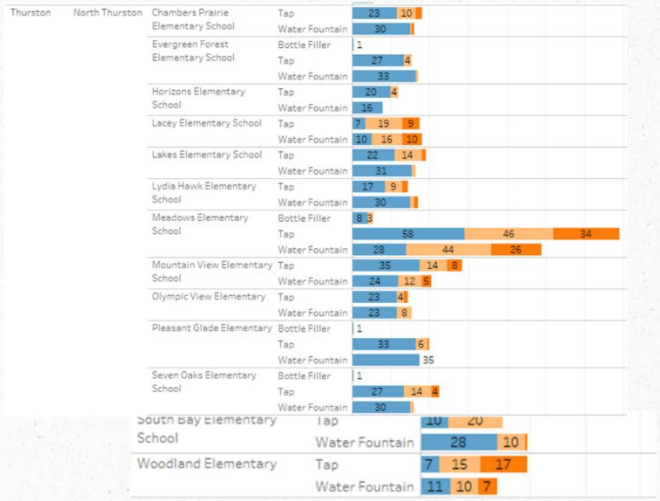
IN BOTH CASES, GETTING RID OF LEAD IMMEDIATELY IS NECESSARY!

03

THE ISSUE

Lead by The Numbers
School Drinking Water Toxicity

LEAD LEVELS IN NORTH THURSTON SCHOOL DISTRICT



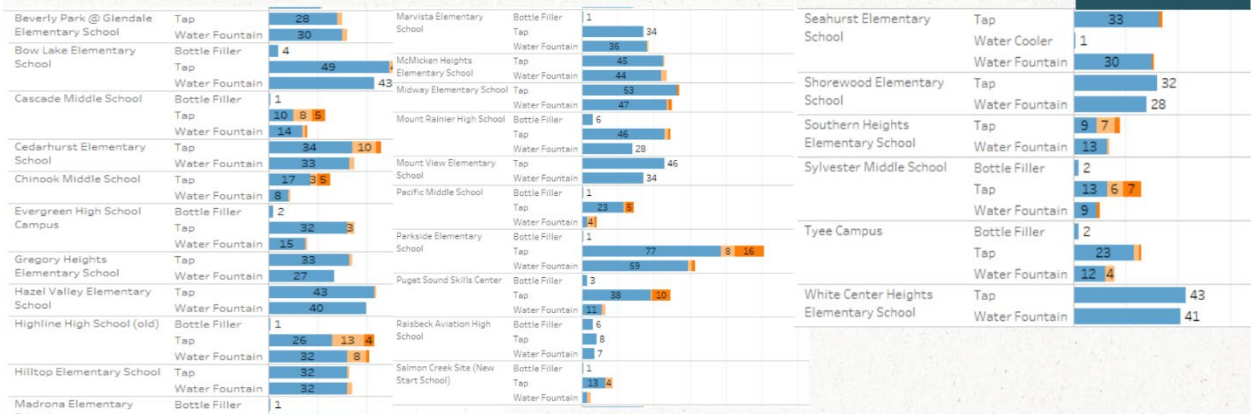
KEY:
Blue: <5 ppb
Peach: >5 and <15 ppb
Dark Orange: >15 ppb

>5 ppb = dangerous to consume

BREAKDOWN

- North Thurston spends less than the average $18,000 on its students, making it a low expenditure school district.
- Out of the 1074 water sources tested, 290 came back with concerning lead amounts, about 42%.
- Of those, 164 had so much lead that they were required to shut off.

LEAD LEVELS IN HIGHLINE SCHOOL DISTRICT



>5 ppb = dangerous to consume

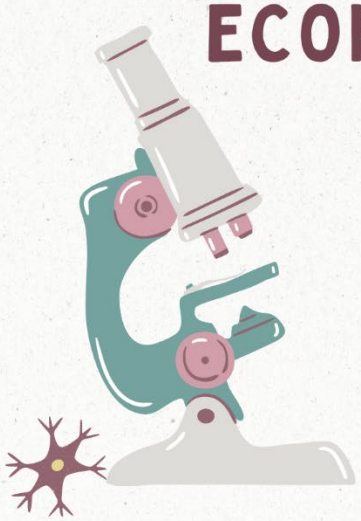
See key on previous data slide

BREAKDOWN

- Highline spends more than the average $18,000 on its students, making it a high expenditure school district.
- Out of the 1802 water sources tested, 115 came back with concerning lead amounts, only about 10%.
- Of those, only 69 were required to shut off, much less than North Thurston.

Situations like this are known as.....

ECONOMIC DISPARITIES



- Economic disparities are inequalities because of uneven cash flow (in our case, in schools).
- Schools that are spending less on their students' well beings (like North Thurston), reportedly have more dangerous environments, like higher lead levels in their water.
- In contrast, schools that spend more on the health of their students (like Highline), are enforcing safer, cleaner environments, like lower lead levels.

WHAT CAN YOU DO?

STUDENTS

----------HELP US RAISE AWARENESS ON THIS ISSUE!----------

Visit https://doh.wa.gov/data-and-statistical-reports/washington-tracking-network-wtn/lead-school-drinking-water/dashboard to find out the quality of your school's water

Is the lead level concerning?
Reach out to your school admin or call the National Lead Information Center at 1-800-424-LEAD.

