An Analysis on Transportation Safety in the US

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Introduction

- For our research, we wished to analyze transportation safety in the US by state from 2010-2021.

- This involved observing fatalities by state and year, and then connecting that information with outside sources.

- This research particularly interests us, because we wish to find reasons of what may cause safer roads.

Our Investigation

- What is the leading cause of highway fatalities overall/by state?

- What states, if any, have stark contrasts in vehicular fatalities?

- Do these states have any laws or regulations that would cause this?

- Do any types of vehicular fatalities correlate with another?

- Have counts of certain types of vehicular fatalities increased or decreased over time?

- How did the COVID-19 pandemic during 2021 affect traffic fatalities?

- Is there a correlation between state revenue/spending and traffic fatalities?

Our Data

Our dataset from Bureau of Transportation Safety contains information from 2010-2021 regarding fatal vehicular accidents that have occurred on highways within the United States by state/territory.

The data can be accessed at the following link: https://www.bts.gov/browse-statistical-products-and-data/state-transportation-statistics/transportation-safety

Supplementary Data

We had three datasets for supplementary data:

1. State Populations (2010 - 2021)
   o From Census.gov

2. State Revenue and Expenditures (2021)
   o From Census.gov

3. Number of Miles driven
   by State Licenses (2010 – 2021)
   o From bts.gov

This data was used to draw inferences in our final analysis of our results.

Preliminary Data Cleaning

- Started with basic things like fixing empty column names and filtering the dataset to only include states

- We also used the R state map dataset in order to create plots

- Finally, we realized that population density was not accounted for in the initial data we found
    - We pulled population data from the U.S. Census Bureau for the years and joined it with our dataset
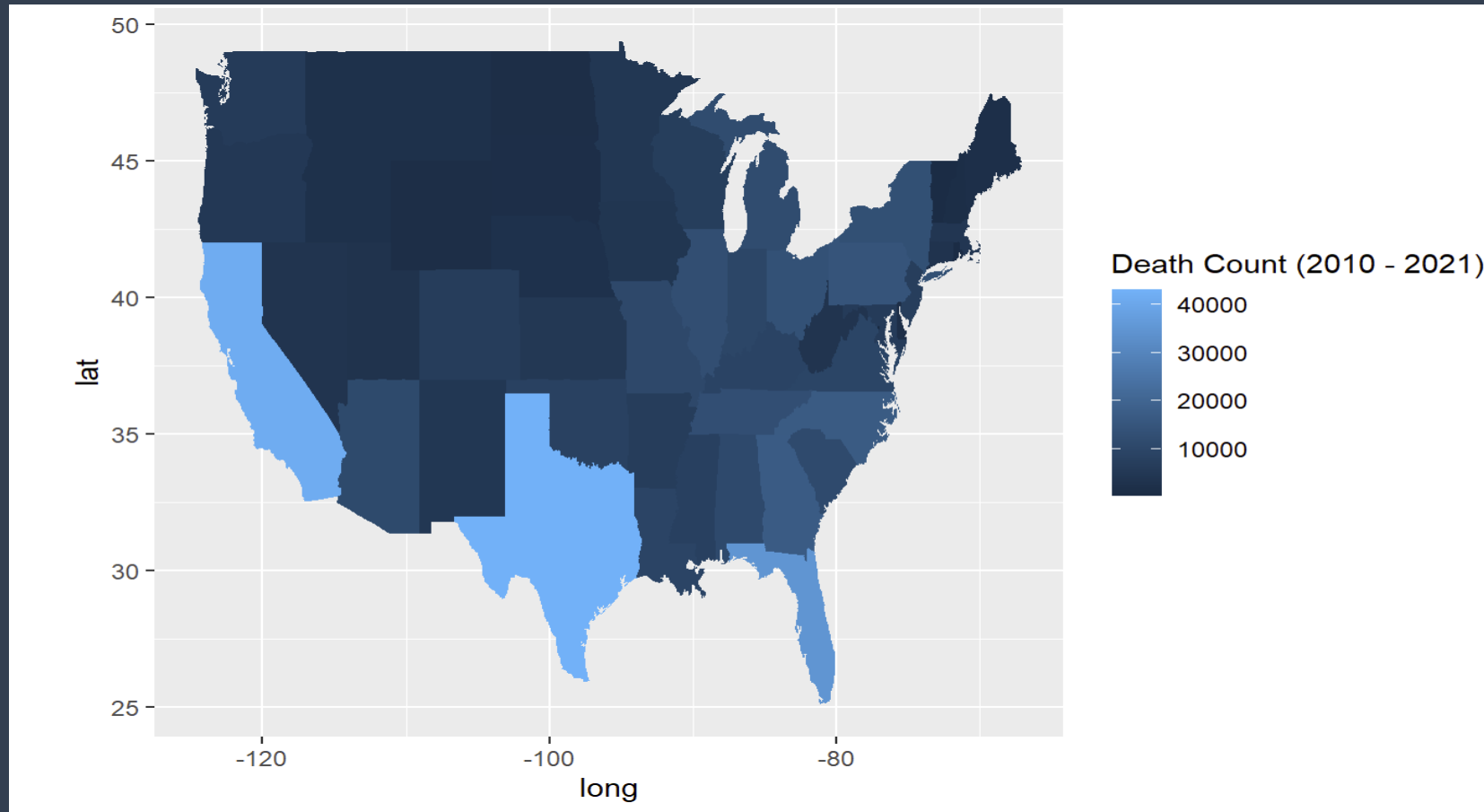
Iowa: Leading Cause of Traffic Fatalities?

- We found that the leading cause of traffic fatalities in Iowa was highway fatalities.

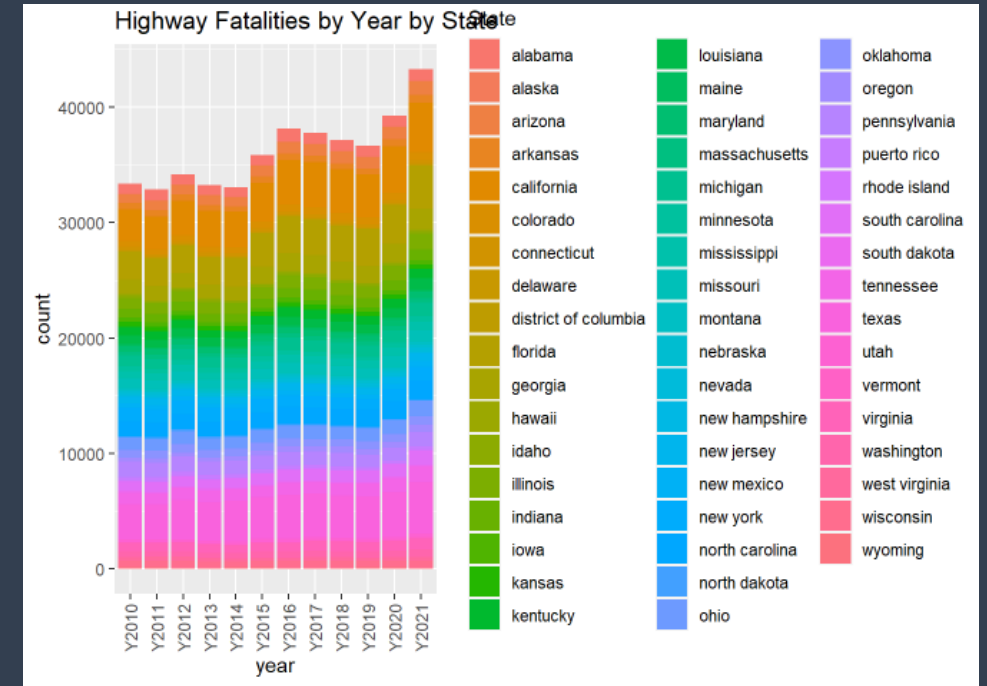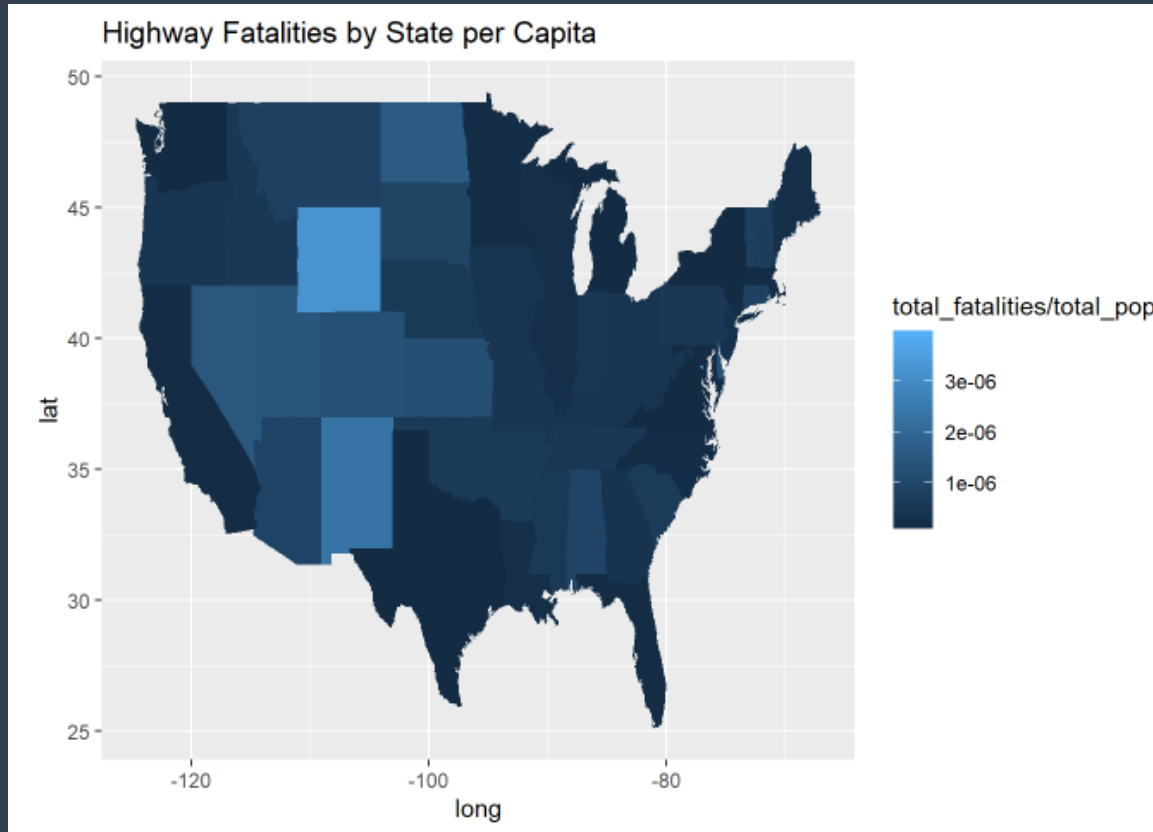- This was consistent across other states as well

