The Human Right to Water: A 20-Year Comparative Analysis of Arsenic in Rural and carceral Drinking Water Systems in California

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Introduction

Access to safe drinking water is considered a universal human right. In the United States, exposure to arsenic contamination in drinking water disproportionately impacts small, groundwater-reliant communities and communities of color.2,3 These inequities are driven by a combination of natural, built, and sociopolitical factors.3 The United Nations calls upon states to especially safeguard the right to safe water for groups that may face difficulties exercising this right, such as incarcerated people.4 Limited research exists on water quality in prisons; however, prisons in the Southwestern United States have elevated arsenic concentrations compared with other community water systems (CWSs) in the region.5

Inorganic arsenic is an odorless, colorless carcinogen, common in California’s San Joaquin Valley groundwater.2,3 In 2001, the U.S. Environmental Protection Agency lowered the maximum contaminant level (MCL) for arsenic from 50 μg/L to a running annual average of <10 μg/L.7 This stronger standard went into effect in 2006. In 2012, California passed its Human Right to Water bill (Assembly Bill 685) mandating safe, affordable, and accessible water for all.

In this article we present a comparative analysis of 20 y of data (2001–2021) on arsenic concentrations in the CWSs serving Kern Valley State Prison (KVSP) and three neighboring rural communities: Allensworth, Delano, and McFarland. Our objective was to better understand trends in water quality, compliance, and treatment following adoption of the revised arsenic MCL and to elucidate differences, if any, between neighboring incarcerated and nonincarcerated populations.

Methods

We selected KVSP because of its well-documented history of arsenic contamination.5 The Allensworth Community Services District, City of Delano, and City of McFarland CWSs are located in close proximity to KVSP, rely exclusively on groundwater sources, and serve >500 people each. All three communities have median household incomes of <60% of California’s statewide average (Table 1). Over the time period analyzed, all four systems served water in exceedance of the revised arsenic MCL in multiple years, and all received violations for exceedances (Figure 1). Mean arsenic levels in served water sources from 2001 to 2021 ranged from 3.4 μg/L [standard deviation (SD) = 6.7 μg/L] in Delano, to 9.3 μg/L (SD = 2.9 μg/L) in Allensworth (n = 2,426 samples from served water sources across four systems) (Table 1). All four systems also received MCL violations for other contaminants (e.g., nitrate, total coliforms, 1,2,3-trichloropropane) over this 20-y period. Disaggregated sampling results for served water sources (Figure 1E–H) reveal that, following arsenic remediation efforts, multiple samples remained >10 μg/L in every system except Delano (Table 1). Uniquely among the three CWSs with arsenic treatment in place, KVSP had several posttreatment water samples with arsenic levels >20 μg/L (Figure 1G). From 2019 to 2021, Allensworth and McFarland also exhibited short periods during which arsenic remediation efforts were not optimized (Figure 1E,H).

Discussion

Although all four CWSs were in compliance with the arsenic MCL as of the third quarter of 2021, sample levels and daily concentrations fluctuate and can periodically exceed legal limits with no violations recorded (Figure 1). Because compliance with the arsenic MCL is determined using a running annual average by water system sampling point, in communities with arsenic levels...
near the MCL, the number of MCL violations (Table 1) likely underestimates the risks of chronic exposures to arsenic, and underreports potential violations of the human right to safe water. Disaggregated sampling results (Figure 1E–H) more accurately reflect the health risks from arsenic levels than do the running annual averages used to assess legal compliance. Metrics such as the 95th percentile of sample results, or the number of samples exceeding half of the MCL, are useful additional tools for tracking such exposure risks.3,10

In low-income rural settings, persistent and known water-related injustices can reach across carceral boundaries. Unlike the other CWSs in our study, KVSP was built following notification of the new arsenic MCL in 2001. After 2006, KVSP was out of compliance for 7 y. Despite a ~$6-million state investment for arsenic remediation (Table 1),3 violations of the human right to water persisted at KVSP with respect to day-to-day water safety and access to alternatives (Figure 1C,G). Bottled water is sold at KVSP, but because incarcerated people often lack the funding needed to adequately mitigate exposures at a local level, small CWSs serving low-income communities sometimes lack a long-term solution for their arsenic exposure, although the state subsidizes bottled water access. Because federal laws situate the responsibility for CWS financing primarily to a local level, small CWSs serving low-income communities often lack the funding needed to adequately mitigate exposures to water contaminants such as arsenic.4 Repeated individual sampling results for arsenic >10 µg/L in Allensworth, KVSP, and McFarland (Figure 1E,G,H) reveal the limitations of current arsenic remediation efforts.

Our analysis is bound by reported CWS data and limited by a lack of water quality testing data at the point of use; thus,
we cannot properly estimate individual exposures. Generalization of our findings to other carceral and rural communities may be limited by the particulars of KVSP and the other study communities.

Conclusions

Overall, our findings illustrate that structural challenges to the realization of the human right to safe water occur pre- and post-arsenic treatment and unfold in distinct ways for incarcerated communities.
and nonincarcerated rural communities, b) human right to water violations can persist even following state investments for remediation, and c) annually averaged water quality data used to track and publicly report violations of the Safe Drinking Water Act provide only a partial guide to whether the human right to water is being realized. Publicly available, disaggregated monitoring data enables a more nuanced comparison of water quality and of progress toward the human right to water.

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URLs for all data sources as well as the R scripts used for data processing and analysis are included in the supporting information files (https://osf.io/7wqvn).

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