Association between State Prescription Drug

Monitoring Programs

and Fatal Opioid Overdoses

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Abstract

Opioid overdose rates have been steadily increasing in the United States since the late 1990s. Prescription Drug Monitoring Programs (PDMPs) are systems that collect and distribute information on controlled substances and are accessible to healthcare providers and authorities. This study estimates the association between establishing an operational PDMP and the overall opioid overdose death rate. Using data from 2000 to 2020 from all 50 states and the District of Columbia, this study evaluates the effectiveness of PDMPs in regulating the distribution of opioids, which is theorized to lead to lower levels of opioid misuse and diversion, and as a result, lower levels of opioid overdoses. Opioid overdose death rate data was collected from the CDC Wonder Database, and data was collected on the year in which an operational PDMP was established in a state. A panel data regression model with state and year-fixed effects is employed, and the results suggest that states with operational PDMPs experience an average of 1.063 fewer opioid overdose deaths per 100,000 people, compared to states without a PDMP. Previous research on this topic has shown mixed findings. This study uses a different set of covariates compared to previous studies over a more extended period and employs the date when the PDMPs became operational, rather than when legislation for PDMPs was established in each state. The results are similar in magnitude to those studies that have found PDMPs to reduce opioid overdoses.

JEL:

Key Words:

**1. Introduction**

The United States is currently in the midst of an opioid epidemic, which has emerged as a significant concern over the past few decades. The number of deaths caused by opioid overdoses has been rapidly increasing since 2000. According to the U.S. Department of Health and Human Services (2023), opioid overdose deaths rose from 21,089 in 2010 to 47,600 in 2017. Over the years, these overdose fatalities can be categorized into three distinct waves. The first wave began in 1999, characterized by a rise in prescription overdose deaths. The second wave started in 2010 due to a rapid increase in heroin overdoses. Finally, the third wave began in 2013, due to the proliferation of illicitly manufactured fentanyl and other synthetic opioids. To make matters worse, illicitly manufactured fentanyl is occasionally mixed with heroin, cocaine, and other drugs, as outlined by the Centers for Disease Control and Prevention (2022a).

Both the U.S. federal government and state governments have implemented several measures to fight the opioid overdose epidemic. These actions include identifying outbreaks, collecting data, and providing care to affected communities. Among the strategies employed today, Prescription Drug Monitoring Programs (PDMPs) stand out as a particularly promising state-level intervention. PDMPs aim to enhance opioid prescribing practices and reduce diversion of these substances. PDMPs are electronic databases that track controlled substance prescriptions within a state, accessible by health authorities and healthcare providers (Centers for Disease Control and Prevention, 2022c). In this analysis, observational data is used to estimate the association between a state’s implementation of an operational PDMP and its corresponding opioid overdose death rate.

Some researchers have suggested that PDMPs can reduce the supply of prescription drugs in some states (Brady et al., 2014). According to this theory, healthcare providers reference PDMPs to regulate the number of opioids they prescribe, specifically to individuals who already received an adequate amount for their condition. This objective is believed to reduce the number of people dependent on opioids, consequently lowering both prescription opioid overdoses and opioid overdoses from illicit markets. Other research has suggested that PDMPs contribute to a decrease in prescription opioid overdose deaths (Cerda et al., 2021). Furthermore, research focusing on the effect of PDMPs on the overall opioid overdose death rate has suggested that newly implemented programs are associated with lower opioid overdose rates (Patrick et al., 2017). However, findings in this area are mixed, and alternative perspectives argue that PDMPs are not associated with decreases in opioid-related overdoses. Critics propose that PDMPs have a minimal effect on the consumption of opioids and emphasize the need for PDMP managers to enhance the utilization of their data to address the issue of opioid overdoses (Paulozzi et al., 2011).

Between 2000 and 2020, a total of 33 states implemented operational PDMPs. However, limited research has examined whether PDMPs have the same impact on opioid overdoses across different categories of opioids. Additionally, much of the previous literature surrounding the effectiveness of PDMPs have focused on a relatively short time frame, potentially resulting in estimates that may differ significantly when considering more recent data. The objective of this analysis is to examine the association between a state’s operational PDMP status and opioid overdose rates. The hypothesis suggests that the implementation of operational PDMPs in a state is associated with a decrease in the opioid overdose death rate across all categories of opioids.

