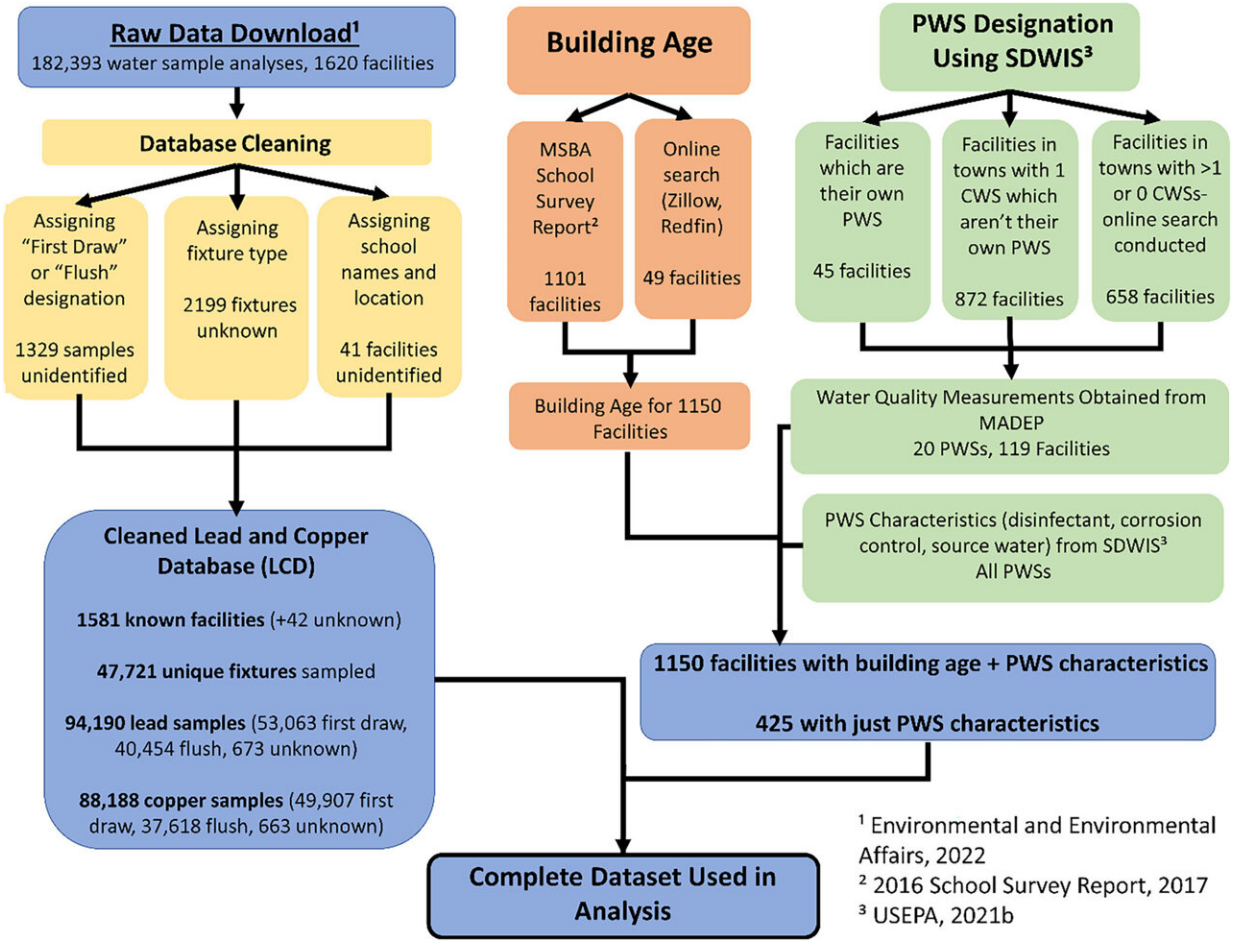
Unsafe lead levels in school drinking water: Study identifies building risk factors

November 30 2023, by Julia Westbrook



Data cleaning and merging methodology. Credit: *AWWA Water Science* (2023). DOI: 10.1002/aws2.1358

University of Massachusetts Amherst civil and environmental engineers have determined the factors that may help identify the schools and daycare centers at greatest risk for elevated lead levels in drinking water. The most telling characteristic for schools in Massachusetts is building age, with facilities built in the 1960s and 1970s—nearly a third of the facilities tested—at the greatest risk for having dangerously high water lead levels.

There is no safe exposure level to lead. The Massachusetts Department of Environmental Protection (MassDEP) recommends that schools and childcare facilities achieve the lowest lead levels possible, with a goal of 1 ppb (parts per billion) or less, often the lowest measurement that a laboratory can make. Childhood exposure can cause brain and nervous system damage, slowed growth and development, learning and behavioral problems, and hearing and speech issues.

