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TO: Dr. Robert Andrews, Commissioner
SUBJECT: Evidence on Strategies for Addressing the Opioid Epidemic
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EXECUTIVE SUMMARY

This memo documents the evidence supporting three states with specific and distinct policy changes enacted to combat the opioid epidemic. The country is in the midst of an opioid-related public health crisis, characterized by increased opioid misuse and dependence and accompanying sequelae, including fatal opioid overdose. National survey estimates indicate that in 2018 nearly 10 million people misused prescription opioids, approximately 800,000 used heroin, and 2 million people had an opioid use disorder (OUD). Additionally, initial evidence suggests the COVID-19 pandemic may have increased opioid misuse and mortality. [Preliminary data](#) released by the Centers for Disease Control and Prevention (CDC) indicates overdose deaths rose 28.5% nationally in 2020, and 38.5% in Minnesota. In response to the ongoing crisis, state governments have enacted a broad array of policies. This report attempts to quantify the impact of specific policy changes in order to determine whether and to what extent these policies have addressed the current problems, and whether the policy changes analyzed can inform the development of better regulations in the state of Minnesota. Three policies analyzed here were enacted in Florida in 2010, Texas in 2007, and Washington in 2012.

POLICIES UNDER INVESTIGATION

Each of the three states analyzed in this memo attempted to address the opioid crisis with different approaches. The policy changes enacted are summarized below.

- Florida (2010): The Florida state legislature instituted several changes to regulations and rules regarding the prescription of opioids. These changes included: requiring pain clinics to register with the state, conducting statewide raids of pain clinics, prohibiting physicians from dispensing controlled substances from their offices, and increasing regulations on drug distributors.
- Texas (2007): The Texas medical board adopted new regulations with regards to the prescriptions of opioids. Physicians were newly required to conduct a patient evaluation and obtain informed patient consent before prescribing opioids. Additionally, physicians were required to conduct periodic review of patients prescribed opioids.

- Washington (2012): The Washington Department of Health adopted a new regulatory rule regarding the prescription of opioids. This rule instituted periodic reviews and mandatory consultations for patients on higher doses of opioids.

DATA SOURCES

There were three datasets utilized in this analysis:

- All opioid prescription drug shipments in the US from 2006-2012 (from US Drug Enforcement Agency, requested by Washington Post).
- County-level mortality data US from 2003-2015 (from US Vital Statistics records).
- County-level population estimates from 2003-2015 (from US Census).

ANALYSIS METHODS

From the data sources mentioned above, we adjusted opioid shipment and opioid-related deaths using county population. In the shipment data, observations are represented as the quantity of opioid shipments in a given county in a specific month, measured in morphine milligram equivalents (MME) per resident. In the mortality data, we calculated the opioid-related mortality rate per 100,000 residents for each county each year. Two methodologies were employed to investigate the effect of opioid drug prescription regulations on opioid shipment and drug overdose deaths. Firstly, the trend of opioid shipment or mortality before the policy took effect was directly compared to the trend after the policy went into effect – this method is known as a pre-post comparison. Following this, the change in the trend of the metrics before and after the regulations are computed and compared with the change in similar counties – this method is known as difference-in-difference.

The pre-post comparison provides a straightforward way to visualize the effect of the regulations of opioids. Using this method, one can easily discern changes in trends before and after the regulations went into effect. However, it does not provide context for such observed changes in trends. For instance, it is unclear if changes in trends were due to the regulations or something else that happened to occur at the same time.

In comparison, the difference-in-difference selects similar counties from other states to act as the “control group”. A county was selected into the control group if its growth rate of opioid shipment or opioid-related mortality rate was similar to that of a county in Florida, Texas, or Washington. Florida, Texas, and Washington each had their own control group. The assumption here is that if the state-level regulations had not been implemented in those three states, their trends of opioid shipment / mortality

would have followed the same paths as those of the control group. By comparing the trends of the three states with the trends of the control groups after the regulations, we can get closer to measuring the true effect of the regulations.