Iowa Fatality Types
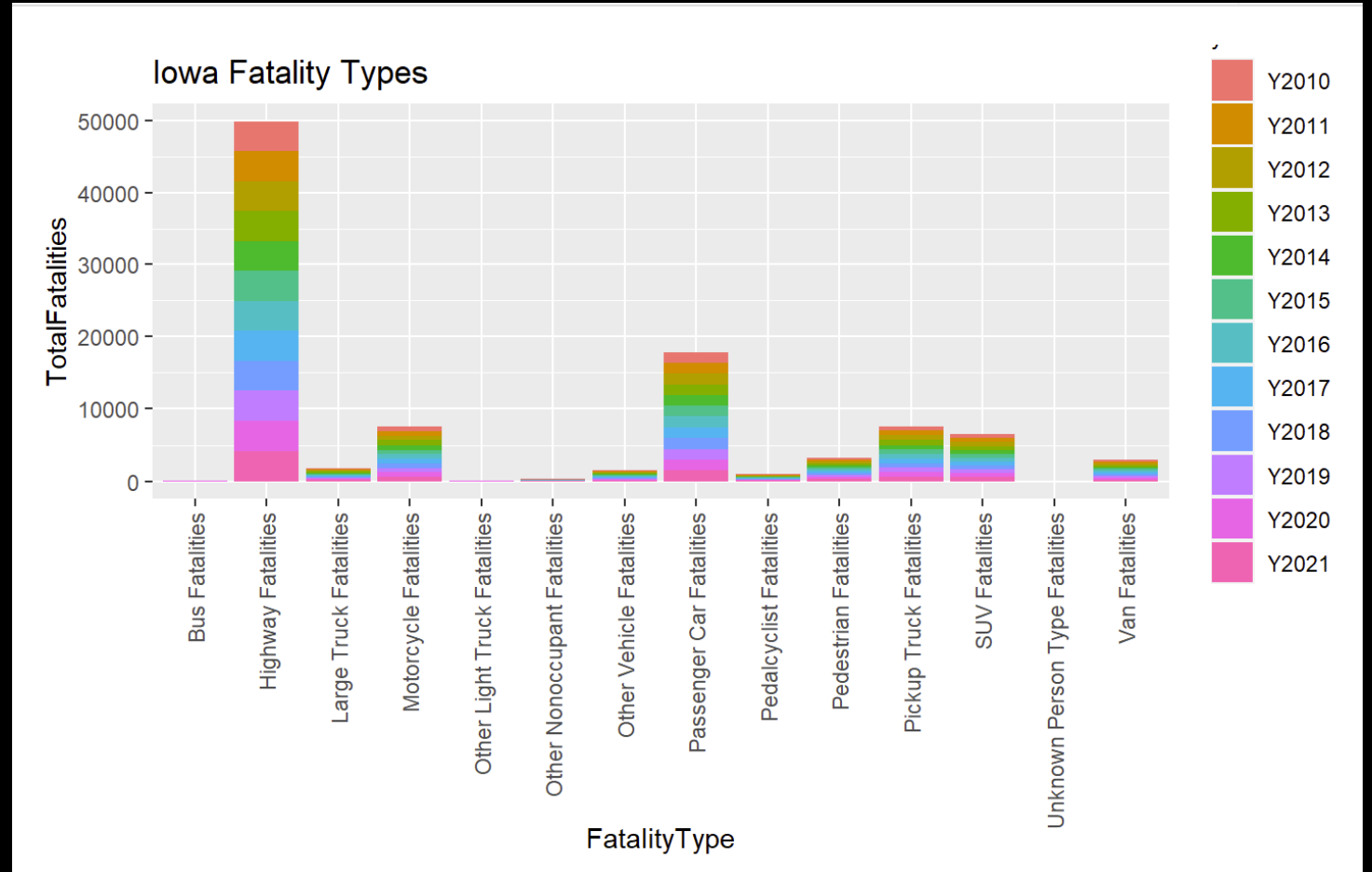
US Highway Fatalities by State (2010-2021)

States with larger populations such as Texas, Florida, and California had a larger total amount of highway fatalities.
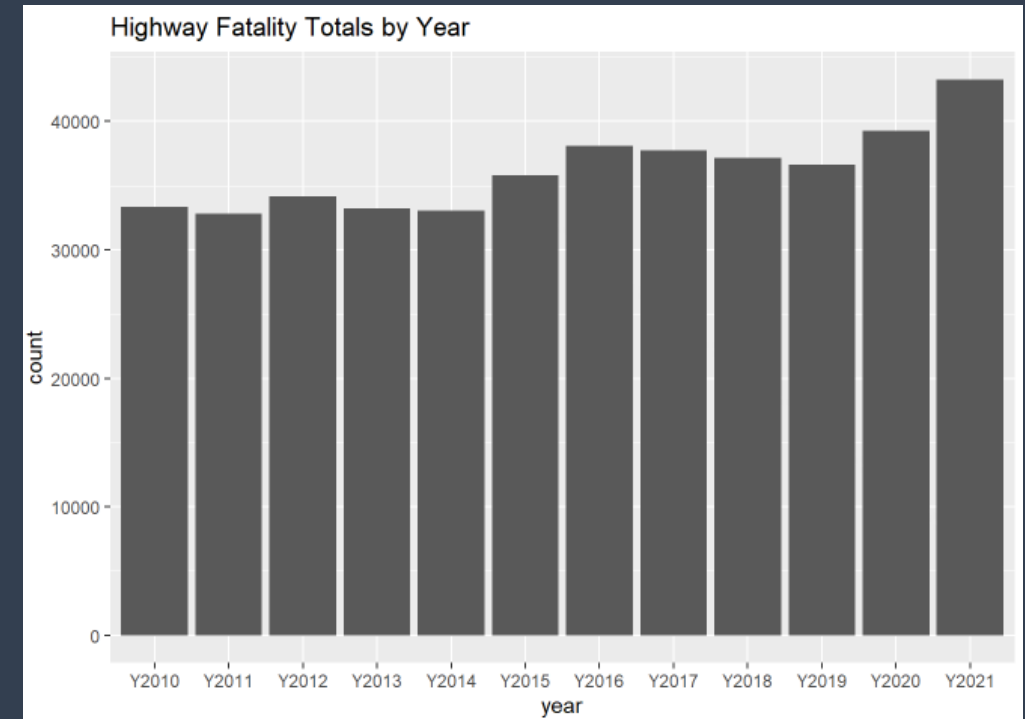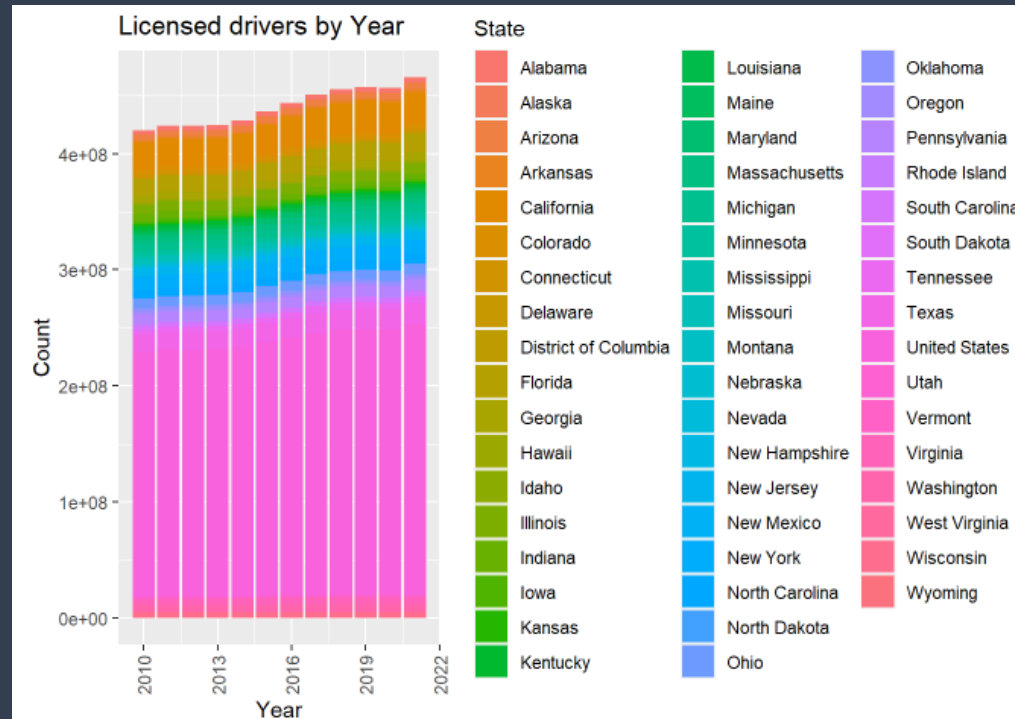
US Highway Fatalities by State (2010-2021)

States with smaller populations such as Wyoming showed a larger fatality rate per person.
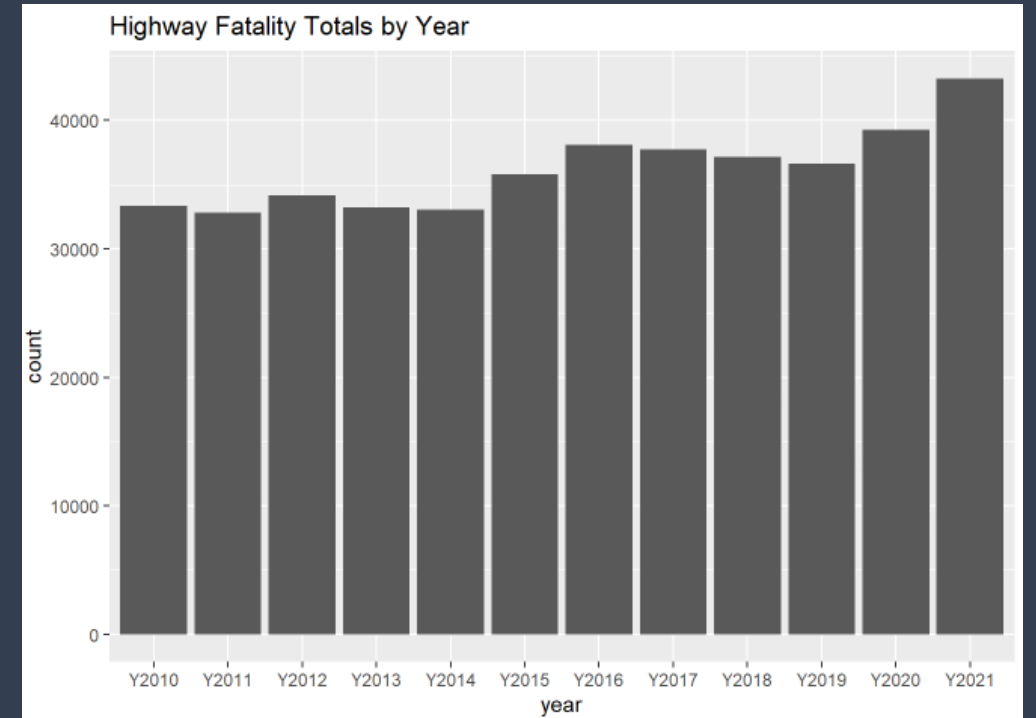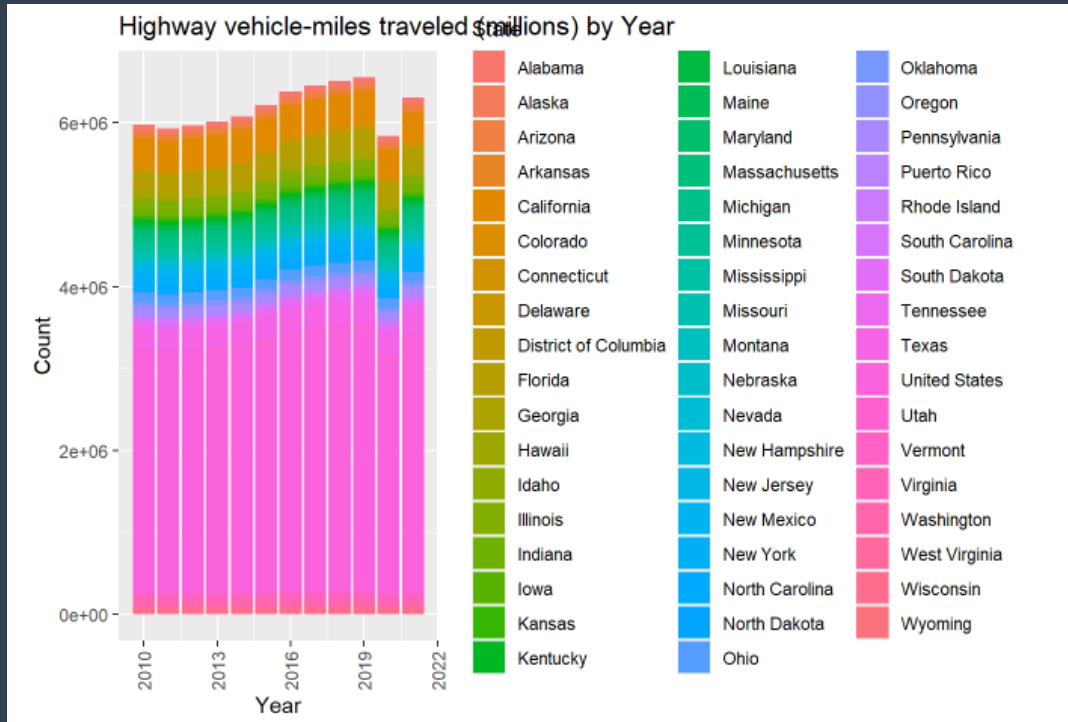
Highway fatalities increased from 2010.

