

## Technical Aspects of the Project

As we began delving into the challenge, we realized that the CDC had already conducted extensive analyses on the relationship between the opioid crisis and factors such as gender, type of opioid, age, ethnicity, region, and population density. We therefore began focusing on overlooked variables that may be contributing to the opioid crisis. We ran linear regression models on 20+ variables against the rate of opioid-related deaths in each state in order to help us focus our time and resources the most promising variables: mean altitude, political parties, minimum wage, number of veterinarians, type of drug responsible for overdoses, disabled veteran population, number of unemployed veterans, population of impoverished veterans, and total veteran population.

Our research on hypoxia, the most common direct cause of opioid-related deaths, led us to analyze “mean altitude” per state in relation to opioid-related deaths. Opioids can cause a condition called hypoxia which limits the amount of oxygen that reaches the brain and can ultimately lead to death; we hypothesized that states with higher mean elevations (i.e. lower available oxygen) would have higher rates of opioid overdoses.

We chose to analyze proportions of political parties in each state’s House of Representatives to see whether they influence healthcare regulations that could impede people from gaining access to overdose reversal drugs such as Narcan. The graph in the PowerPoint presentation displays proportion of Democrats and Republicans by geographical region plotted against the overdose death rates per 100,000.

Another way to help curb the opioid crisis is to cut off the flow of illegal opioids at their source. Hence, we examined state minimum wage to evaluate purchasing power of opioids, and the number of veterinarians per state since they are one of the primary utilizers of synthetic opioids like fentanyl. This idea is corroborated by the fact that veterinarians are currently experiencing a shortage of fentanyl... maybe it’s going into the addicts’ pockets!

Although the CDC has detailed data on the opioid crisis, it does not cover veteran-specific research and this sub-population may have a comparatively high usage of prescription opioids. Therefore, we amalgamated data from various government websites (listed below) to assess the relationship between veteran sample populations and prescription opioid-related deaths. The value that we obtained for veteran population is a count while the values that we obtained for unemployed veterans, impoverished veterans, and disabled veterans are given as rates per 100,000 people. In order to improve the linearity of the data, we re-expressed the rates using the square root function.

Ultimately, we concluded that the positive associations between our variables were masked by three to five outliers per graph which is reflected by the contrast between the apparent linearity and the small correlation values.

- ▶ Main Dataset: <https://wonder.cdc.gov/mcd.html>
- ▶ External Datasets (accessed November 1<sup>st</sup>, 2018)
  - ▶ <https://www.cdc.gov/drugoverdose/data/prescribing.html>
  - ▶ <https://www.bls.gov/oes/current/oes291131.htm>
  - ▶ [http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS\\_14\\_1YR\\_S2101&prodType=table](http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_14_1YR_S2101&prodType=table)
  - ▶ <https://www.va.gov/vetdata/report.asp>
  - ▶ <https://www.cdc.gov/drugoverdose/data/analysis.html>
  - ▶ [https://www.census.gov/data/tables/2017/demo/popest/state-total.html?fbclid=IwAR12sOVM7IvqvV8jjhI-xBaZmdhSWmfAvZMGCzVZgua4ofgacYIOjNGhGGQ#par\\_textimage\\_1574439295](https://www.census.gov/data/tables/2017/demo/popest/state-total.html?fbclid=IwAR12sOVM7IvqvV8jjhI-xBaZmdhSWmfAvZMGCzVZgua4ofgacYIOjNGhGGQ#par_textimage_1574439295)
- ▶ Other supplementary sources
  - ▶ <https://www.forbes.com/sites/davidkroll/2017/10/31/the-u-s-has-a-fentanyl-shortage-in-the-clinic-not-on-the-streets/#5710d82a2d0e>