**2. Literature Review**

Previous research has yielded inconsistent findings regarding the impact of PDMPs on reducing opioid overdose death rates. Numerous studies have explored the relationship between PDMP implementation and levels of prescription opioid prescribing, as well as opioid overdoses.

Brady et al. (2014) conducted an investigation into the impact of PDMPs on prescription opioid dispensing levels in the United States. Using quarterly opioid dispensing data from each state and the District of Columbia from 1999 to 2008, the researchers used a multivariable model. The finding of their analysis, after adjusting for temporal trends and demographic characteristics, indicated that there was no statistically significant difference in morphine milligram equivalents (MMEs) dispensed in state quarters with PDMPs compared to those without PDMPs. The researchers found that the implementation of PDMPs was associated with significantly fewer MMEs dispensed per capita in nine states, while eight states experienced a significant increase in MMEs dispensed per capita. These results highlight the variation in the effects of PDMP implementation across different states, suggesting that the design and functionality of PDMP programs likely play an important role in determining their effectiveness in curbing opioid dispensing.

While the previous findings do not provide evidence supporting the effectiveness of PDMPs in reducing the levels of opioids dispensed, it is crucial to examine whether PDMPs effectively reduce negative opioid-related outcomes. In their study, Cerda et al. (2021) investigate the association between proactive reporting of state-level PDMPs and county-level fatal prescription opioid overdoses. The authors analyze county-level data from 3,109 counties in 49 states, covering the period from 2002 to 2016, to estimate the impact of electronic PDMP access on opioid overdoses. The results of the study indicate that electronic PDMPs are linked to a significant reduction in prescription opioid overdose deaths after a span of three years. Specifically, the study reveals that electronic PDMP access is associated with a 9% decrease in rates of fatal prescription opioid overdoses after three years. Furthermore, the researchers find that electronic PDMP access is correlated with lower overdose fatalities, specifically for methadone and synthetic opioids, while the effects on natural/semisynthetic opioids, which are the primary focus of PDMP programs, are not well-supported.

# In a similar study, Patrick et al. (2016) employed an interrupted time-series design to estimate the association between the implementation of PDMPs, as well as specific program characteristics, and opioid overdose rates. The annual rate of opioid-related overdose deaths in each state was obtained from the CDC Wonder database, spanning the years 1999 to 2013. The researchers considered both the year of legislative enactment and the year of implementation to isolate the effect of PDMP implementation. The study findings indicate that states newly implementing a PDMP were associated with a decrease of 1.12 opioid-related overdose deaths per 100,000 individuals annually compared to states without a program. Furthermore, the researchers concluded that PDMPs monitoring four or more drug schedules and updating their data at least weekly were predicted to have 1.55 fewer opioid-related overdose deaths per 100,000 population annually compared to states without a program. The authors acknowledge the possibility of not including all pertinent time-varying state-level factors that could act as confounding variables. Additionally, the study did not evaluate how PDMP implementation affects death rates for different types of opioids, such as prescription opioids or illicitly manufactured opioids. Nevertheless, the study results strongly suggest that implementing PDMPs is associated with significant reductions in opioid-related death rates, thereby contributing to the growing body of evidence highlighting the effectiveness of PDMPs.

Further evidence on the effectiveness of PDMPs has been conducted by Reifler et al. (2012), who aim to assess whether PDMPs have an impact on state-level trends in opioid abuse. The researchers used quarterly data from 2003 to 2009 from the RADARS System Poison Center and Opioid Treatment surveillance databases to measure the level of opioid abuse in each state. Their findings indicate that states without a PDMP experienced an average quarterly increase of 4.9% in opioid treatment admissions, while states with a PDMP witnessed a lower increase of 2.6%. Additionally, they observed that in states without a PDMP, Poison Center exposures increased by an average of 1.9% per quarter, compared to only 0.2% per quarter on average in states with a PDMP in place. These results suggest that PDMPs are successful programs at reducing overall opioid misuse and abuse, with the analysis utilizing a different dependent variable other than overdose rates. One limitation of this study is that the treatment admission data is subject to self-reporting and selection bias, which may lead to inaccurate numbers.

