Correlation between Pharmaceutical Payments and Drug Overdoses

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What Are We Trying To Find Out

- Is there a correlation between the amount of money physicians receive from pharmaceutical companies and the the number of drug overdoses in a state.

Data Sources

- Pharmaceutical Payment Data
  - https://openpaymentsdata.cms.gov
- Population Data
  - https://census.gov
- Drug Overdose Data
  - https://data.cdc.gov

Pharmaceutical Payment Data

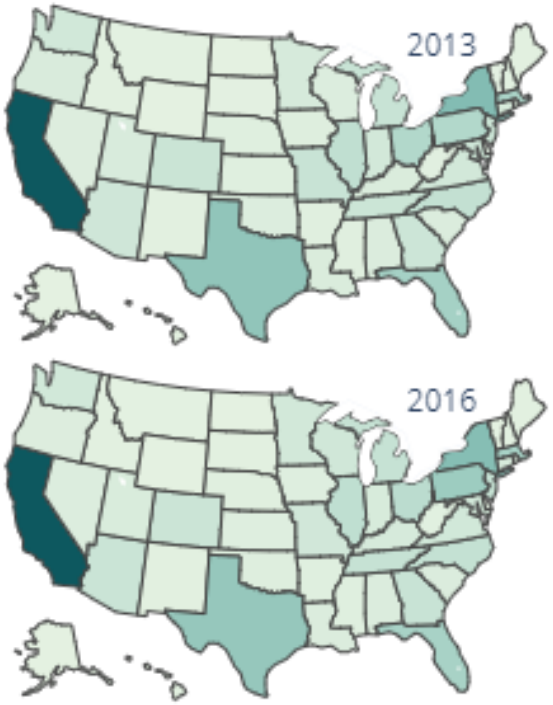
- Pharmaceutical Data is stored in a Socrata API.
- The API uses calls similar to SQL
- Example of API call:

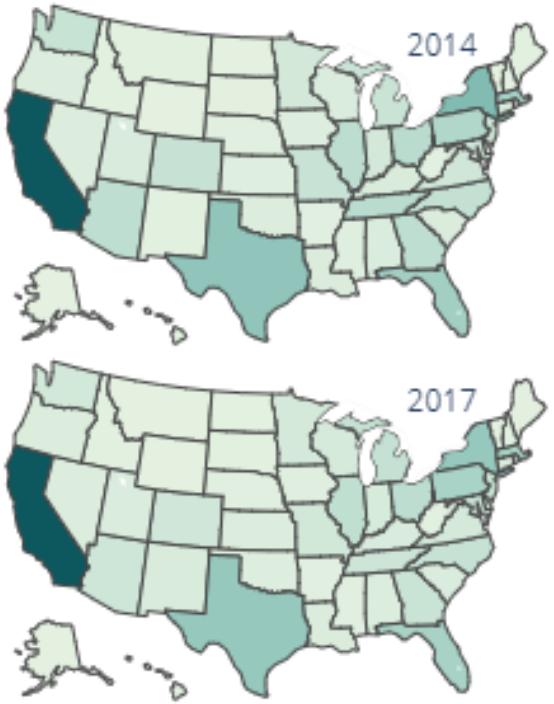
```
requests.get("https://openpaymentsdata.cms.gov/resource/p2ve-2ws5.json?" + \
                    "$select=recipient_state,sum(total_amount_of_payment_usdollars)" + \
                    "&$group=recipient_state").json()
```

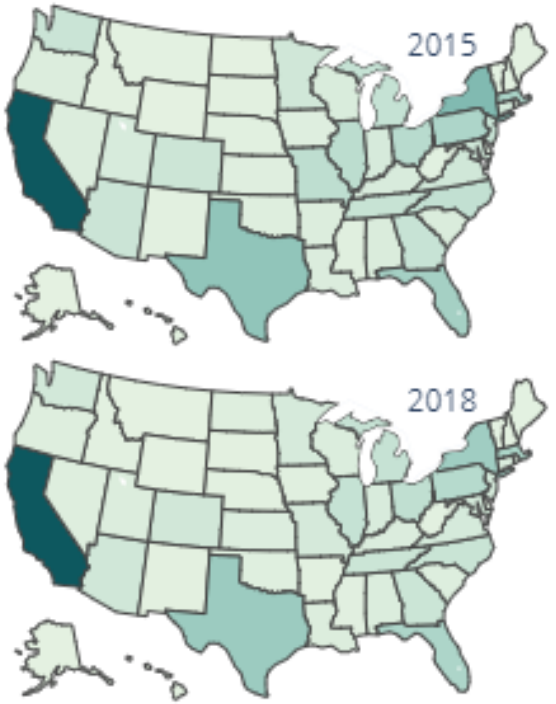
Plotting Pharmaceutical Data

- The payments were grouped by state and year
- A subplot was used for each year of data
- The data is best visualized using a choropleth
- Plotly was used to map the data

