Prescribing of Opioids among Medical Professionals

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Objective

- Detect possible opioid abuse from outliers in opioid claims of healthcare providers.
- Data Source:
  - Drug claims to Medicare Part D from 2013.
  - https://www.cdc.gov/drugoverdose/pdf/pubs/2018-cdc-drug-surveillance-report.pdf

Source:https://www.healthline.com/health-news/opioids-problems-for-chronic-pain-patients

Background

- In 2016, approximately 63,693 Americans died from drug-overdosing.
- 42,249 (66.4%) involved at least one prescription and/or illegal opioid.
- Due to their addictive nature, opioids are treated as controlled substances in the United States.

https://www.drugabuse.gov/related-topics/trends-statistics/overdose-death-rates

Source:https://www.healthline.com/health-news/opioids-problems-for-chronic-pain-patients

Financial Cost of Opioid Crisis

- In 2016, it was estimated that 11.5 million or 4.3% of US population over the age of twelve misused illegal or prescription opioids.[1]
- Based on 2013 data, it was estimated that the economic burden for the misuse of opioids was $78.5 billion.[2]
- The health care costs to private insurance companies was $14.0 thousand per patient.[2]
- It is in the interest of insurance companies to track the misuse to prescription opioids.

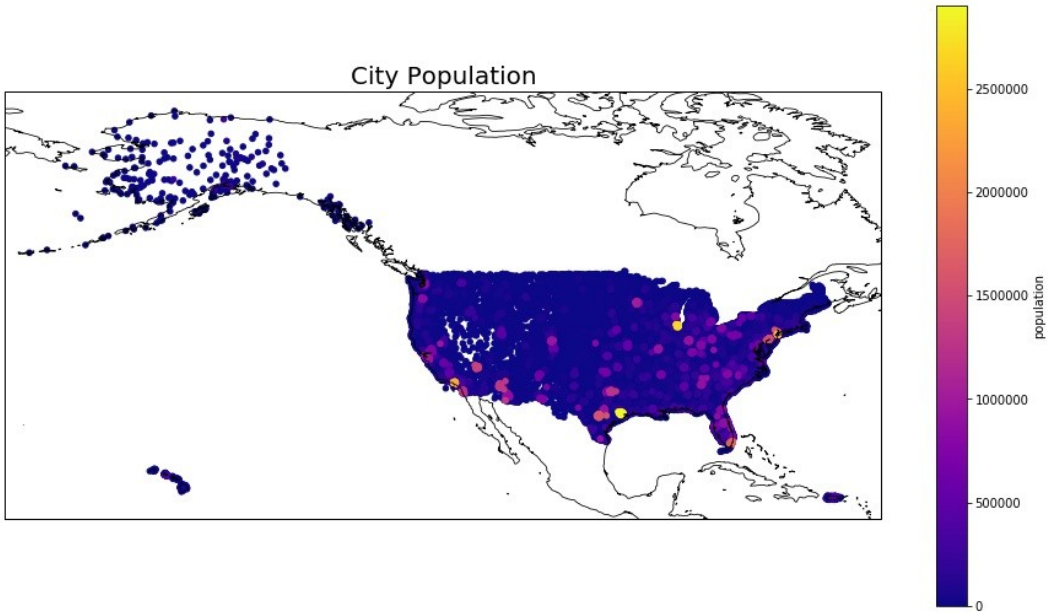
[1]Hoots, B. H.; Seth, P. “Annual Surveillance Report of Drug-Relate”, 2018
[2] Florence, C. S.; Zhou, C.; Luo, F.; Xu, L. Medical Care 2016, 54, 901–906.

Data Set:

- Data set has for each health care provider
  - name
  - number of opioid and drug claim
  - percentage of claims that are opoids
  - zip code, state and city
  - specialty
- Any health care provider with unspecified number of claims is assumed to be zero.
- There are 1,049,326 healthcare providers on the database, 496,744 that prescribe opioids.

Population Datasets

- If zip code longitude and longitude of the median of the zip codes in the city by more than two degrees, it was assumed to be incorrect.
  - The longitude and longitude would be replaced by median of the zip codes in the same city.