The pre-period of each analysis includes all years before the regulation took effect in the state. The year that the regulation took effect and onwards are the post-period. Each of the three states we investigated implemented regulations in different years. In addition, the opioid shipment and drug overdose death datasets cover different time periods. As such, the pre-and post-periods for each analysis are different. Below are the pre-and post-periods for each analysis below to clarify the periods of each analysis.

State	Analysis	Regulation Date	Pre-Period	Post-Period
Florida	Opioid Shipment	February, 2010	2006 - 2009	2010 - 2012
Florida	Opioid Overdose Death	February, 2010	2003 - 2009	2010 - 2015
Texas	Opioid Shipment	January, 2007	2006	2007 - 2012
Texas	Opioid Overdose Death	January, 2007	2003 - 2006	2007 - 2015
Washington	Opioid Shipment	January, 2012	2006 - 2011	2012
Washington	Opioid Overdose Death	January, 2012	2003 - 2011	2012 - 2015

ANALYSIS RESULTS

Below the results of the pre-post analysis are displayed for Florida. Figure 1 and 2 display both opioid shipments per capita and mortality per capita before and after the policy change in 2010.

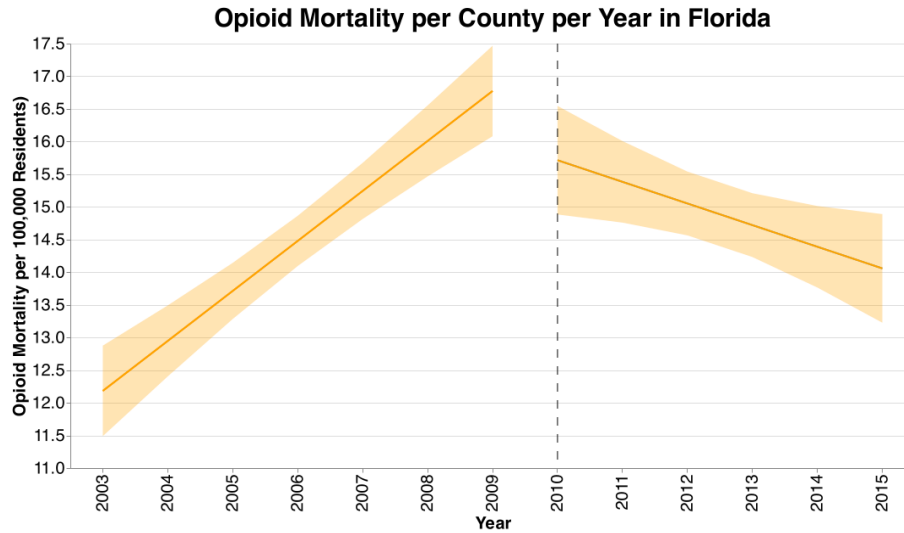


Figure 1 opioid mortality per county per year in Florida

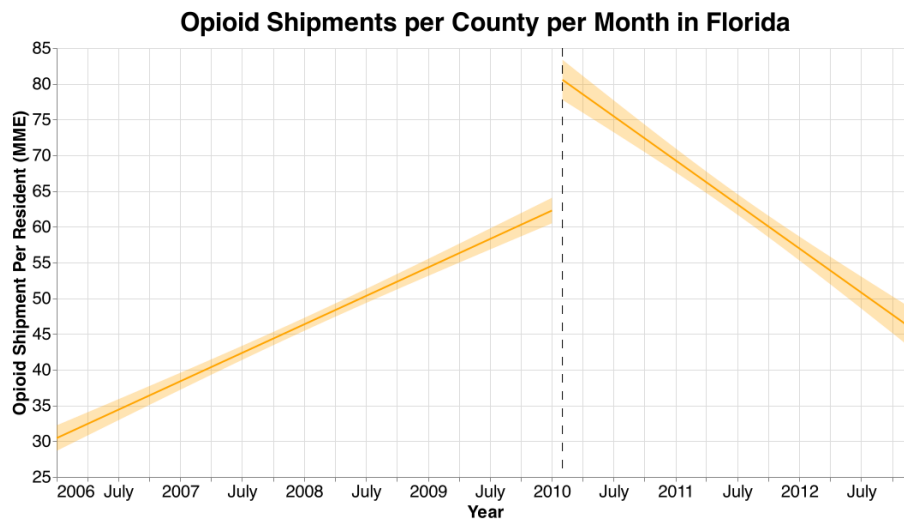


Figure 2 opioid shipments per county per year in Florida

Interestingly, there is a clear increasing trend in both opioid shipments and opioid mortality before 2010, which is reversed. However, as visualized by the 95% confidence bands, there is more uncertainty (i.e., more spread) in the mortality data. Overall, from these graphs, it can be asserted relatively confidently that there was a change in the trend of opioid shipments per capita in Florida after the policy change, and mortality also appears to display a different trend. Still, we are less confident due to the more significant error bands.

Next, displayed are opioid mortality and shipment trends in Texas, again, before and after policy changes. In the case of mortality, there is a visible reversal of trend. However, with regards to opioid shipments, it is clear that opioid shipments are increasing both before and after the policy change—although, the rate at which shipments increase post-policy is lower.

