

# Analysis of “Prescribing of Opioids among Medical Professionals”

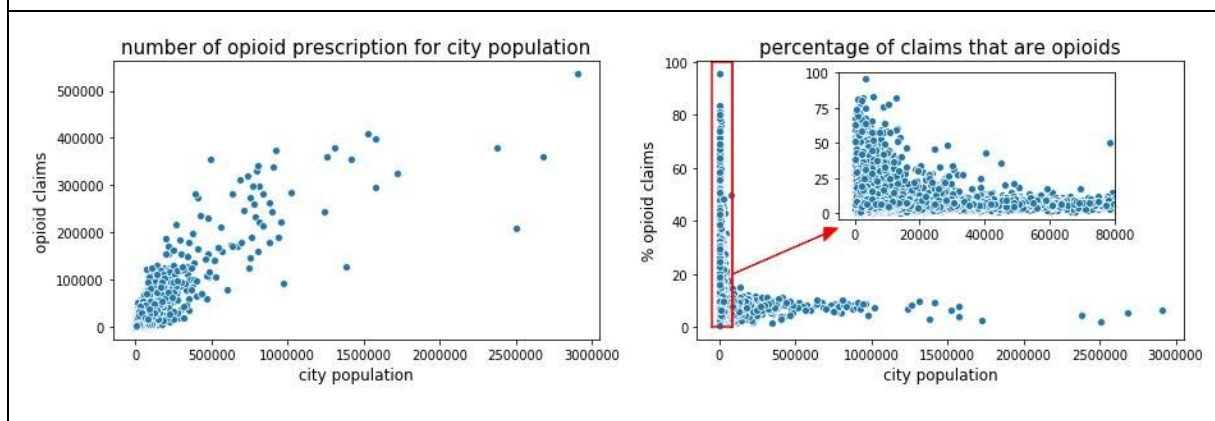
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In this project, I will attempt to find red flags of opioid abuse by examining the opioid claims by healthcare providers based on specialty and city population size. In this section, I will examine the relationship between city population size and total opioid claims and examine the opioid claims among healthcare providers. In addition, I will look for possible outliers that may indicate high levels of opioid abuse.

## 1. Opioid claims of a city population

From Figure 1, we can see that the number of opioid claims increases with city population. This is what is expected; as the size of the population increases, the number of people who would be prescribed opioids also increases. But when we switch from total opioid claims to percentage of claims that are for opioids, the trends change. For smaller cities with lower population ranges, there is a huge range of percentage opioid claims, with values reaching as high as 100%. On closer inspection (see the scatterplot of populations <80,000) it is clear that an inverse relation between population size and percentage opioid claims exists. The maximum opioid prescribed percentages settles in the range 5-10%. As the number of claims increase with population, any health care provider who prescribed high levels of opioids is unlikely to have a large influence on the overall percentages; this most likely the reason why this inverse relation between population and opioid prescribed percentages occurs.

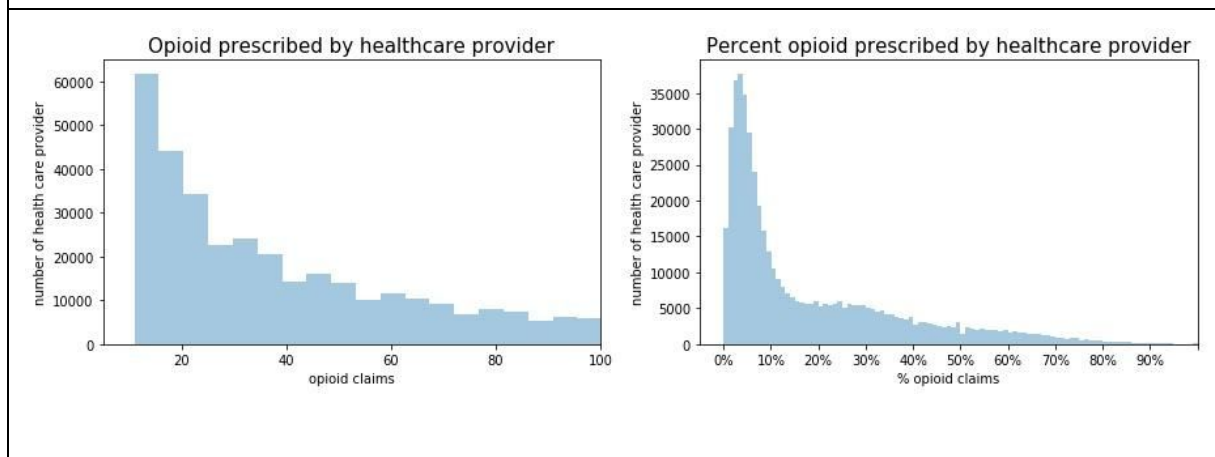
Figure 1) Opioid claims by population. On the left, the number of opioid claims versus population is shown. On the right, the percentage of claims that are for opioids is shown. The third plot inside the population on right is a zoom-in on the percentage of opioid claims <80,000.