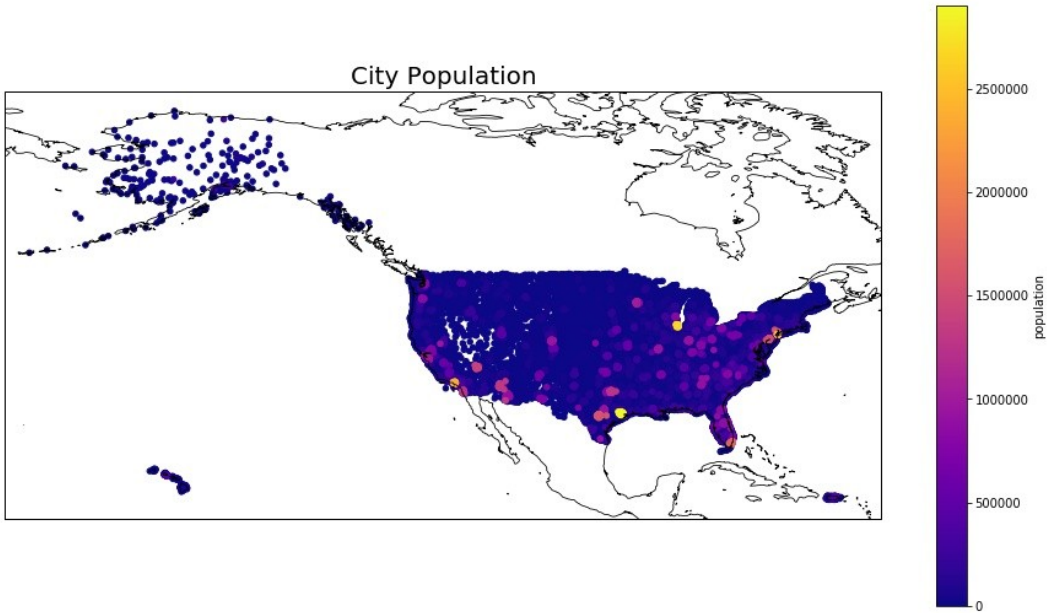
Population Datasets

- Online database compiled from the 2010 census, USPS, and National Weather Service

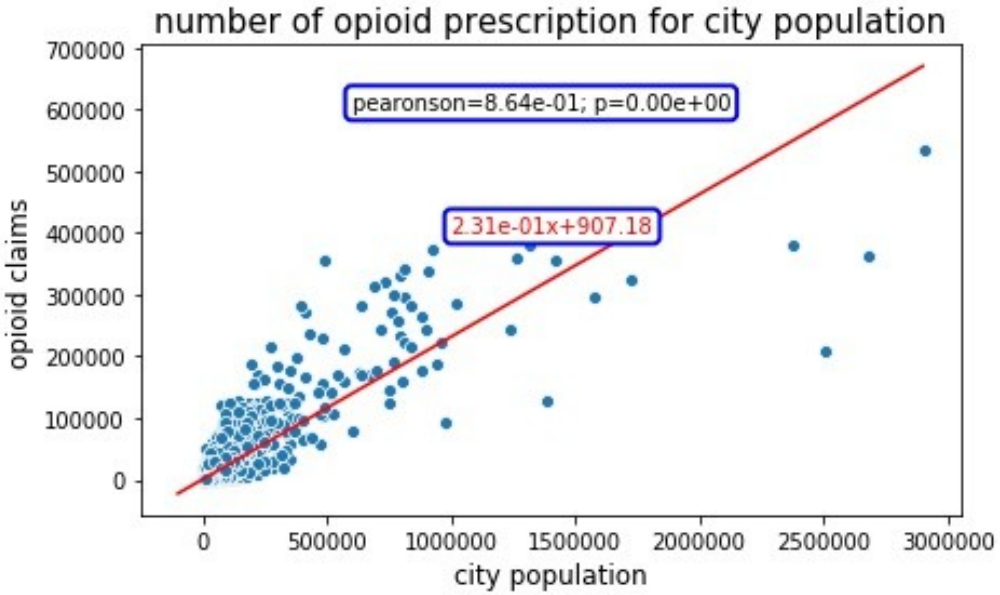
  Source: https://simplemaps.com/data/us-zips

