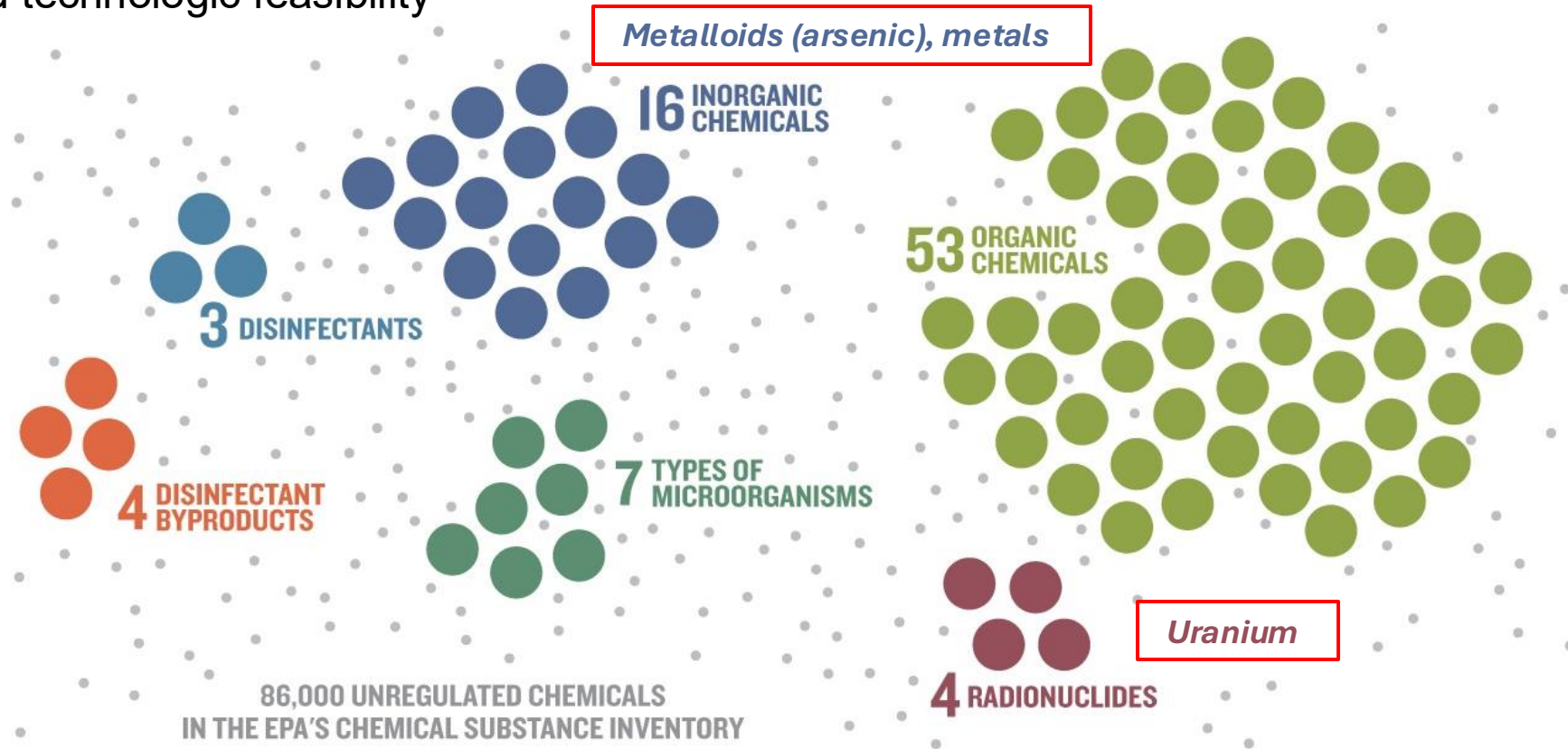


Background & Motivation

- Populations are exposed to multiple contaminants in drinking water
- Drinking water inequalities: some communities are disproportionately exposed
- Potential health effects from chronic exposures to toxicants in drinking water
- **Gaps in understanding:**
 - Effects of exposures at levels below regulatory effects
 - Combined effect of exposures to multiple contaminants

