Water Quality Analysis

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Is there a relationship between a state's water quality and their population demographics?

In this analysis, we looked at the level of contamination of 3 of the major pollutants in the community water systems of 25 of the states, and compared it to some of the population demographics of those states (income, poverty rate, education and unemployment).

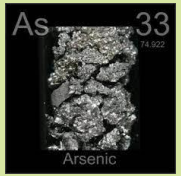
Hypothesis

- Going into this analysis, we believed we would see lower quality of water (higher contamination levels) in states with populations of lower median income levels and higher poverty rates
- We also believed we would see higher contamination levels in the water systems of states with higher unemployment rates, as well as those states with a higher percentage of adults with education levels of less than a high school diploma
- If a state's population has lower income and education levels, as well as higher poverty and unemployment rates, then there will be higher contamination levels in their community water systems

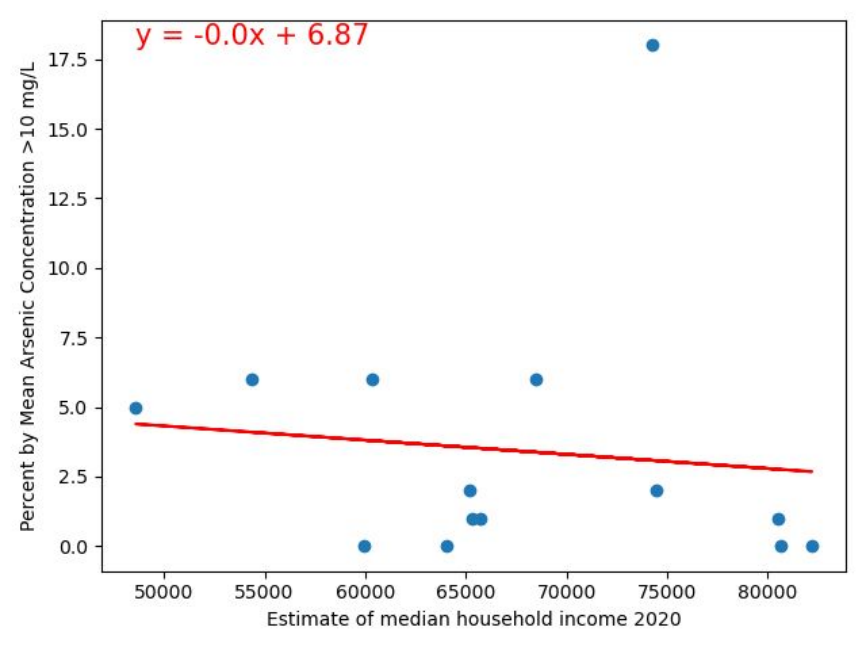
Water Sources

- When analyzing water quality data, we wanted to look at the sources of water that most directly impact communities
- Over 90% of Americans get their tap water from community water systems
- Community water systems are public water systems that supply water to the same populations year-round
- American drinking water quality is subject to EPA regulations and rules set forth by the Safe Drinking Water Act

