

## HEALTHY COMMUNITIES DATA AND INDICATORS PROJECT

**Short Title:** Unsafe Drinking Water

**Full Title:** Percent of the population served by community water systems not meeting regulations of the Safe Drinking Water Act

1. **Healthy Community Framework:** Quality and sustainability of environment
2. **What is our aspirational goal:** Clean air, soil and water, and environments free of excessive noise
3. **Why is this important to health?**

### Description of significance and health connection

Drinking water is water that is used for domestic purposes, drinking, cooking, and personal hygiene. Drinking water is safe when it meets standards that limit the presence of harmful microbes and chemicals. All public water systems (PWS) are required to follow the standards and regulations set by the U.S. Environmental Protection Agency (USEPA) under the Safe Drinking Water Act (SDWA). Water contaminants are classified as microorganisms, water disinfectants, disinfection byproducts, inorganic chemicals, organic chemicals, and radionuclides. The USEPA sets limits on water maximum contaminant levels (MCLs), maximum residual disinfectant levels (MRDLs), regulates treatment techniques (TT), and regulates the compliance of PWS to monitoring and reporting (M/R) rules.

Over 20% of PWS in the U.S. failed provisions of the SDWA from 2004 to 2009, with the majority of the violations occurring within small and rural water systems. Unincorporated, low-income, rural communities of color spend over 10% of their annual incomes purchasing water. In California for instance, the Central and Salinas valleys use groundwater exposed to contamination by agricultural fertilizers and livestock manure. This contamination financially burdens the poorest mostly Latino communities.

### Summary of evidence

There were 33 drinking water-associated pathogen outbreaks (mainly *Giardia*, *Legionella*, Norovirus, *Shigella*, and *Campylobacter*) in the U.S. in 2009-2010 causing 1,040 cases of illness, 85 hospitalizations, and 9 deaths. California reported one Norovirus outbreak in a non-community PWS in 2010. The most common violations reported for California PWSs in 2008-2011 were 34% total coliform rule violations, 34% arsenic, and 10% nitrates. Prolonged exposures to arsenic (above the MCL) can cause skin damage, problems with the circulatory system, or an increased risk of certain cancers. Excessive levels of nitrate can cause serious illness, and in rare instances death in infants less than six-months of age. The presence of fecal coliforms is usually associated with direct contamination by sewage or animal wastes and indicates possible contamination with organisms that can cause disease.

### Key References

- World Health Organization. [Health through Safe Drinking Water and Basic Sanitation](#). Accessed April 21<sup>st</sup>, 2014.
- Centers for Disease Control and Prevention. [Public Water Systems](#). Accessed April 21<sup>st</sup>, 2014.
- United States Environmental Protection Agency. [Drinking Water Contaminants](#). Accessed April 21<sup>st</sup>, 2014.
- Pannu C. Drinking Water and Exclusion: A Case Study from California's Central Valley. *Cal L Rev* 2012; 100(223): 227-268.
- California State Water Resources Control Board. [Recommendations Addressing Nitrate in Groundwater \(Report to the Legislature\)](#), 2013. Accessed April 21<sup>st</sup>, 2014.
- Centers for Disease Control and Prevention. Surveillance for Waterborne Disease Outbreaks Associated with Drinking Water and Other Nonrecreational Water — United States, 2009–2010. *MMWR* 2013; 62:714-720.
- California Department of Public Health. Division of Drinking Water and Environmental Management. [Annual Compliance Reports. 2008, 2009, 2010, and 2011](#). Accessed June 19<sup>th</sup>, 2014.

#### 4. What is the indicator?

##### Detailed Definition:

$$\text{Percent of the population served by water systems not meeting regulations of the Safe Drinking Water Act} \\ = \frac{\text{Population living in a geographic area served by a community} \\ \text{water system with 1 or more violations of the MCL/TT in a time period}}{\text{Population living in a geographic area served by a community water system}}$$

Stratification: Race/ethnicity (8 categories), violation category (5 categories)

##### Data Description

- Data sources: California Department of Public Health (CDPH), Division of Drinking Water and Environmental Management (DDWEM), [Drinking Water Program \(DWP\)](#), [Annual Compliance Reports](#), CDPH, California Environmental Health Tracking Program (CEHTP), [Water System Boundary Tool](#). Department of Finance (DOF), [Demographic Research Unit, Redistricting files](#).
- Years available: 5 year aggregate (2008-2012)
- Updated: annually (annual Compliance Reports)
- Geographies available: census tracts, cities/towns, counties, county divisions, regions and state.

