

# Estimating the Impact of Opioid Control Policies

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## Motivation for Project

Opioid usage in the United States has increased substantially over the past two decades, leading to an increase in addiction to both prescription opioids and non-prescription illegal opioids. This has necessitated the enforcement of various opioid control policies. The White House's Office of National Drug Control Policy and the federal agencies such as the Drug Enforcement Agency (DEA) and the Department of Health and Social Services (DHSS) have made efforts to combat this national crisis. Across various parts of the US, state-level opioid control policies have also been implemented. For instance, the states of Florida, Texas, and Washington implemented certain policy changes for pain treatment with opioids.

However, it is also important to assess the effectiveness of these state-level policy interventions, which are designed to limit the over-prescription of opioids. This is because there is a troubling possibility that they cause unintended effects. For instance, even though they may reduce the likelihood that future patients will end up addicted to opioids, they may drive the already addicted patients to turn to alternative forms of opioids, such as illegally purchased prescription drugs, heroin, or fentanyl. Since the drug users (mostly) are unaware of the appropriate levels of dosage for a given strength of illegal drugs, there is a greater probability of overdosing on them than on prescription drugs. The potency of illegal drugs is great - a little as 3 milligrams of fentanyl can be lethal.

Thus, it is necessary to gauge and analyze the effects of state-level opioid control policies. This can help the policymakers to understand the strengths and weaknesses of the policies and accordingly improve or modify them for better welfare of people. This analysis aims to assess the effects of policy changes related to opioid drug prescription regulations on the volume of opioid shipments in Florida, Texas, and Washington and opioid overdose deaths in Florida, and Washington. Our analysis will primarily employ two approaches to estimate the causal effects of the policy changes in the three states - pre-post analysis and difference-in-difference analysis. Pre-post analysis will involve the comparison of the outcomes (opioid mortality and opioid

shipment) before and after the implementation of the policy changes in the states. Difference-in-difference approach will compare the changes in outcomes over time between a state with policy changes and other states where no policy changes have been implemented.

## **Data Overview**

### **Data Sources**

The following sources were used for obtaining the relevant data.

- 1) Vital Statistics Mortality Data: This is the best national source of data on drug overdoses, since it includes data on every death in the United States. The statistics comprise the number of deaths each year, broken down by each county, and includes the cause of death as qualified by drug or alcohol induced. [1]
- 2) Opioid Drug Shipment Data: This dataset, released in 2020, by the Washington Post, contains the data on all prescription opioid drug shipments in the United States from 2006 to 2014. This data was obtained through a Freedom of Information Act (FOIA) request to the US Drug Enforcement Agency (DEA). [2]
- 3) US Census Population Data: This dataset has the information regarding population in all counties across the United States. [3]

### **Control States**

For our analysis, we chose three control states (for each target state) based on similarity in terms of opioid overdose deaths over the years.

For Florida, the chosen control states are Pennsylvania (PA), Michigan (MI), and North Carolina (NC). Figure 1 compares opioid overdose deaths in Florida and its control states. For Texas, the chosen control states are Massachusetts (MA), Michigan (MI), and Illinois (IL). Figure 2 compares opioid overdose deaths in Texas and its control states. The control states chosen for Washington are Maryland (MD), North Carolina (NC), and Colorado (CO). Figure 3 compares opioid overdose deaths in Washington and its control states. We determined that these control states had similar trends in opioid overdose deaths when compared to their target states and thus, they could be used for the analysis.