Water Contaminants

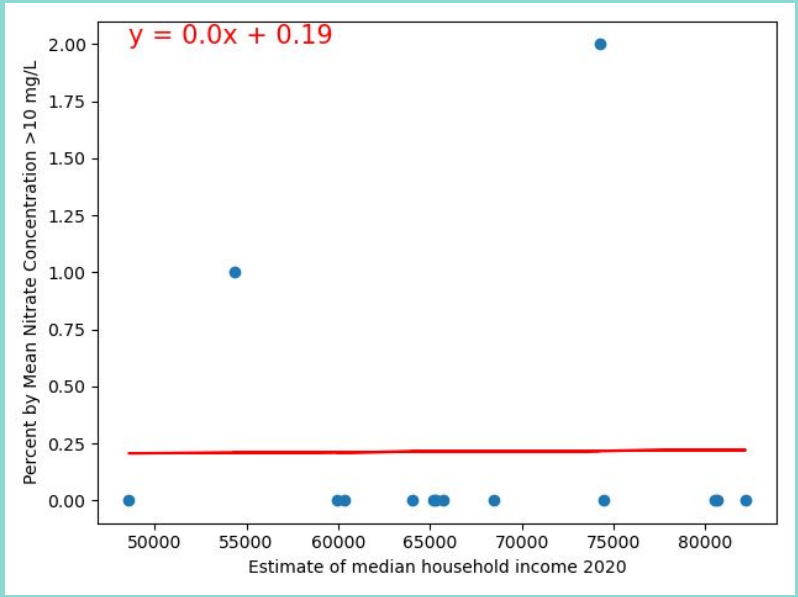
	Health Risks	EPA Standards	Contamination Sources
Arsenic 	Can cause cancer, skin lesions, cardiovascular disease and diabetes	10 micrograms per liter (µg/L)	Natural mineral deposits, industrial and agricultural wastewater
Nitrates 	Can cause cancer, thyroid disease and birth defects	10 milligrams per liter (mg/L)	Runoff/fertilizers, wastewater, landfills, animal feed lots, septic systems and urban drainage
Uranium 	Can cause cardiovascular disease, kidney damage and lung cancer	30 micrograms per liter (µg/L)	Natural mineral deposits, mining, fertilizers, nuclear facilities and military activities

Arsenic vs Income



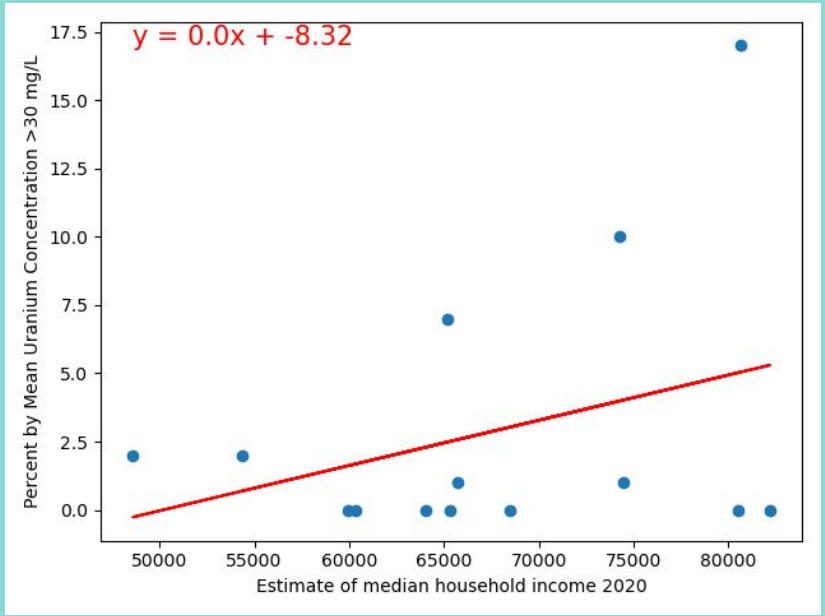
- Negative regression line
- r-squared: .0037

Nitrate vs Income



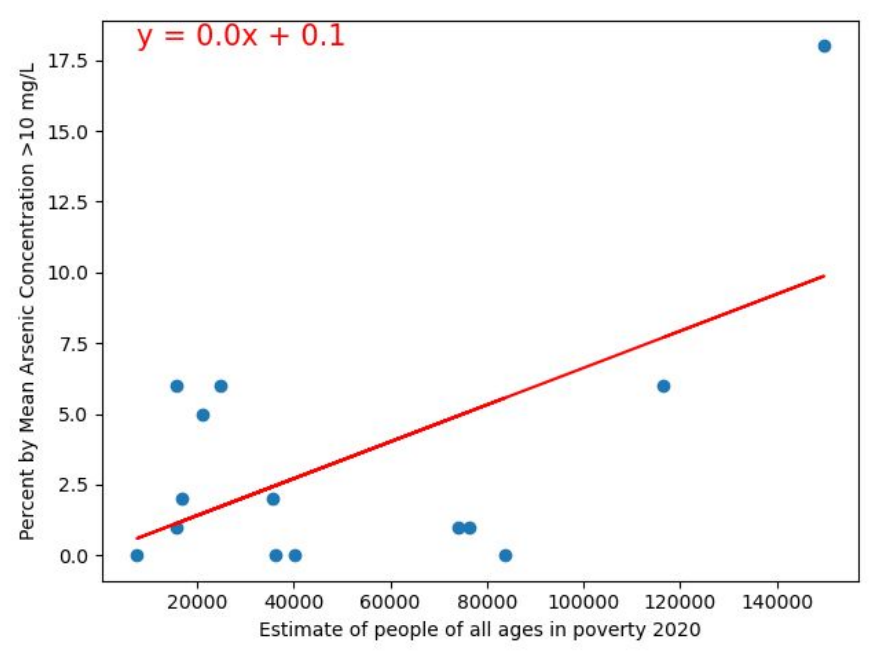
- Flat regression line
- r-squared: .0004