Physician Payments by State 2013-2019







Analyzing Pharmaceutical Data

- The concentration of funding does not change much year after year
- The states that receive the most money also seem to be states with higher populations
- Before comparing funding to other data, it must be adjust for population

Getting Population

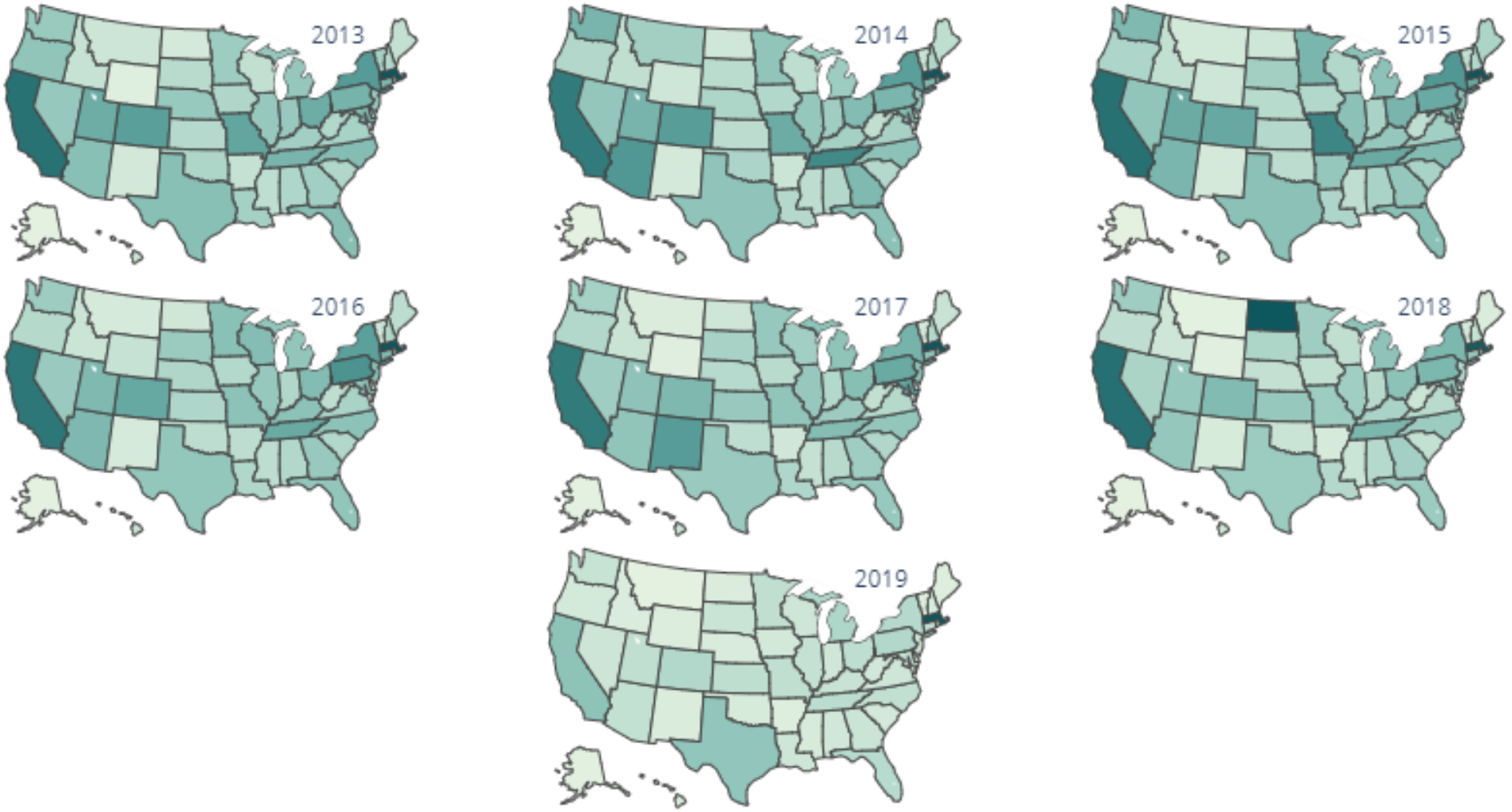
- Census data is stored in a CSV
  - https://www2.census.gov/programs-surveys/popest/datasets/2010-2019/national/totals/nst-est2019-alldata.csv
- The data was loaded into a DataFrame using the request module
- The data was then plotted in a similar fashion to the pharmaceutical payments maps