## Analysis - Estimating effects of opioid control policies on opioid shipment

### Florida

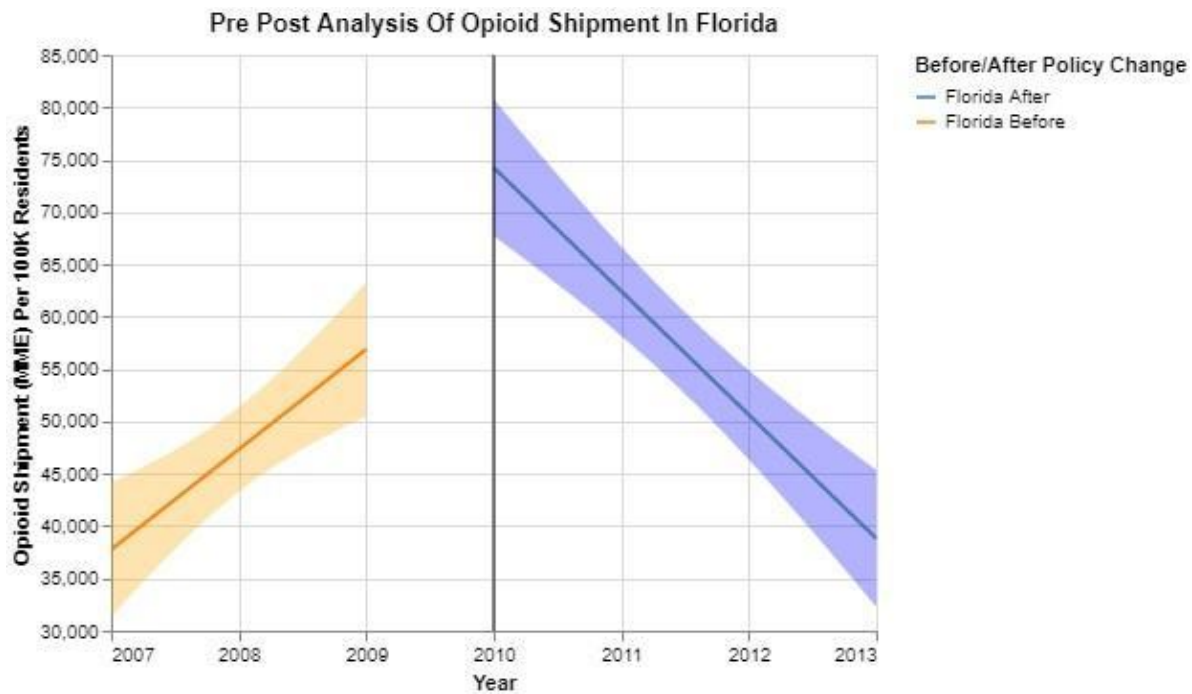


Figure 1: Opioid shipment in Florida - before and after policy changes in 2010

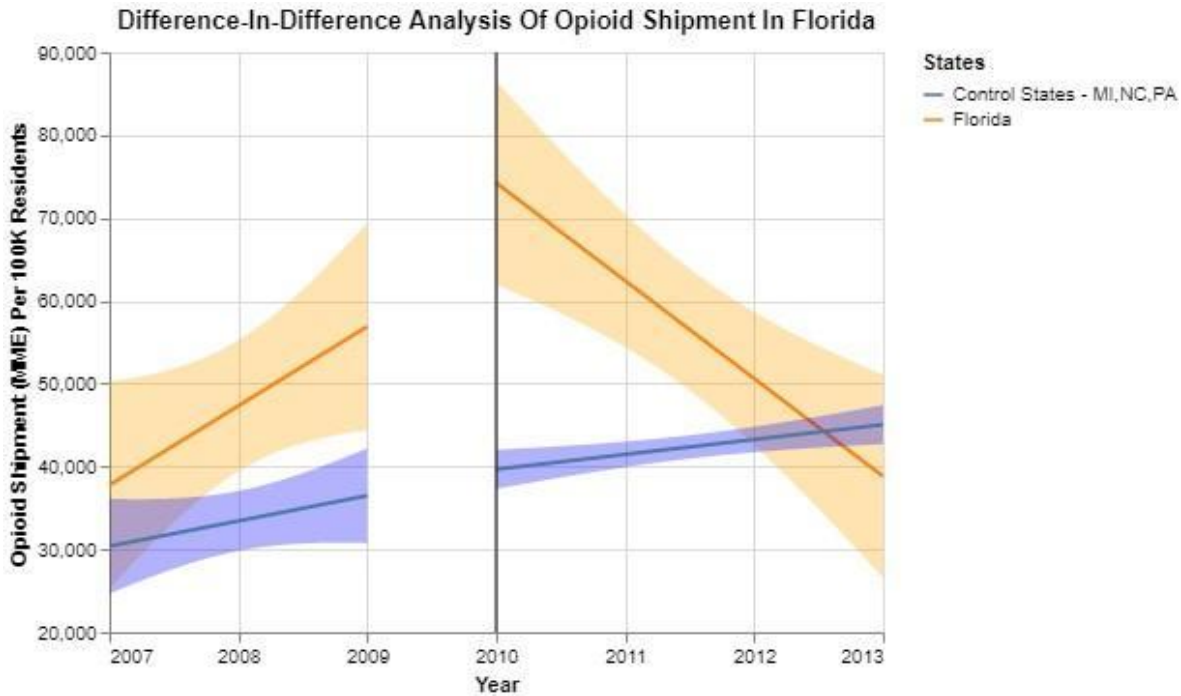


Figure 2: Opioid shipment in Florida and its control states- before and after policy changes in 2010

In Figure 1, it can be seen that before the implementation of opioid control policies there was a rapid increase in the opioid shipments in Florida. But after the implementation of the policy changes in 2010, a rapid and substantial decrease can be seen in the opioid shipment (MME per 100,000 residents). From the pre-post analysis, it can be concluded that the policy changes have reduced opioid shipment in Florida. But to be doubly sure about this conclusion, a difference-in-difference analysis needs to be conducted too. Thus, the rate of opioid shipment in Florida is compared to the rate of opioid shipment in the control states - Pennsylvania, Michigan, and North Carolina. Figure 2 shows that before 2010, there was a somewhat similar trend for Florida and the control states - there was an increase in the opioid shipment. In fact, the rate of increase was higher for Florida than for the control states. But after the implementation of policy changes in 2010, it can be seen that the opioid shipment continued to increase steadily for the control states, meanwhile Florida witnessed a drastic drop in opioid shipments. Thus, we can more confidently affirm that the opioid control policies have reduced opioid shipments in Florida.

