Analysis of Opioid Prescription Trends in the United States

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Project Description

Opioids are potent drugs that are widely used in medicine for the treatment of pain. Unfortunately, these drugs are also highly efficient at activating the 'pleasure center' of the brain-releasing neurochemicals such as dopamine and serotonin. Due to this property, opioids have a high potential for abuse and addiction when prescribed, and are aptly dispensed as controlled substances. Higher potency opioid prescriptions such as Oxycodone and Fentanyl are schedule II (highly monitored), while lower potency opioids such as Tramadol and Codeine are less strictly monitored and controlled, being schedule IV and III.
This project will attempt to classify areas of the United States by both average income of a region as well as type of region, and the amount of opioids prescribed by doctors in that area.

Research Questions

Primary Question: Are opioids prescribed more frequently in certain states or regions, dependent on income?

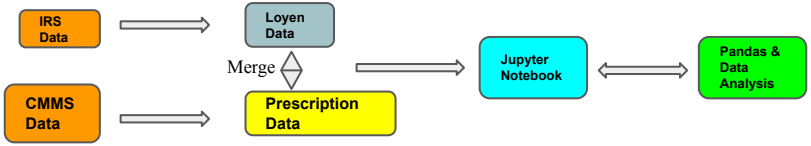
B: Are prescriptions less common in states that place additional limitations on doctors for prescribing opioids such as California?

C: Is Long-Acting opioid treatment therapy used more often in higher income areas? (note: patients with access to long-acting medications may have a higher potential for abuse and addiction)

D: How have rates of prescriptions in the US changed over the years?

Workflow & DataFrame

Data for this project comes from the Centers for Medicare and Medicaid Services, as well as the Internal Revenue Service.

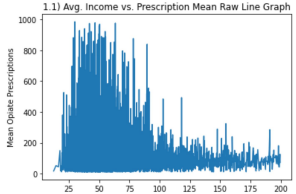


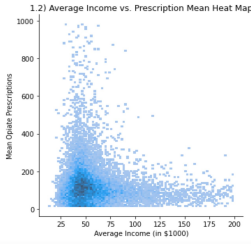
	zip_code	state	doc_spec	op_cnt	op_rate	LA_op_cnt	LA_op_rate	zip_avg_income
0	21502	MD	Internal Medicine	13.0	0.03	0.0	0.00	45.932160
1	21502	MD	Hospitalist	17.0	0.03	0.0	0.00	45.932160
2	21502	MD	Pain Management	994.0	0.71	224.0	0.23	45.932160

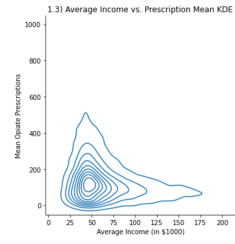
Finalized DataFrame (**op_data**) contains the following: **zip_code**: location of prescriber
state: State prescriber is located in.
doc_spec: Specialty of prescriber.
op_cnt: Number of prescriptions written.
op_rate: Changes in prescribers rate in 5 years.
LA_op_cnt: Number of Long-Acting prescriptions written.
LA_op_rate: Changes in Long-Acting prescription rate for prescriber over 5 years.
zip_avg_income: Average income of the ZIP code prescriber is located, in $1000.

Visualizations

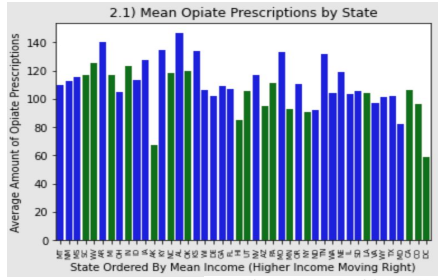
First, I would like to solve my primary question: Are opioids prescribed more frequently in certain states or zip codes with higher average income?



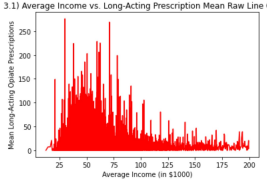


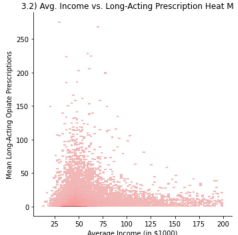


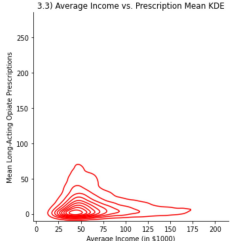
Now we will group our data values by state, using the income of all zips in a state to create a column for each state's average income, labeled **state_avg_income**. Certain states have additional limitations regarding prescription. For instance, **California** requires that opioid naive (first time opioid users) must be limited to a 7 day (or less) prescription with a maximum of 100mg of morphine per day.
States using similar limitations regarding opioids include:
Alaska, Hawaii, Colorado, Utah, Oklahoma, Louisiana, Missouri, Indiana, West Virginia, South Carolina, Pennsylvania, New York, Maine, Arizona, North Carolina, and **New Jersey**. These states are marked in **GREEN**. All other states are **BLUE.**



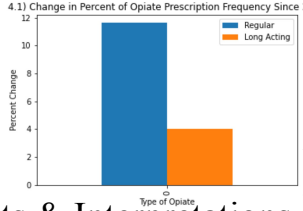
Additionally, I want to analyze if **Long-Acting** opioid treatment therapy is used more often in higher income areas.







Last, I wanted to view changes in prescription rates over the last 5 years.
Results:
Regular: **11.9%**
LA: **4.24%**



Results & Interpretations

A: Opioids appear to be less frequently prescribed in regions with a higher average income, as shown by the stretching in fig.1.3 as well as the heat map (fig.1.2). The mean prescription density spreads horizontally and drops steeply and significantly after region incomes of $50,000. Thus, we can see as income increases, opioid prescription frequency decreases. There is also a decrease in opioid prescribing for income areas below $25,000. One possible explanation for this could be an inability to afford proper healthcare and be able to see a doctor to prescribed opioids- even if they may really need them.
B: From looking at graph 2.1, cannot definitively conclude that states with higher average incomes have lower frequency of opioid prescriptions. However, it can be observed that states placing additional, more stringent requirements on prescriptions have distinctive decreases in mean opioid prescriptions.
C: Although there is similar decrease in frequency as income increases between regular and Long-Acting opioids, it is notable that there is much quicker decreases for short acting. Thus, to some extent, there can be a greater frequency of prescribing LA opioids instead for higher income areas, even though the average amount of opioids prescribed still remains lower for higher income areas. A possible explanation for this is that those in higher income areas may live busier life, and thus doctors may prescribe Long-Acting to prevent skipped or forgotten doses.
D: There has been a 11.9% increase in regular acting prescriptions and 4.24% increase in Long-Acting prescriptions for opioids over the last 5 years.

Works Cited

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