US Population by State 2013-2019

Adjusting for Population

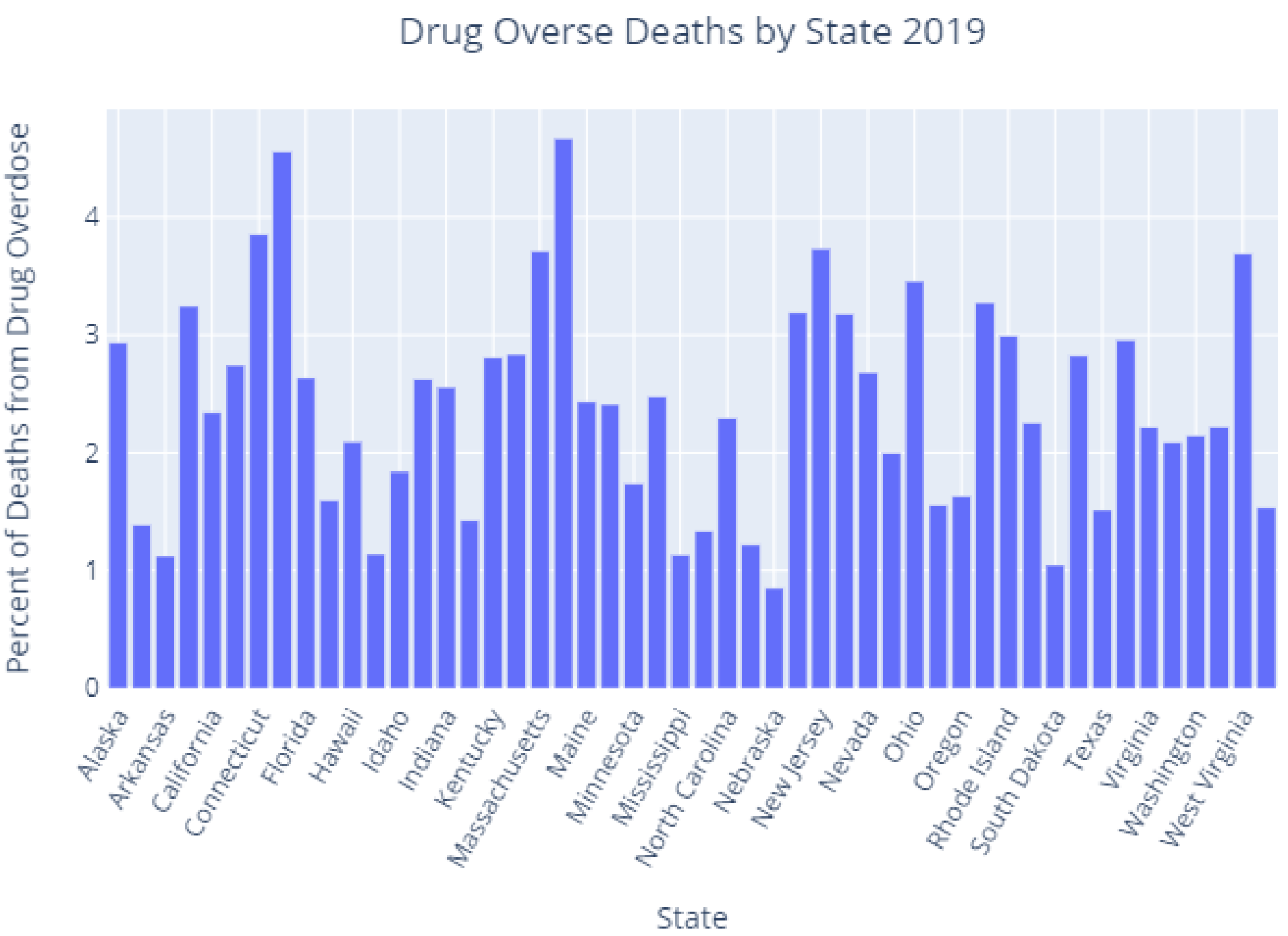
- The census data was merged into the pharmaceutical payments dataframes
- The payment data was plotted again, this time dividing it by the states population