## Washington

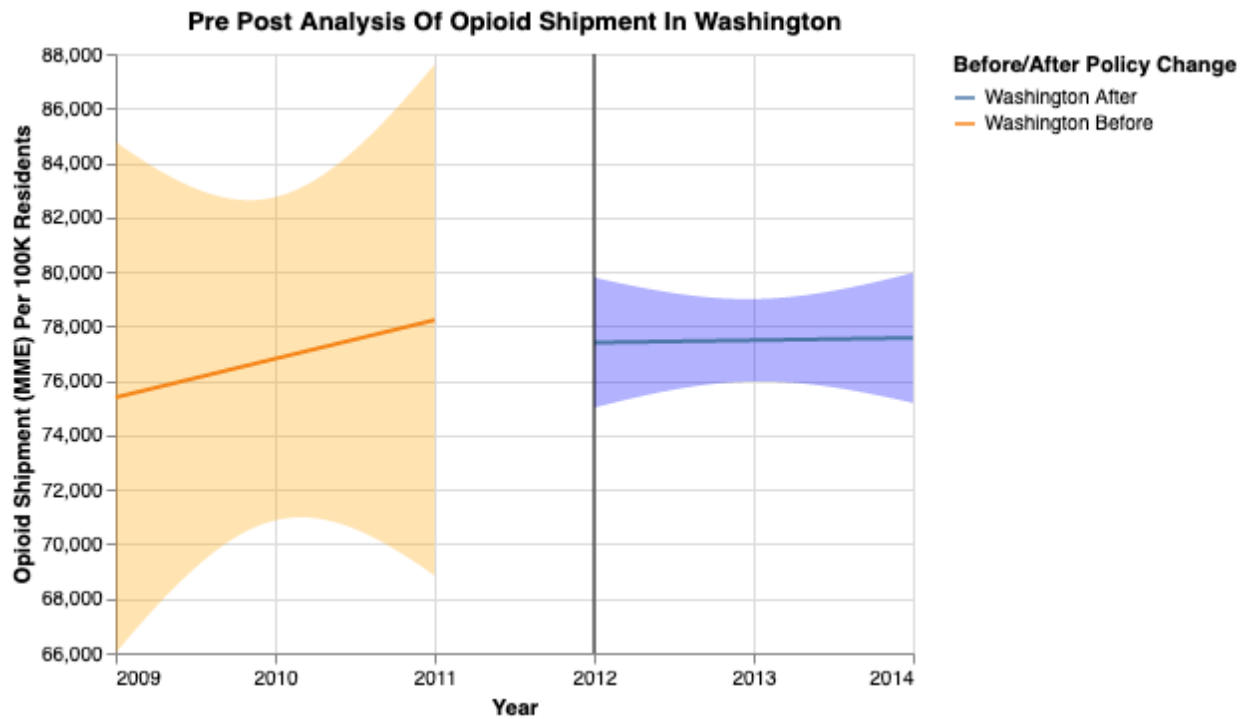


Figure 3: Opioid shipment in Washington - before and after policy changes in 2012