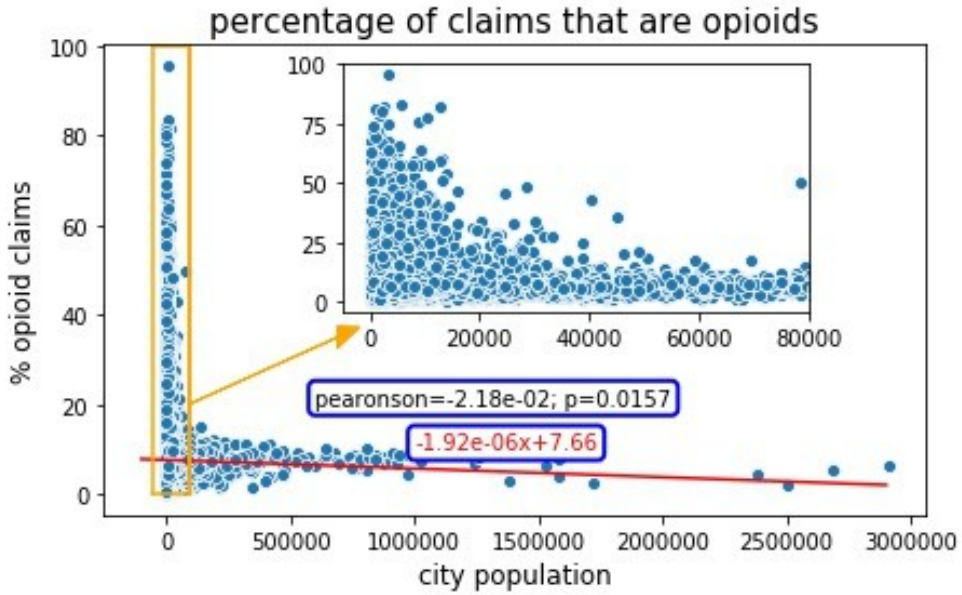
- Contains, zip code population, longtude and langitude, city and state.

- The city population of healthcare providers determined from the sum of the population of zip codes in the same city.