Uranium vs Income



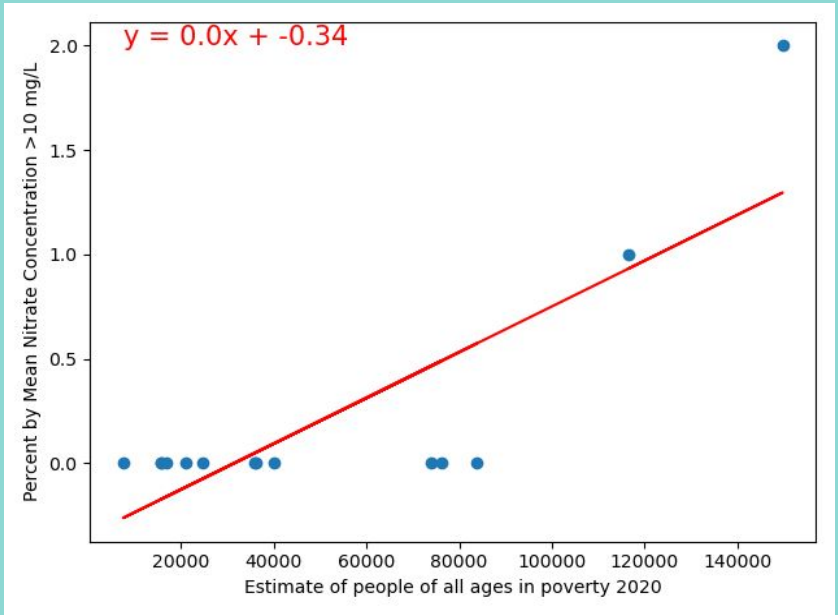
- Positive regression line
- r-squared: .0854

Arsenic vs Poverty Rate



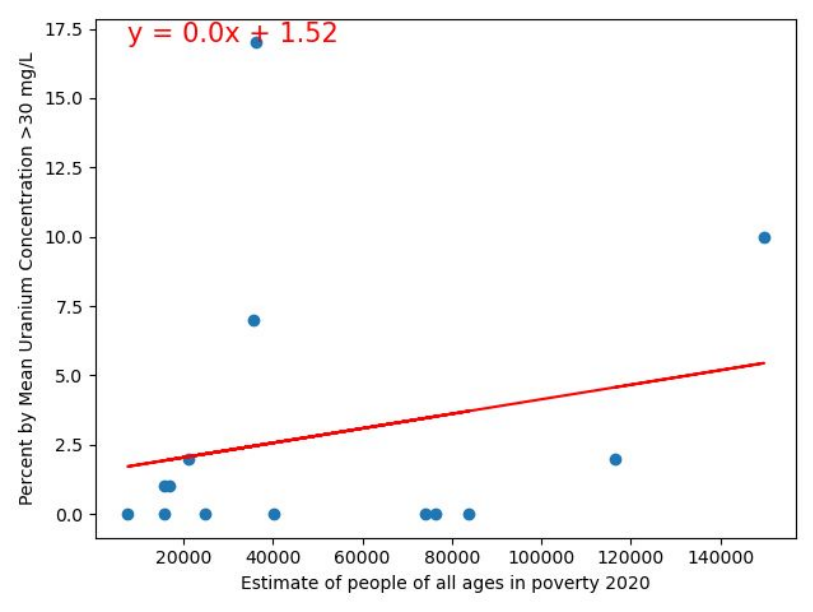
- Positive regression line
- r-squared .3730

