Investigating a possible opioid crisis: California and New York States
Data 551 - Lab 1 Report
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Deaths due to opioid overdose have spiked in Canada, doubling between 2015 and 2017 (Statistics Canada, 2017). Statistics Canada claims that while illegal drugs with fentanyl are part of the problem, "...prescription opioids have also contributed to the crisis… High rates of opioid prescribing mean that more people are being exposed to the risks of opioids."

We were not able to locate data to back up Statistics Canada's statement, but we were able to get informative data from our neighbours to the South: The Washington Post (2020) has compiled and published detailed information about supplier-retail opioid sales in the US, which we with the US's National Centre for Health Statistics' (NCHS) annual estimates for deaths due to opioid poisoning (2019), and Tableau's native population data. We have used this data to explore the relationship between the white-market opioid retail sales and opioid poisoning (at least in the US).

To simplify our exploration, we decided to zero in on the US's two best-known states: California and New York State. According to at least one number-cruncher, New York State spends more per capita on Social Welfare than any other state (gobankingrate.com, 2019), making it a particularly interesting state to compare with others.

Our Tableau file shows three dashboards: Overall and Per capita opioid use in CA and NY, opioid-related deaths, and the change in death rate over time in relation to oxycodone and hydrocodone.

Dashboard 1: Location and Opioid Retail

The first dashboard compares New York and California's overall and per capita opioid usage. (We adopt per capita as a measure because there is a significant difference in the population of California (38.8 million), and New York (12.9 million)).

In the heat map for drug usage in California and New York, dots represent counties. The darker the dot, the larger overall opioid usage measure in weight of drug (kg), with maroon being the largest usage. The background map, divided at county borders, provides per capita income level of each county. You can see that overall drug usages are generally concentrated in the most populous counties. In CA, high usage presents in Los Angeles, San Diego, Riverside, and Alameda. In NY, high rates are in Kings, Queens, New York, Suffolk, Erie and Orange. The anomaly here is Kings, a less populous county that has high rates. Kings has one of the largest populations of adolescents and veterans in the state, groups known for prescription drug misuse (Community Health Needs Assessment, 2019). Interestingly, we could find that oxycodone usages are higher in the lower-income central valley region compared with hydrocodone. Oxycodone is a moderately priced drug, whereas the hydrocodone is a more expensive pain reliever. The similar pattern in two types of drug usage could be seen in Erie county and New York City (including Queens, Bronx, Kings [Brooklyn's county], Manhattan) in New York.

The bottom left bar chart compares the per capita prescribed drug usage between CA and NY, with blue representing hydrocodone and orange representing oxycodone. California sells almost double as much in prescription opioids in New York. The bottom middle and bottom right bar charts show differences in drug usage between the seven largest cities in CA and NY, respectively. In NY, Buffalo (the major gateway for commerce towards Canada) and Niagara Falls (another boundary city, not shown), more hydrocodone than oxycodone is prescribed, while in the greater New York Metropolitan area (Bronx, Brooklyn, and Manhattan), Rochester (3rd most populated city in NY) and Syracuse (fifth-most populated city in NY) oxycodone takes over. The opposite is true in California: Downey city of Los Angeles County, the most populated county in the united states, prescribes more hydrocodone, whereas Carlsbad, the coastal city of Santiago prescribes more oxycodone.

Dashboard 2: Location and Death Rates

All the the charts on the "Death" dashboard show Opioid-Related Death- tes in NY and CA Over Time as assessed by the NCHS. Specifically, the "Rate" chart has a shortened axis (it ranges from eight to 12 deaths per

1000 people per year) and shows the New York had a lower opioid-related death rate from 2006-2011, but this difference began to reverse in 2009 and for 2014, has been equal to California's. The "Proportion" chart is similar, but this time the y axis shows the percent that each state contributes to the total number of deaths between the two states. Again, we see that California initially had a greater contribution, but it is now 50/50. The "Side-by-Side" chart allows the reader to compare each state, by year.

Dashboard 3: A Temporal Look at State, Death Rates and Type of Drug

Beginning in 2013, New York State restricted the distribution of hydrocodone without a doctor's visit (WBFO). As well, all products containing hydrocodone in any amount and in any combination were added to Schedule II - Controlled/Restricted Substance (Barrett, n.d.) As a result, we wanted to explore whether or not these measures led to fewer opioid overdoses.

Accordingly, the third dashboard demonstrates the relationship between types of prescribed opioids over time, and the average opioid-related death rate, calculated as the rate of opioid caused deaths/100,000 people. Examples of this calculation are shown below. We used this measurement to compare death rates between states. Where the population varies it is simpler to keep our measurement of death as a per capita rate, rather than a count of total opioid-caused deaths.

Observing the graph for CA shows heavy use of both oxycodone and hydrocodone, with hydrocodone typically used more. There is a distinct increase and peak usage of both drugs in 2012, followed by decrease. The maximum usage exceeds 1250 kg/year for hydrocodone, and about 1225 kg/year of oxycodone. Overall the opioid-caused death rate increases over time at a relatively constant rate, reaching approximately 12.5 in 2014.

The NY state graph shows the sales of these two drugs, but there are some very clear differences between the two state graphs. The dramatic difference of drug use in NY state, as compared to CA state is the most obvious difference. In NY, the use of oxycodone is steadily and quickly increasing over time, contrary to the use of hydrocodone, which plateaus. Both drugs seem to be used at similar levels in 2006, but quickly diverge as oxycodone becomes the more heavily used drug, more than doubling the usage of hydrocodone by 2009, and increasing as time goes on. This pattern is very different from that seen in California, where both drugs increase and decrease in use together and neither seems to be the preferred choice. Another major difference between the states is the magnitude of drug usage. A quick look to the left hand y-axis would indicate the the base-level of drug usage in CA is more than double the base level of drug usage in NY state (2006 CA: 752.1 versus 2006 NY: 343, for just the lesser used drug)

Investigating the death rate for NY state shows that the opioid-caused death rate increases over time at a relatively constant rate, reaching approximately 12 in 2014. Clearly the death rate for each state California and New York are nearly identical by 2014, this suggests that the precautions and restrictions which were put into place in NY state by health officials is not effective enough for reduction of opioid caused deaths. We can hypothesize that perhaps there is not enough temporal data (implementation occured in early 2013, our data is only available until 2014), or that the limitation placed only on hydrocodone was not enough and should have been on both, hydrocodone and oxycodone, given that oxycodone is used more in NY State.

Conclusion

Much information, patterns, and insight are observed in the dashboards we created. First, the spatial visualization of NY and CA states showed how the county income, population demographics, and location can have an impact on the level of drug usage. Secondly, the trends of opioid-related deaths have been on the rise in both states, and have a very similar rate of approximately 12 deaths per 100,000 people in 2014. Finally, the third dashboard, a temporal visualization brought the drug use and opioid related death data together to investigate if there was any connection between the drug use over time and the opioid-related death rate in the state. Overall, we found that although NY has the most social welfare spending per capita, the opioid-related death rate is equivalent to that of California, and this suggests that the measures which were put in place in NY state in order to curb prescription drug abuse has not been effective.