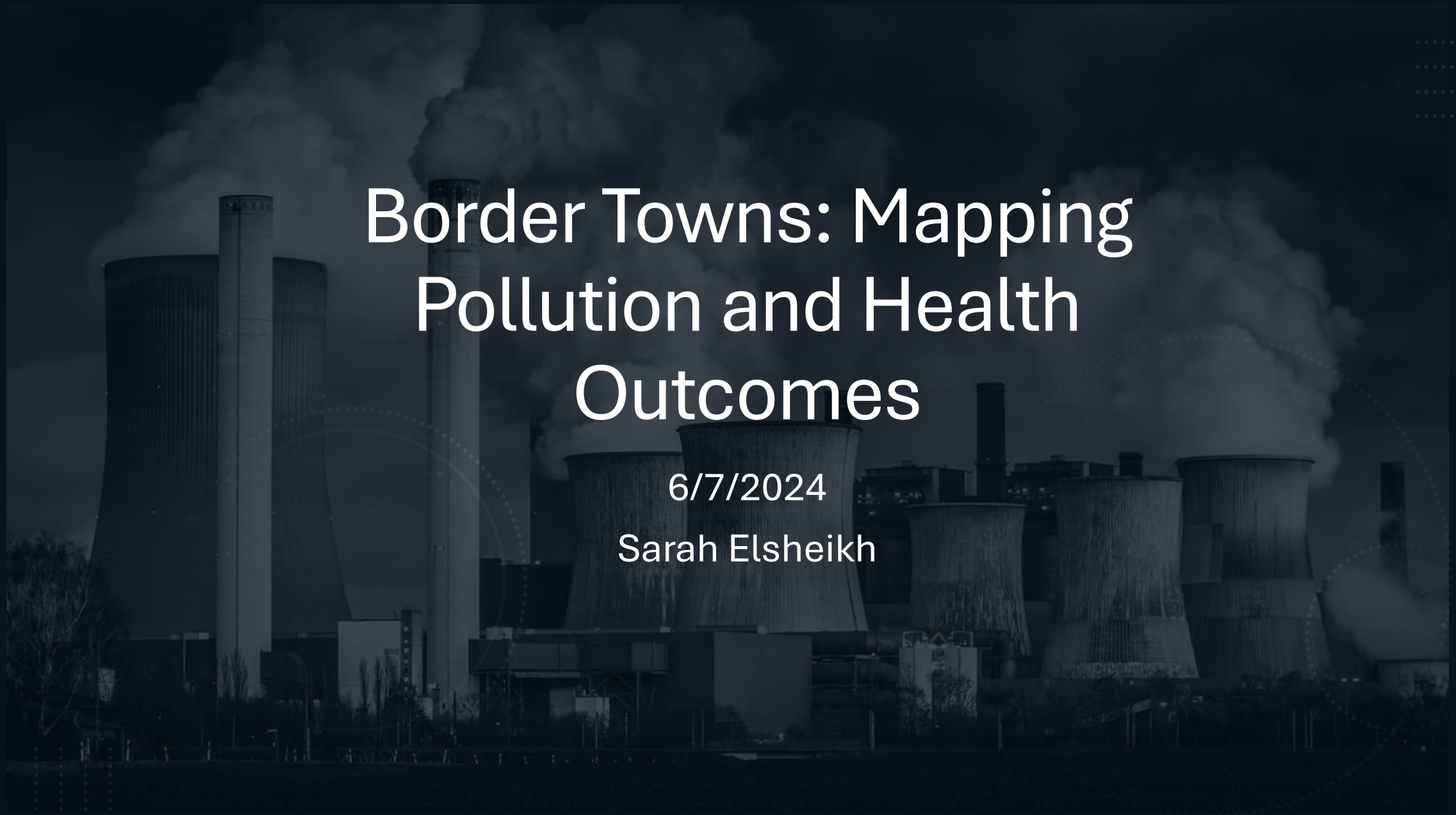


Border Towns: Mapping Pollution and Health Outcomes

6/7/2024

Sarah Elsheikh

Question:What is the relationship between air and water pollution levels in border towns and the health outcomes of both migrant and resident populations?

Hypothesis : Higher levels of air and water pollution in border towns correlate with poorer health outcomes among both migrant and resident populations. This could manifest as higher rates of respiratory illnesses, cardiovascular diseases, and other health issues.