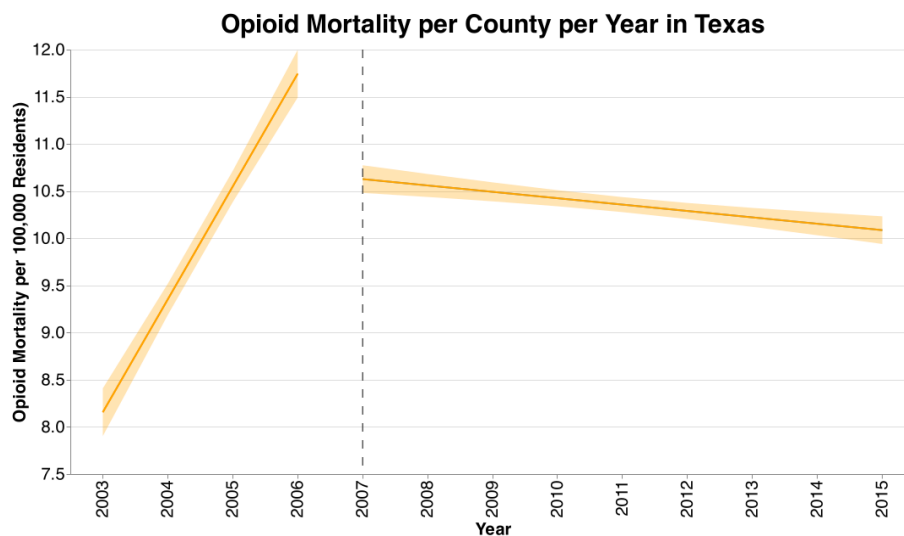


Figure 3 opioid mortality per county per year in Texas

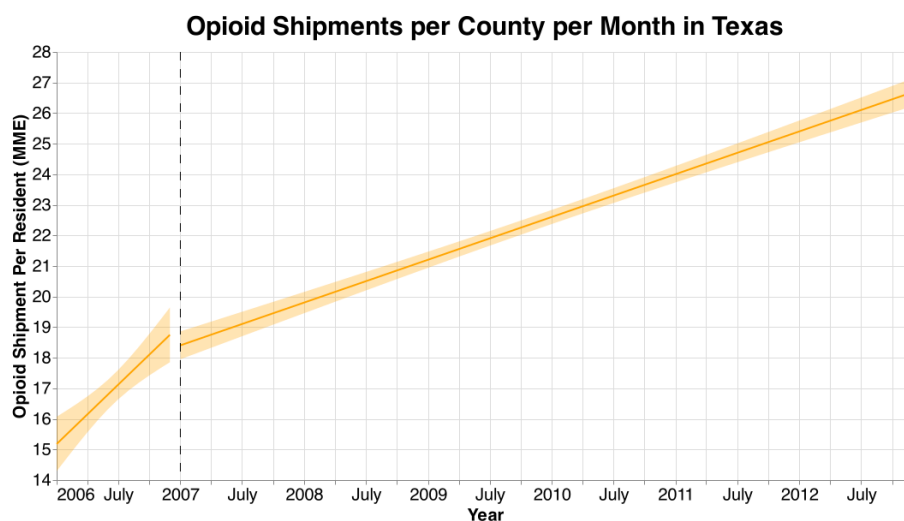


Figure 4 opioid shipments per county per year in Texas

Lastly, the results for Washington are displayed below.

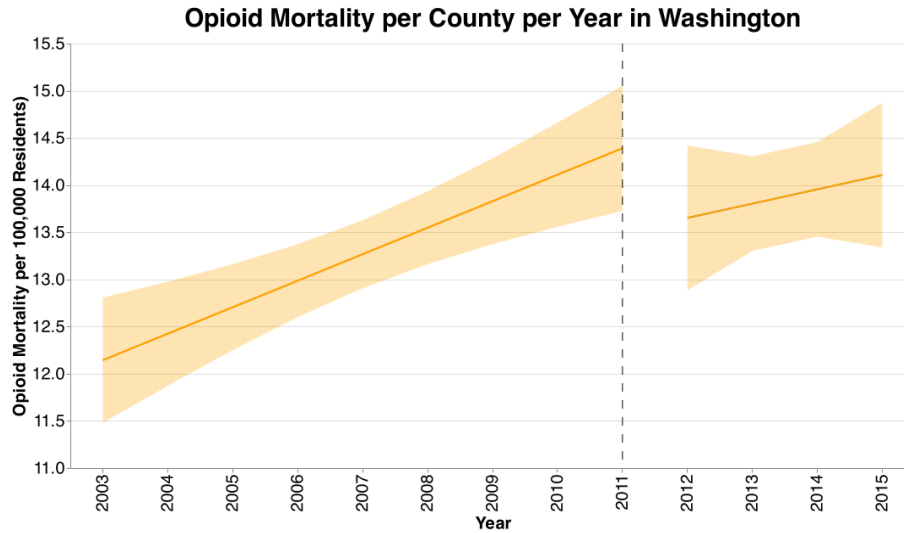


Figure 5 opioid mortality per county per year in Washington

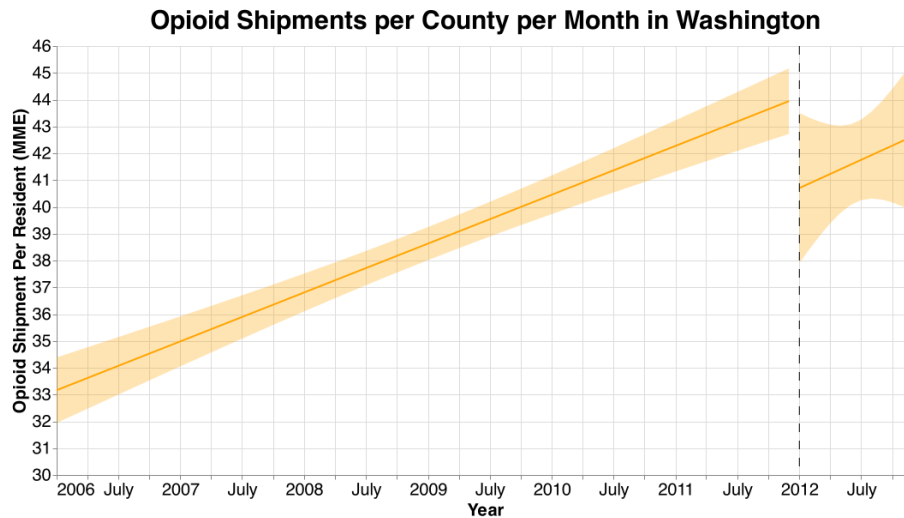


Figure 6 opioid shipments per county per year in Washington

Given the width of the confidence bands, interpretation of results is trickier here. In both shipment and mortality, like the other states, there is a visible increasing trend by month before the policy change. While the regression lines suggest a continuation of these trends, the confidence bands width easily demonstrate that we are not confident about either the direction or the magnitude of the trend post policy change. In short, more data is needed here.