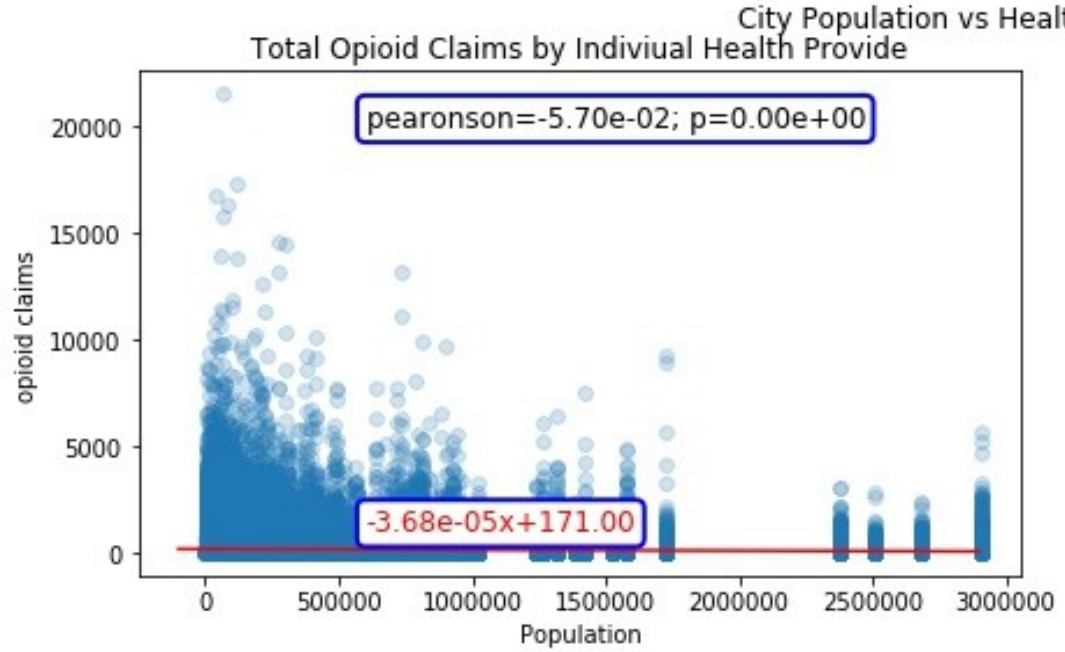
City Opioid Claims vs City Population

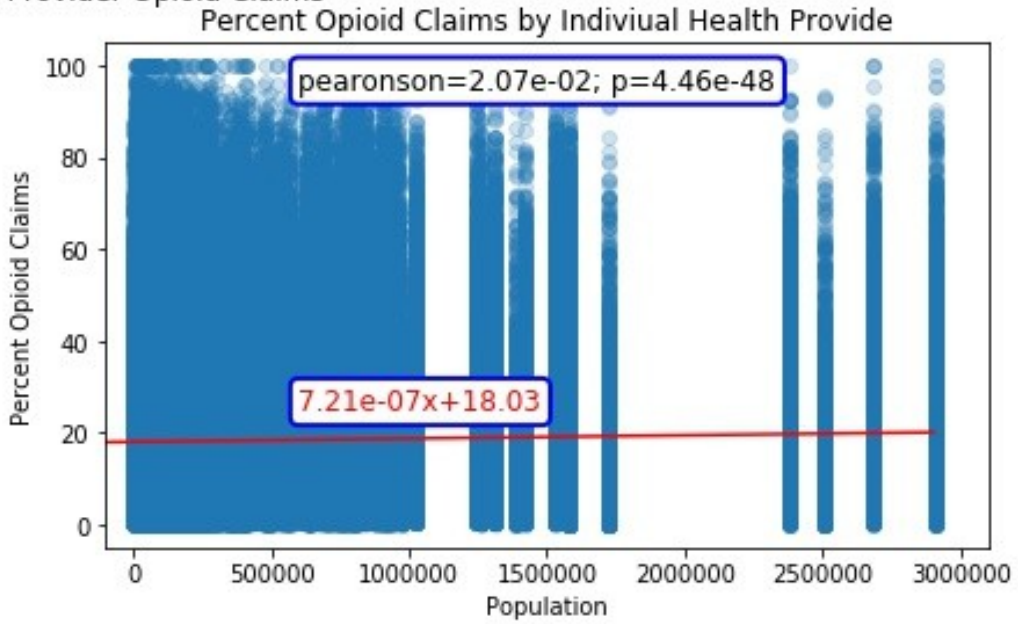




- Total city population is correlated with city opioid claims but not with percent opioid claims.
- Larger range of percent opioid for at lower population.
- Highest percent opioid claims and city population are inverse related.

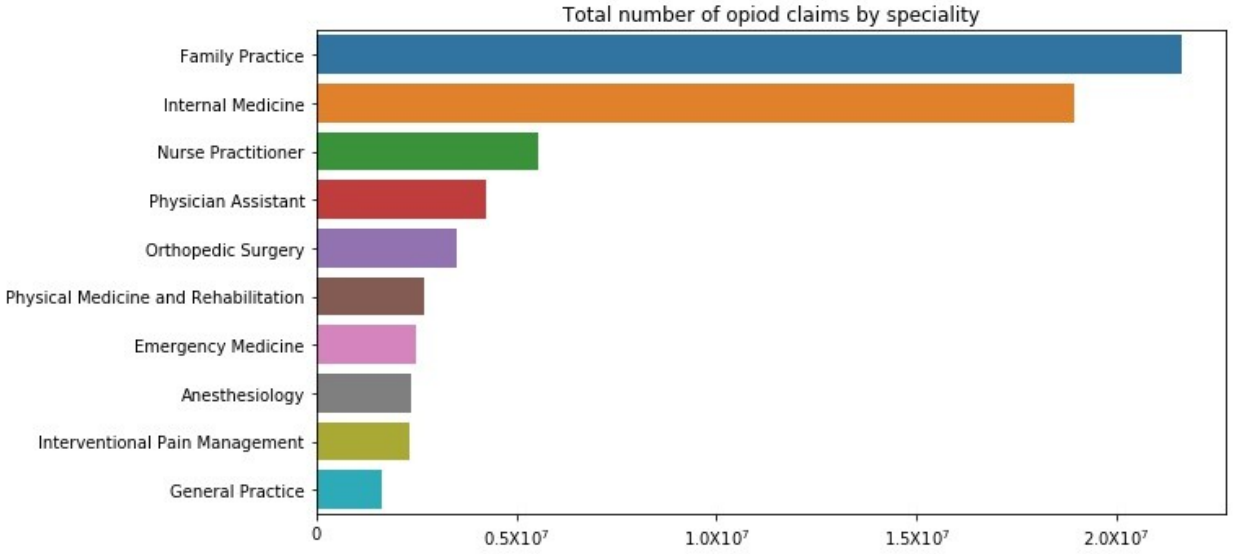
City Population vs Healthcare provider claims.