Types of water contaminants regulated by US EPA

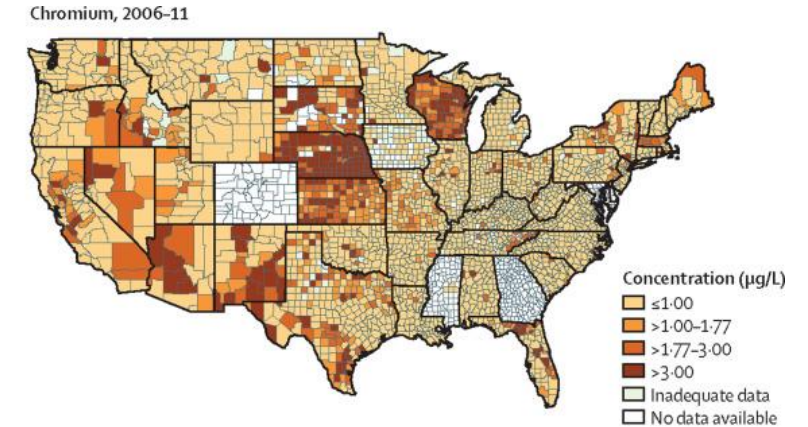
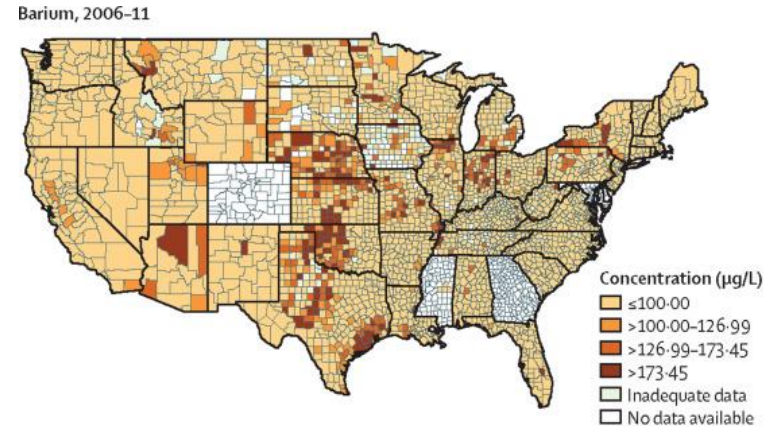
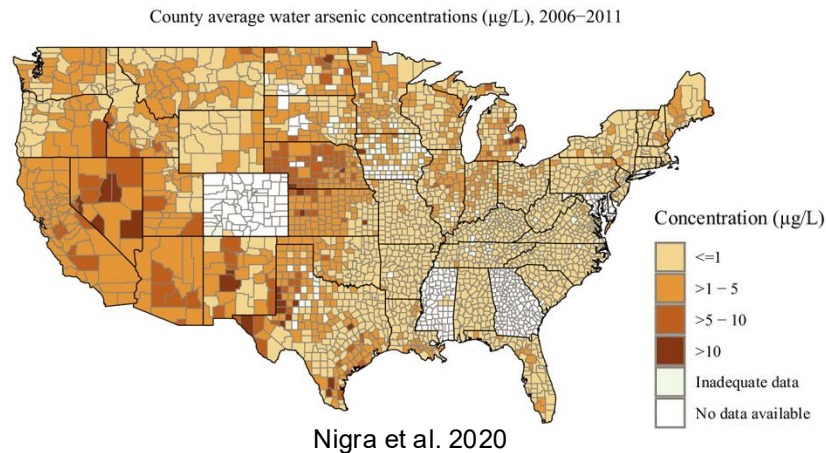
- Public water systems regulated by US EPA
- Some contaminants are regulated using maximum contaminant levels (MCLs), based on health risk, economic and technologic feasibility



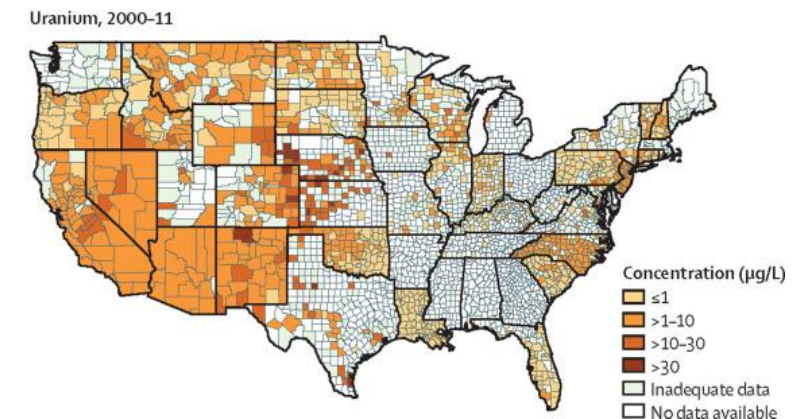
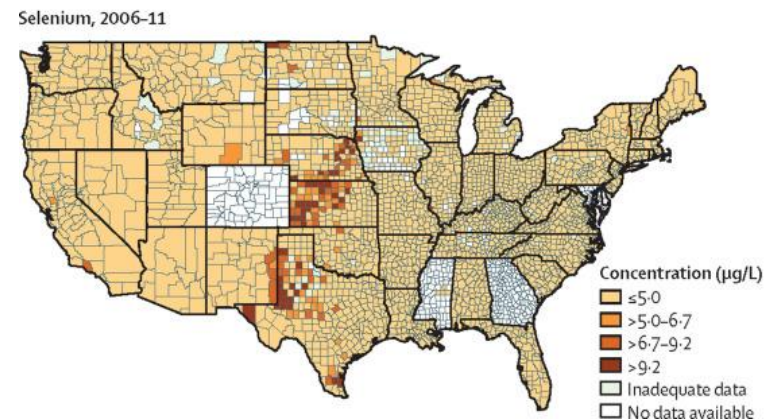
Source: U.S. Environmental Protection Agency and American Chemistry Council