Next are displayed the results of the difference-in-difference analysis. As previously, there are the same six graphs, but in this case, the graphs also include the selected control counties before and after the policy change.

Here, the results of the previously seen pre-post graph for Florida's opioid mortality are strengthened by addition of the controls. Visibly, the control counties experienced nearly the same rate of increase after the policy change, potentially indicating that the trend observed is accountable to the policy change in Florida. For Florida's opioid shipment data, the same is true. While it is visible that control counties also experience a change (in this case, a flattening) in the rate of opioid shipments over time, the effect is clearly much stronger in Florida.

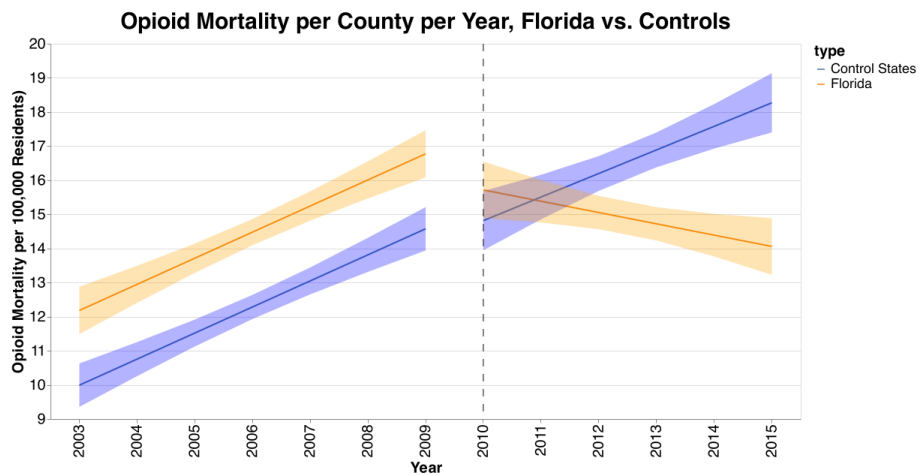


Figure 7 opioid mortality per county per year in Florida vs. controls

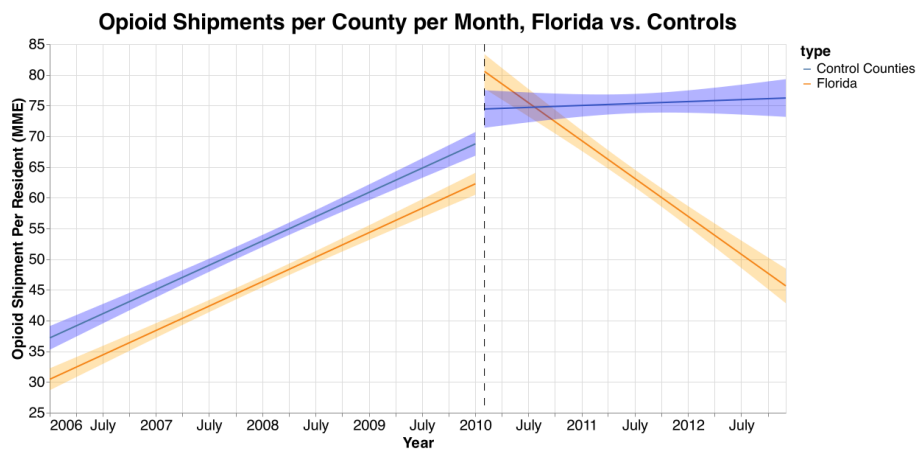


Figure 8 opioid shipment per county per year in Florida vs. controls

Similarly, below are the graphs for mortality and shipment in Texas. Here, the control states show a clear continuation of trends in opioid mortality, with very little change, while Texas's flattening (and perhaps reversal) is clear. With shipment data, the picture is less clear. It does appear that Texas's policy change may have altered the slope of the increasing trend in shipment, but the change is minimal.

