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TIME FOR ACTION?

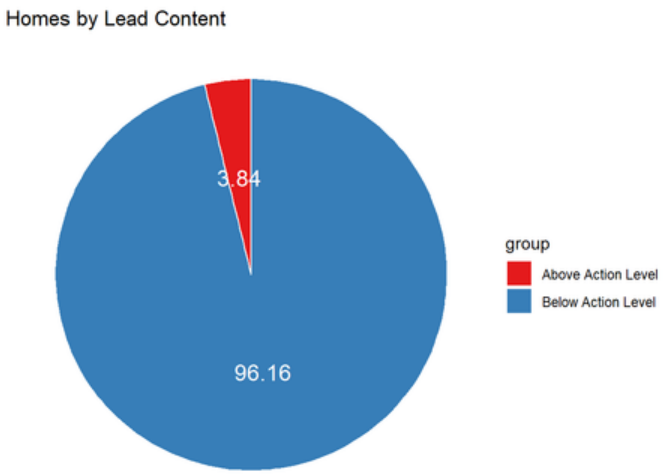
New Study Shines Light on Lead in Water

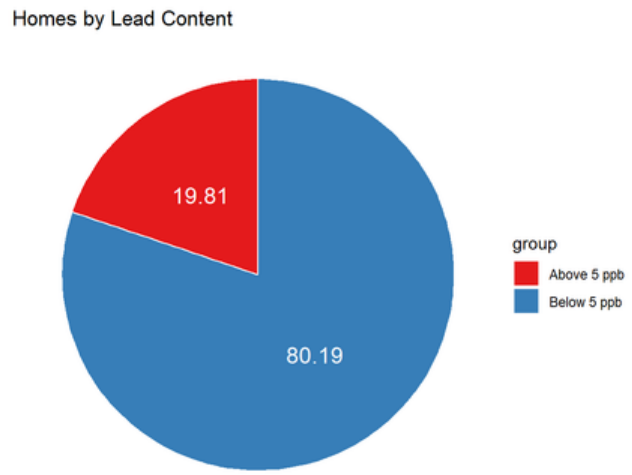
A PIPE PROBLEM

More than any other U.S. city, about 400,000 homes in Chicago are still serviced by lead pipes. The high number of lead pipes in Chicago is partly due to the city code requiring their usage until 1986, when lead pipes were banned federally in the Safe Drinking Water Act (SDWA). In addition, the SDWA also required the Environmental Protection Agency (EPA) to set health-based standards for drinking water against contaminants such as lead. To comply, the EPA set what they call a “maximum contaminant level goal (MCLG)” for lead at zero parts per billion (pbb). We know that no amount of lead in drinking water is safe and that it can cause various health risks, especially in children.

SETTING REGULATIONS

The EPA states that an MCLG of zero for lead is an non-enforceable goal because “lead contamination of drinking water often results from corrosion of the plumbing materials belonging to water system customers.” As such, the EPA argues that enforcing the MCLG for lead is not feasible. Instead, the EPA introduced the “Lead and Copper Rule,” which outlines an enforceable treatment technique which water systems must follow to control lead. In this regulation, the EPA set an action limit of 15 ppb for lead and requires water systems to amend their water treatment if more than 10% of customer tap water samples exceed the action limit. As a result, Chicago is technically still in compliance with federal regulations even with thousands of lead pipes. Further, tap water samples in Chicago are voluntary – residents must request one from the city and conduct the sample themselves.





Many critics, such as the environmental advocacy group Natural Resources Defense Council, argue that the EPA should lower its action limit for lead from 15 pbb to 5 pbb, which is on par with limits set by the EU and Canada. In an article by NPR,, a former employee who helped draft the action limit on lead disclosed that it was based on what water utilities could handle in the late 1980s. Almost four decades later, the EPA has yet to revise this rule.

NEW RESEARCH

With this in mind, researchers at the University of Texas at Austin conducted a statistical study which sought to estimate the proportion of Chicago households that have lead concentration levels above the action level set by the EPA. Researchers gathered public data from the City of Chicago's Department of Water Management, which includes partially anonymized addresses and the lead concentration in ppb recorded after immediately running the tap water, after running the tap for two minutes, and after 3 minutes. By considering each city block as a cluster, researchers employed a multistage sampling method and randomly selected one address from each cluster, resulting in a sample set of n = 15,129 addresses. A sample proportion of 3.84% was calculated and conditions for conducting a confidence interval were satisfied as .0384*n >10 and (1-.0384)*n>10 and the observations were independent due to the random sample. At a 95% confidence level, researchers found the confidence interval to be (.0353, .0415). That is to say, researchers are 95% confident that the true proportion of Chicago households that have lead concentration levels above 15 ppb in drinking water is between 3.53% and 4.15%.

To see how this interval would change if the EPA changed the action limit to 5 ppb, researchers conducted another confidence interval with the same sample. This time, a sample proportion of 19.81% was calculated and conditions for conducting a confidence interval were satisfied as .1981*n >10 and (1-.1981)*n>10 and the observations were once again independent due to the random sample. At a 95% confidence level, researchers found the confidence interval to be (.1911, .2050). In other words, researchers are 95% confident that the true proportion of Chicago households that have lead concentration levels above 5 ppb in drinking water is between 19.11% and 20.5%, which is double the minimum percentage of households the EPA outlines before requiring the city to take action.

CONCLUSION

As this study shows, reducing the lead action limit highlights just how at risk Chicago households are at for lead contamination. 19% of the houses sampled having above 5 ppb of lead in drinking water is a surprisingly high amount. We argue that the EPA must lower its action limit for lead and enforce stricter regulations in the name of public health. If the EPA cannot enforce a stricter limit on lead in drinking water, then is the agency actually adhering to the Safe Drinking Water Act? One potential issue with the study is that the data comes from houses that asked to get their water tested for led, potentially creating some volunteer bias. Further studies would ideally randomly sample houses and test them for lead instead of using data from houses asking to be tested.

CREDITS

Veronica Alejandro: Created the random sample, conducted inference, wrote the parameter and methodology parts of the document
Nicholas Rao: Created visualizations of the data, conducted inference, formatted the document, wrote the document's conclusion