How does this compare to the total number of licensed drivers during these years?

Total number of licensed drivers by year vs highway fatalities by year

How does this compare to the total amount of miles driven by vehicles during these years?

Total number of miles driven (in millions) by year vs highway fatalities by year

Spike in Traffic Fatalities in Late 2020 - 2021

- The first cases of COVID-19 reached the US in January 2020.

- The Trump Administration declared a nationwide emergency on the COVID-19 pandemic in March 2020.

- According to the National Highway Traffic Safety Administration, the number of fatal traffic crashes increased by 6.8%.

- This would seem strange, considering that less people overall were driving on the road without the need to commute to work.

- Sources:
    - https://www.cdc.gov/museum/timeline/covid19.html.
    - https://www.nhtsa.gov/press-releases/2020-traffic-crash-data-fatalities

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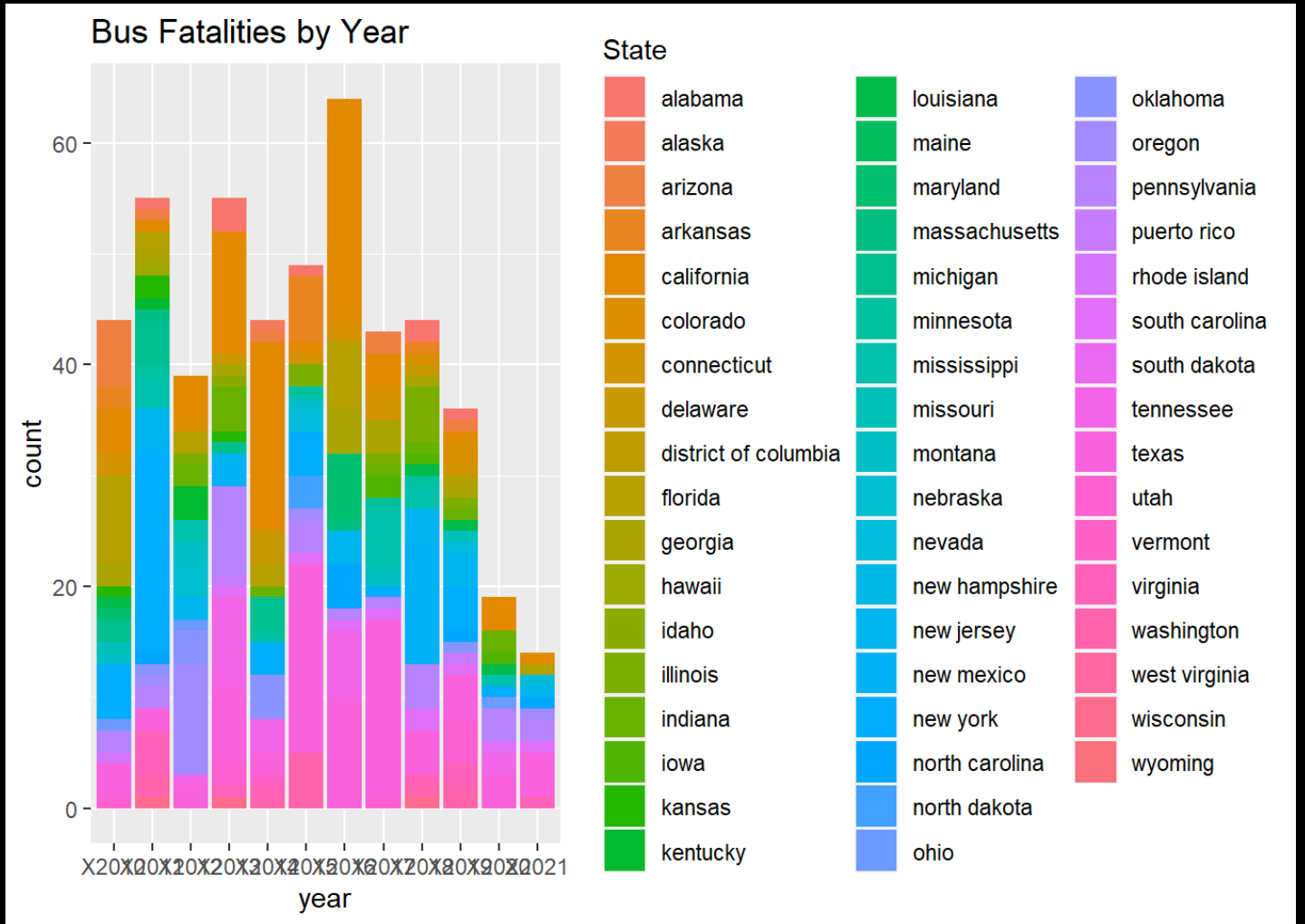# Spike in Traffic Fatalities from COVID-Era

- Megan McArdle, a columnist the Washington Post, indicated that this may be due to an increase in young and risky male drivers taking advantage of empty COVID-era roads.

- A study done by the AAA Foundation for Traffic Safety indicated that young males were the only people who indicated that they were driving more during the COVID pandemic - taking their risky driving with them.

- Source: https://www.washingtonpost.com/opinions/2022/03/10/pandemic-risky-driving-maybe-here-to-stay/.

COVID-Era Exception: Public Transport

- Michael Wilbur, a PHD Student in Vanderbilt University, in a paper published in the Transportation Research Record: Journal of the Transportation Research Board, published a report on public transport accessibility.

- He found a decrease in operation hours for buses during the COVID-19 pandemic, due to social distancing measures and precautions advised and enforced by state legislature.

- A decrease in bus fatalities during the COVID-era may have occurred due to these measures and precautions.
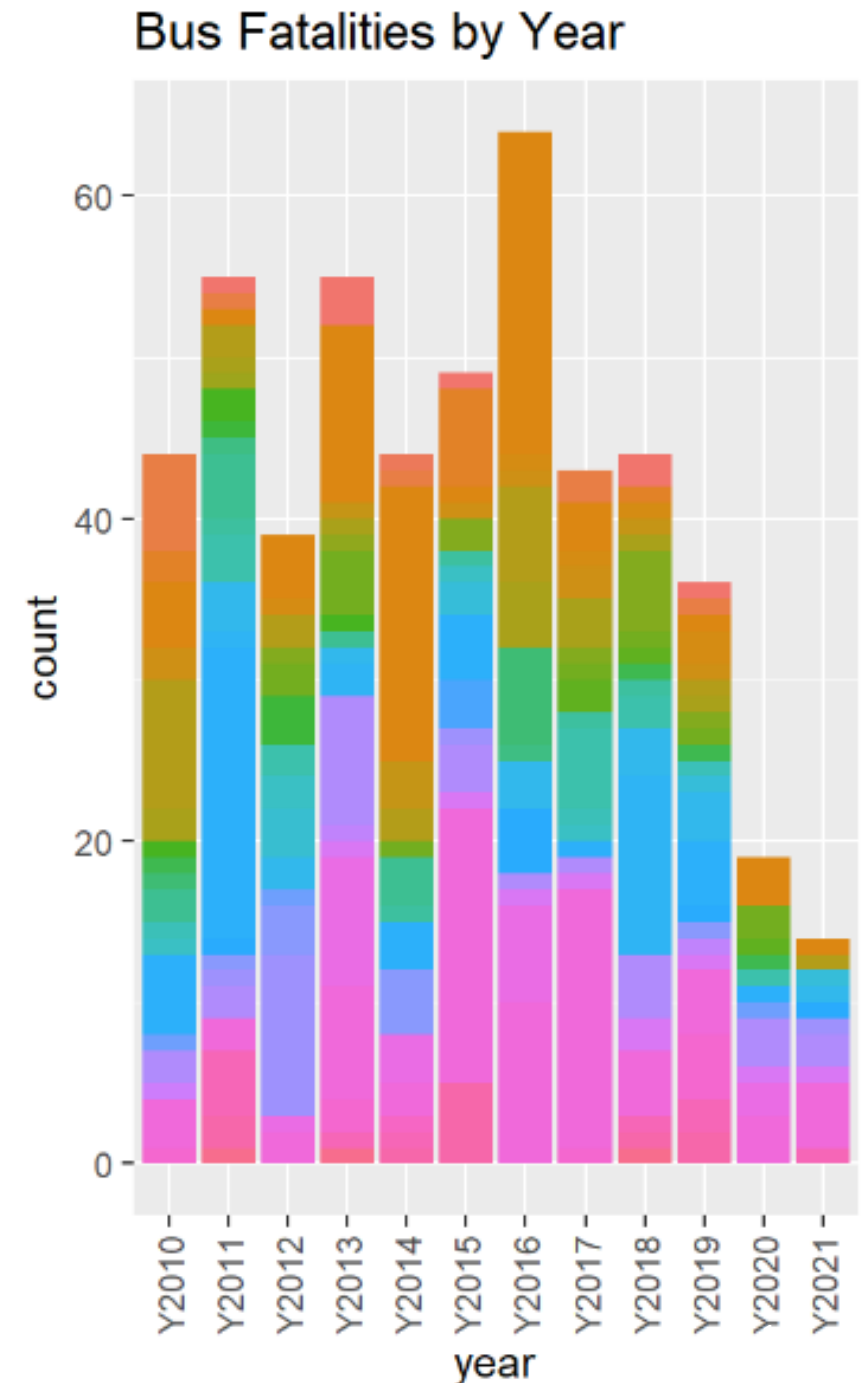
- Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10107069/)

COVID-Era
Exception:
Public Transport

Bus Fatalities by Year

COVID-Era Exception: Public Transport

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- Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10107069/)

Bus Fatalities by Year

State Revenue & State Expenditure

- Would state revenue and expenditure have a correlation with traffic fatalities?

