Effects of Opioid Crisis Policy in the United States

Backwards Design Concept

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Topic

The problem this project seeks to address is the assessing the effectiveness of policy on the opioid crisis in America. Throughout the past years, America has seen a sharp increase in opioid usage, addiction, and related fatalities. It is important to assess the effects of policy implementation to ensure that we are iteratively approaching positive change within our society. Without reflective assessment, policies have subjective influence, are prone to politicization, and may not be effective in addressing the problem at hand. In this assessment we will both seek to understand the effectiveness of policy implementatio as well as establish a framework for future policy assessment.

Project Question

The two questions we seek to answer within our analysis of policies directed at the opioid crisis are:

1. What is the effect of opioid drug prescription regulation on the volume of opioids prescribed?
2. What is the effect of opioid drug prescription regulation on the number of opioid related deaths?

In these questions we find two ouput variables: the volume of opioids prescribed (shipments) and opioid related deaths. We will seek to understand the effect of policy on these two variables.

Project Hypothesis

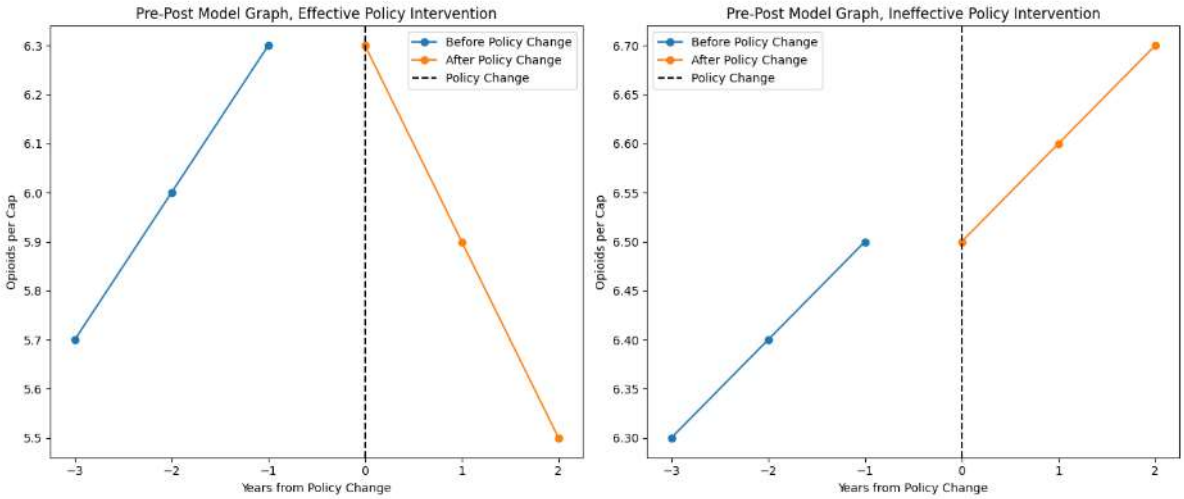
The hypothesis for this project posits that policy interventions aimed at addressing the opioid crisis in America have had a mitigating effect on opioid usage. Specifically, it is anticipated that these interventions have led to a reduction in the volume of opioids prescribed, indicating a decrease in drug usage across the United States. Furthermore, the hypothesis suggests that policy interventions have also contributed to a decline in the number of opioid-related deaths, reflecting an overall positive impact on public health and safety in relation to opioid use. The policies in question are shown below:

Policy Outlines:

- Florida (2010): In 2010, Florida was home to 98 of the 100 U.S. physicians who dispensed the highest quantities of oxycodone directly from their offices.
  - In February 2010, the Drug Enforcement Administration and various Florida law enforcement agencies began to work together in Operation Pill Nation. Operation Pill Nation was an edeavor to crack down on rogue pain clinics and 'pill mills' which were distributing opioids in large quantities. There were a series of policy evolutions here but they are referenced as having occured in February of 2010.
  - Additional milestones of interest are the declaration of a public health emergency by the Florida Surgeon General, the prohibition of physician dispensing of Schedule II and III drugs, and the implementation of the Prescription Drug Monitoring Program (PDMP).
- Texas (2007): Texas Medical Board adopted regulations for the treatment of pain with controlled substances which included:
  - Perfroming a patient evaluation before prescribing opioids including a review of prescription history.
  - Obtaining informed consent from the patient for opioid treatment.
  - Conducting periodic reviews of the patient's progress with a complete medical recod of treatment.
- Washington (2012): In 2012, Washington State enacted regulations for the prescribing of opioids which included requirements that must be met prior to the prescription of opioids to a patient:
  - For stable patients involving non-escalating doses (daily) of 40mg per day or less. Annual review of the patient's treatment required.
  - For patients who would recieve 120mg per day, a mandatory consultation is required.
  - If there is a prescription above the consultation threshold, a consultation with a pain management specialist is required.
  - The physician must document all consultations.
  - Prescription above the 120mg is not recommended for patients demonstrating improvement in function or without first obtaining a consultation with a pain management specialist.