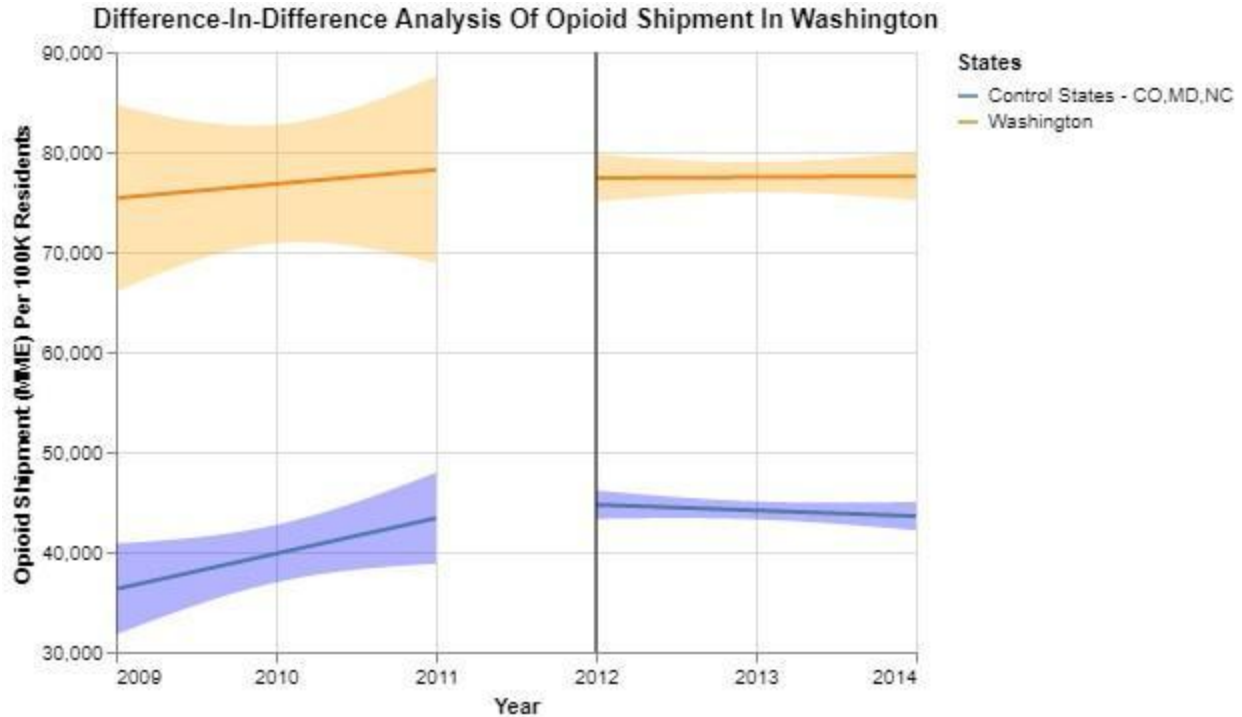


Figure 4: Opioid shipment in Washington and its control states- before and after policy changes in 2012

In Figure 3, it can be seen that before the implementation of opioid control policies there was a steady increase in the opioid shipment rates in Washington. But after the implementation of the policy changes in 2012, the rate of increase somehow gets flatlined. It can be understood that the policy changes implemented may have reduced the rate of opioid shipment. The rate of increase of opioid shipment in Washington is also compared with that of its control states - Colorado, Maryland, and North Carolina. It can be seen from Figure 4 that after 2012, even though no opioid control policies were implemented in those states, they witnessed a slight drop in the opioid shipments. The rate of decrease in the opioid shipment for these states is marginally greater than that of Washington. Perhaps, it can be concluded that the opioid control policies have minutely impacted the opioid shipment in Washington and slightly reduced them.

## Analysis - Estimating effects of opioid control policies on opioid overdose deaths

### Florida

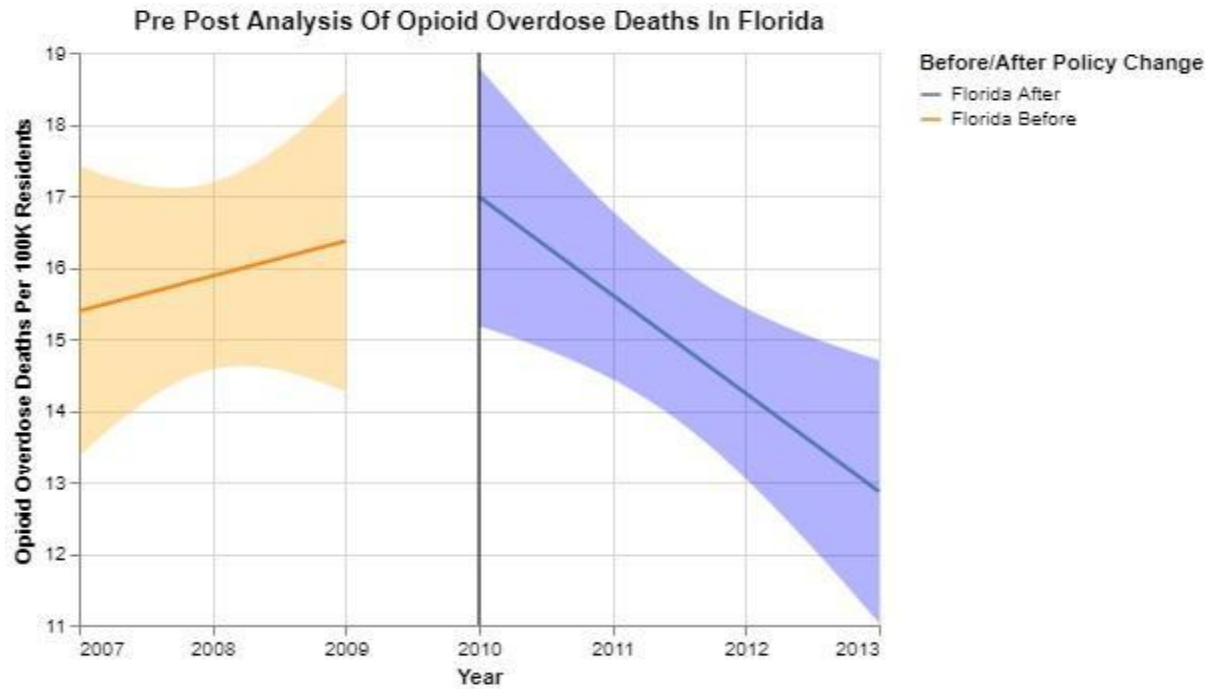


Figure 5: Opioid overdose deaths in Florida - before and after policy changes in 2010