Physician Payments by Drug Companies (Adjusted by State Population) 2013-2019



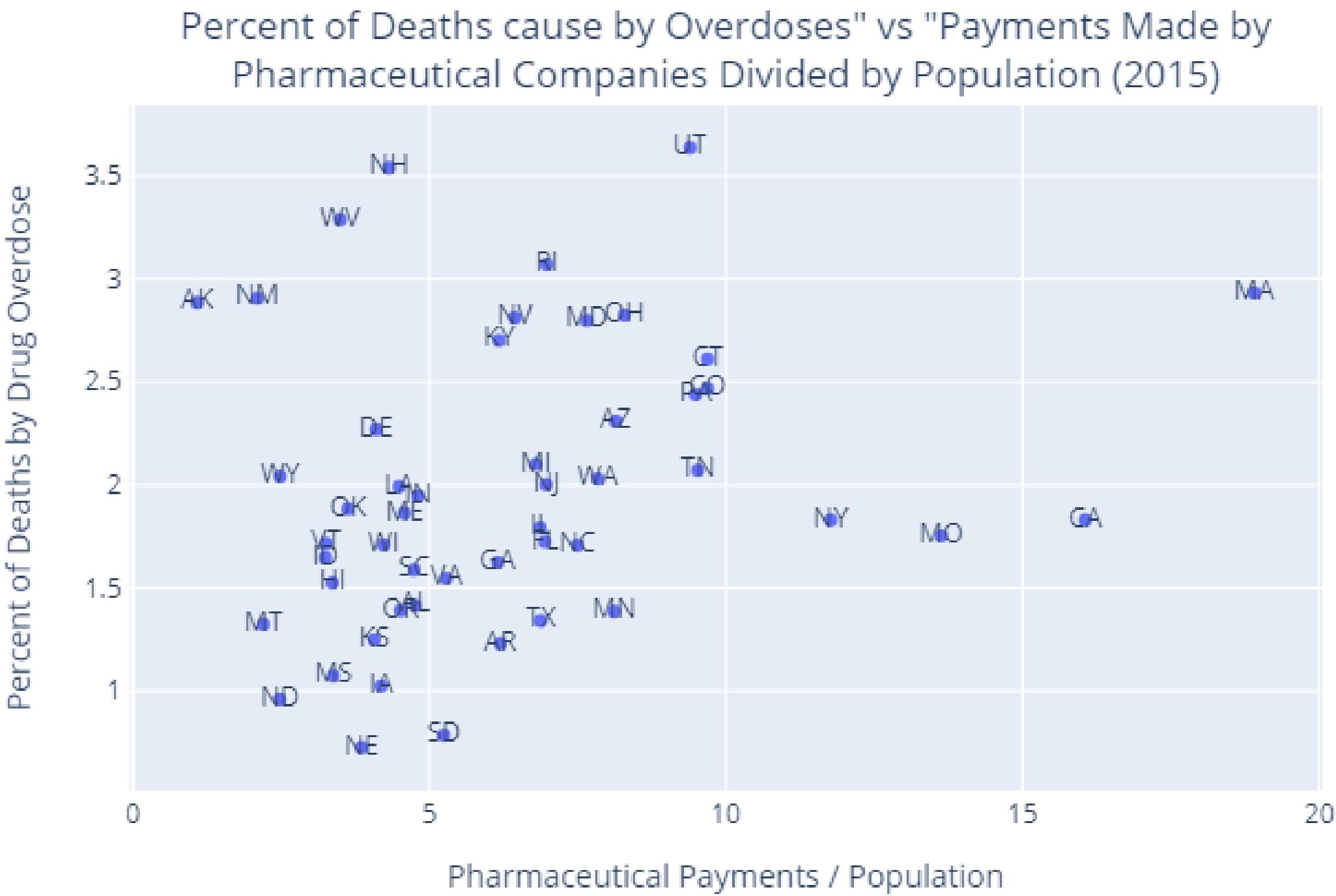
Drug Overdose Data

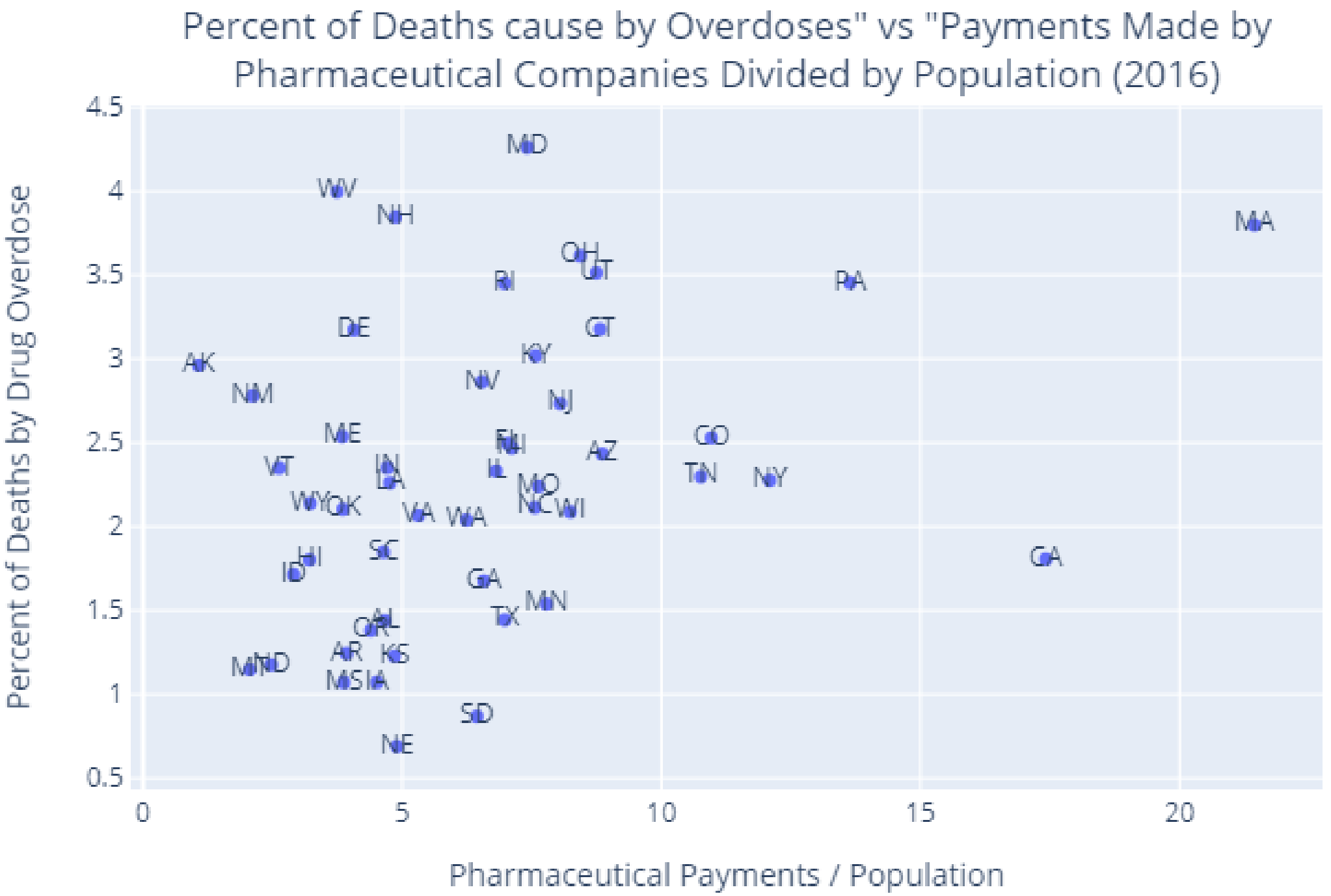
- The CDC provides data on drug overdoses
- VSRR Provisional Drug Overdose Death Counts
  - https://data.cdc.gov/resource/xkb8-kh2a.json
- Drug overdoses for 2019 were plotted to test that the data was received correctly