Background

Mier, Nelda, et al. "Health-related quality of life among Mexican Americans living in colonias at the Texas–Mexico border." *Social Science & Medicine* 66.8 (2008): 1760-1771.	We found that border Mexican Americans living in *colonias* were of similar mental health status compared to the general population of the United States, but worse off in terms of physical health. Poor education and long-term residency in *colonias* were predictors of lower physical health. Women reported worse mental health than men. Length of time living in a *colonia*, co-morbidity status, and perceived problems with access to healthcare was associated with poorer mental health status.
Martinez-Donate, Ana P., et al. "Health profile and health care access of Mexican migration flows traversing the northern border of Mexico." *Medical care* 58.5 (2020): 474-482.	Mexican migrants' health profile and health care access vary significantly across migration flows and generally are worse for migrants with US migration experience.
Wutich, Amber, et al. "Water insecurity in the Global North: A review of experiences in US colonias communities along the Mexico border." *Wiley Interdisciplinary Reviews: Water* 9.4 (2022): e1595.	We show that water insecurity had led to negative outcomes—including poor water access, risks to physical health, and mental ill-health—in U.S. colonias
Khanum, Saleha, Zohir Chowdhury, and Karilyn E. Sant. "Association between particulate matter air pollution and heart attacks in San Diego County." *Journal of the Air & Waste Management Association* 71.12 (2021): 1585-1594.	There is an association between elevated local PM concentrations in San Diego County communities with emergency hospital visits due to heart attacks, and that these associations are an environmental justice issue disproportionally affecting disadvantaged communities.

Data Collection

Air Quality

EPA.GOV

Most recent Data
May 2023

21 counties missing

*not able to download from Economics dashboard

Water Quality

USDG.gov

Most recent Data
May 2024 /June 2024

24 counties missing

(manual data input)

Asthma

Healthdata.gov

Most recent Data
2020

California counties only

Mortality

CDC.Gov

Most recent Data
2022

Data is available for all counties

Health indicators

CDC.Gov

Most recent Data
2020

only available for 7 counties

Border Boundaries

New Mexico

Texas

California

Arizona

*by county & zip code

PFAS

EPA.gov

Most recent Data
2023/2015

Only available for 10 counties

Data Cleaning Process

Data Set Name	Rows	Columns
Mortality Rate(California)	6	3
Mortality Rate(New Mexico)	6	6
Mortality Rate(Arizona)	6	7
Mortality Rate(Texas)	6	28
Air Quality	13	1,144
Asthma Hospitalization	7	4,485
Health Indicators	21	1,046,036
Water Quality	5	41
PFAS	37	8,272