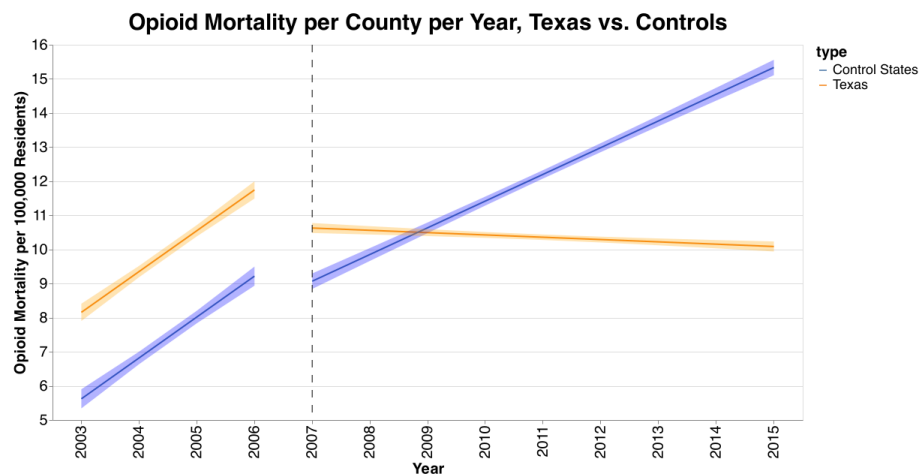


Figure 9 opioid mortality per county per year in Texas vs. controls

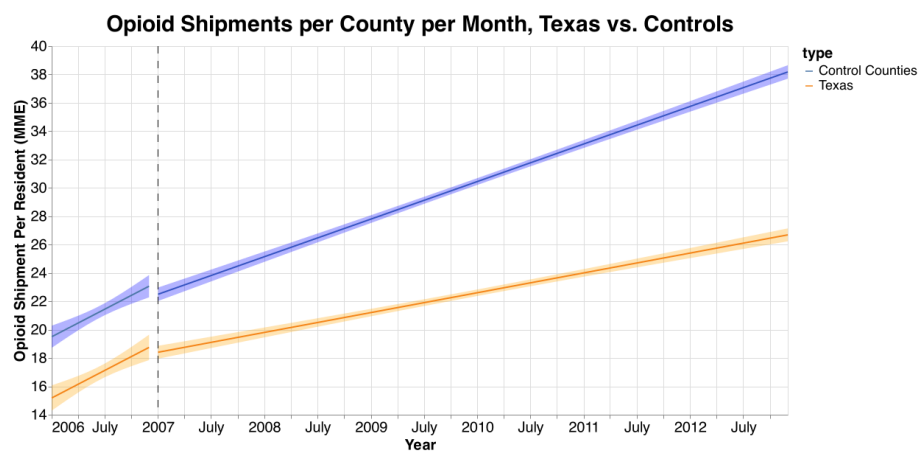


Figure 10 opioid shipments per county per year in Texas vs. controls

The last graphs displayed here are the difference-in-difference analyses for Washington.