In fact, today, the Environmental Protection Agency announced proposed changes to the Lead and Copper Rule Improvements.

The UMass study, published in the journal *Water Science*, compared water lead-level data to a myriad of other characteristics that could influence these levels.

"Is it certain types of fixtures? Is it certain types of buildings? Is it certain places? Is the chemistry of the water supply? Is there anything about the water treatment process?" says Emily Kumpel, one of the study authors and assistant professor of civil and environmental engineering at UMass Amherst.

Building age was the most important contributing factor for a few reasons. Legislation has been passed over the years to improve the safety of school water. The federal Safe Drinking Water Act Amendment in 1986 required using "lead-free" piping, solder, and flux in buildings. The

definition of "lead-free" was then refined to more stringent levels in 2011.

Kumpel explains that there is a clear "before" and "after" around each of these time points: 50% of water samples from buildings constructed in 1986 and earlier had a water lead level of 2.1 ppb or higher, and 13.7% of samples were greater than 15 parts per billion (or 0.0015 mg of lead per liter of water). After 1986, this declined so that half of the samples had one ppb or less of lead, and only 4.6% of samples had lead levels higher than 15 ppb.

Importantly, these results represent water lead levels captured at "first draw," meaning the water had been stagnant in the pipes overnight. The pattern was similar when looking at samples after the pipes had been flushed for 30 seconds, though less pronounced and with significantly lower lead levels after flushing.

Buildings constructed in the 1960s and 1970s—about 30% of all schools tested—were the most likely to have faucets, water fountains or other fixtures with elevated water lead levels at first draw. Half of the first draw water samples taken from schools built in these decades had lead concentrations at or above 2.8 and 2.9 ppb, respectively. Plus, 16% of fixtures in 1960s buildings and 19.5% of fixtures in 1970s buildings had first draw levels over 15 ppb.

"That means that if you go into a facility built in the '60s or '70s and are the first one to get a glass of water in the morning or after a long school break, you'd have a high chance of it having a dangerously high level of lead. However, if the tap was flushed or had been used throughout the day, this would drop substantially. This is why flushing or other remediation actions are important," Kumpel says.

Schools built in the 1950s and 1980s were also at slightly lower, but still

elevated, risk.

Kumpel explains that this reflects certain construction decisions that were made in particular places at particular times. She also notes that trends in Massachusetts likely extend to other parts of New England that aren't so geographically different and likely had similar building trends and best practices over the years.

The study's data came from the Assistance Program for Lead in School Drinking Water, a MassDEP and UMass Amherst water monitoring collaboration that began in 2016. This initiative now has information from more than 1,500 schools and childcare facilities.

"This publicly available large data set has been used for previous studies as well and provides a basis for facilities to take action to protect children's health, including applying for funding to install filtered bottle fill stations under the Massachusetts School Water Improvement Grant (SWIG) program," notes John Tobiason, professor and head of the UMass Amherst civil and environmental engineering department, who leads the UMass work in support of the MassDEP initiative and is a co-author on this paper.

Part of this current analysis of the results from MassDEP's voluntary testing program included evaluating if the results may also serve a predictive purpose by identifying the risk factors for elevated water lead levels.

"As of last year, around 60% [of Massachusetts schools] have had sampling done and reported to this public database, but 40% have not, though each month more schools and childcare facilities are testing," says Kumpel. "That was what we were trying to get at with this model: of those that haven't yet tested, can we prioritize the places that we might need to look at the most? Using these factors, can we then predict where

we should make sure to follow up?"

There are obvious implications for school administrators and legislators looking to enact environmental protections, but what are the takeaways for parents?

"It's close to home for me as someone with young children," says Kumpel. "But I'm also an engineer that works particularly on water distribution systems and providing safe tap water. This is why there are programs to test the water and report results; that way you can have the assurance that there is monitoring. This is where, as engineers, we strive to achieve due diligence and transparency."

Where lead was detected, technical assistance was offered for remediation actions, including help in applying for the SWIG grants for water bottle filling stations, she adds.

Her advice: stay informed. Massachusetts makes it particularly easy to do that. "Massachusetts has made the data available in a public database ," she says. "See if your child's school or daycare has been tested. There is this free testing program so, as a parent, it could be advocating that your childcare provider or school sign up for the testing program and get that information."

More information: Liam Amery et al, Water lead levels in Massachusetts schools and early education and childcare facilities, *AWWA Water Science* (2023). DOI: 10.1002/aws2.1358

Provided by University of Massachusetts Amherst

November 30) retrieved 9 May 2024 from https://techxplore.com/news/2023-11-unsafe-school-factors.html