Nitrate vs Poverty Rate



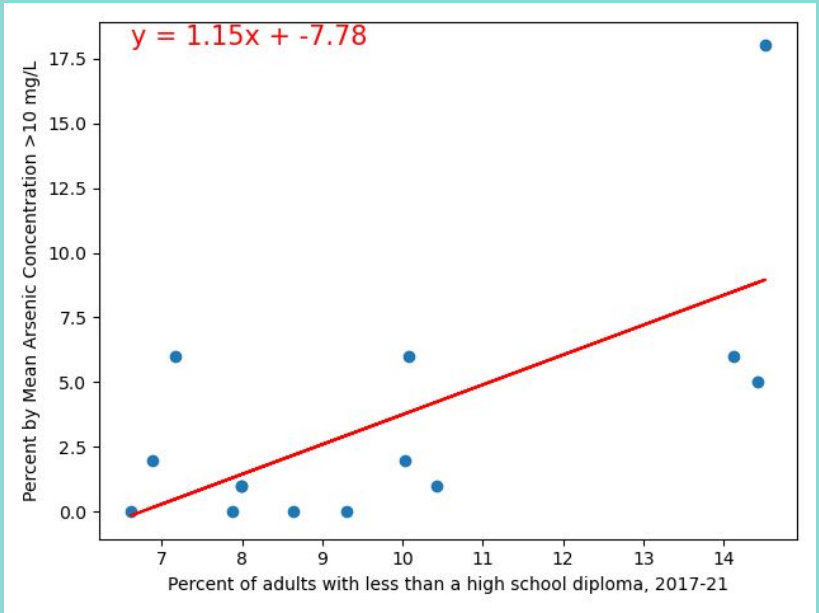
- Positive regression line
- r-squared: .6468

Uranium vs Poverty Rate



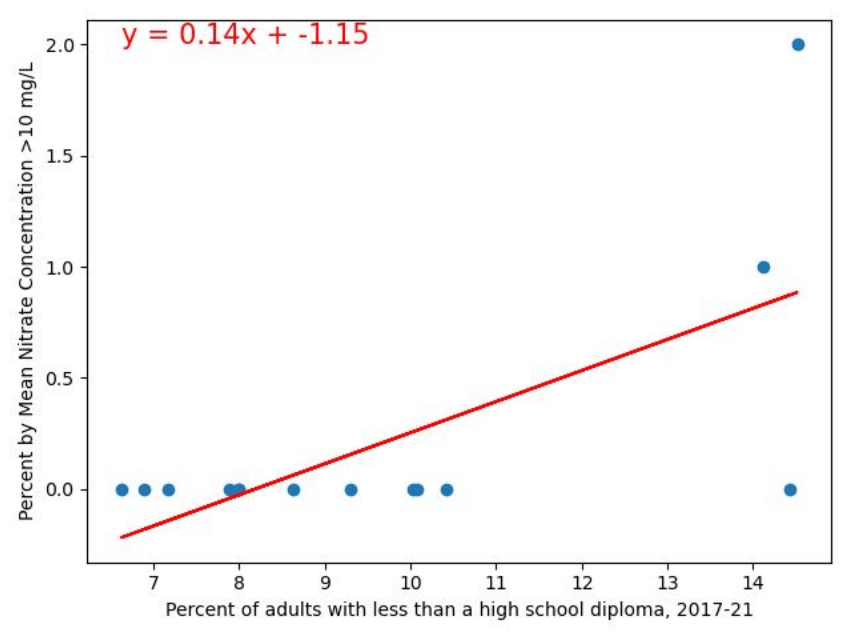
- Positive regression line
- r-squared: .0820