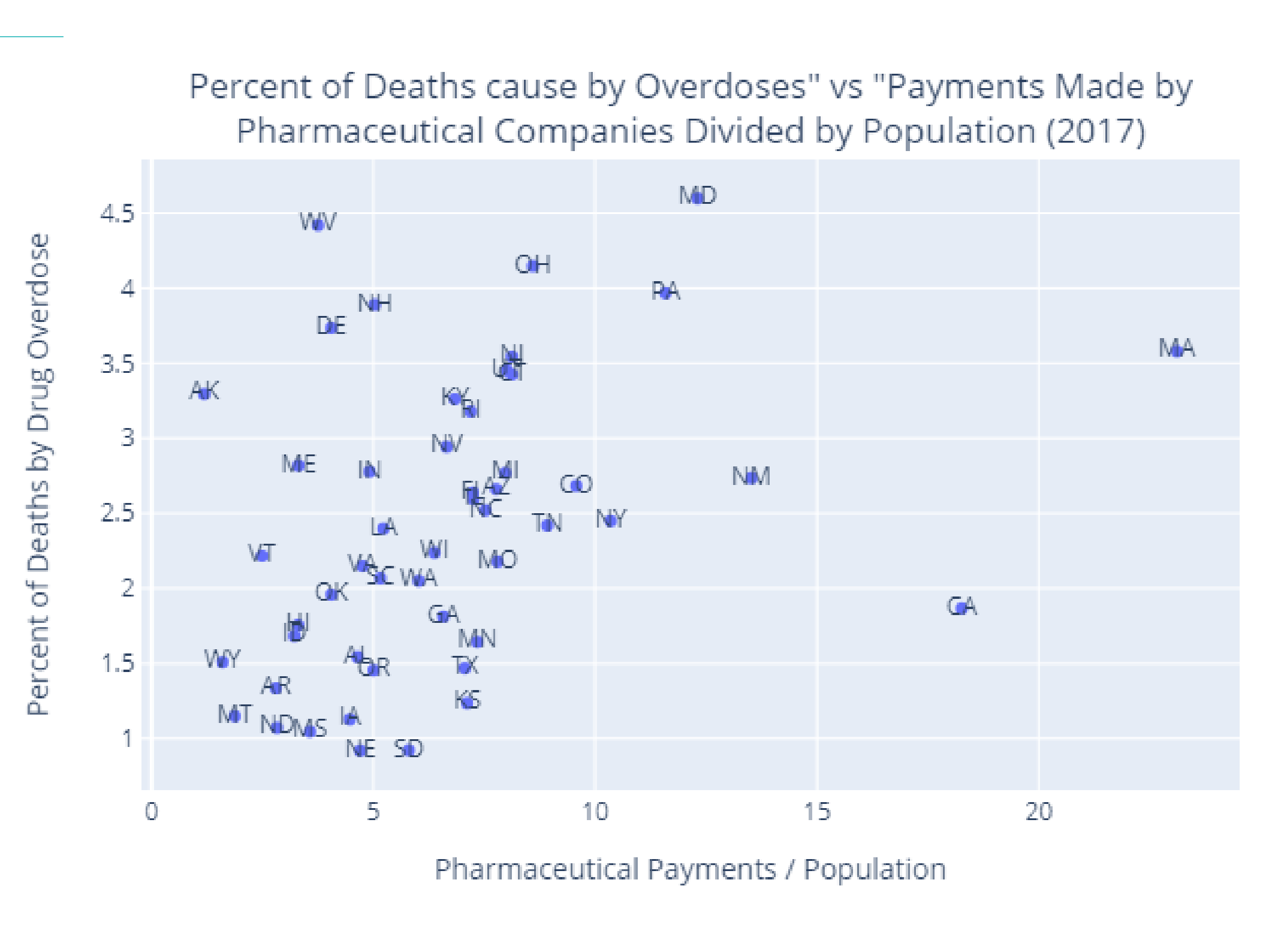

Drug Overse Deaths by State 2019
Percent of Deaths from Drug Overdose
0
1
2
3
4
Alaska
Arkansas
California
Connecticut
Florida
Hawaii
Idaho
Indiana
Kentucky
Massachusetts
Maine
Minnesota
Mississippi
North Carolina
Nebraska
New Jersey
Nevada
Ohio
Oregon
Rhode Island
South Dakota
Texas
Virginia
Washington
West Virginia
State