WHAT CAN YOU DO?

SCHOOL BOARD MEMBERS

-----ADVOCATE FOR CHANGING THE BUDGETING SYSTEM FOR SCHOOLS!-----

Visit https://wallethub.com/edu/e/most-least-equitable-school-districts-in-washington/77142 to see how much money schools in your area are spending.

Are they spending less than the average $18000? Chances are, the school has a lot of lead concentration in the water as well (which you can check by visiting the link on the previous slide).

Advocate to change the budgeting system and have more money go to ensuring students' safety! (details on next slide)

PROPOSED BUDGETING SYSTEM

POPULATION BASED FUNDING

The budget would change based on the number of people (staff and students) at the school to ensure complete fairness. It would also make sure every school has the best budget possible for its population.

ECONOMICALLY DISADVANTAGED SCHOOLS

The budget would have a set minimum amount. This would guarantee even the smallest school having enough funding to support itself.

EQUITY IMPACT

The budgeting system would stay the same across the state to certify everyone getting equal access to an appropriate budget. This would help highly contaminated schools spend more money on keeping their students safe.

WORKS CITED

Lead in drinking water. (n.d.). CDC. Retrieved April 14, 2023, from https://www.cdc.gov/nceh/lead/prevention/sources/water.htm#:~:text=Lead%20can%20enter%20drinking%20water,acidity%20or%20low%20mineral%20content.

Lead poisoning (Causes, symptoms, and treatment). (n.d.). Patient. Retrieved April 14, 2023, from https://patient.info/doctor/lead-poisoning-pro

Lead poisoning- diagnosis and treatment. (n.d.). Mayo Clinic. Retrieved April 14, 2023, from https://www.mayoclinic.org/diseases-conditions/lead-poisoning/diagnosis-treatment/drc-20354723

Lead in school drinking water dashboard. (n.d.). Washington State Department of Health. Retrieved April 14, 2023, from https://doh.wa.gov/data-and-statistical-reports/washington-tracking-network-wtn/lead-school-drinking-water/dashboard


Lead By The Numbers
School Drinking Water Toxicity
THANK YOU!
Remember, you can make a difference!

Works Cited

Basic information about lead in drinking water. (n.d.). US EPA. Retrieved April 14, 2023, from https://www.epa.gov/ground-water-and-drinking-water/basic-information-about-lead-drinking-water#:~:text=Adults%20exposed%20to%20lead%20can,in%20both%20men%20and%20women

Bethel school district. (n.d.). US News Education. Retrieved April 14, 2023, from https://www.usnews.com/education/k12/washington/districts/bethel-school-district-109890

Causes and effects of lead in water. (n.d.). NRDC. Retrieved April 14, 2023, from https://www.nrdc.org/stories/causes-and-effects-lead-water

Division of Elementary and Secondary Education - Offices - Learning Services - School Health Services - Lead Testing Opportunity. (n.d.). https://dese.ade.arkansas.gov/Offices/learning-services/school-health-services/lead-testing-opportunity

Flint water crisis: Everything you need to know. (n.d.). NRDC. Retrieved April 14, 2023, from https://www.nrdc.org/stories/flint-water-crisis-everything-you-need-know

Get the lead out 2019. (n.d.). Environment America. Retrieved April 14, 2023, from https://environmentamerica.org/center/resources/get-the-lead-out-2019/

How to test for lead in your home water supply. (n.d.). CNN. Retrieved April 14, 2023, from https://www.cnn.com/2016/01/21/health/lead-testing-home-drinking-water/index.html

Lead in drinking water. (n.d.). CDC. Retrieved April 14, 2023, from https://www.cdc.gov/nceh/lead/prevention/sources/water.htm#:~:text=Lead%20can%20enter%20drinking%20water,acidity%20or%20low%20mineral%20content.

Lead in school drinking water dashboard. (n.d.). Washington State Department of Health. Retrieved April 14, 2023, from https://doh.wa.gov/data-and-statistical-reports/washington-tracking-network-wtn/lead-school-drinking-water/dashboard

Lead poisoning (Causes, symptoms, and treatment). (n.d.). Patient. Retrieved April 14, 2023, from https://patient.info/doctor/lead-poisoning-pro

Lead poisoning- diagnosis and treatment. (n.d.). Mayo Clinic. Retrieved April 14, 2023, from https://www.mayoclinic.org/diseases-conditions/lead-poisoning/diagnosis-treatment/drc-20354723

Most and least equitable school districts in Washington. (n.d.). Wallet Hub. Retrieved April 14, 2023, from https://wallethub.com/edu/e/most-least-equitable-school-districts-in-washington/77142

6 Michigan cities listed among worst places to live in US. (n.d.). Click on Detroit. Retrieved April 14, 2023, from https://www.clickondetroit.com/all-about-michigan/2019/02/08/6-michigan-cities-listed-among-worst-places-to-live-in-us/#:~:text=Flint,-Population%3A%2097%2C810&text=Flint%2C%20Michigan%2C%20is%20one%20of,lives%20below%20the%20poverty%20line

6 side effects of not drinking enough water. (n.d.). Henry Ford Health. Retrieved April 14, 2023, from https://www.henryford.com/blog/2020/05/side-effects-of-not-drinking-water