Arsenic vs Education



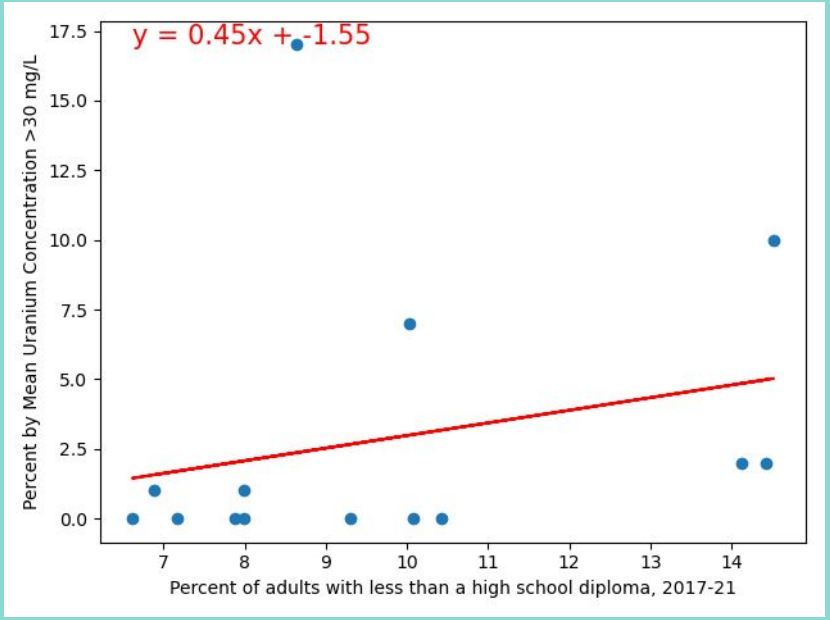
- Positive regression line
- r-squared: .3710

Nitrate vs Education



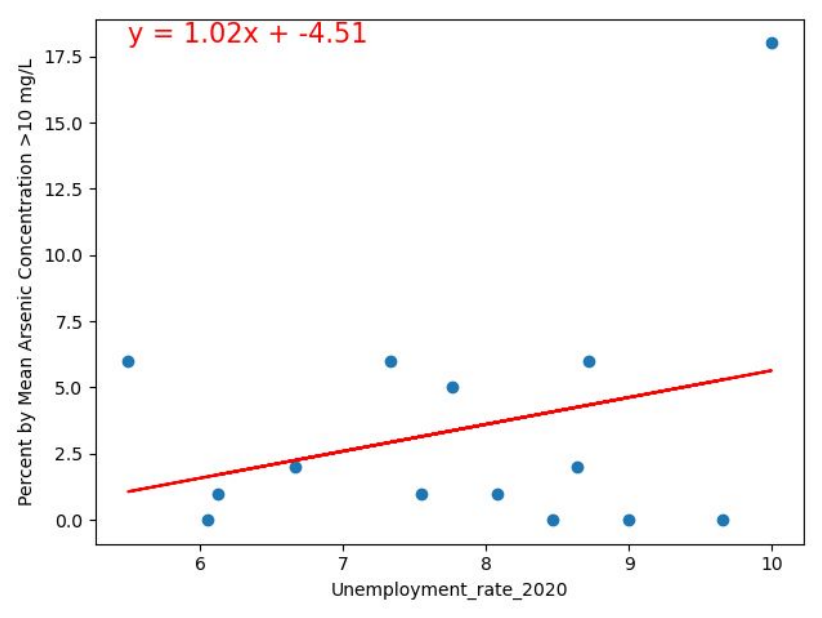
- Positive regression line
- r-squared: .3974