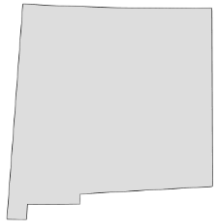
Counties of interest

Arizona

Conchise
La Paz
Maricopa
Pima
Santa Cruz
Yuma

California

Imperial
Riverside
San Diego



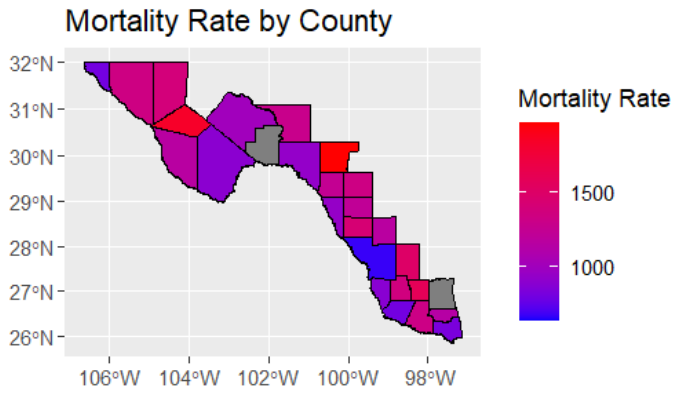
New Mexico

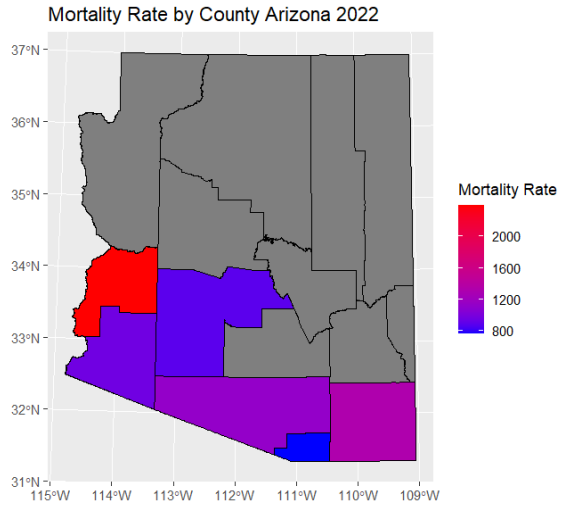
Dona Ana
Grant
Hidalgo
Luna
Otero

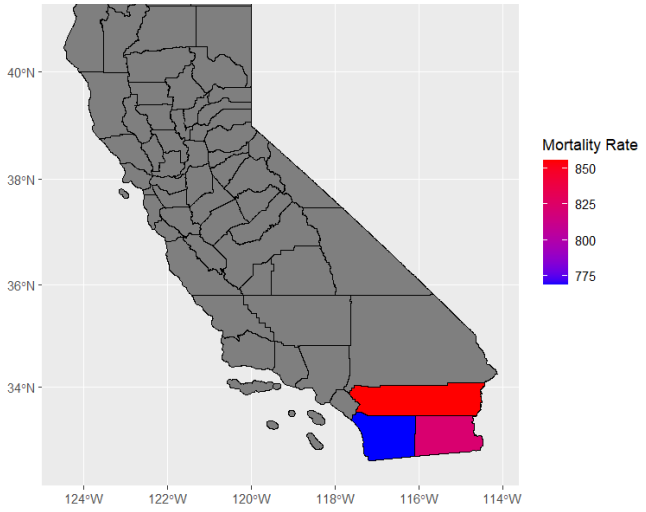
Texas

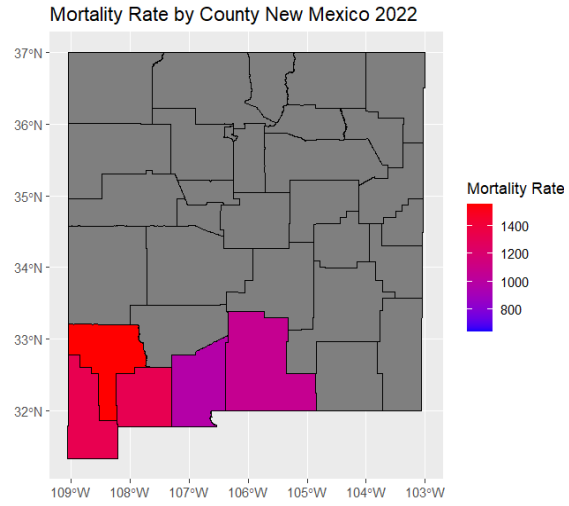
Brewster
Brooks
Cameron
Crockett
Dimmit
Duval
Edwards
El Paso
Hidalgo
Hudspeth
Jeff Davis
Jim hogg
Kenedy
Kinney
La salle
Maverick
Pecos
Presidio
Starr
Terrell
Uvalde
Val Verde
Webb
Willacy
Zapata
Zevala