However, there are studies that present contrasting findings and do not support the notion that PDMPs effectively reduce negative outcomes associated with opioids. In a study conducted by Nam et al. (2017), the researchers examine the impact of PDMPs on fatal drug overdose mortality rates in the United States. They employ multivariate regression models with state and year fixed effects, as well as state-specific linear time trends. The analysis utilizes data on drug mortality rates from the CDC Wonder database, as well as de-identified individual-level unsuppressed mortality data from the NCHS, covering the period from 1999 to 2010. The researchers exclude the 15 states that had implemented PDMPs before 2000. The results break down the association of PDMPs with various types of drugs. They find that PDMPs were not associated with a decrease in the overdose mortality rate for overall opioids, prescription opioids, and legal narcotics. Furthermore, the researchers observe that PDMPs are often linked to increased mortality rates for illicit drugs, suggesting that restricted access to prescription drugs may lead individuals with addictive disorders to seek out substitute drugs. This study suggests that PDMPs may not fully address the issues of prescription diversion, doctor shopping, or similar behaviors. Additionally, it raises the possibility that PDMPs may discourage patients from seeking help from doctors who could assist them in addressing drug abuse.

In another study conducted by Paulozzi et al. (2011), the association between PDMPs and rates of opioid overdose mortality and opioid drug consumption is examined. The researchers analyze state-level data on opioid overdose mortality rates and opioid drug consumption using observational data in the United States from 1999 to 2005. Mortality data is obtained from the CDC Wonder database, while retail distributions of prescription opioids are obtained from the ARCOS database of the United States DEA. Panel regression models are employed, with morphine milligram equivalents (MMEs) calculated from the ARCOS data serving as a measure of opioid consumption, and overdose rates and MME rates as dependent variables. The study findings indicate that the presence of a PDMP is not a significant predictor of mortality or MME rates. The authors acknowledge the primary limitation of the study, which is the inability to rule out residual confounding. It is possible that states with a predisposition towards drug abuse initially had higher drug overdose rates, making them more likely to establish a PDMP. Consequently, the authors cannot definitively ascertain that mortality rates in PDMP states would not have been even higher in the absence of a program. Additionally, the study is limited by its relatively short time frame, spanning only from 1999 to 2005.

The existing body of literature on the effectiveness of PDMPs in mitigating negative outcomes related to opioids presents mixed findings. Overall, the previous studies have indicated that the impact of PDMPs on opioid-related outcomes is not highly substantial, even in cases where PDMPs have shown some effectiveness. It is worth noting that, except for a specific subset of the study by Nam et al. (2017), there is no evidence suggesting that the implementation of PDMPs is associated with increases in opioid deaths or dispensing. While the evidence regarding the efficacy of PDMPs remains inconclusive, it does not appear that there are significant unintended consequences associated with the implementation of these programs.

**Economic Theory**

The goal of this empirical analysis is to examine the association between opioid overdose rates with operational PDMP status. In this analysis, states without operational PDMPs are the control states and by controlling for various characteristics are the state-year level along with state and year-fixed levels, the association between PDMPs and opioid overdose rates is observed. The year in which a PDMP became operational rather than when legislation was passed to authorize it is used because the operational date is when the program was actively functioning and health care providers were accessing the information, which occurs after legislation is first passed.

PDMPs provide opioid prescribers with more information on the patients they are prescribing to and PDMPs improve prescribers’ ability to identify patients who are more at risk of abusing or overdosing on opioids. The supply of prescription opioids is influenced by the cost of production, regulations, and government policies. PDMPs may limit the number of prescriptions that can be written for certain drugs or require doctors to follow stricter guidelines when prescribing (Centers for Disease Control and Prevention, 2022c). The theoretical purpose of PDMPs is to regulate the distribution of opioids and reduce drug diversion, which would lead to a lower supply of prescription drugs overall, specifically to those most at risk of abusing them. Economic theory suggests that having a lower supply of these drugs, as well as having fewer people exposed to the drugs in the first place, should lead to lower levels of opioid use and as a result, opioid overdoses. If people generally have less access to the drugs, they are less likely to become addicted to them, so the overall demand for opioids should decrease as well over time, which will ultimately result in a reduction in the number of opioid overdose deaths.

PDMPs may take time after implementation before they start to influence the opioid overdose death rate. PDMPs may not be effective at reducing the overdose rates for those already abusing opioids before implementation, but they may lead to fewer people being exposed to the drugs in the future and may prevent many people who use the drugs from developing addictions. The assumptions of this model are that prescribers consider information from the PDMPs before prescribing opioids and that an economically significant amount of the opioids being used by the population come from prescriptions.

In this analysis, the categories of opioid death rates are as follow. The first category contains all opioids. The second category includes heroin and synthetic opioid analgesics other than methadone. The third category includes natural opioid analgesics, semisynthetic opioids, in addition to other and unspecified narcotics. The fourth and final category includes methadone only.