Definition: PWS are subdivided in community and non-community systems. A community water system (CWS) supplies water to the same population year-round. It serves at least 25 people at their primary residences or at least 15 residences that are primary residences. Part 1: Data on PWS with MCL/TT violations for any contaminant between 2008 and 2012 was obtained from the DWP-Annual Compliance Reports. Violations were classified in five categories: Treatment Technique (tt), MCL Total Coliform Rule-Bacteriologic (tcrb), arsenic, nitrates and all other MCL (other). A subset of data including only CWS and violations information was joined to the Water System Boundary shapefile using ArcMap. New shapefiles containing only CWS (CWSs) and CWS with violations by category (CWSVs) were created. Census block centroids (2010) were spatially joined to the polygons in CWSs and CWSVs to obtain the blocks in geographic areas served by CWS and the blocks in areas served by a CWS with violations. Part 2: These Census blocks were imported into SAS and merged with population (2010) data by block. The total population in geographic areas served by CWS (denominator) and the total population in geographic areas served by CWS with violations (numerator) were calculated for Census tracts, places, counties, county divisions, regions and state. Regions were based on counties of metropolitan transportation organizations (MPO) regions as reported in the [2010 California Regional Progress Report](#). Standard errors, relative standard errors, and 95% upper and lower confidence intervals, decile rankings of places and relative risk in relation to state average were calculated. The percentage of the population covered by CWS for which data was available was calculated.

#### 5. Limitations

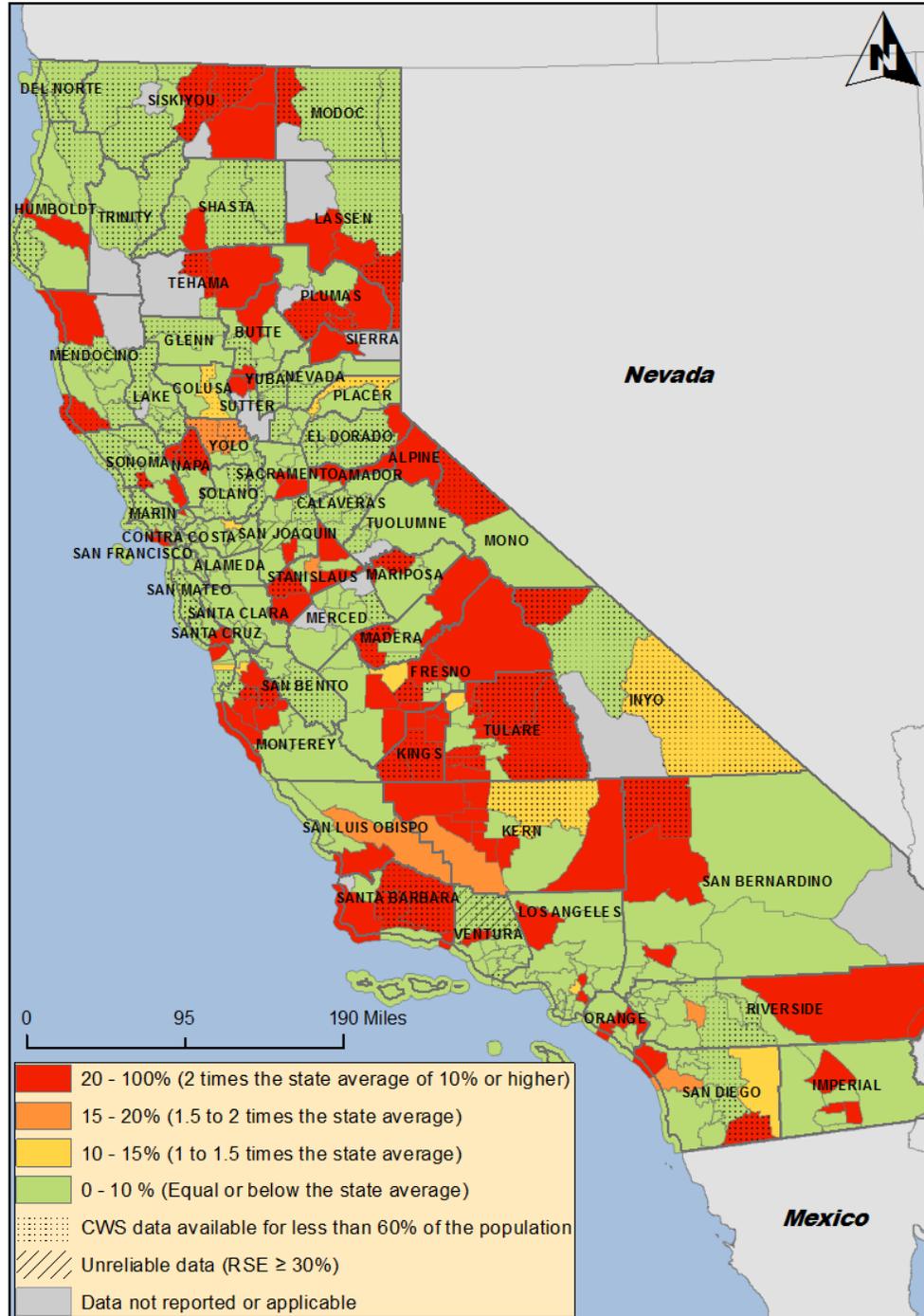
This indicator measures water availability but not consumption. The violations in the Annual Compliance Reports could have been corrected before serving the water to the public. MRDLs or M/R violations were not included. This indicator only refers to Community Water Systems (CWS) and not to private domestic wells or small CWS. A discussion of the many limitations regarding the collection of water quality data and its use for Public Health purposes can be found here [http://www.ehib.org/page.jsp?page\\_key=153](http://www.ehib.org/page.jsp?page_key=153). Only 1597 of 4000 CWS in California and only 475 of the 854 CWS with 1 or more MCL/TT violations (2008-2012) are currently included in the Water Systems Boundary shapefile. Some water system boundaries might change in the future as the shapefile is updated.