Uranium vs Education



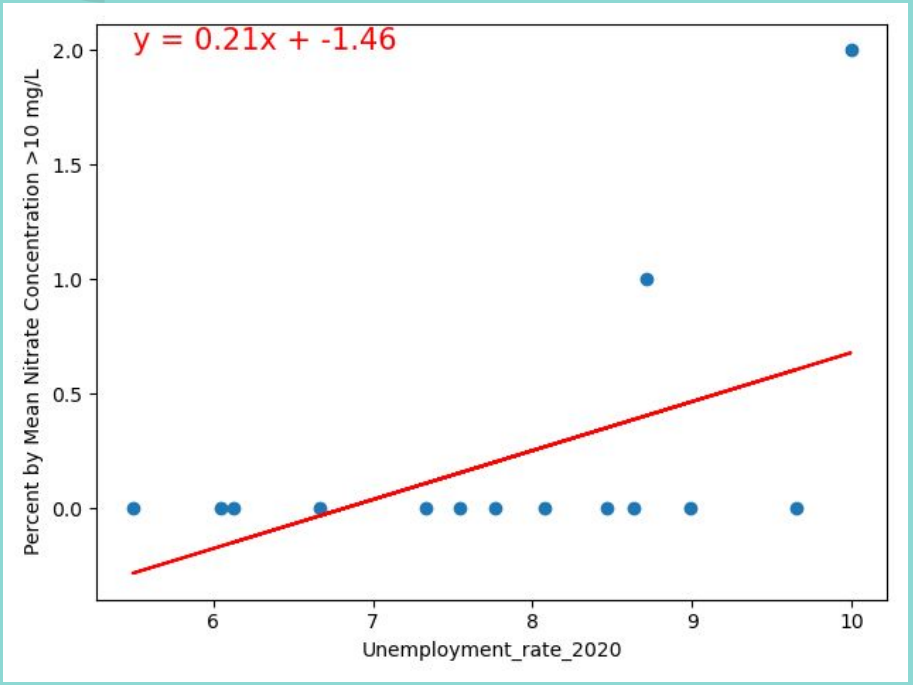
- Positive regression line
- r-squared: .0637

Arsenic vs Unemployment



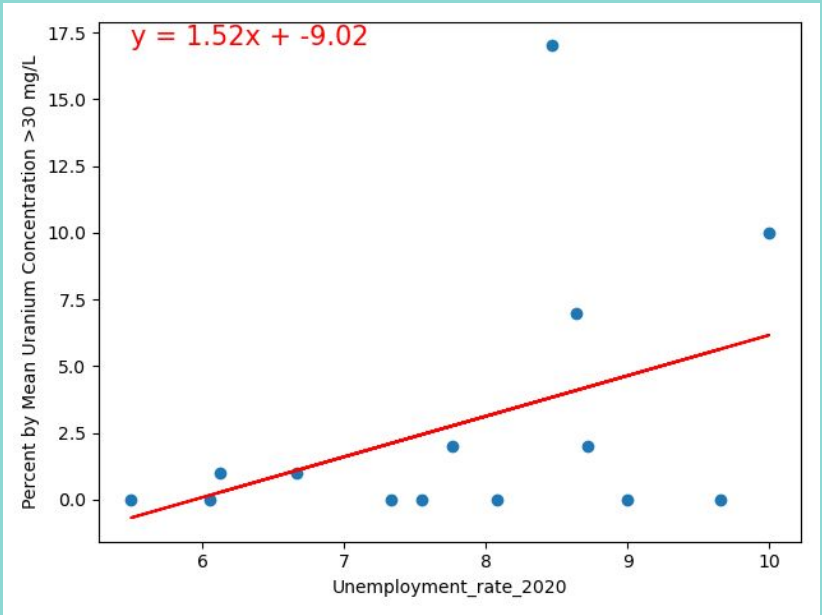
- Positive regression line
- r-squared: .1461

