

# After final public water systems ruling, arsenic levels decline for most highly exposed US communities

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A large sample of native arsenic. Credit: Aram Dulyan/Public Domain

Reductions in arsenic exposure among the U.S. population were reported for users of public water systems in the South and West, and among Mexican American participants, according to a new study by Columbia University Mailman School of Public Health. Differences in change over time were reported by educational attainment in addition to by region, race/ethnicity, and public water arsenic level. The full findings are published in the journal *Environmental Pollution*.

The Final Arsenic Rule, first enforced since 2006, reduced the arsenic maximum contaminant level to 10 µg/L in [public water systems](#).

"We found that implementing a lower regulatory standard for arsenic in public water systems successfully reduced water [arsenic exposure](#) for many communities across the United States, and that reductions were largest for certain populations and regions with the highest initial water arsenic exposures," said Maya Spaur, Ph.D., in environmental health sciences at Columbia Mailman School of Public Health. "From our results it is apparent that federal water regulations can successfully reduce exposures for the most highly exposed."

Using the 2003-14 National Health and Nutrition Examination Survey (NHANES), the researchers estimated arsenic exposure from water for populations reliant on public water systems by recalibrating urinary dimethylarsinate (rDMA) to remove smoking and dietary contributions. They evaluated the average differences and corresponding percent reductions of urinary rDMA comparing subsequent survey cycles to 2003-04 (baseline), stratified by region, race/ethnicity, [educational attainment](#), and county level water arsenic concentration.

The percent reduction in urine rDMA was 0.32 µg/L (9%) among participants with the highest Community Water System (CWS) arsenic, comparing 2013-14 to 2003-04. Declines in urinary rDMA were largest in regions with the highest water arsenic: the South [0.57 µg/L (16%)]

and West [0.46 µg/L, (14%)]. Declines in urinary rDMA levels were significant and largest among Mexican American [0.99 µg/L (26%)] and non-Hispanic white [0.25 µg/L (10%)] participants.

Long-term exposure to arsenic even at low and moderate levels can increase the risk of cancer and other types of chronic disease. The U.S. Department of Health and Human Services Agency for Toxic Substances and Disease Registry includes arsenic as a human carcinogen and toxicant associated with numerous adverse health outcomes, ranking it number one on their substance priority list. The U.S. Environmental Protection Agency (EPA) regulates arsenic in public drinking water supplies and sets the maximum contaminant level (MCL) allowable in public water systems. The MCL reflects technological feasibility and [financial costs](#), in addition to [public health](#).

In 2006, the EPA reduced the MCL of arsenic in public water systems to 10 µg/L, from 50 µg/L. However, there is no known safe level of exposure to inorganic arsenic, and the EPA set a health-based MCL goal (MCLG) of 0 µg/L.

"Though the current MCL is a significant reduction from the previous MCL, it is substantially higher than the MCLs for New Jersey, New Hampshire, Denmark and the Netherlands," said Spaur. "Additional efforts are still needed to address remaining inequalities in CWS arsenic exposure."

"Future regulatory efforts and managerial, financial, and technological assistance should target communities with public water [arsenic](#) levels that remain elevated, to address persistent disparities in drinking water quality. Our study shows that federal drinking water regulations are critical for improving environmental equity and justice," said Anne E. Nigra, assistant professor of [environmental health sciences](#) at Columbia Mailman School of Public Health, and senior author.

Co-authors are Benjamin Bostick and Steven Chillrud, Lamont-Doherty Earth Observatory, Columbia; and Pam Factor-Litvak, Ana Navas-Acien and Anne E. Nigra, Columbia Public Health.

**More information:** Maya Spaur et al, Impact of lowering the US maximum contaminant level on arsenic exposure: Differences by race, region, and water arsenic in NHANES 2003–2014, *Environmental Pollution* (2023). [DOI: 10.1016/j.envpol.2023.122047](https://doi.org/10.1016/j.envpol.2023.122047)

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