### 6. Projects using this indicator

English P, Gunier R, Kreutzer R, Lee D, McLaughlin R, Parikh-Patel A, Von Behren J, Wersinger E, Yuan Y. California Environmental Health Indicators. CDPH-EHIB; 2002. [http://www.ehib.org/papers/health\\_indicators.pdf](http://www.ehib.org/papers/health_indicators.pdf)

### 7. Examples of Maps, Figures, and Tables

**Map 1: Percent of the Population Served by Community Water Systems (CWS) that Reported at Least One Violation (MCL or TT) to the Safe Drinking Water Act Regulations Between 2008-2012, County Divisions, California**



Sources: California Department of Public Health, Division of Drinking Water and Environmental Management, Drinking Water Program. California Department of Finance.

Analysis by CDPH and UCSF

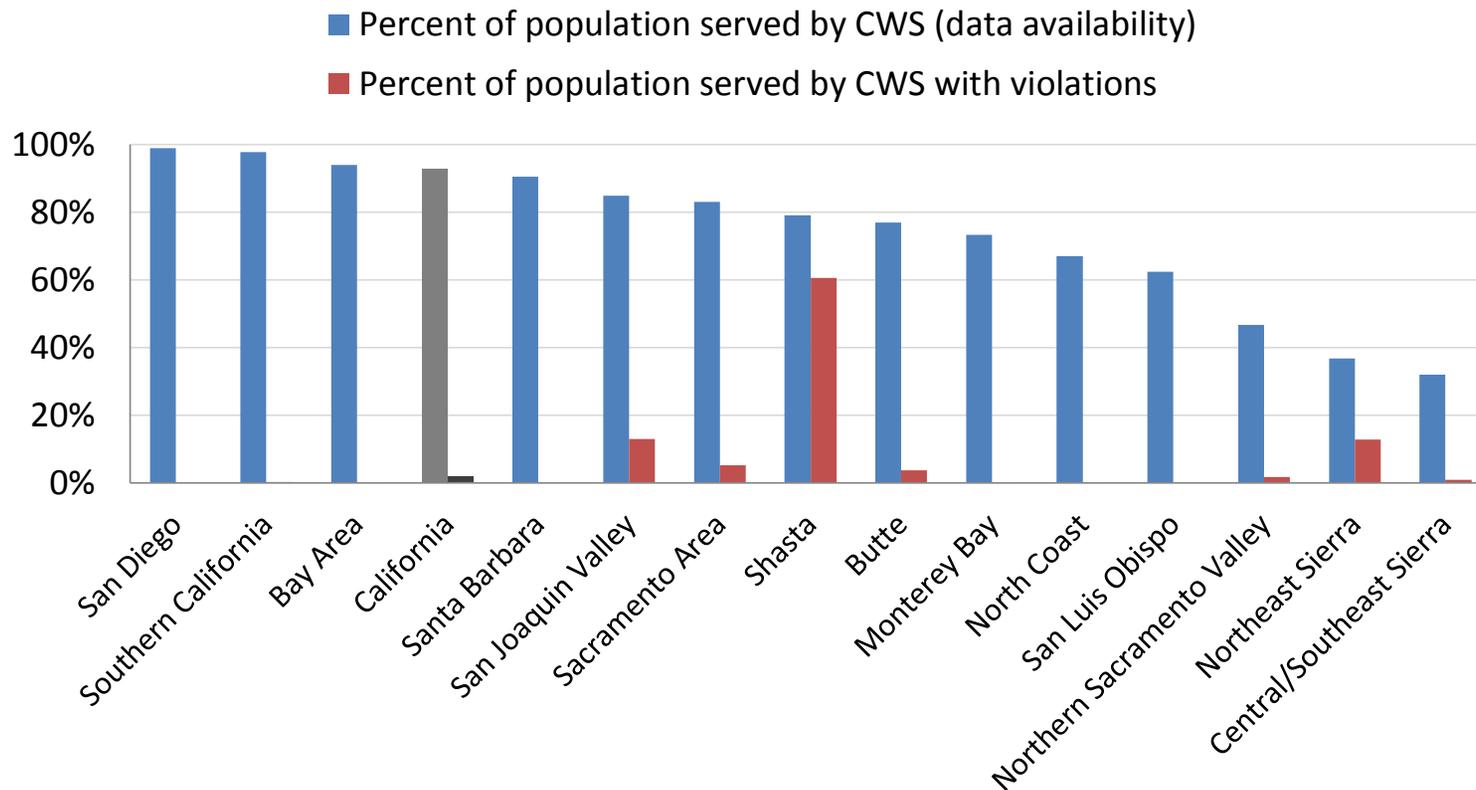
**Map 2: Percentage of the Population Served by Community Water Systems Reporting at Least one Total Coliform Rule MCL Violation, Cities and Towns in Southern California, 2008-2012**



Sources: California Department of Public Health, Division of Drinking Water and Environmental Management, Drinking Water Program. California Department of Finance.

Analysis by CDPH and UCSF

## Percent of the Population Served by Community Water Systems<sup>a</sup> (CWS) that Reported at Least One Arsenic MCL Violation, Regions of California, 2008-2012



Sources: California Department of Public Health, Division of Drinking Water and Environmental Management, Drinking Water Program. California Department of Finance. <sup>a</sup>Only those CWS that appear in the CEHTP-Water System Boundary Tool.