- Observed correlation between revenue and expenditure in most states.
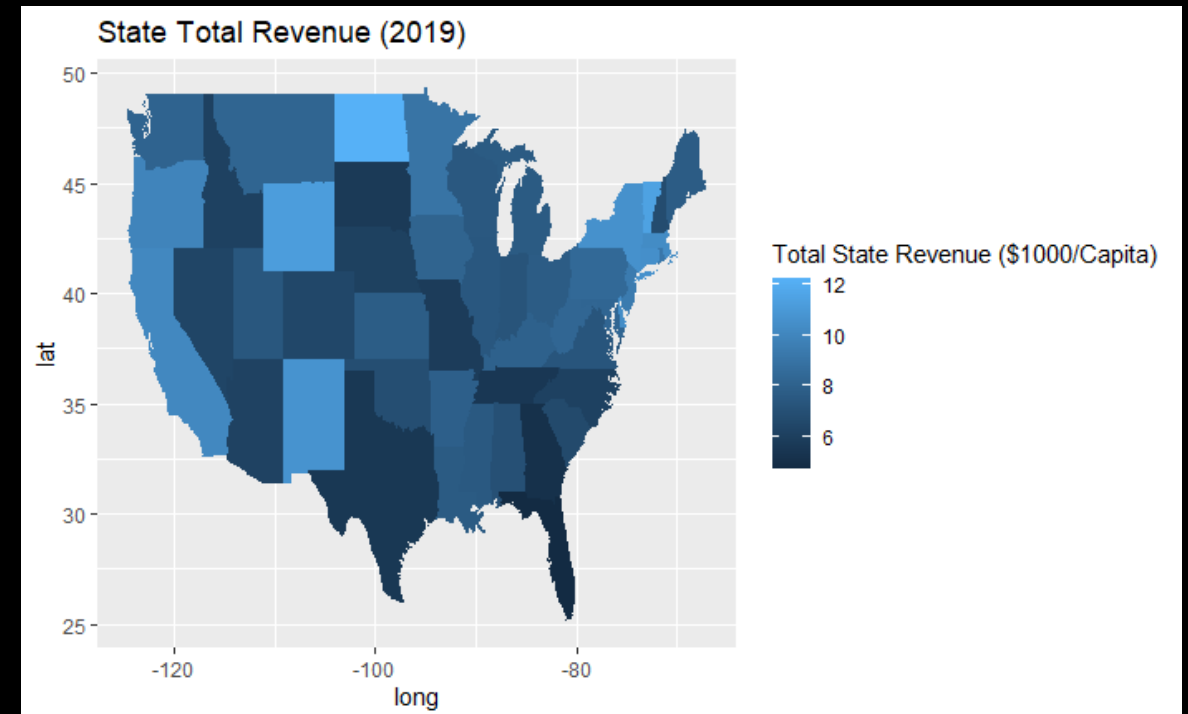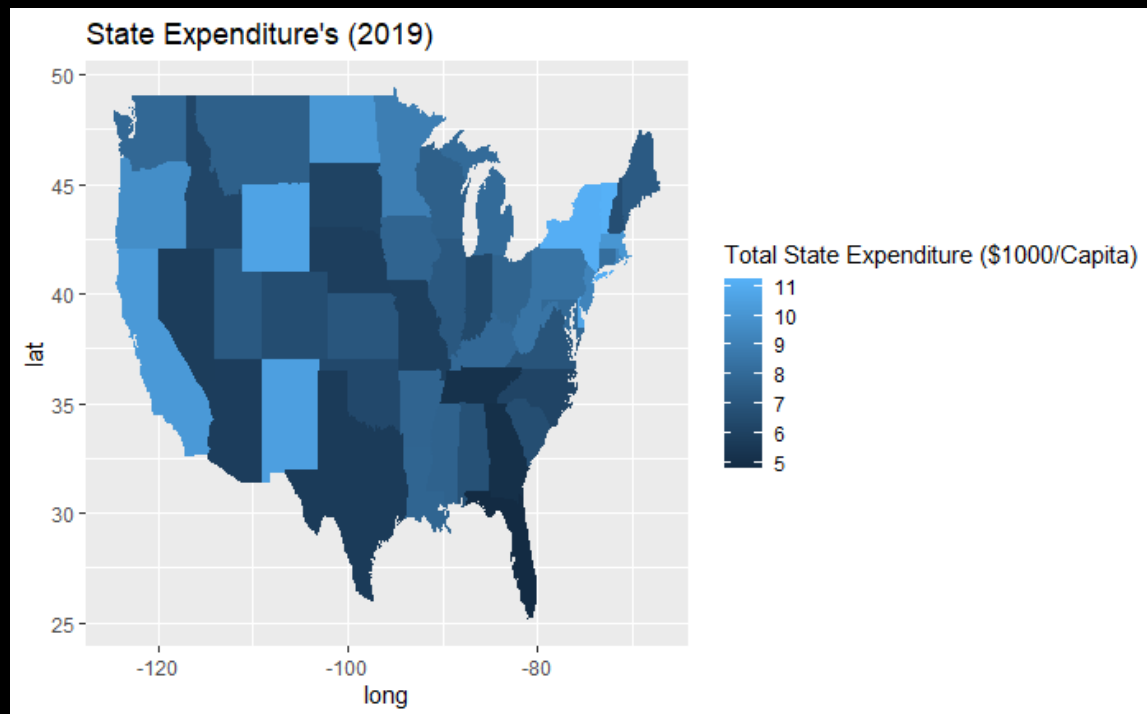
State Expenditure's (2019)

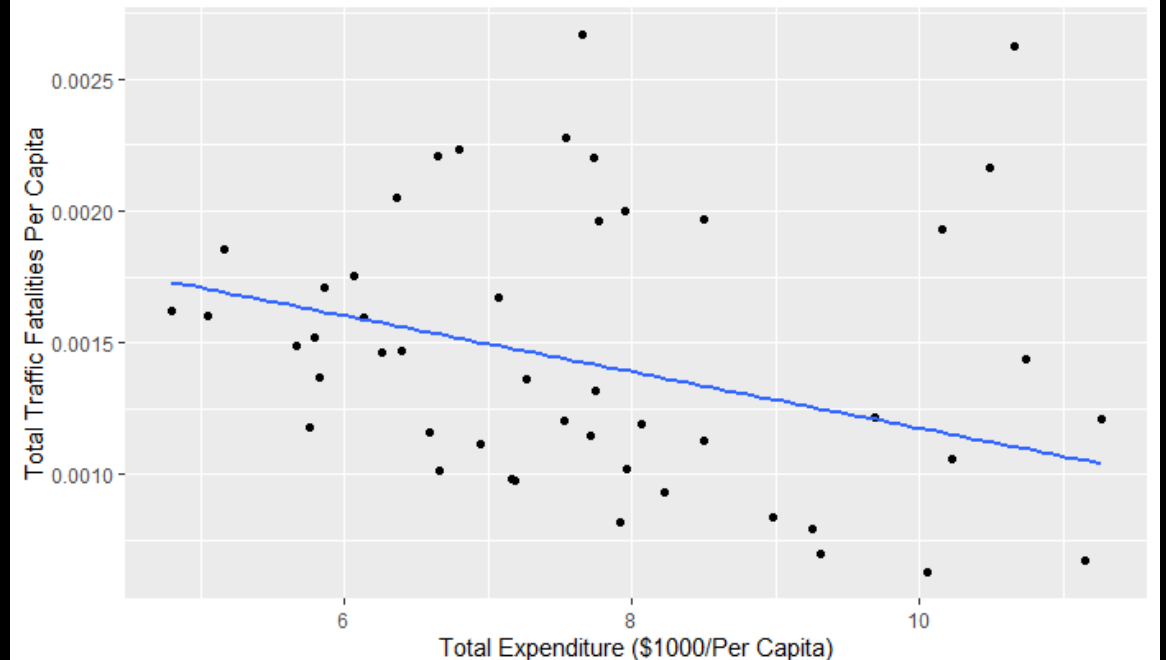
State Total Revenue (2019)

State Revenue & State Expenditure

- Would state revenue and expenditure have a correlation with traffic fatalities?

- Observed a negative correlation between revenue & expenditure and traffic fatalities.

State Revenue's Effect on Traffic Fatalities (2019)
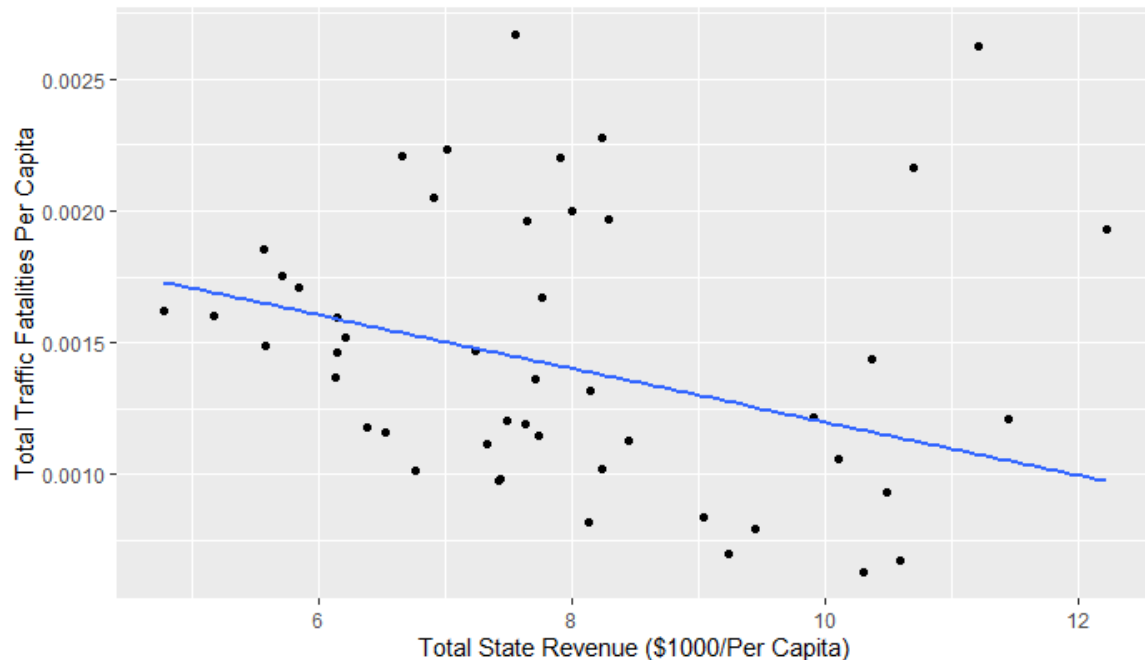
State Expenditure's Effect on Traffic Fatalities (2019)

Effect of Different State Funding on Traffic Fatalities

- What impact would specific types of state funding (expenditure) have on traffic fatalities?