Example Data from Ravalli et al. 2021

- County-level, population-weighted average concentrations of metals and metalloids in U.S. community water systems
- Exposures were generally below regulatory limits: Average CWS concentrations >MCL: arsenic (2.6%), uranium (2.1%), and all other metals (<0.1%)

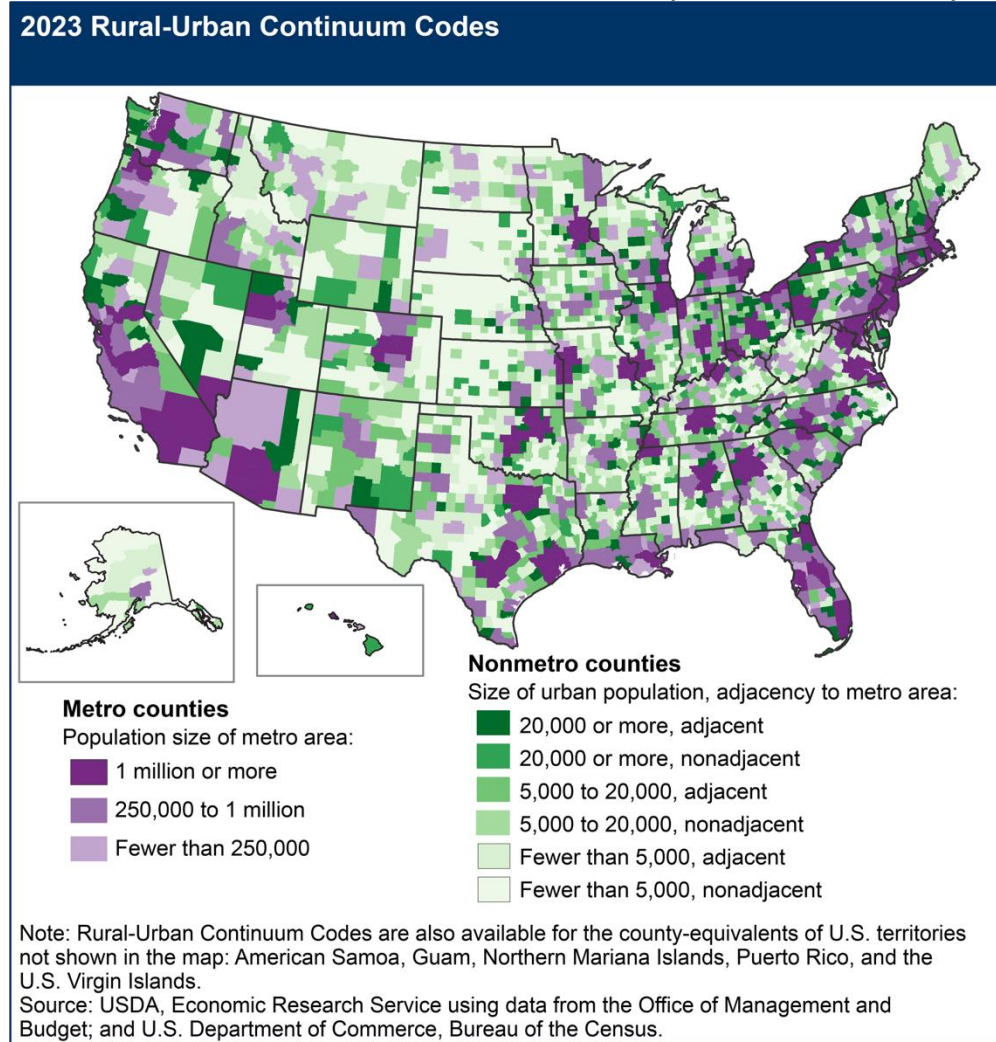


Regional and sociodemographic inequalities in exposures



Sociodemographic county-level data

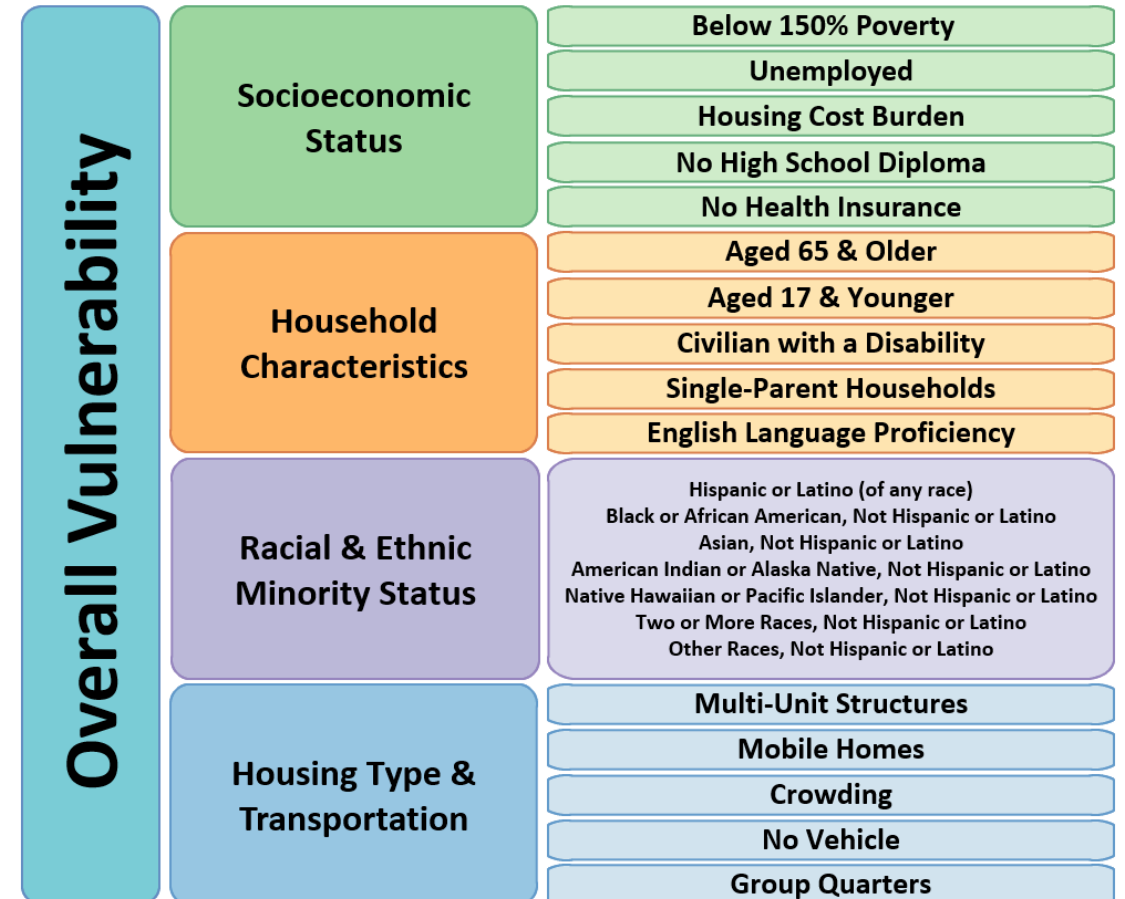
- Rural-Urban Continuum Codes (Rural, Urban)



Source: <https://www.ers.usda.gov/data-products/rural-urban-continuum-codes>

- Social Vulnerability Index (0 Lowest to 1 Highest)

- Place-based index derived from 16 U.S. census variables from the 5-year American Community Survey to identify communities that may need support before, during, or after disasters.



Source: <https://www.atsdr.cdc.gov/place-health/php/svi/index.html> 2022

Applied part of workshop (copied from worksheet)

- Describe the contaminant concentrations overall, and by subgroup (region and rurality/urbanicity).
 - Which groups are most highly exposed?
- Which contaminants are positively or negatively correlated?
 - How would this impact an analysis of combined effects?
- Simulating interventions using parametric g-formulas
 - Try reducing concentrations of one contaminant at a time.
 - Try reducing concentrations of multiple contaminants simultaneously.
 - What is the impact of reducing all contaminants by 50%, vs. setting all exposures that are above 1 µg/L, to be equal to 1 µg/L?
 - What is the impact of using non-parametric bootstrapping, vs. no bootstrapping using quantile g-computation?