## 2. Opioids prescribed by health providers

Figure 2 shows two histograms; the left presents the number of opioid claims by prescribed by healthcare providers and the right presents percentage of drug claims that are opioids prescribed by healthcare providers. As shown, the majority of healthcare providers each provided <25 opioid prescriptions for their patients in 2013; which consisted of about 0%-15% of drug claims.

Figure 2: Opioid prescriptions by healthcare providers. The histogram on the left presents the number of healthcare providers bracketed by number of opioids claims. The histogram on the right brackets by percentage of opioid claims.

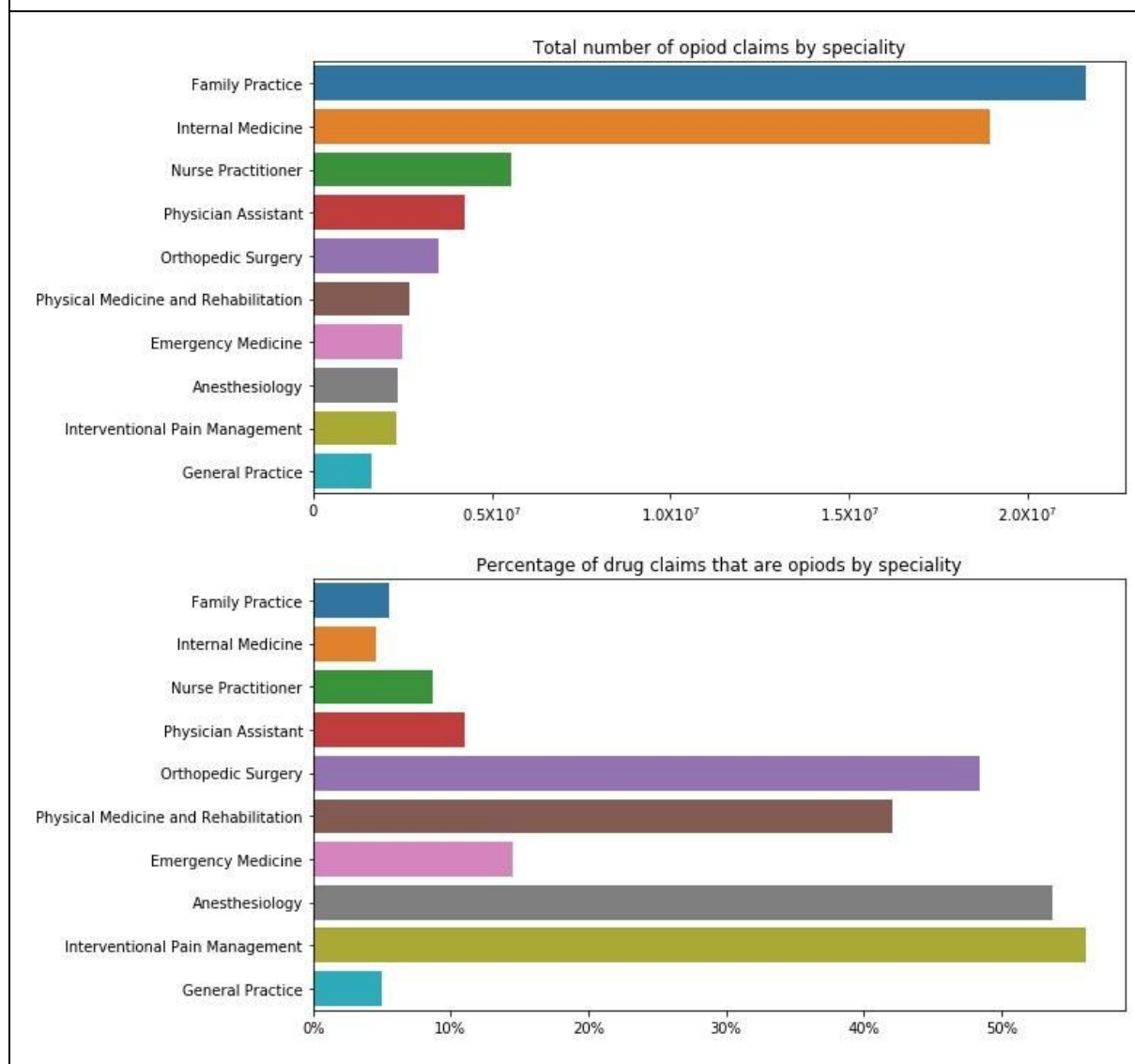


## 3. Opioid prescribed by clinicians

Figure 4 examines the amount of opioid prescriptions of the ten top prescribers by speciality. Medicare Part D patients are prescribed opioids more frequently by family practice and internal medicine physicians than any specialist, 21.6 million and 18.9 million in total, respectively. The third most frequent prescribers of opioids, nurse practitioners, are responsible for far fewer opioid claims, 6.4 million. Interesting, only about 5.5% and 4.6% of the total number of prescriptions by family practice and internal medicine physicians respectively were opioids. Family practice and internal medicine physicians treat a broad range of illnesses and disorders and are generally the first clinicians that patients consult for any complaint. This can explain why these two groups are responsible for far more opioid claims but opioids only include a small portion of their prescriptions. Orthopedic surgery, physical medicine and rehabilitation, anesthesiology, and interventional pain management are the most frequent prescribers of opioids; with more than 40% of their prescriptions falling into that category. This would be

expected because two treat patients in or recovering from pain (physical medicine and rehabilitation and interventional pain management) and two perform surgeries (orthopedic surgery and anesthesiology) for which opioids are commonly given for post-operative pain.