**Table 1. Percent of the Population by Race/Ethnicity Served by Community Water Systems<sup>a</sup> (CWS) with at Least One Violation (MCL or TT) to the Safe Drinking Water Act Regulations between 2008 and 2012, California**

Race/Ethnicity	Total population (A)	Population served by CWS (B)	Percent (%) of the population served by CWS <sup>a</sup> (A/B*100)	Population served by CWS with at least 1 MCL/TT violation (C)	Percent (%) of the population served by CWS with at least 1 MCL/TT violation (C/B*100)
African American	2,163,804	2,068,755	96	129,126	6
American Indian/ Alaska native	162,250	125,248	77	17,212	14
Asian	4,775,070	4,591,922	96	411,410	9
Latino	14,013,719	13,276,997	95	1,399,514	11
Multiple	968,696	894,301	92	81,578	9
Native Hawaiian/ Other Pacific Islander	128,577	118,904	92	6,407	5
Other	85,587	79,122	92	7,325	9
White	14,956,253	13,371,185	89	1,354,711	10
<b>Total</b>	<b>37,253,956</b>	<b>34,526,434</b>	<b>93</b>	<b>3,407,283</b>	<b>10</b>
<b>Total from DWP<sup>b</sup></b>		<b>37,721,734</b>		<b>3,234,475</b>	<b>9</b>

<sup>a</sup>Only those CWS that appear in the CEHTP-Water System Boundary Tool.

<sup>b</sup>For comparison purposes we include estimates based on population counts reported in the PWS database, CDPH-Drinking Water Program (DWP). “Community Water Systems (CWS) are required to estimate the number of people served for regulatory purposes. Because of the complexity of water systems, there is no way to know exactly how many people each water system serves, and the methods for estimation are inaccurate” ([http://www.ehib.org/page.jsp?page\\_key=151](http://www.ehib.org/page.jsp?page_key=151)).