- State funding on services like policing and education had a weak negative correlation to traffic fatalities


State Police Funding's Effect on Traffic Fatalities (2019)

State Education Funding's Effect on Traffic Fatalities (2019)
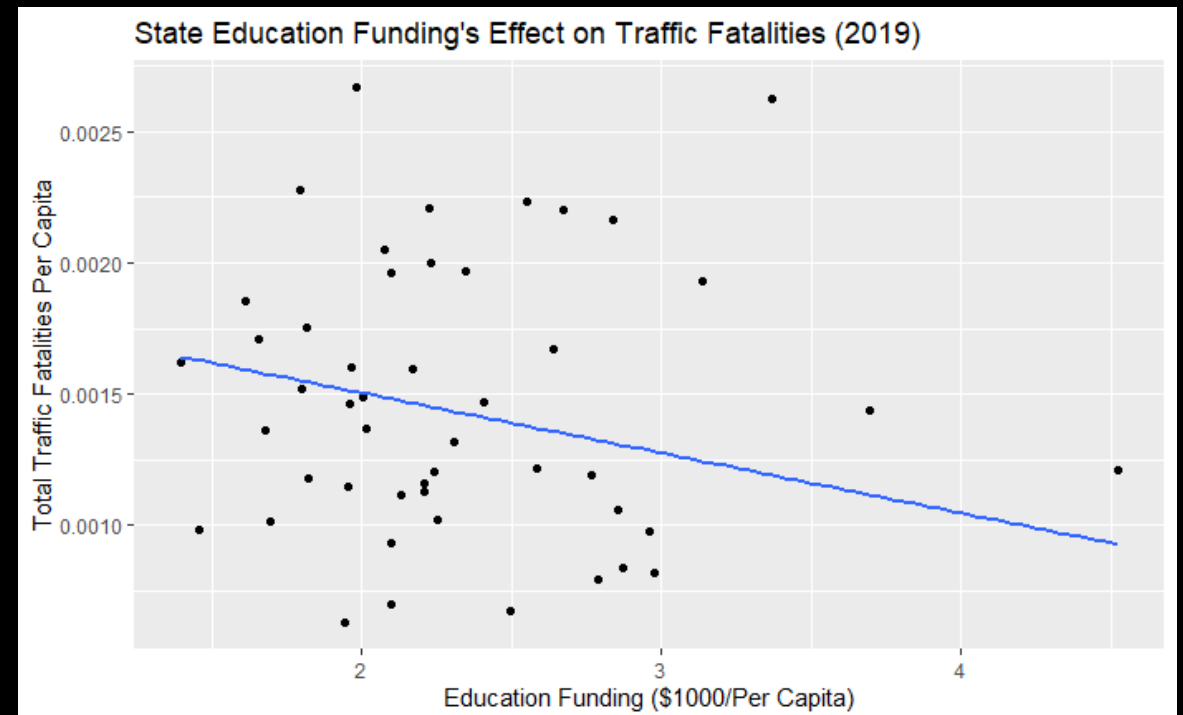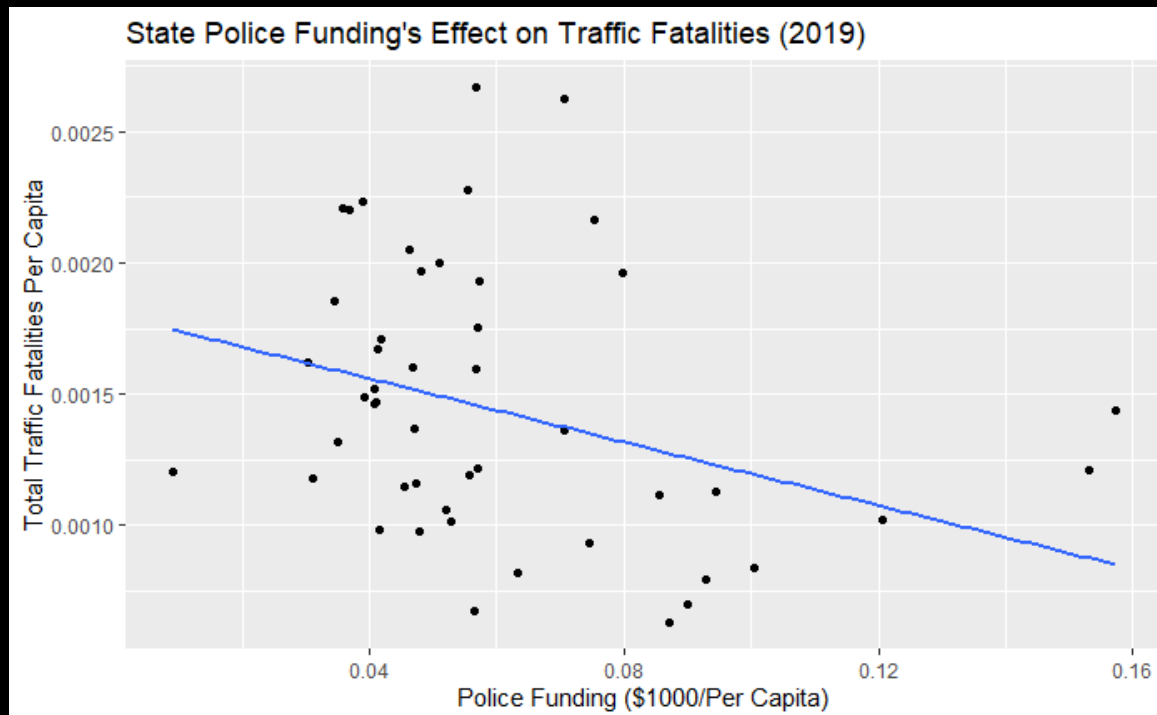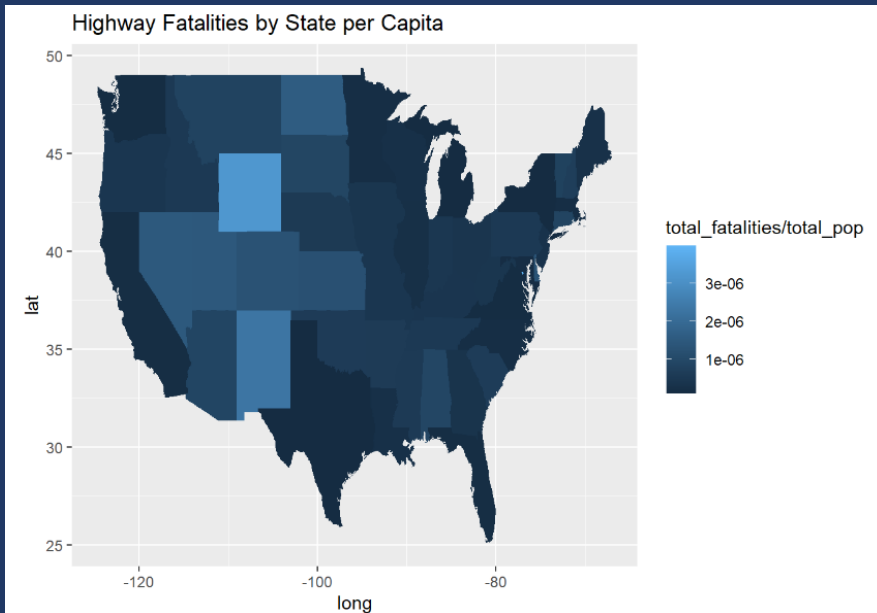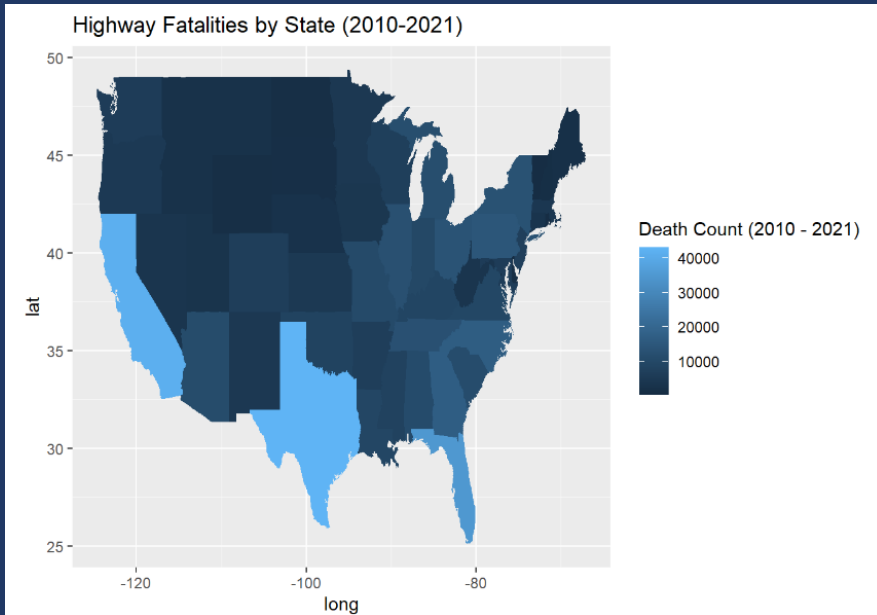
Most Dangerous States to Drive In?
What States Stand Out?