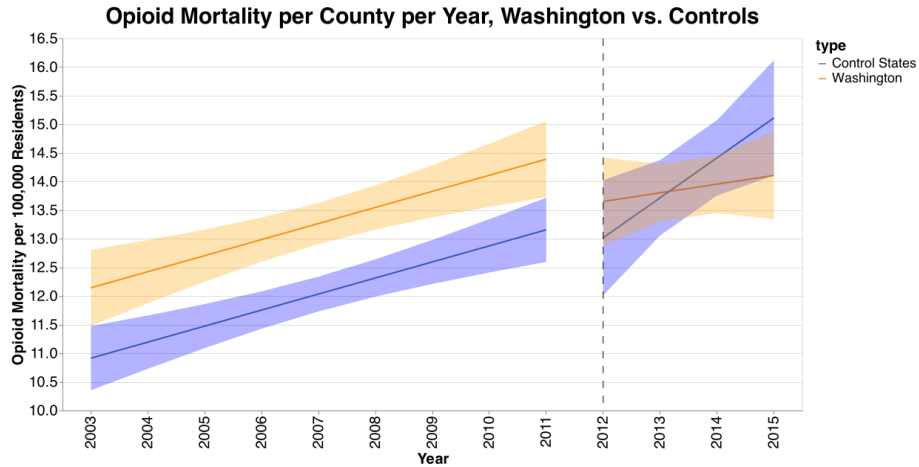


Figure 11 opioid mortality per county per year in Washington vs. controls

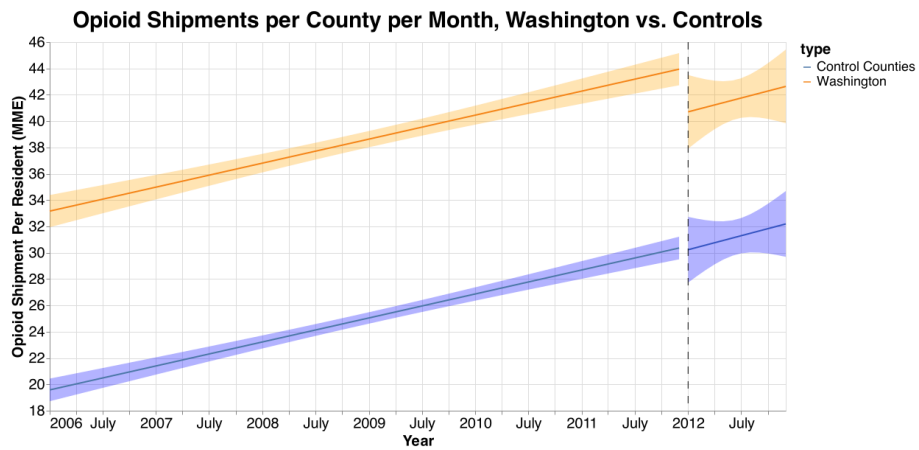


Figure 12 opioid shipments per county per year in Washington vs. controls

While the control counties add needed context to Washington’s policy change, meaningful analysis is unfortunately still made challenging by the confidence bands. Without more data, the results are uncertain.

DISCUSSION

It is clear that public policies must be enacted to better protect Minnesotans from this deadly epidemic. This memo outlines effective directions that the state could pursue. The results of this analysis demonstrate that the policy changes in Texas and Florida were successful in altering the rate of increase for both prescription opioid shipments and opioid mortality. In fact, Florida’s policies were very successful—in both measures, the increasing trend prior to the policy change was entirely reversed. In Texas, the results were very strong for opioid mortality, however, the shipment of prescription opioids continued to increase after the policy change took effect. In Washington, this analysis did not provide

evidence to suggest that the policies were successful in reducing mortality or shipments. Florida's legislature adopted the strongest policy changes of the three analyzed, and the results show significant change.

It is also important to address key limitations of this analysis. The first is the lack of data. For privacy protection, counties with yearly deaths of less than 10 in a specific category are suppressed. Using the data available, the death rates for these counties were imputed, but it is possible that this imputation could skew the data. Continually, with the goal of evaluating the effectiveness of policies, it would be beneficial to include more policy changes, as well as different metrics for effectiveness. Finally, an important caveat to keep in mind while considering future policy changes is that the COVID-19 pandemic may very well have changed the opioid landscape, and the factors that influence the epidemic.