The total opioid overdose rate serves as a measure of the entire opioid overdose issue in each state and year. The more specific categories of opioid overdose death rates serve as a measure of how various types of opioid overdoses, such as from prescription opioids, or illicitly manufactured opioid are changing with PDMPs.

The heroin and synthetic opioid overdose rate serves as a measure of overdoses from illicitly manufactured opioids, which are not opioids that PDMPs regulate because they are not prescribed. Heroin is a Schedule 1 substance under the Controlled Substances Act, meaning that there is no currently accepted medical use of heroin in the United States (Drug Enforcement Administration, 2020). In this same category is synthetic opioid overdoses, which are largely driven by illicitly manufactured fentanyl-involved overdoses (Centers for Disease Control and Prevention, 2022b). The natural, semisynthetic, and other opioid category serves as a measure of the prescription opioid overdose death rate, as it includes morphine, codeine, oxycodone, hydrocodone, hydromorphone, and oxymorphone (National Center for Health Statistics, 2023). According to the Centers for Disease Control and Prevention (2022d), all these opioids are among the most commonly prescribed opioids. Finally, the methadone overdose rate is another measure of prescription opioid overdose levels because methadone is used to treat severe pain and opioid addiction and is one of the most commonly prescribed opioids (CAMH, 2021).

Since it is assumed that opiod prescribers asccess the information on PDMPs to regulate and reduce the overall supply of opioids, it is expected that the overdose death rates for all categories of opioids in a state should decrease after some period after the implementation of a operational PDMP in that given state. It is expected that PDMPs would be associated with greater decreases in prescription opioid overdose rates compared to illicitly manfuctured opioid rates, because PDMPs regulate prescription opioids specifically. It is expected that PDMPs are associated with lower illicitly manufactured overdose rates as well, because may illicit opioid users who overdose started by using prescription opioids (Utah Department of Health, 2018). Therefore, by reducing the number of people who start using prescription opioids, this should reduce the number of people who use illicitlyly manufactured opoiodis too.

**3. Data and Methodology**

**Data**

This analysis uses observational state-year-level data from 2000 to 2020. In this analysis, the four dependent variables used in the various models are the total opioid overdose rate, the heroin and synthetic opioid overdose rate, the natural opioid and other opioid overdose rate, and the methadone overdose rate. These data were obtained from the CDC Wonder Multiple Cause of Death Database, which included the death counts and populations in each state-year pair for various categories of opioid overdoses. In this analysis, the multiple cause of death ICD-10 codes were used to categorize the type of opioid overdose. Codes T40.1-T40.4 and T40.6 were used to calculate the total opioid overdose rate, codes T40.1 and T40.4 for the heroin and synthetic opioid overdose rate, codes T40.2 and T40.6 for the natural and other opioid overdose rate, and code T40.3 for the methadone overdose rate (CDC WONDER, 2023).

We would expect there to be 21 years of data for the 50 states and the District of Columbia, resulting in 1,071 observations for each of the four dependent variables. However, for each of the four overdose rate variables, there were missing values, generally for the less populous states in the earlier years of the study. The CDC Wonder database suppresses mortality data when the number of deaths is fewer than 10. The methadone overdose rates for North Dakota, South Dakota, and Wyoming were missing for all years, so those three states were removed from the regression for methadone overdoses. The total opioid overdose rate had nine missing values, the heroin and synthetic opioid overdose rate had 108 missing values, the natural opioid and other opioid overdose rate had 25 missing values, and the methadone overdose rate still had 86 missing after completely removing the three states.

Linear imputation was applied to fill in the missing values individually for each state and overdose rate. In each state, the overdose rates generally increased linearly and similarly over time across states, so using only year for the linear imputation provided reliable results for the missing values.

Using information from the Prescription Drug Abuse Policy System, an indicator variable was created to indicate whether an operational PDMP was in place in a given state and year (PDAPS, 2017).

Data were also obtained for various covariates in the models. Median income data were obtained for each state-year pair and were converted to thousands of dollars in the model (US Census Bureau, 2022). Using the IPUMS USA Community Survey, data were obtained on the percentage of the state that identified as white, the unemployment rate, the percentage of the state with a bachelor’s degree or higher, and the average age for each state-year pair (IPUMS USA, 2022). These percentages and estimates were calculated after accounting for the person weight variable in the data, which indicates how many individuals in the US population are represented by a given individual in the IPUMS USA sample. Finally, personal health care spending per capita in thousands of dollars was obtained as an additional covariate in the models (Centers for Medicare & Medicaid Services, 2023).