- Christy Bieber, J.D., after summarizing data from the National Highway Traffic Safety Administration (NHTSA), she indicated that the top 5 most deadliest states to drive in are (in order):
  - Montana, South Carolina, <u>New Mexico</u>, <u>Wyoming</u>, and Texas.
- This seems to partially align with our data for Total Fatalities by State Per Capita.
- Source: https://www.forbes.com/advisor/legal/most-dangerous-states-for-drivers/
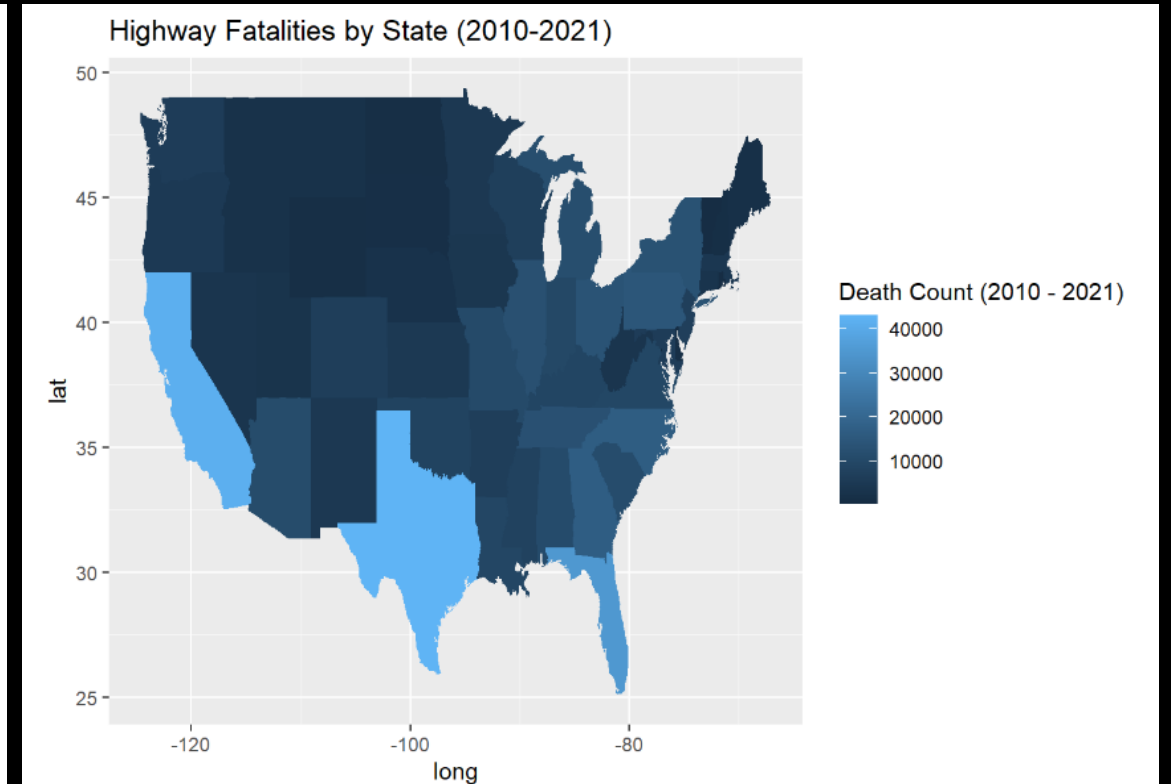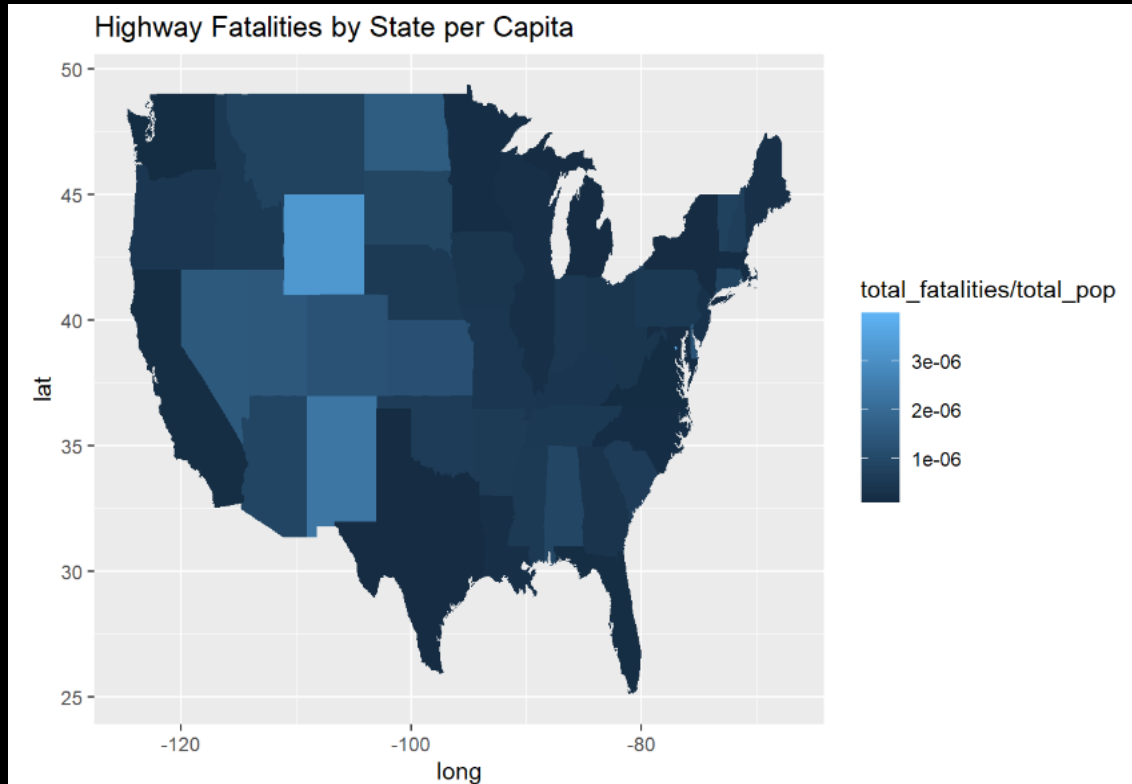
Investigating Texas, Per Capita vs. Total

Highway Fatalities by State (2010-2021)

Highway Fatalities by State per Capita

Texas

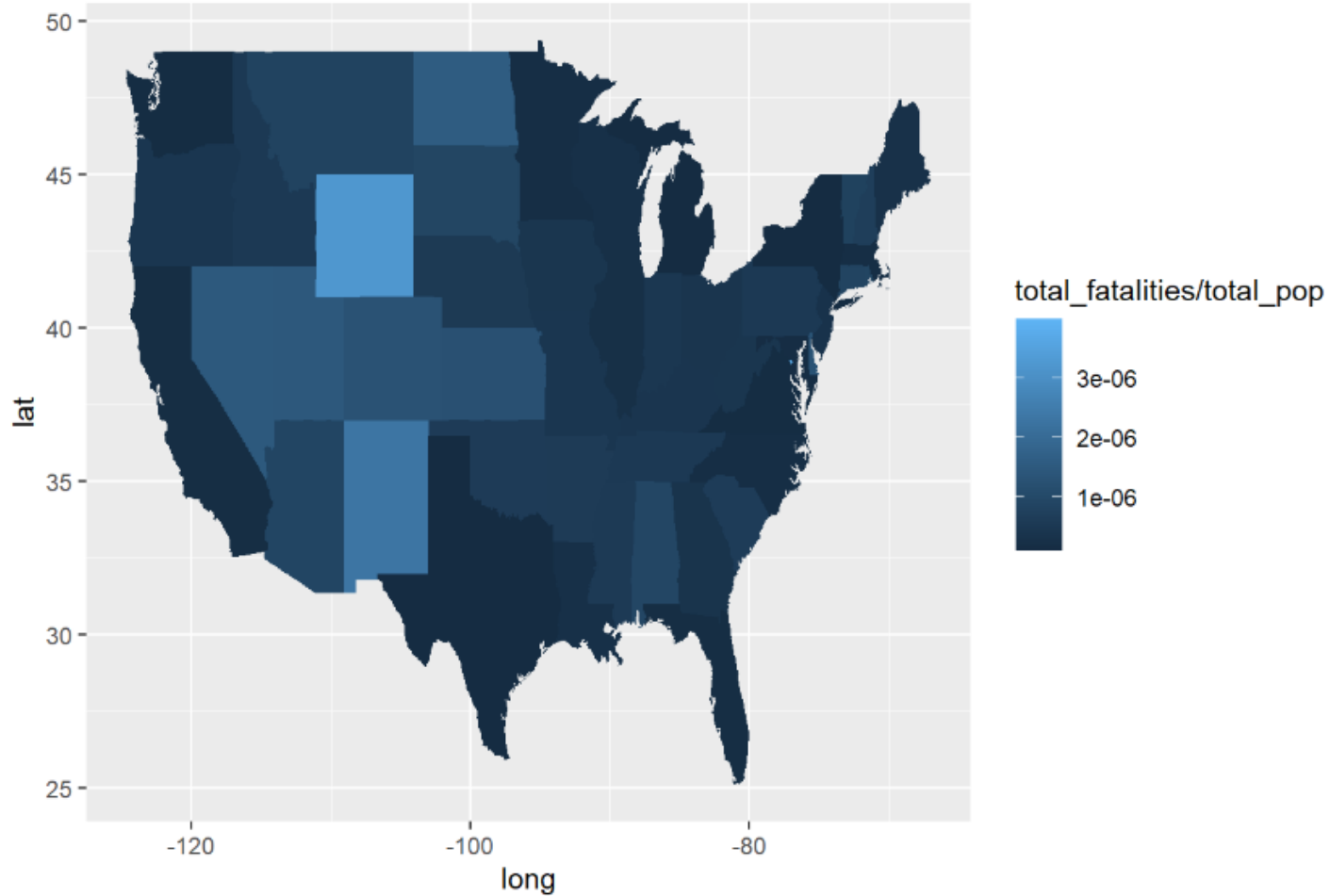- Lots of total fatalities, but also one of the most populous states

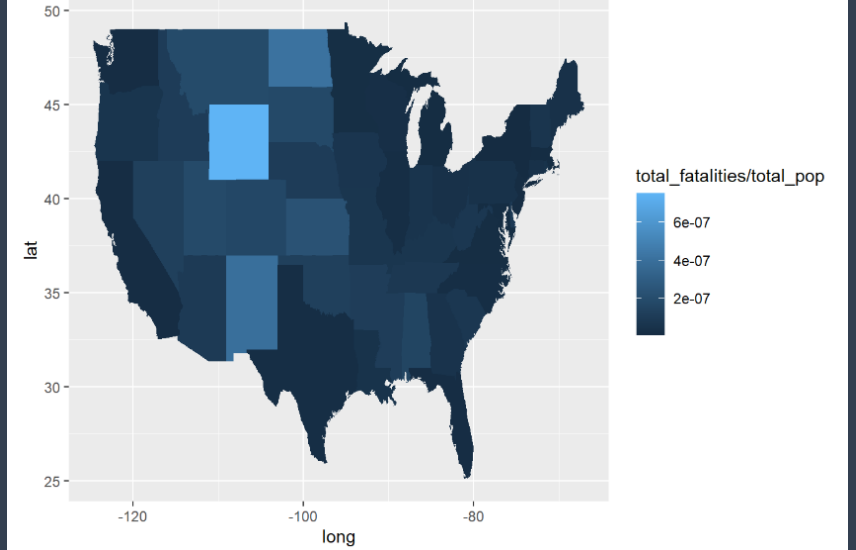- Shows the importance of comparing by population density instead of just totals