Mortality Rate by County

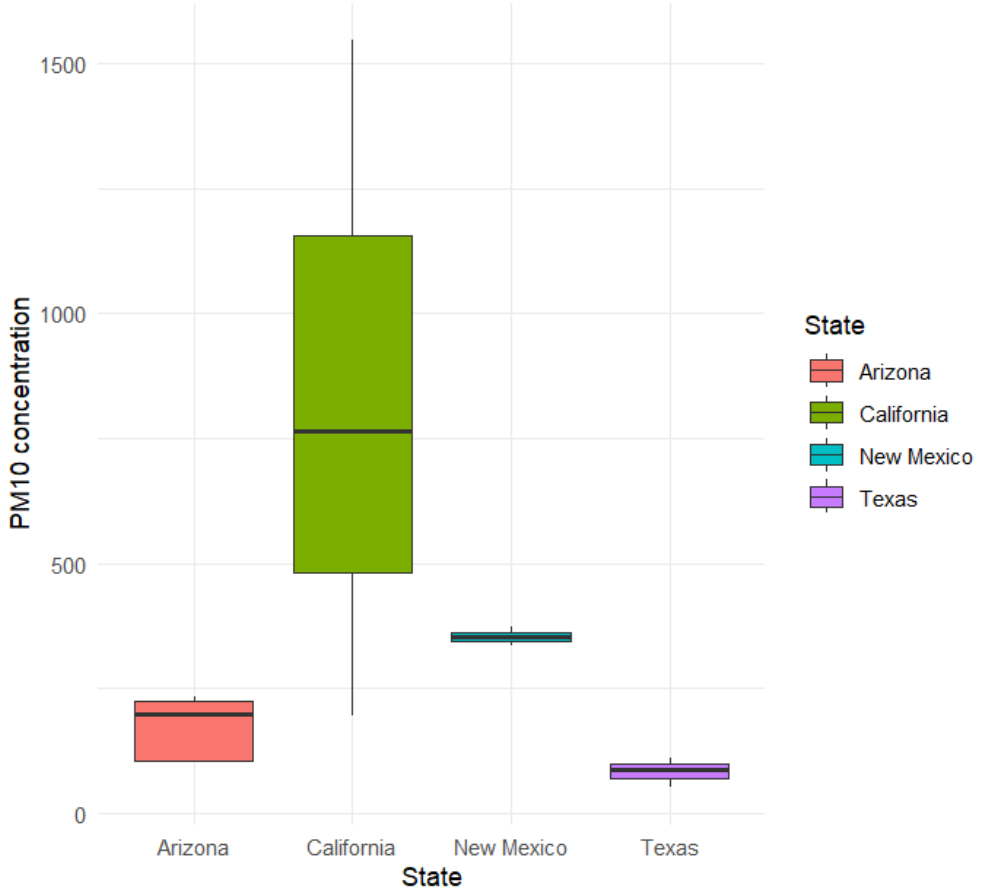








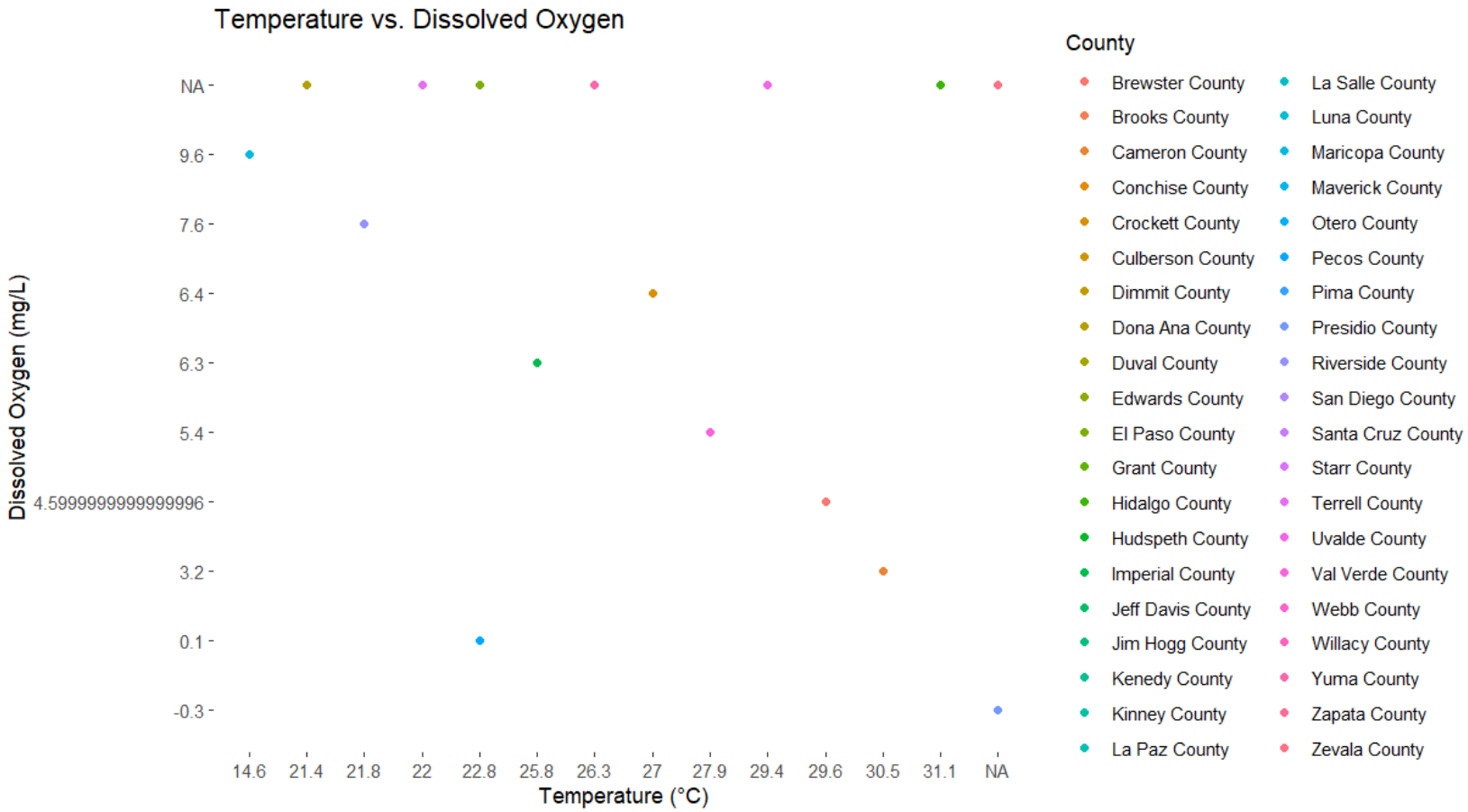
Air Quality by State



Air Quality by County

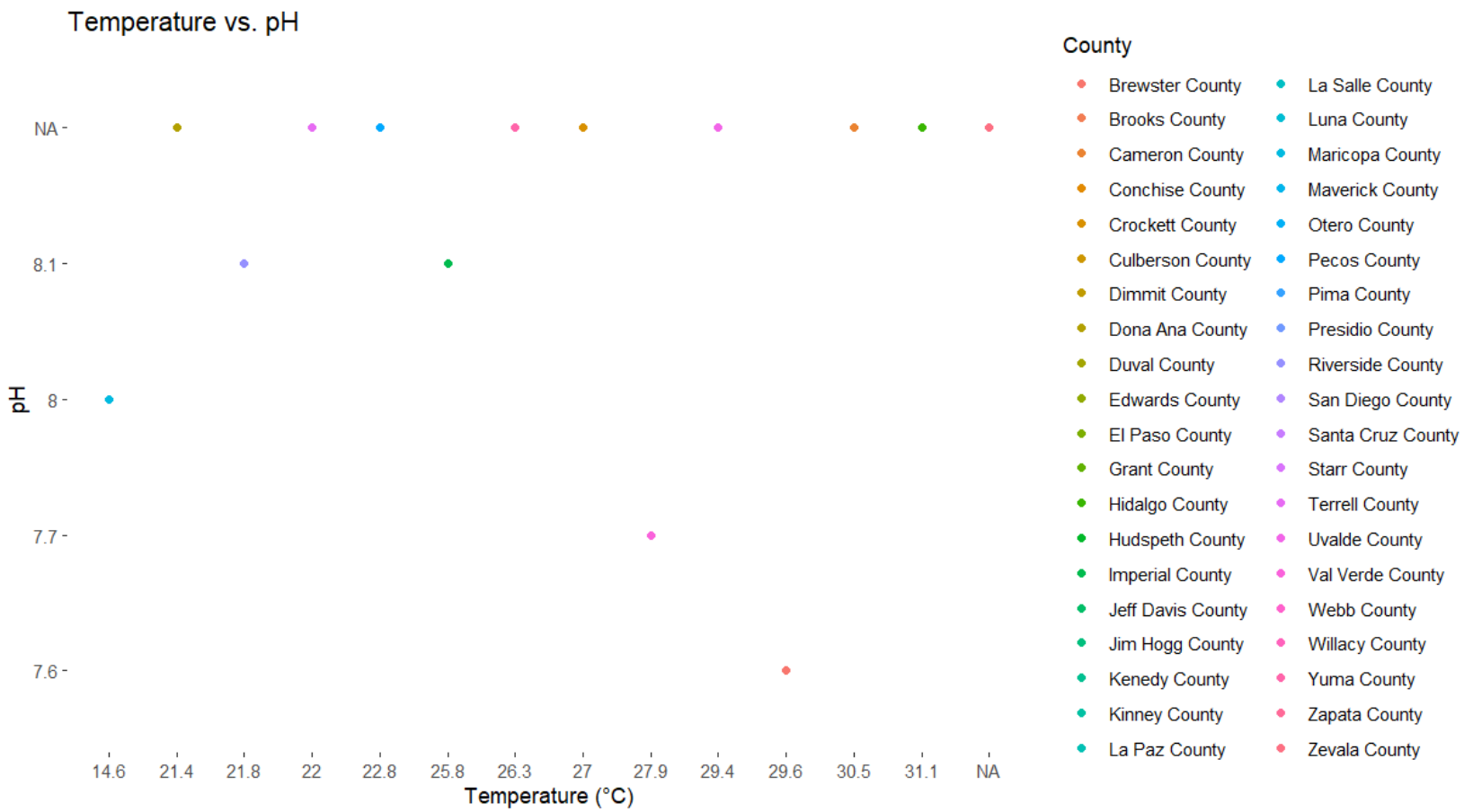
29 counties missing

Water Quality by county

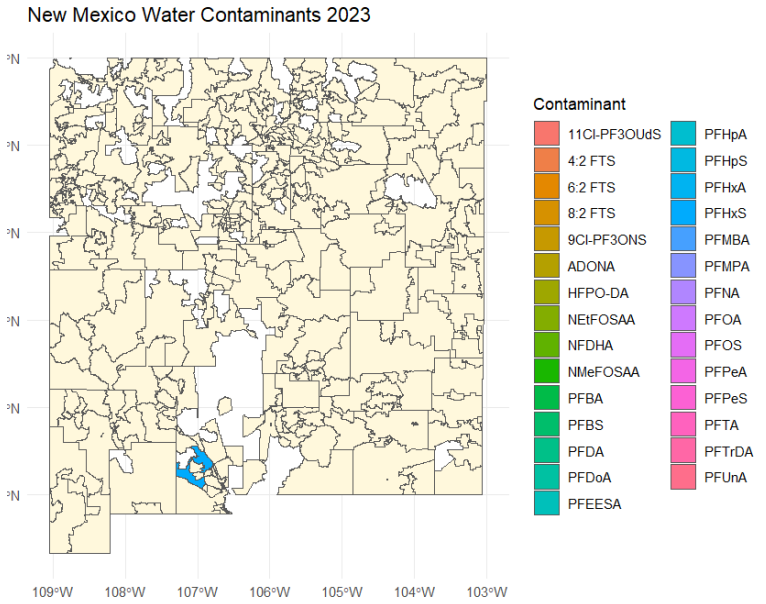


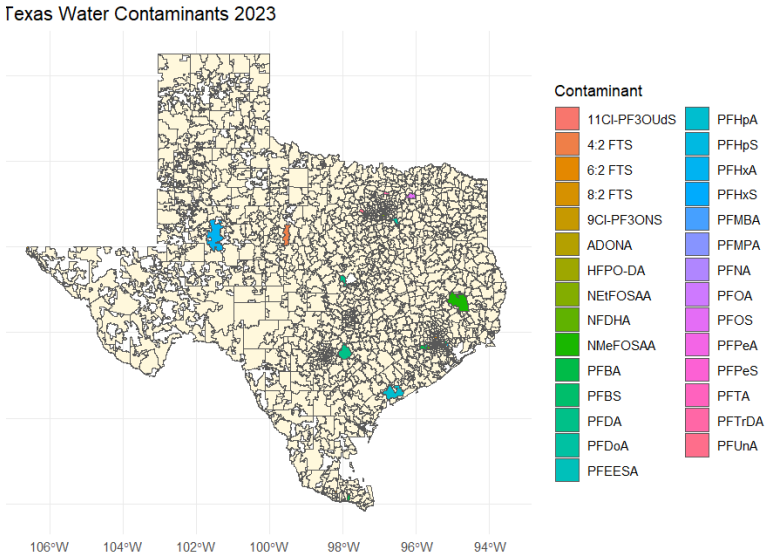
32 counties missing

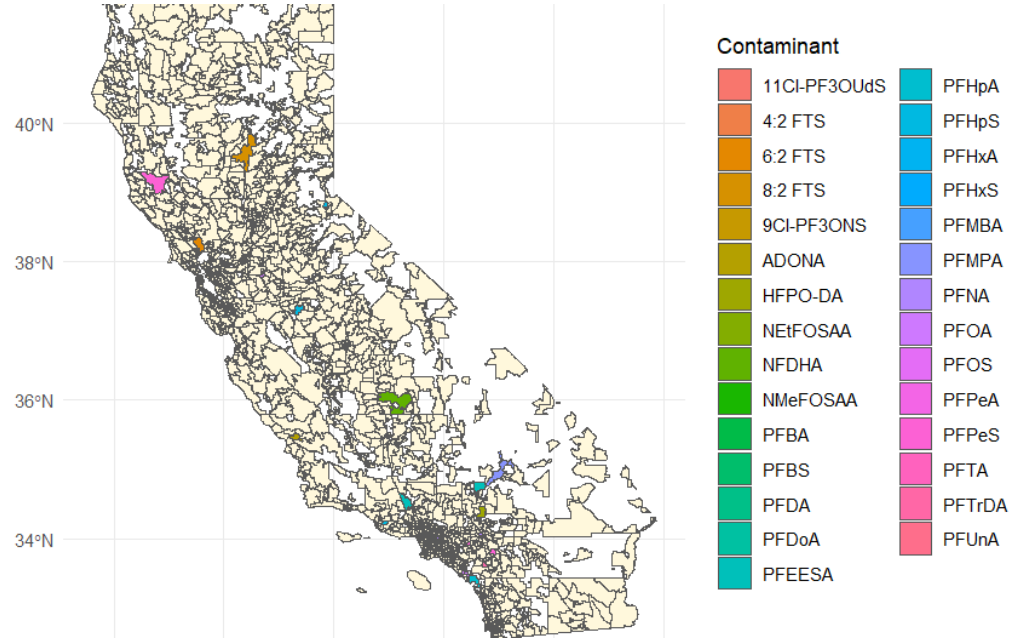
Water Quality by county



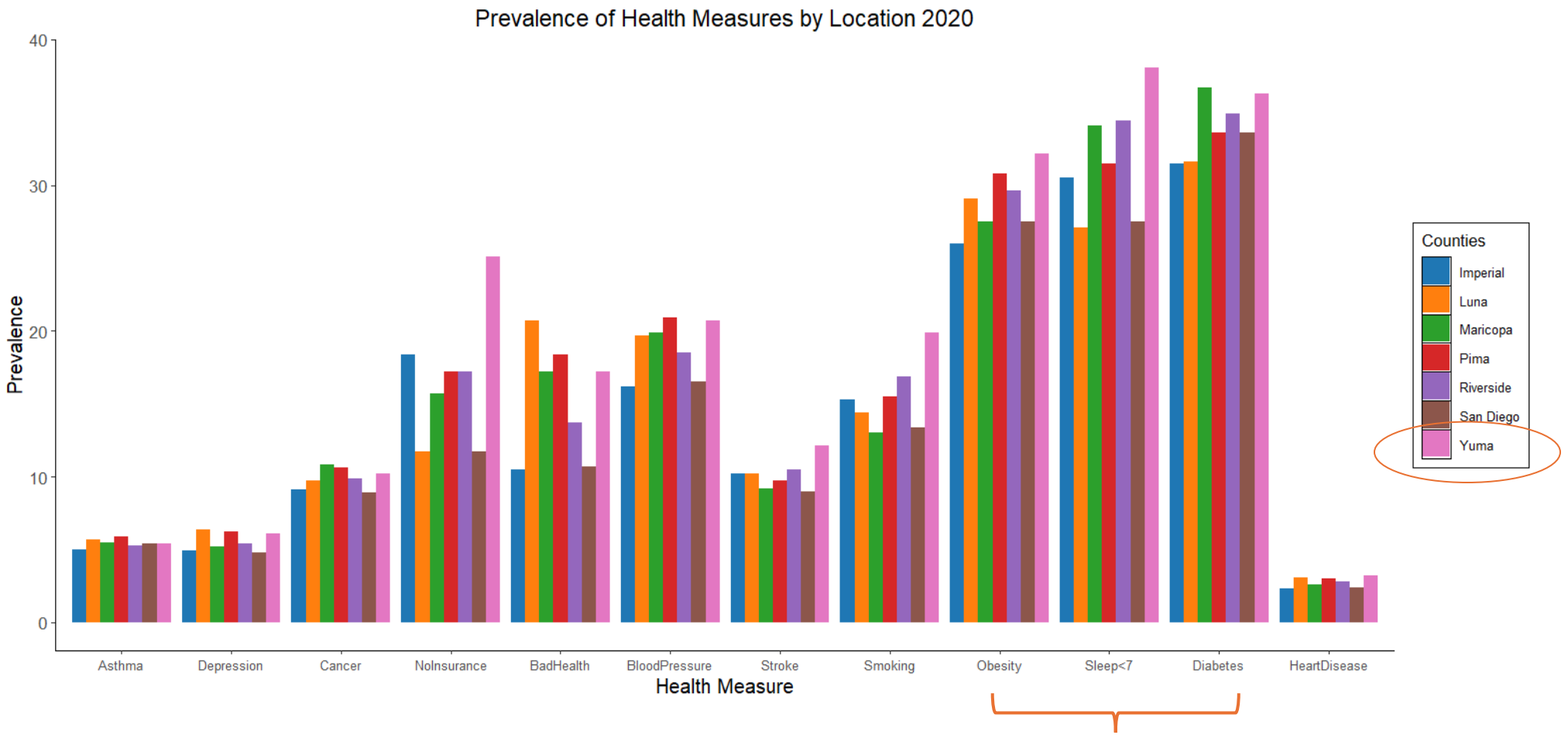
39 counties missing



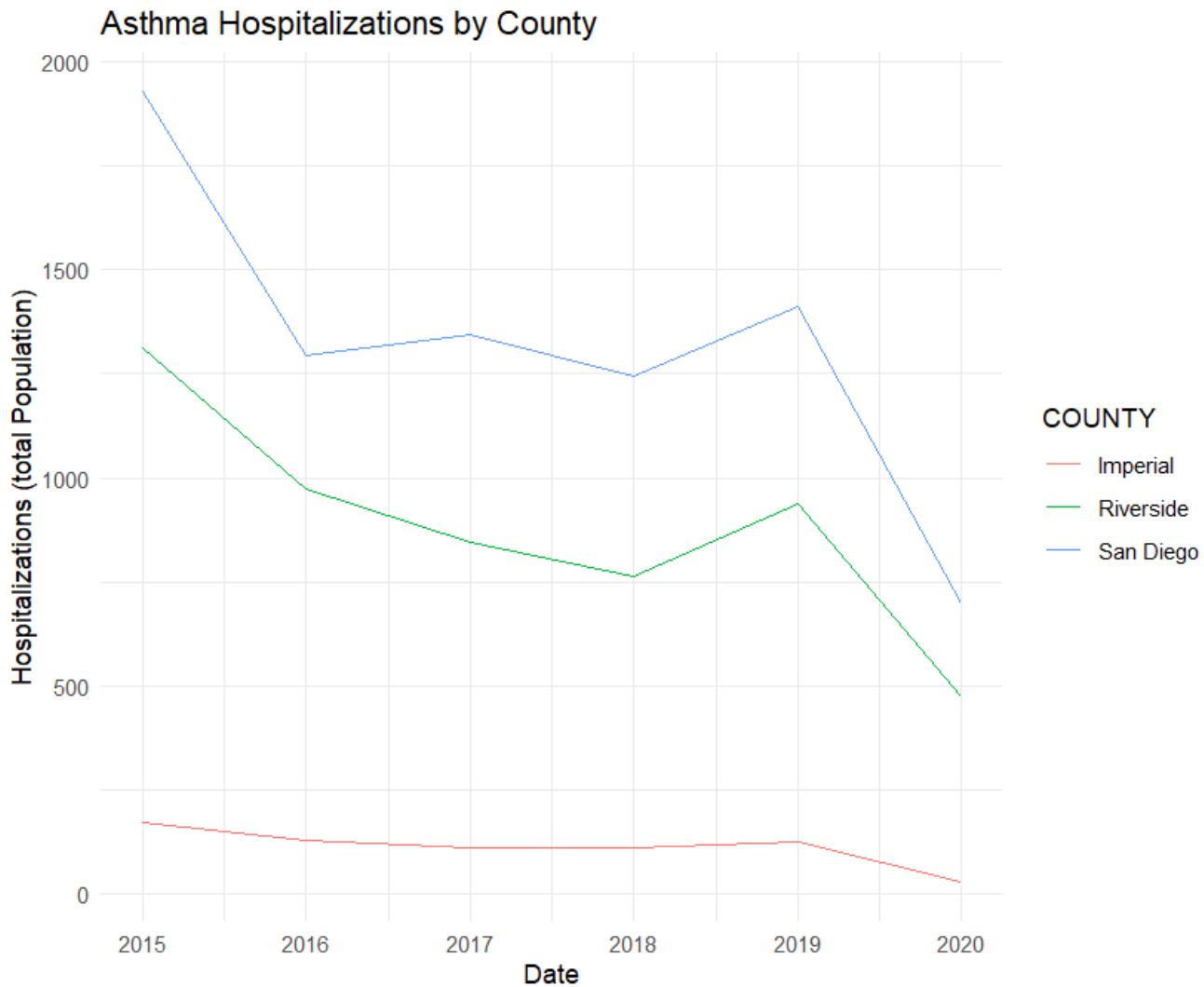




