CSC605 Data Science

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# Opioid Epidemic Data Analysis

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**What is the project all about?**

Accidental death by fatal drug overdose is a rising trend in the United States. In the 1990s Opioid was prescribed as a pain reliever and the companies assured us that it's not an addictive drug. Later with the increase in the prescriptions for opioids, it came to light that people started misusing an overdose of the drug was highly addictive. This led to increased fatality rates.

We are going to study the underlying patterns that exist between opioid-related deaths and the different socio-economic, demographic, geographic, and equity-related variables that are available for the US population. The goal of this project is to extract such patterns, analyze them using data science techniques and compare them with the other publicly available datasets for trends across the US and how this has affected people.

**Why is this an important area of work?**

It is important to study opioid mortality and other related issues because it can give a clear picture of how a simple drug such as a prescribed painkiller can get addictive and cause such a wide range of side effects. According to the research, opioid numbers have been growing exponentially and have resulted in addiction. Also, based on some evidence this can be so addictive that withdrawal from the usage can result in some harmful consequences. Opioids trigger the release of endorphins, which are usually released in the human body when he/she experiences pleasure. Pleasure is something very addictive to humans and the tendency of getting addicted to this pleasure is also high. Some opioid users believe that they need to be treated with high dosages of opioids especially when they are experiencing high levels of pain, like pains induced by cancer. Usually, cancer patients are prescribed fentanyl which is a painkiller but it can get so addictive that cancer patients find it hard to give up taking this drug even after the cancer is cured. Because of this potent addiction to fentanyl, this is often associated with a significant number of deaths caused by using heroin- here it becomes important to understand how a pain reliever became so addictive that the individual was attracted to taking illegal drugs to experience the same pleasure. In such situations, a clear study can prevent such incidents from occurring, for example, the individuals exposed to opioids can be kept under a certain period of observation and help them overcome this addiction. Just like how we have rehabs for drug addicts, there can also be rehab for individuals who are exposed to the usage of opioids over a long time. **It is nearly impossible to predict who and what kind of individuals can be affected by this drug. Therefore, by studying various factors like the number of people affected, gender, and age group of the people - over the past years, we can derive an analogy which may result in some reduction in the addiction to this disease.**

**How can Data Science help?**

In this project, we will analyze the factors responsible for opioid-induced deaths. Factors such as socioeconomic, demographic etc. With the help of data science techniques, we can combine various factors and infer direct and indirect relationships with death number, rate and ratio. Our goal of the project is to analyze these parameters and determine the underlying pattern between opioid deaths and other parameters.

We will be performing comparative data modelling and analysis. We use graphical visualization in python to represent the mortality rate of various states and counties in the US. Dataframe creation as per states and counties makes it easier to comprehend data and also makes data more informative.

Along with the comparative analysis, we can perform hypothesis testing in data science. We use various statistical and probabilistic methods to check the data distribution, along with machine learning techniques to discover patterns.

Lastly, we can develop dashboards to visualize the data analysis. Dynamic plots and graphical representation are some of the best methods to visualize data. Scatter plots in ‘Plolty’ are some of the methods to plot the data, we can also plot maps on the dashboard and visualize various parameters on a map too.

So these are some ways data science can help in this project. Data science is a broad field and the methods are not limited to the above-mentioned ones.

**Outline how the datasets can be merged together and the common variables**

We have 3 datasets:

1. Cause of Death dataset
2. Health Ranking dataset
3. Opioid rate dataset

There are a few common variables in them. One common variable in all datasets is the County FIPS code.

Health Ranking and Opioid rate dataset have county and state values in common to merge on.

We can merge data using an “Inner Join” in python which takes only the values common to both tables.