- Source: https://www.census.gov/data/tables/time-series/demo/popest/2020s-state-total.html#v2022
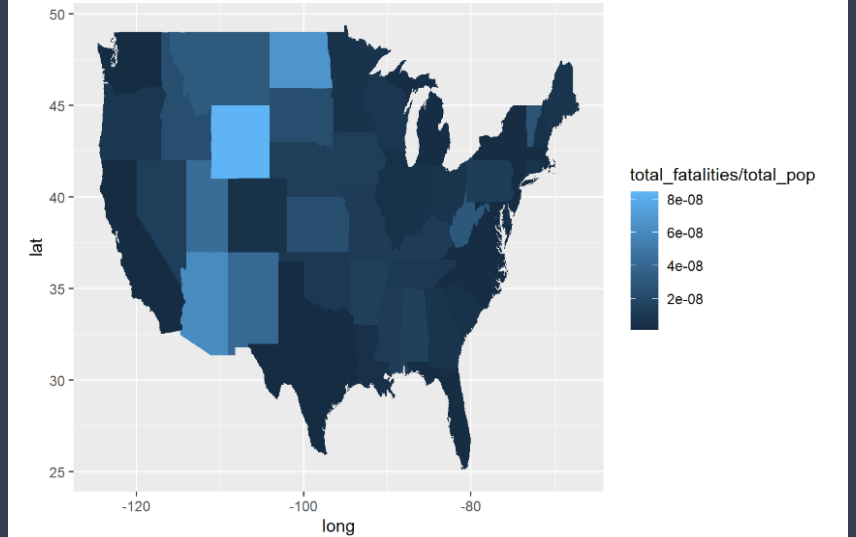
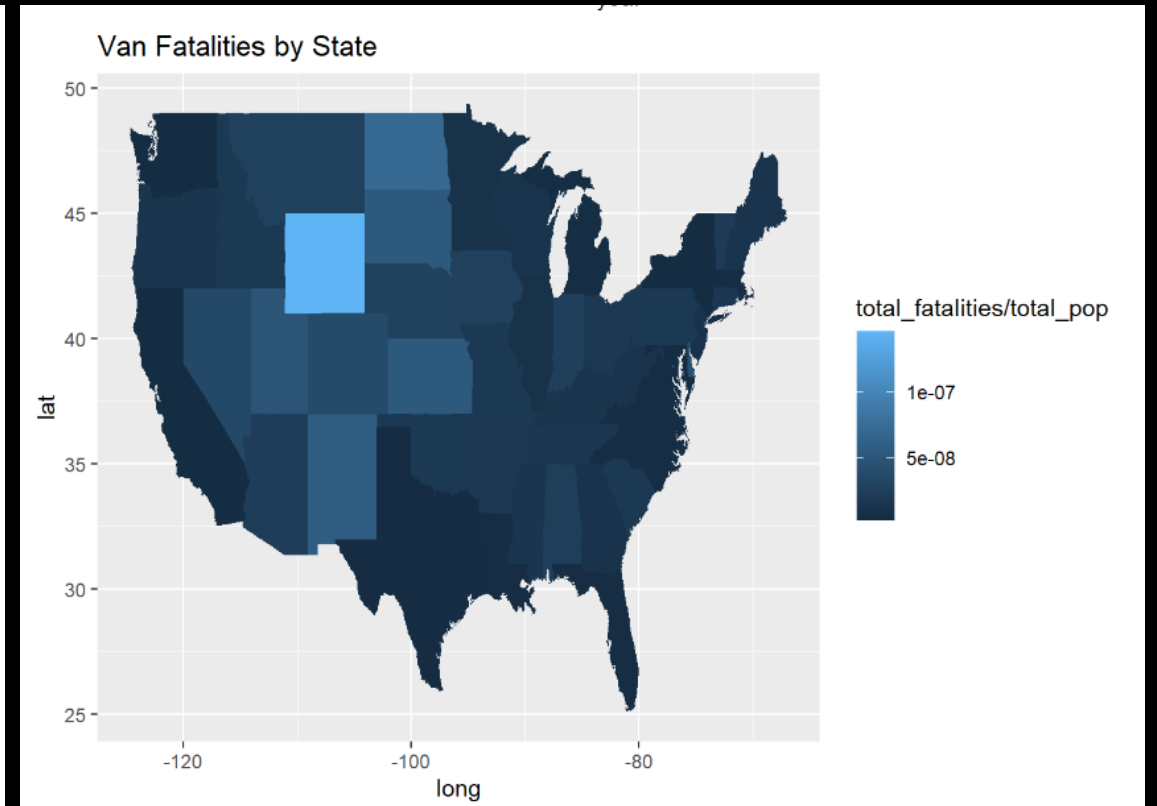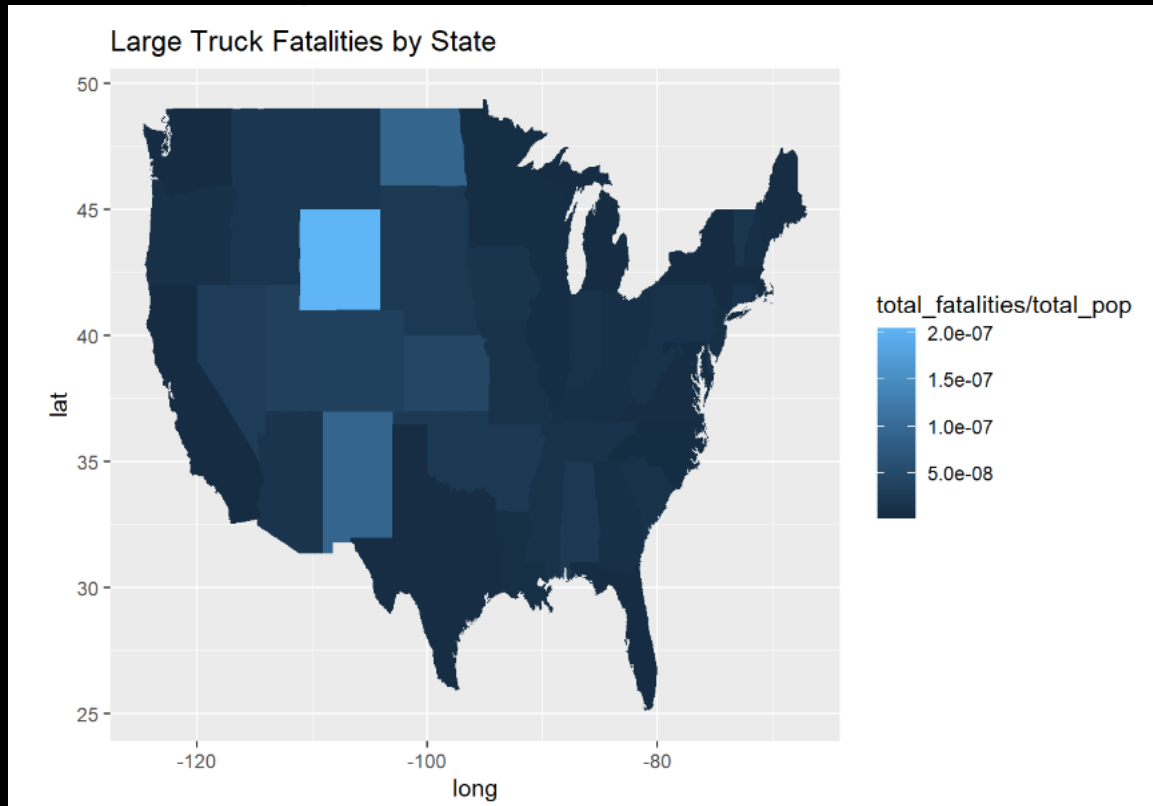# Wyoming Per Capita

Highway Fatalities by State per Capita
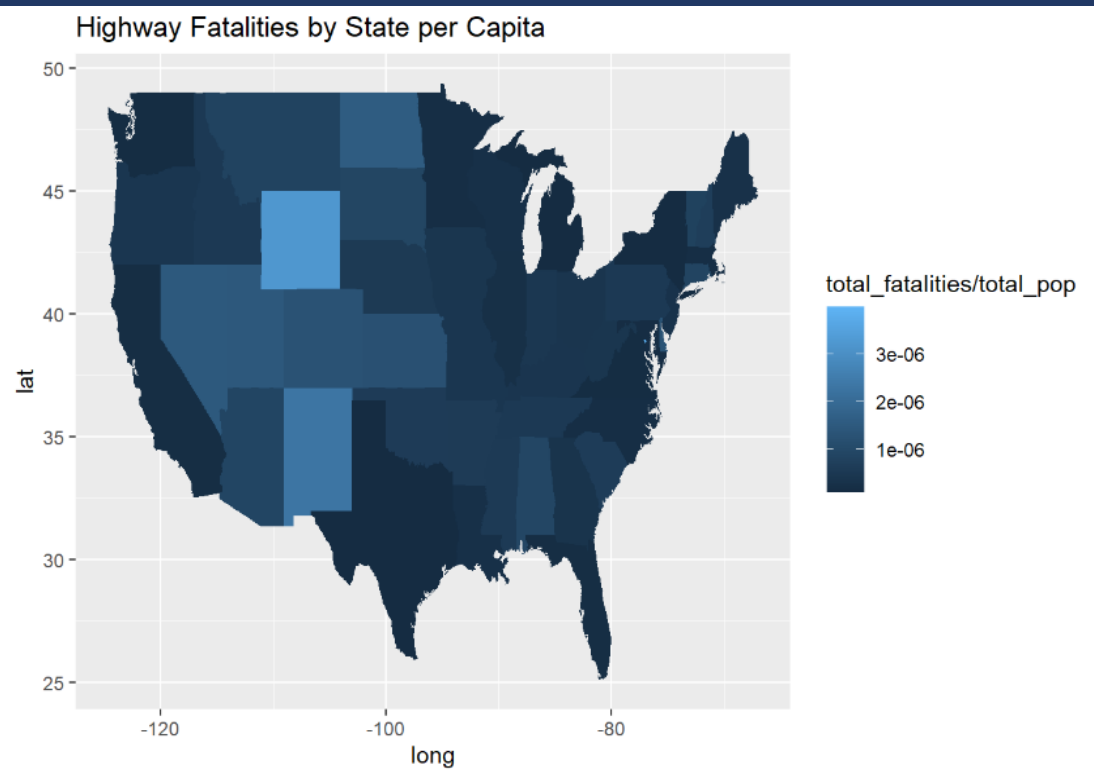

Pickup Truck Fatalities by State

Other Vehicle Fatalities by State

Large Truck Fatalities by State / Van Fatalities by State
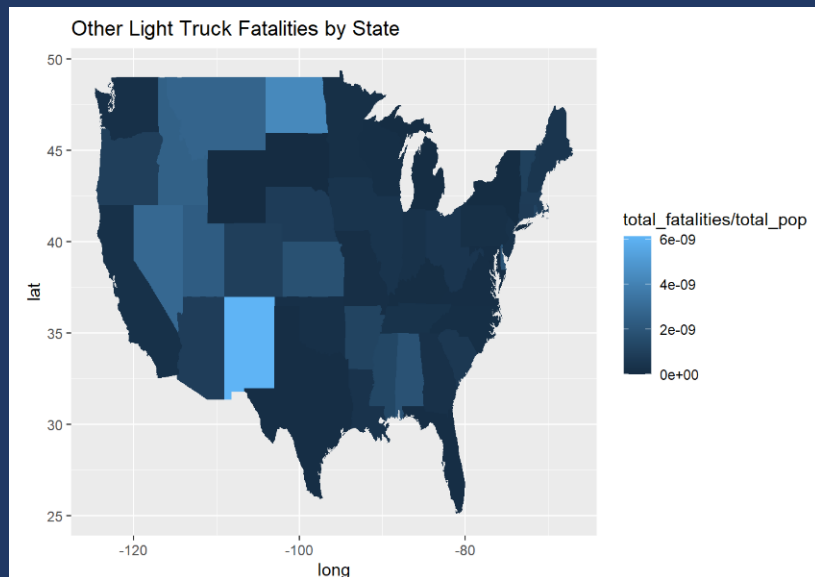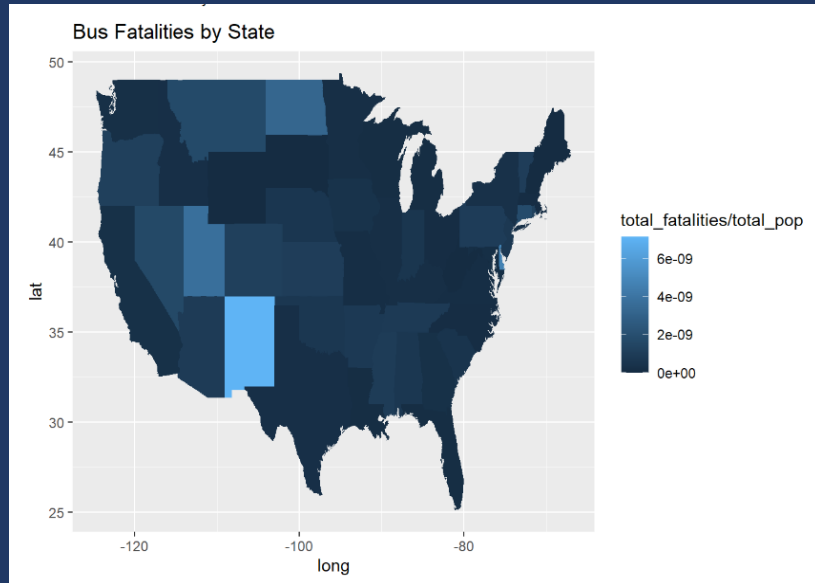
Wyoming Per Capita

Highway Fatalities by State per Capita

Wyoming

- Lowest state population, lots of mountains and dangerous road conditions

- Travelers who are unversed with these roads may lead to a disproportionate number of vehicular fatalities

- Source: https://www.census.gov/data/tables/time-series/demo/popest/2020s-state-total.html#v2022

Bus Fatalities by State

Other Light Truck Fatalities by State

New Mexico

- New Mexico has the highest per capita Bus Fatalities and Other Light Truck Fatalities

- One of the main spikes was one incident where unfortunately 8 people died in a bus crash back in 2018

- Source: https://abcnews.go.com/US/victims-identified-mexico-bus-crash-deaths-caused-blunt/story?id=57557710#:~:text=Authorities%20also%20announced%20all%20eight,%2C%20and%20Luis%20Alvarez%2C%2050.