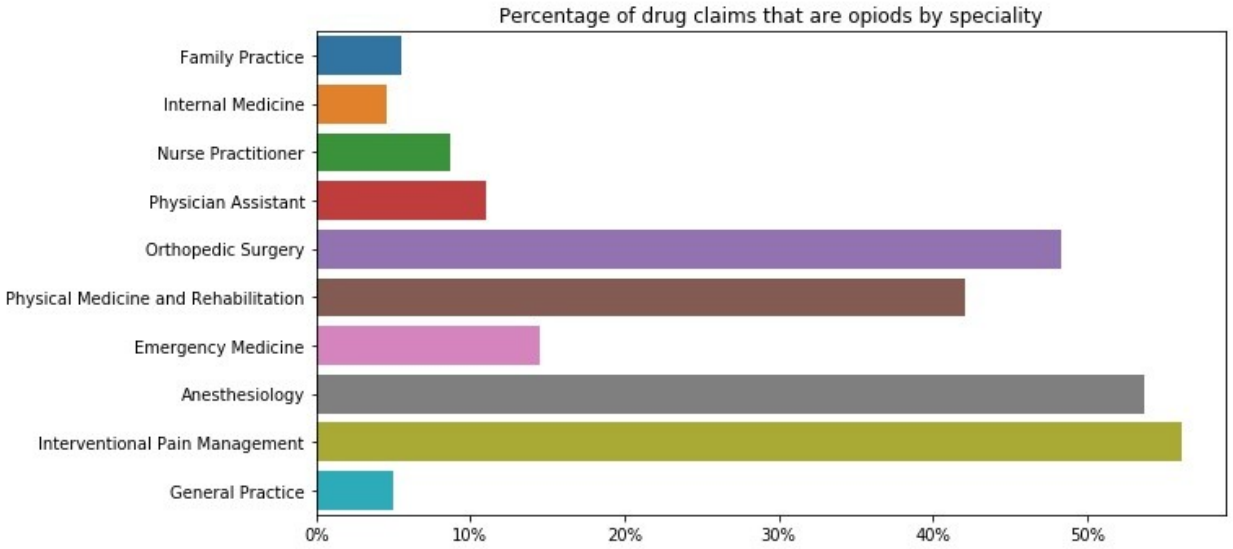




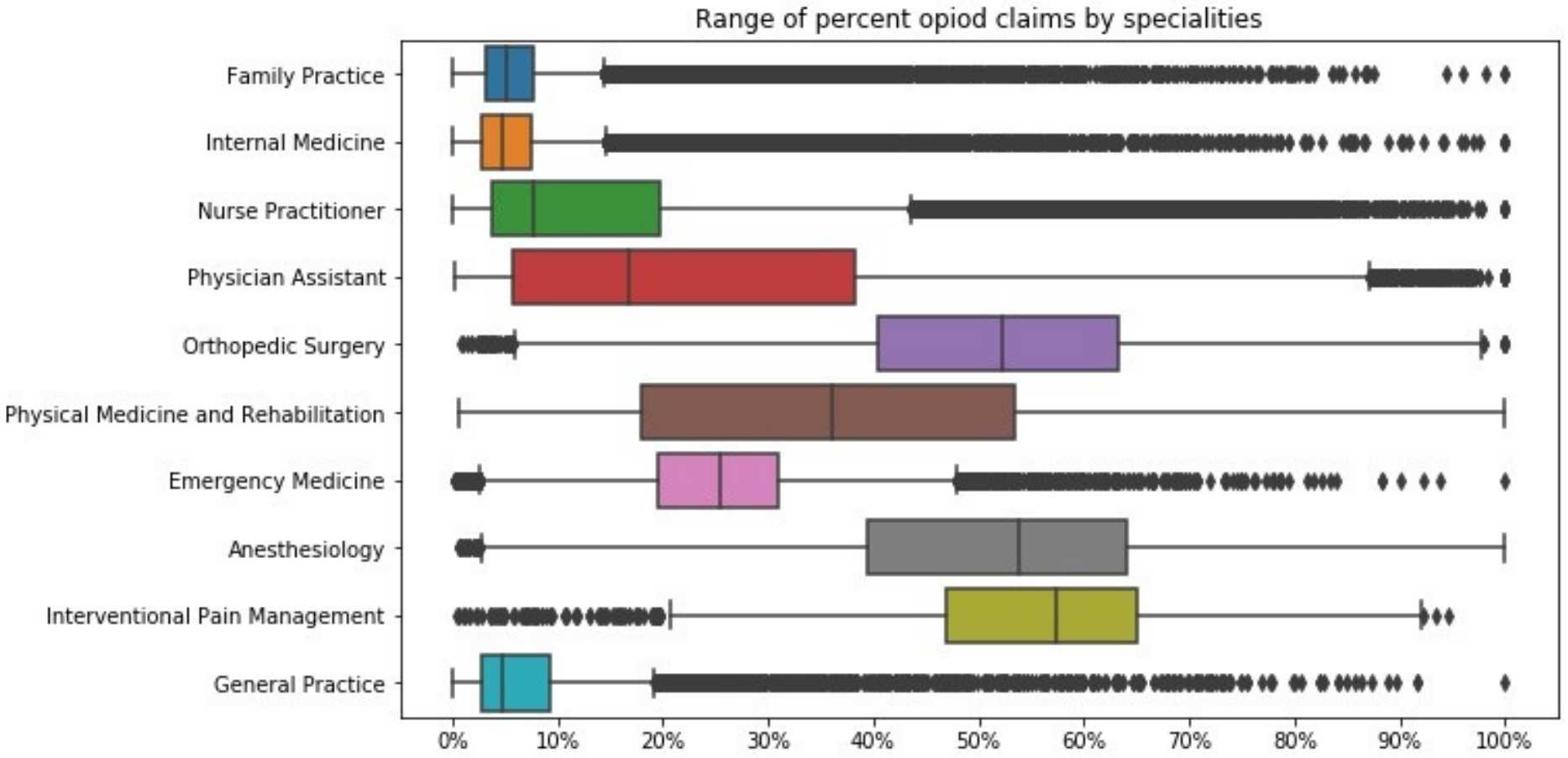
- While city population and city opioid claims are correlated, city population and individual healthcare provider opioid claims are not.
- City population is not a good attribute to determine outliers opioid claims

Top Ten Opioid Prescriber by Specialty





Top Ten Opioid Prescriber Range



- Healthcare providers that do not prescribe opioids were excluded.

Top Ten Opioid Prescriber Range

specialty description	median	1Q	3Q	top whisk	bottom whisk	# outliers	# providers	% outliers
Family Practice	5.09	3.28	7.72	14.37	0.00	5267	84070	6.27
Internal Medicine	4.74	2.85	7.55	14.60	0.00	4826	82311	5.86
Nurse Practitioner	7.68	3.77	19.72	43.66	0.00	3883	43495	8.93
Physician Assistant	16.83	5.67	38.24	87.10	0.00	204	40308	0.51
Orthopedic Surgery	52.26	40.35	63.35	97.86	5.85	52	19969	0.26
Physical Medicine and Rehabilitation	36.09	17.87	53.45	100.00	0.00	0	6164	0.00
Emergency Medicine	25.55	19.62	30.97	47.99	2.60	642	36000	1.78
Anesthesiology	53.77	39.48	64.06	100.00	2.61	24	3562	0.67
Interventional Pain Management	57.42	46.90	65.00	92.15	19.75	93	1865	4.99
General Practice	4.80	2.70	9.30	19.19	0.00	790	7143	11.06

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Conclusion

- The percentage of opioid claims by healthcare providers have a defined range of values with a low percentage of outliers.
- Hopefully we will be able to determine other attributes that correlation with percent opioid claims that could be used as a improve model and lower outliers.
- Population is weakly correlated with opoiod claim therefore a poor candidate for an attribute.
- By lowering the number of outliers by the model, we can improve our predictions for fraud.

Special Thanks

- Yogendra Pandey, my adviser at SpringBoard, for all his help.
- Liam Doherty, for creating the template for these slides.

  https://github.com/dohliam/libreoffice-impress-templates