Nitrate vs Unemployment



- Positive regression line
- r-squared: .2662

Uranium vs Unemployment



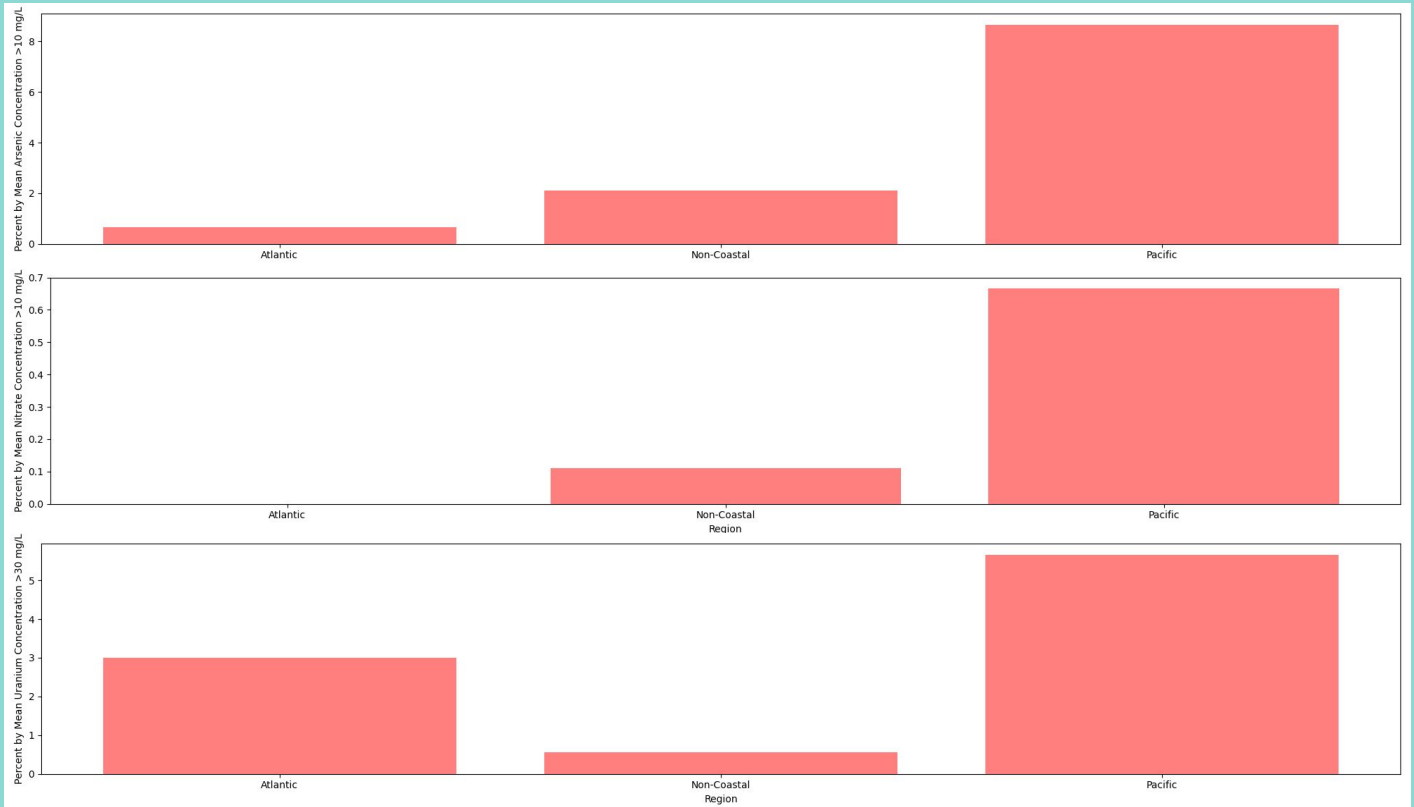
- Positive regression line
- r-squared: .2208

Contamination by Region

Arsenic

Nitrates

Uranium



Conclusions

- While we did not have enough data to make any statistically significant conclusions about the relationship between a community's water quality and their population demographic...
- There tended to be higher contamination levels in states with higher unemployment and poverty rates
- In states with higher percentages of adults with less than a high school education, there tended to be higher contamination levels in their community water systems
- When it comes to income level, we saw more flat and even negative regression lines, meaning contamination levels tended to be the same or even lower in higher income areas (with the exception of uranium)
- We can also see that Pacific Coast states consistently have higher levels of contamination of all 3 pollutants in their community water systems than Atlantic Coast and Non-Coastal states

Limitations of Analysis

- We were only able to obtain data for half of the U.S. states
- We only analyzed the levels of 3 different contaminants
- We only looked at one source of water data: community water systems

Usage of Analysis

- This Water Quality Analysis is to be used for educational and research purposes

- Can be used to look at average contamination levels of 3 specific pollutants in community water systems in 3 different regions of the United States: Atlantic Coast states, Pacific Coast states and Non-Coastal States

Sources

- Water quality data was obtained from the CDC
- State demographic data was obtained from the U.S. Department of Commerce, Bureau of the Census
- Water quality regulation information came from the EPA and CDC