Most Dangerous States to Drive In?

- Wyoming, Montana, and South Carolina are in the top 5, matching what Bieber found in her investigation

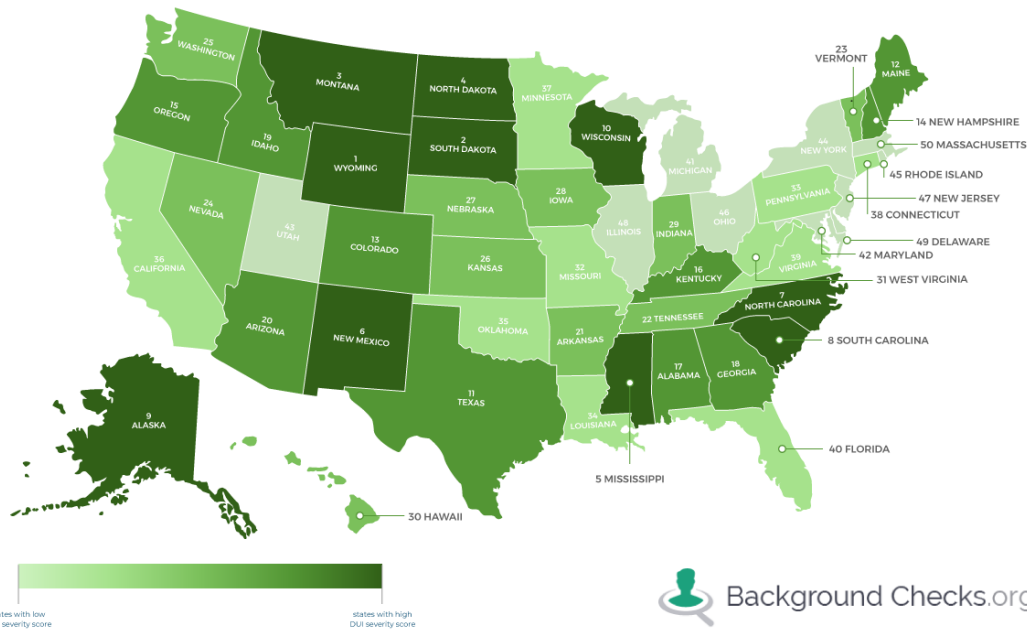| State <chr>	total_fatalities_percapita <dbl>
mississippi	0.002666372
wyoming	0.002634464
montana	0.002348336
south carolina	0.002308927
alabama	0.002253886

Reason for Safety: Enforcement

- According to Alina Comoreanu, a Senior researcher at WalletHub, the top 5 states that had the most strictest enforcement on speeding and reckless driving are (in order):
  - Delaware, Colorado, Arizona, New Mexico, and California

- This seems to correlate with our data for Highway Fatalities by State Population Density.

- Source: https://wallethub.com/edu/strictest-and-most-lenient-states-on-speeding/14211

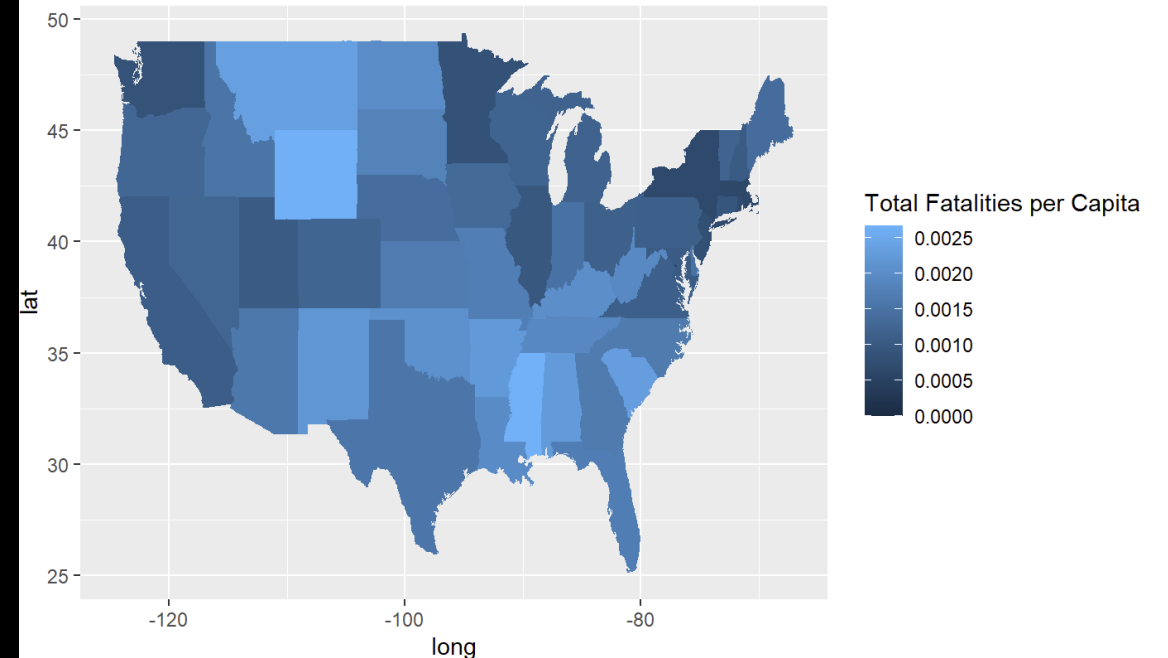Highway Fatalities by State per Capita
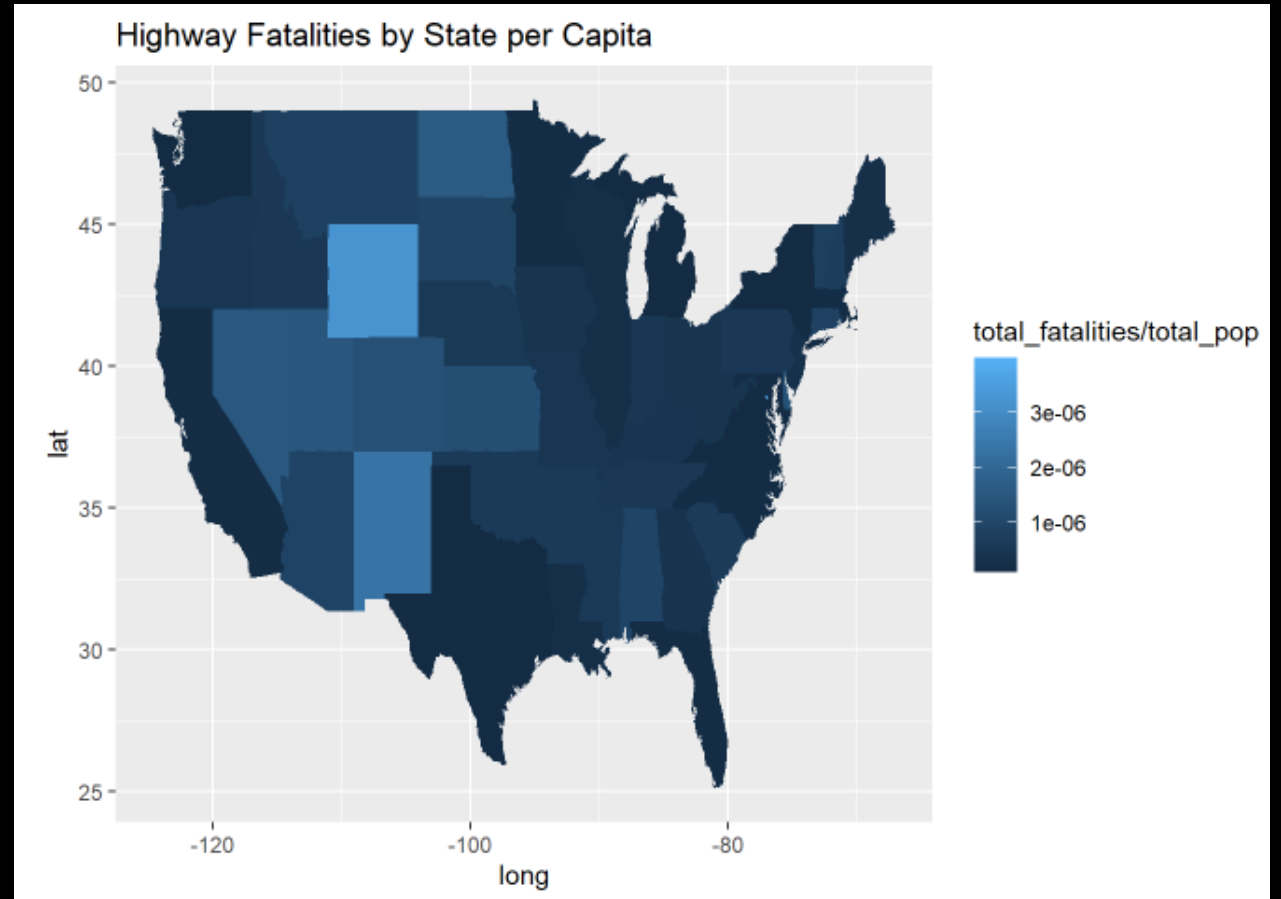
Reason for Safety: Enforcement

- Cluster of states near Wyoming shows that lenient drunk driving laws lead to more fatalities
- Utah and New York have high DUI severity and an extremely low amount of fatalities accordingly

Best and Worst States for Drunk Driving

Total Fatalities per State per Capita

- Source: https://www.google.com/url?sa=i&url=https%3A%2F%2Fbackgroundchecks.org%2Fwhich-states-have-the-worst-dui-problems.html&psig=AOvVaw3yThGVklZs6UR2YavOPK4A&ust=1701998289841000&source=images&cd=vfe&ved=0CBMQjhxqFwoTCODMpdaU_IIDFQAAAAAdAAAAABAE

Conclusion

- We found that an increase in traffic fatalities at the end of the reported data (late 2020 and late 2021) during COVID-19 due to different factors
    - Light Trucks and Public Transport were exceptions to this.

- We found that the most deadliest states to drive had a correlation to high pedestrian fatalities.

- We found an inverse correlation between enforcement of speed laws and reckless driving and traffic fatalities.

- We found Iowa's leading cause of traffic fatalities was highway fatalities.