Figure 3: Prescriptions by clinician type. The top bar plot is the number of opioid claims of the 10 clinician categories who prescribe the most opioids. The bottom bar plot is percentage of the claims that are opioids by the same clinician categories.

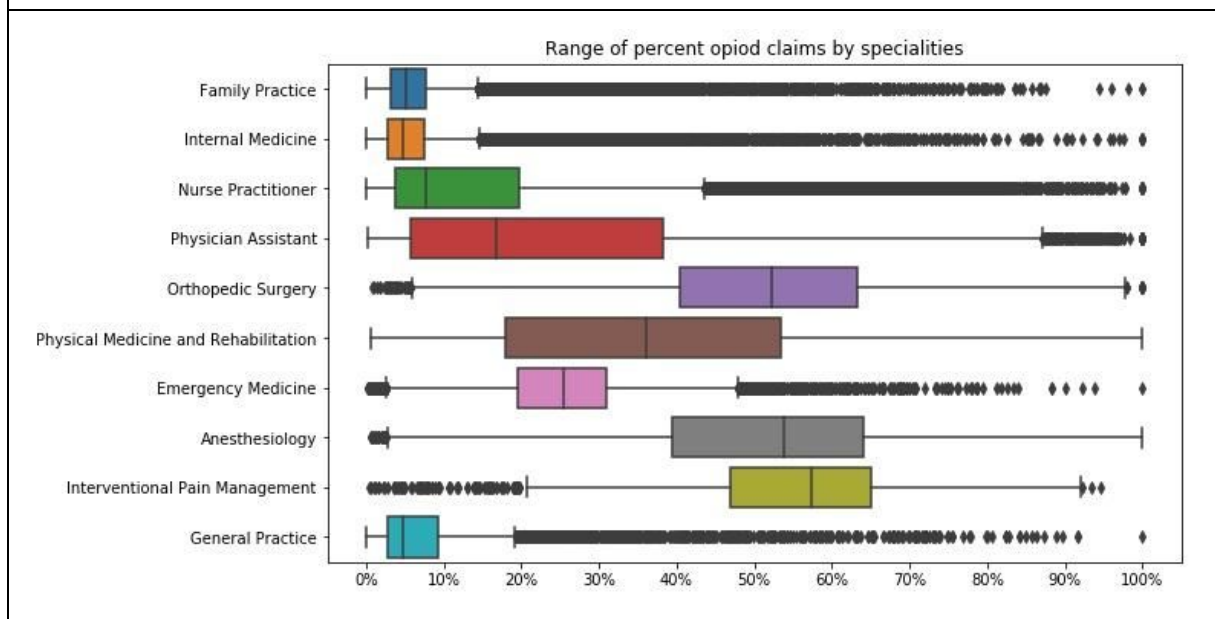


#### 4. Range of opioid prescription by clinicians

Figure 5 examines the range of percentages of opioid prescribed by the specialists in Figure 4. While family practice, internal medicine, and general practice physicians have narrow

spreads of their percentages (the whiskers in their boxes range from 0% to 14%), they have outliers that reach 100%. However, their outliers are only about 6% of the total number of healthcare providers in those categories. Healthcare providers are considered outliers of their specialty if their percentage of their opioid claims are outside the first and third quartile by 1.5 the interquartile ranges (difference of the first to third quartile). Physical medicine and rehabilitation's boxplot has a whiskers span of 0% to 100% while orthopedic surgery, physician assistant, and anesthesiology's whiskers span most of this range. All of the top ten prescribers of opioids, as outliers or in the normal range of the plot, span 0 to 100%. Despite the wide range of values, only general practice had more than 10% of healthcare providers as outliers, at 11%. Nurse practitioner were slightly below at 9%. While it makes sense that specialties that deal with pain relief or surgery would have a wide range, that family practice and internal medicine healthcare providers have a significant number of outliers suggests that they are too lenient with opioid prescriptions

Figure 4: The range of percentage of claims that are opioids of individual healthcare provider separated by the specialties in Figure 3. The black line inside the colored box is the median. The edges of the colored box are the first and third quartile. The whiskers are located at a distance of 1.5 times the interquartile range (distance of the first and third quartile) for the colored box. Anything outside this range is considered an outlier.



## 5. Conclusion:

The analysis of the opioid use by population and by the number of claims by healthcare providers is relatively uninteresting. The opioid claims by city population reveals a high degree of variability at lower populations which narrows at higher

population. Most healthcare providers prescribe a lower number of opioids compared to other drugs. The most interesting reveals from this data are the specialities that make the most opioid claims and range of their claims. There seems to be a wide range of percentages of opioid claims for all the specialities. It would be interesting to investigate other factors that determine the amount of opioids prescribed such as population. Once these factors are accounted for, will this effect who is considered an outlier?