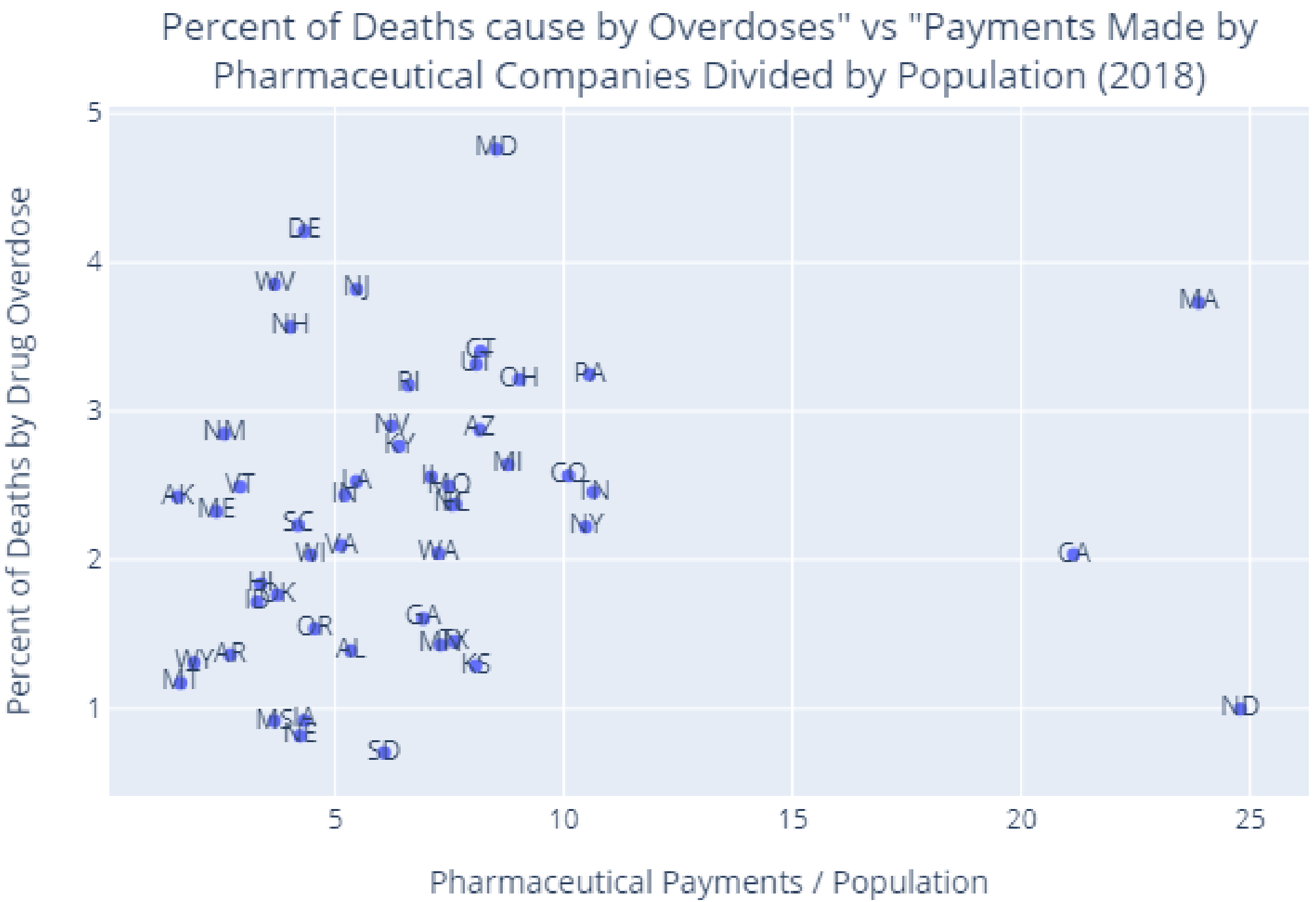
Final Visualizations

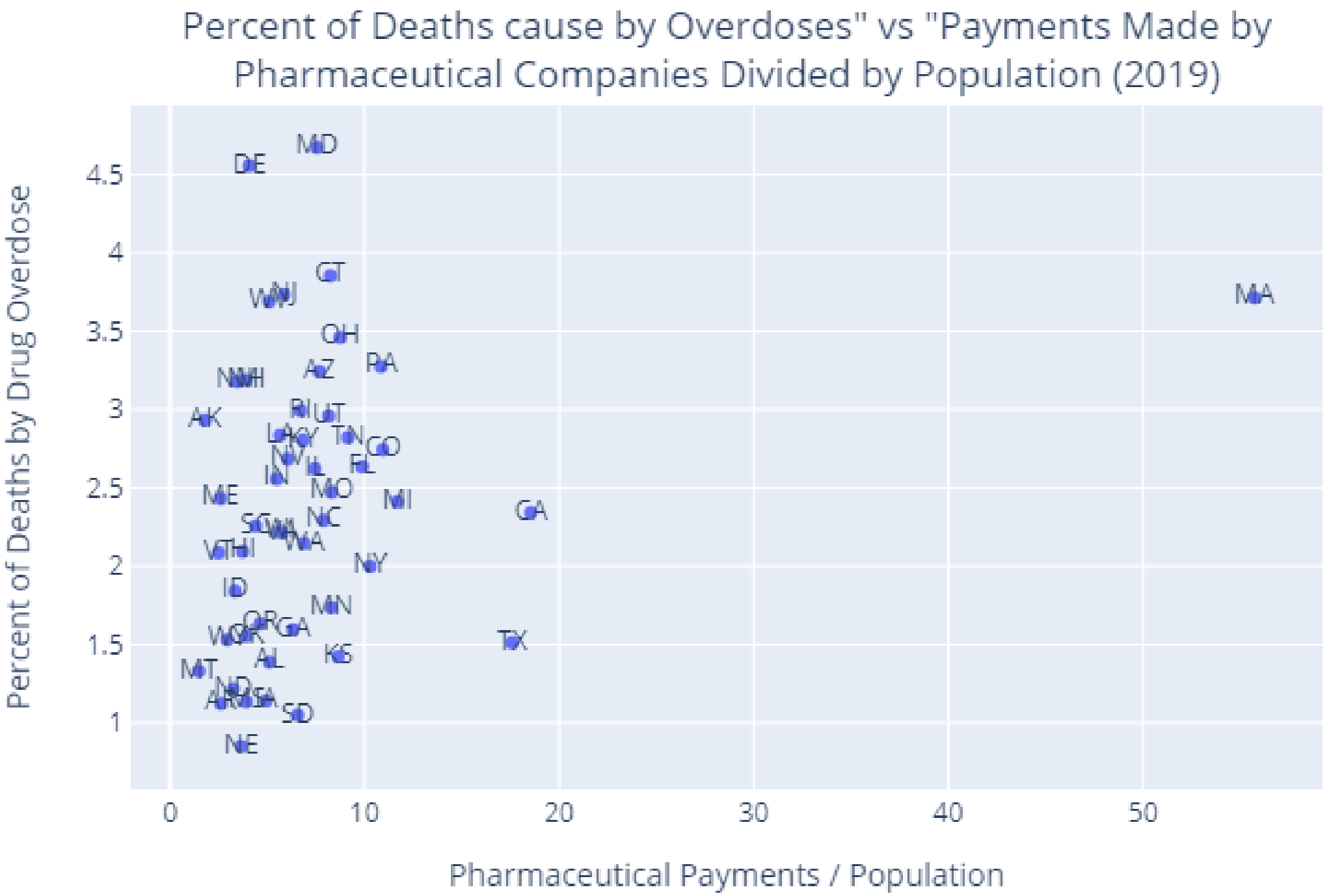
- Pharmaceutical payments, population, and drug overdoses were combined into one dataframe per year
- 5 years of data were available
- Each year was mapped as "Percent of Deaths cause by Overdoses" vs "Payments Made by Pharmaceutical Companies Divided by Population"


Percent of Deaths cause by Overdoses" vs "Payments Made by Pharmaceutical Companies Divided by Population (2015)
Percent of Deaths by Drug Overdose
Pharmaceutical Payments / Population
0
5
10
15
20
1
1.5
2
2.5
3
3.5


Percent of Deaths cause by Overdoses" vs "Payments Made by Pharmaceutical Companies Divided by Population (2016)
Percent of Deaths by Drug Overdose
Pharmaceutical Payments / Population
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
5
10
15
20


Percent of Deaths cause by Overdoses" vs "Payments Made by Pharmaceutical Companies Divided by Population (2017)
Percent of Deaths by Drug Overdose
Pharmaceutical Payments / Population
4.5
4
3.5
3
2.5
2
1.5
1
0
5
10
15
20


Percent of Deaths cause by Overdoses" vs "Payments Made by Pharmaceutical Companies Divided by Population (2018)
Percent of Deaths by Drug Overdose
Pharmaceutical Payments / Population
5
4
3
2
1
5
10
15
20
25


Percent of Deaths cause by Overdoses" vs "Payments Made by Pharmaceutical Companies Divided by Population (2019)
Percent of Deaths by Drug Overdose
4.5
4
3.5
3
2.5
2
1.5
1
0
10
20
30
40
50
Pharmaceutical Payments / Population

Conclusion

- From the charts, there appears to me no correlation between Drug Overdoses and Pharmaceutical Payments to Physicians. Not all data exploration returns interesting results, so in this case, more was learned from the destination than the journey. It's probably a good thing that I was unable to prove a connection between pharmaceutical company payments to doctors and drug overdoses in their state.