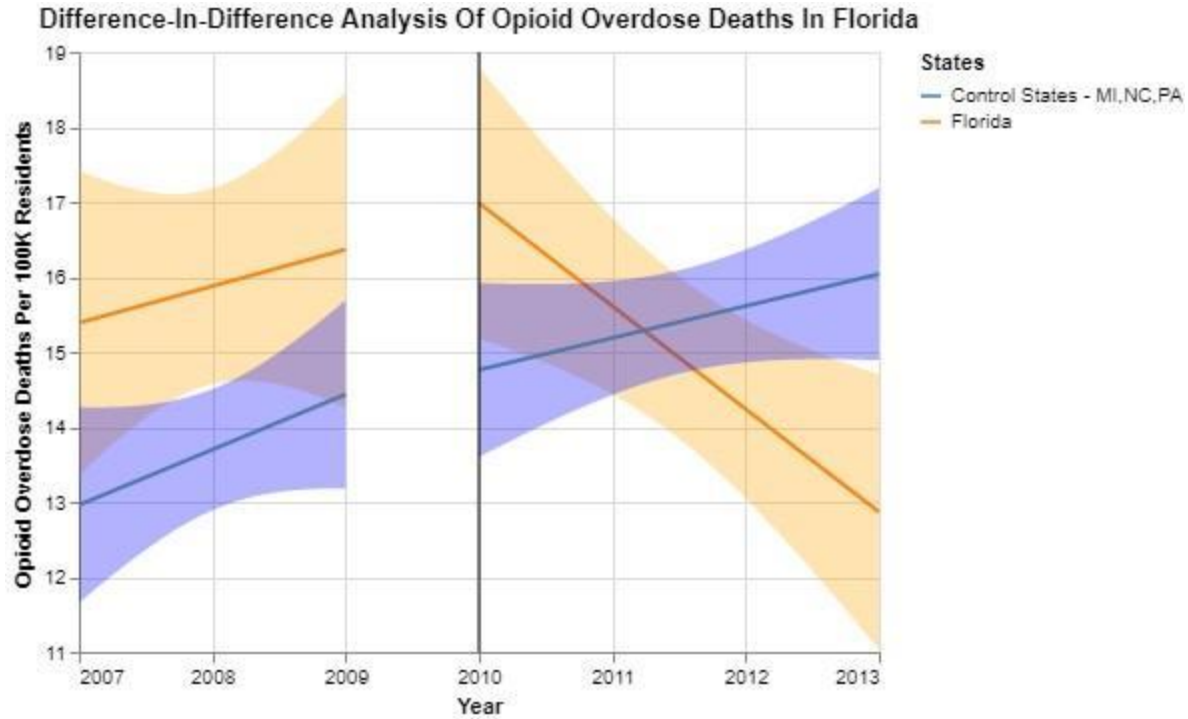


Figure 6: Opioid overdose deaths in Florida and its control states- before and after policy changes in 2010

In Figure 5, it can be seen that before the implementation of opioid control policies there was steady increase in the opioid overdose deaths. But after the implementation of the policy in 2010, a substantial decrease can be seen in the opioid overdose deaths. From the pre-post analysis, it can be concluded that the policy changes have reduced opioid overdose deaths in Florida. But to be doubly sure about this conclusion, a difference-in-difference analysis needs to be conducted too. Thus, the rate of opioid overdose deaths in Florida is compared to the rate of opioid overdose deaths in the control states - Pennsylvania, Michigan, and North Carolina. Figure 6 shows that before 2010, there was a similar trend in the rate of increase in opioid overdose deaths in Florida and its control states. But after 2010, the trends changed. After the implementation of policy changes in Florida, a drastic drop in rate of opioid overdose deaths is seen. On the contrary, in the control states, where no policy changes were implemented, the rise in rate of overdose deaths continues. Thus, we can more confidently affirm that the opioid control policies have reduced opioid overdose deaths in Florida.