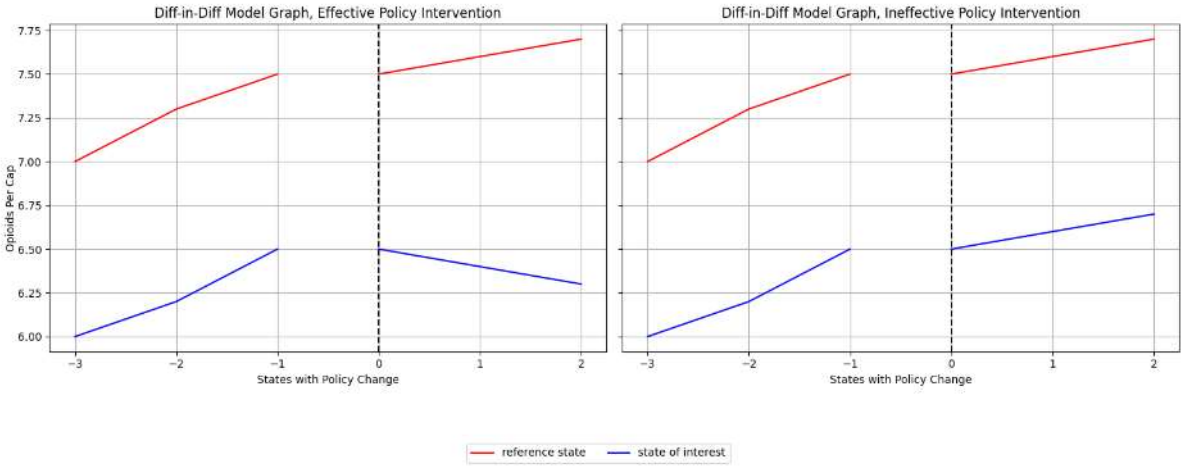
Model Results

To assess the effectiveness of State implemented policies against the opioid crisis, we will use a difference-in-difference assessment as well as a pre-post assessment. The first figure demonstrates what our pre-post assesment of individual States of interest may look like:



This figure looks are opioid regulation metrics (in this instance Opioids per capita) over a time period spanning the policy implementation. This allows the visualization of the effects of the policy as quantified by our selected regulation assessment metrics.

Taking the pre-post assessment further, we can include a reference State to evaluate the difference-in-difference between our State of interest and a State where no policy was implemented.



The figure above demonstrates what a difference-in-difference output might be at the conclusion of our investigation. Both figures show our State of interest in blue and a control State in red. The figure on the left shows what a difference-in-difference output might look like if the policy was effective. The figure on the right shows what a difference-in-difference output might look like if the policy was not effective. Our hypothesis is that the policies implemented in Florida, Texas, and Washington will be effective in reducing the volume of opioids prescribed and the number of opioid related deaths.

Final Variables Required

For this assessment we will need data on opioid mortality and opioid volume. Because of the disparity between state/county populations we will need to normalize our respective outcome variables as per-capita averages over all counties. This will require county population data in addition to opioid shipment data and mortality data. The data we will use is as follows:

- Opioid Drug Shipments by County.
- Opioids Mortality Data by County.
- US Census Bureau County Population Data.

Data Sources

This data will be sourced from the following locations:

- Washington post Opioid Drug Shipment data sourced via the Freedom of Information Act from the Drug Enforcement Administration:

https://www.washingtonpost.com/national/2019/07/18/how-download-use-dea-pain-pills-database/?arc404=true

- US Vital Statistics Records on Opioid Mortality:

https://www.dropbox.com/s/kad4dwebr88l3ud/US_VitalStatistics.zip?dl=0

- US Census Bureau County Population Data:

https://www.census.gov/data/datasets/time-series/demo/popest/2010s-counties-total.html
https://repository.duke.edu/catalog/f49b199b-1496-4636-91f3-36226c8e7f80

We intend to merge these datasets on the County level by year. The final dataset should have county-year observations spanning each of the three State's policy implementation by at least 5 years. Each observation should have county-year opioid mortality, opioid shipments, and population. We can then feature engineer per-capita opioid mortality and opioid shipments for a more accurate comparison between states.

Division of Labor

The major phases of this project are as follows:

- ***Phase I: Data Wrangling and Cleaning***
  - Data Sourcing - Largely Complete after Backwards Design
  - Data Storage - Selection of collaborative data storage platform (Minling and Ofosu)
  - Data Cleaning - Merging and Cleaning Data, particular attention to missing values (All)

  - Feature Engineering - Per Capita normalization of relevant variables (Poojitha and John)
  - **Phase I Output**: Finalized Dataset for Analysis

- ***Phase II: Data Analysis and Visualization***
  - Selection of Control State for each State of Interest (Divide by State across the group)
  - Pre-Post Analysis of each State of Interest (Divide by State across the group)
  - Difference-in-Difference Analysis of each State of Interest (Divide by State across the group)
  - **Phase II Output**: Data Visualizations complete for each State of Interest

- ***Phase III: Report Generation***
  - Data Science Report (Ofosu and Poojitha)
  - Stakeholder Report (Minling and John)
  - **Phase III Output**: Final Report for Stakeholders and Data Science Report for Data Science Audience