**Stylized Facts**

Fig. 1 shows the total number of operational PDMPs in effect in each year of this study. In 2000, the first year in this analysis, there were 16 operational PDMPS in place. By 2014, there were 49 operational PDMPS in effect, leaving Missouri and the District of Columbia to be the only states without an operational PDMP. From 2002 to 2014, 33 states implemented an operational PDMP at a steady rate over these years, which the data of this analysis covers.

Fig. 2 plots the average total opioid overdose rate among states with and without an operational PDMP in effect by year. The trend of the states with no operational PDMP in effect from 2000 to 2014 appears to follow the trend of states with an operational PDMP in effect in an approximately parallel fashion. From 2000 to 2008, the average rate for the states with an operational PDMP was consistently higher by about 1.5 overdoses compared to those states with no operational PDMP. After 2014, the trends of the two groups begin to differ as the states with no operational PDMP in effect have a significantly higher overdose rate on average compared to those states with an operational PDMP in effect. However, it is important to note that the number of states with no operational PDMP in effect is decreasing over this time frame. By 2014, only 2 states had no operational PDMP in effect, so the average overdose rate for those states is based on the rates of only Missouri and the District of Columbia after 2014. The high overdose rates in the District of Columbia after 2014 are what is causing these two trends to diverge. Fig. 2 demonstrates that the average opioid overdose rates for states with and without an operational PDMP in effect have been very similar to each other since 2000 and that PDMPs have not dramatically changed the overdose rates in their respective state.

Fig. 3 plots the median overdose rate among the states in each year for the four categories of opioids in this analysis. The median total opioid overdose rate increased steadily from 2000 to 2012 and then rose greatly thereafter due to significant increases in overdose deaths involving synthetic opioids. The median overdose rates for methadone and the natural and semisynthetic opioid categories increased greatly during the 2000s but have not significantly increased since. The median methadone overdose rate has even decreased since 2010. During the 2010s the increased in the total opioid overdose rates can be attributed to the rise in heroin overdose deaths and the rise in synthetic opioid overdose deaths, largely due to illicitly manufactured fentanyl (Centers for Disease Control, 2022).

Fig. 4 provides a comprehensive overview of the distribution of the total opioid overdose rates across the 50 states and the District of Columbia. The table displays the quantile of opioid overdose rates, representing the values at which a particular percentage of states fall below for select years. Fig. 4 demonstrates that there has been a consistent rise in overdose rates observed across all quantiles, indicating that increases in average and median overdose rates are not only being driven by increased in rates in only some states. This indicates a widespread and escalating problem affecting all regions across the country.

**Empirical Regression**

The goal of this research paper is to compare the opioid overdose rates in states with an operational PDMP to states without an operational PDMP. This analysis uses a panel data model with state-year fixed effects to examine the association between having an operational PDMP in a given state and year and various opioid overdose death rates. This model treats states without an operational PDMP as control states and the differential timing of states creating operational PDMPs is used to estimate the effect of operational PDMPs on opioid overdoses. The panel data regression equations are of the following form:

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Where *Ys,* t is the given overdose death rate for state *s* in time *t*, *αs* are state-fixed effects, and *γt* are year-fixed effects. *PDMP* is a binary variable equal to 1 for a state in years after PDMP implementation and 0 otherwise. The vector of the covariates contains the following characteristics of a state-year pair: the average age, the percentage of the state with a bachelor’s degree or higher, the median income in thousands of dollars, the unemployment rate, the percentage of the state that identifies as white, and the personal health care spending per capita in thousands of dollars. The four overdose rates that will be used as dependent variables are the total opioid overdose rate, the heroin and synthetic opioid overdose rate, the natural, semisynthetic, and other opioid overdose rate, and the methadone overdose rate.

To assess the robustness of the findings, an alternative model was estimated for each of the overdose rates that did not include the covariates, and only included the state and year-fixed effects. These models are of the following form:



These alterative estimates aim to test the robustness and validity of the results by assessing if they hold under different conditions, or by not including potential confounding variables. Comparing the two models for each overdose rate will help to assess whether the relationships are driven by the variables of interest themselves or if they are influenced by the inclusion of other factors.