## Texas

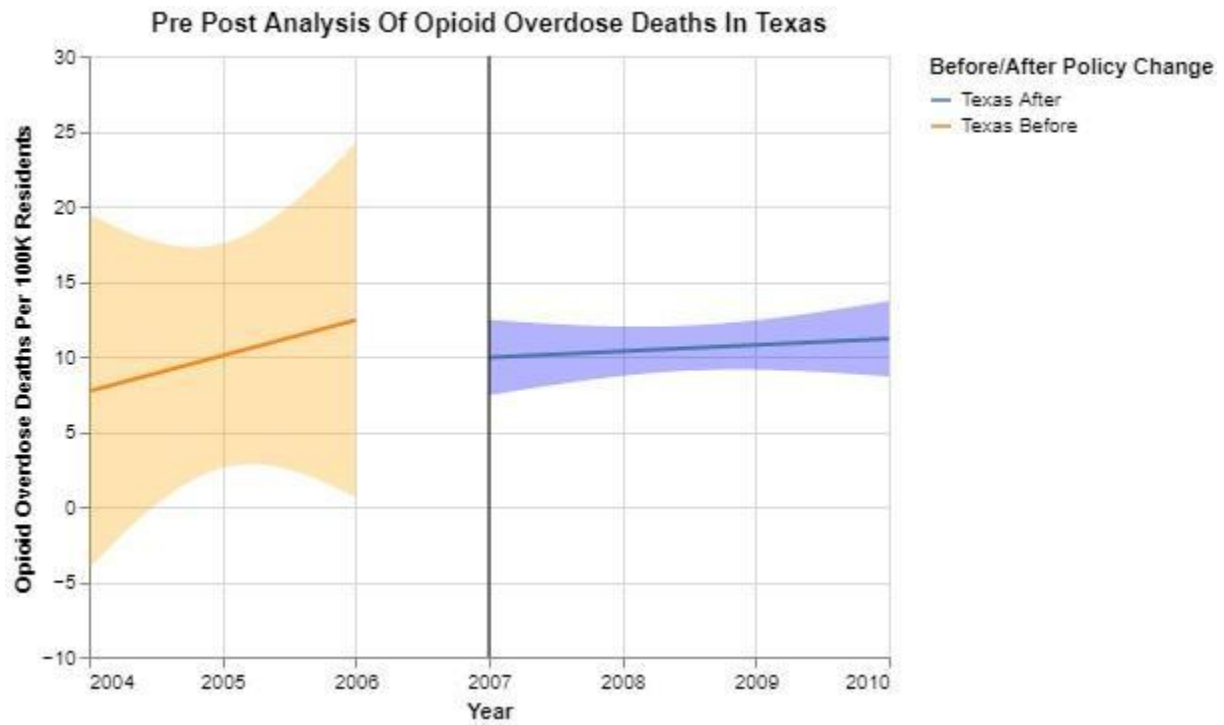


Figure 7: Opioid overdose deaths in Texas - before and after policy changes in 2007

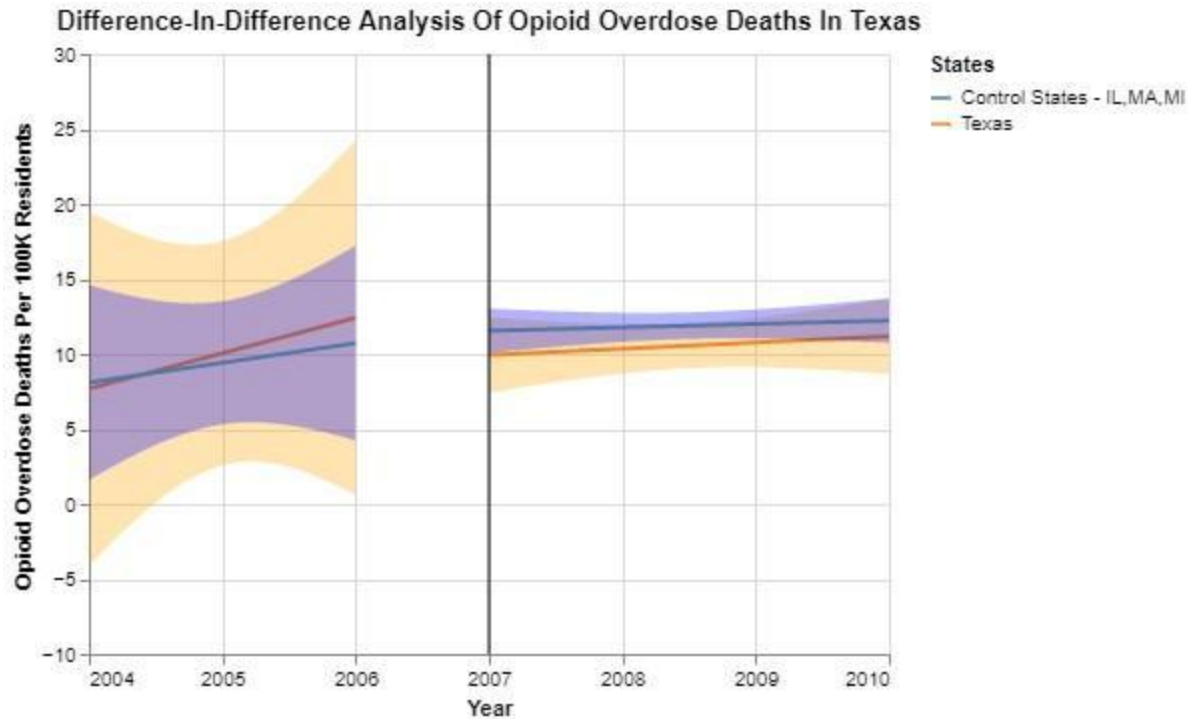


Figure 8: Opioid overdose deaths in Texas and its control states- before and after policy changes in 2007