The majority of county data is absent, with Arizona's data being entirely missing.



Only available for 7 relevant counties


Asthma Hospitalizations by County
Hospitalizations (total Population)
2000
1500
1000
500
0
2015
2016
2017
2018
2019
2020
Date
COUNTY
Imperial
Riverside
San Diego

Regression Analysis

- Independent Variables: Air and water pollution levels in border towns.
- Dependent Variables: Health outcomes of both migrant and resident populations.
- $Yi = \beta 0 + \beta 1 X1i + \beta 2 X2i + \varepsilon i$
- $HealthOutcomesi = \beta 0 + \beta 1 Air\ Qualityi + \beta 2 Water\ Qualityi + \epsilon i$
- $\mathrm{Yi}=\beta 0+\beta 1\mathrm{Air\ Qualityi}+\beta 2\mathrm{Water\ Qualityi}+\beta 3(\mathrm{Air\ Quality}\times\mathrm{Water\ Qualityi})+\epsilon \mathrm{i}$

Regression Analysis

- With substantial gaps in water quality data, we'll focus solely on Air quality in our regression analysis of mortality rates. Our model will be structured as follows:
- $\text{model} <\text{- } \text{lm}(\text{Crude.Rate} \sim \text{data} = \text{Mortality\_Air})$
- However, we have complete data **only** for Riverside and San Diego. With limited data points, no statistical significance to draw meaningful conclusions.

Conclusion

The scarcity of comprehensive data presents a significant obstacle in fully understanding the relationship between pollution levels and health outcomes in border towns. Without robust datasets on air and water quality spanning all relevant counties and timeframes, it becomes challenging to discern patterns, establish causality, and formulate targeted interventions.

Inadequate data may lead to policy gaps and resource allocation inefficiencies, perpetuating environmental injustices and exacerbating health disparities. Addressing these data deficiencies requires concerted efforts to enhance monitoring infrastructure, standardize data collection protocols, **and foster collaborations between governmental agencies, research institutions, and community organizations.**