From figures 7 and 8, it can be seen that both Texas and its control states - Massachusetts, Illinois, and Michigan have a similar, steady upwards trend of opioid overdose deaths before 2007. After the implementation of the policy changes in 2007, we see Texas' trend has more or less flatlined. However, the slope is still slightly positive and the average value seems to hover around the same as that of the pre-policy line. The difference-in-difference result helps add more context to the situation. It can be seen that the trend for the control states flattens out slightly, but for the most part stays on its upwards trajectory. It can thus be concluded that the policy changes have not significantly impacted the opioid overdose deaths in Texas

## Washington

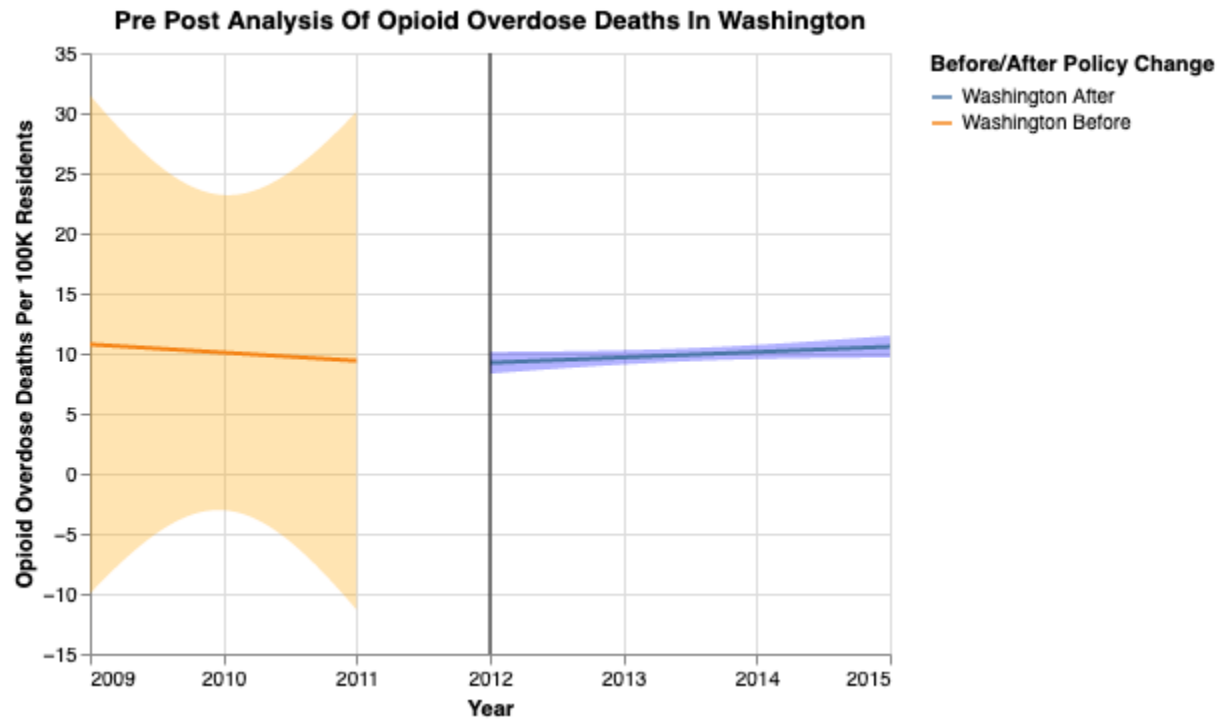


Figure 9: Opioid overdose deaths in Washington - before and after policy changes in 2012

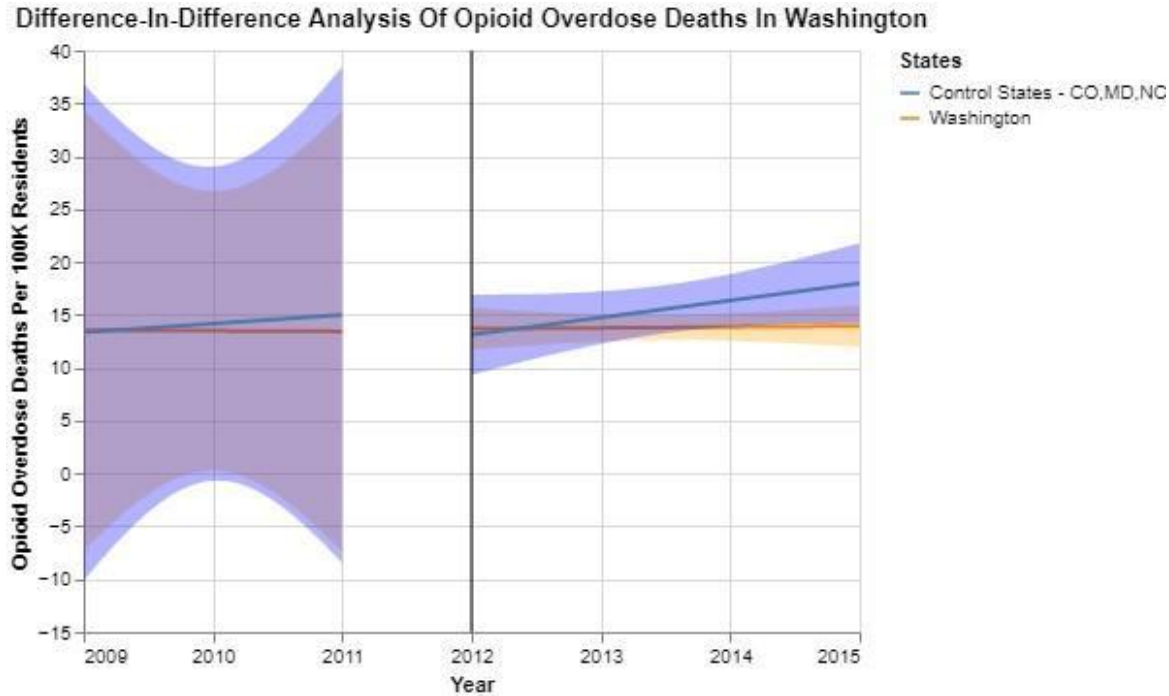


Figure 10: Opioid overdose deaths in Washington and its control states - before and after policy changes in 2012

In Figure 9, it can be seen that before the implementation of opioid control policies there was a minute, but visible decrease in the opioid overdose deaths. After the implementation of the policy changes in 2012, a minute, but visible increase can be seen in the opioid overdose deaths. It can be concluded with some certainty that the opioid control policies have not impacted the opioid overdose deaths in Washington and perhaps, on the contrary, there has been a reversal in the trend of decrease in opioid overdose deaths in Washington. The opioid overdose deaths have increased slightly after the implementation of the policy changes. However, in Figure 10, the result for difference-in-difference analysis shows that the rate of increase of opioid overdose deaths in the control states was higher than that of Washington. After 2012, a more rapid increase in the overdose deaths is seen for the control states. This rate of increase is lower for that of Washington. It can be concluded that the implementation of opioid control policies might have at least prevented the rapid increase in opioid overdose death rates, but not really reduced them.

## **Limitations**

Both types of analyses - pre-post and difference-in-difference are vulnerable to bias. The differences in demographics, socioeconomic status, health conditions, etc. across both the experimental states (where the opioid control policies have been implemented) and the control states are not accounted for. Since there is no information on such potential confounding variables, it is hard to determine which factor is responsible for affecting the opioid overdose deaths or opioid shipments and thus be absolutely sure that the policy interventions have solely affected the opioid mortality or opioid shipment rates. In order to account for missing values in opioid overdose deaths and opioid shipment datasets, we imputed them. Even though the integers imputed were very small, and the number of missing observations is not substantial, some residual bias may still be introduced as the observations may not be missing at random in real life settings. Using a single value of 0 can also be somewhat arbitrary.

## **Conclusion**

The implementation of various opioid control policies in Florida in 2010 such as mandatory registration of pain clinics, collaboration of DEA and various Florida law enforcement agencies in Operation Pill Nation, further expansion of pain clinic regulations (eg: statewide raids, seizures of assets for illegal pain clinics), have been effective in reducing opioid shipment and opioid overdose deaths. The opioid control policies implemented in Texas in 2007 - performing a patient evaluation before opioid prescription, obtaining informed consent from the patient for opioid treatment, conducting periodic review of the opioid treatment, maintaining a complete medical record of the patient's treatment - however have not been effective enough in reducing opioid overdose mortality. Similarly, the opioid control policies implemented in Washington in 2012 such as mandating a consultation threshold for adults (120 mg MED/day (oral)), or documentation of mandatory consultations, have not been effective enough in reducing opioid overdose mortality. However, they have reduced opioid shipment. Thus, the Florida state legislature should continue to implement their opioid control policies since they have been very effective in reducing both opioid shipment and opioid mortality. However, the legislatures of both Texas and Washington need to update their opioid control policies, so that they can more effectively impact the reduction in opioid shipment and opioid mortality.

## References

[1] Mortality Statistics:

[https://www.dropbox.com/s/kad4dwebr88l3ud/US\\_VitalStatistics.zip?dl=0](https://www.dropbox.com/s/kad4dwebr88l3ud/US_VitalStatistics.zip?dl=0)

[2] Rich, Steven, et al. "How to Download and Use the DEA Pain Pills Database." *The Washington Post*, WP Company, 3 Sept. 2019,

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

[3] US Census Data: <https://data.census.gov/>