The coefficient of interest in these models is the coefficient for the *PDMP* variable, *β1*. *β1* can be interpreted as the association between the implementation of an operational PDMP and the opioid overdose death rate, after controlling for state fixed effects, year fixed effects, and the covariates in the model. Consistent with economic theory, it is expected that operational PDMPs are associated with lower overdose rates for all types of opioids. PDMPs are hypothesized to reduce levels of opioid misuse, mitigate opioid diversion, and deter individuals from resorting to illicitly manufactured opioids. Therefore, it is expected that the coefficient of *PDMP* will be negative, indicating a lower overdose death rate on average for states with an operational PDMP compared to those without one.

By including a fixed effects model with both year and state-fixed effects, the models control for unobserved time-varying and state-specific confounders that could influence the opioid overdose death rate. Robust standard errors are reported in each panel data model.

**4. Results**

Table 1 displays the results from estimating the panel data regression equation with state and year-fixed effects with the total opioid overdose rate per 100,000 people as the dependent variable. The estimates in Column (1) of Table 1 display the results without covariates. The *PDMP* coefficient of -1.241 suggests that states with an operational PDMP are estimated to have an average of 1.241 fewer opioid overdose deaths per 100,000. This coefficient is significant at the 1% level of significance. Using a robustness check of this estimate, Column (2) of Table 1 includes all the covariates. The additional control variables shrink the PDMP coefficient to -1.199, but the coefficient does remain statistically significant at the 1% level. The relatively small decrease in the magnitude of the coefficient of PDMP suggests that the fixed effects control for most differences between states and time periods.

Table 2 displays the results for the models using the heroin and synthetic opioid overdose rate per 100,000 as the dependent variable. Column (1) of Table 1 is based on the regression without covariates, and the estimate of the *PDMP* coefficient is -1.196, which is very similar to the coefficient of -1.109 in the model with the covariates. Both estimates are significant at the 1% level. It is also important to note that these estimates are very similar to the estimates in Table 1, which makes sense because heroin and synthetic opioid overdoses account for the vast majority of opioid overdoses in many of the years of this analysis.

The results from estimating the PDMP effect on the the natural, semisynthetic, and other opioid overdose death rate are displayed in Table 3. Column (1) of Table 1 shows the *PDMP* coefficient estimate without covariates, which is -0.285, and is significant at the 10% level. After adding the covariates, the estimate jumps to -0.364, which is significant at the 5% level. This estimate suggests that states with an operational PDMP are estimated to have 0.364 fewer natural, semisynthetic, and other opioid overdose deaths per 100,000 people on average. Given that the average overdose death rate of this opioid category over all the states and years is 4.51 overdoses per 100,000, this decrease is still sizeable.

The estimates of the operational PDMP effect on the methadone overdose rate per 100,000 are displayed in Table 4. The PDMP estimate in Column (1) in Table 4 of -0.056 suggests that states with an operational PDMP experience 0.056 fewer methadone overdoses per 100,000 people on average compared to states without an operational PDMP. However, this estimate is not statistically significant. The estimate in Column (2) of Table 4 with the covariates shrinks the estimate to -0.048, and this estimate is also not statistically significant. Table 5 displays the same estimates in Tables 1-4 for the models with the covariates.

**5. Conclusion**

Earlier research shows that PDMPs likely are effective at reducing opioid-related deaths as well as the number of opioids prescribed, however, the results of the various studies often conflict with each other. This paper attempts to provide another estimate of the effect that PDMPs have on the opioid overdose death rate by using different covariates, as well as using different interaction variables and aspects of PDMPs to explore the ways in which they are or are not effective. PDMPs provide healthcare providers with reliable information on the prescriptions of their patients, which likely leads to lower levels of opioid diversion and opioid misuse. To account for a wide time period, I account for demographic factors in each state and year, and I use state-level PDMP operation status as the treatment variable.

The preliminary results of my study suggest that states with operational PDMPs are expected to see reductions of about 1 opioid-related overdose per 100,000 people per year. For a state like California, with a population of about 39 million, this would mean that we would expect to see about 415 fewer opioid-related overdoses annually after a PDMP become operational. Future studies could improve upon the results of this paper by collecting more data on health-related covariates such as the number of naloxone medications provided or other opioid-related efforts in states.

Creating well-funded and well-functioning PDMPs is unlikely to solve the opioid epidemic, but the evidence of a significant reduction in the opioid overdose death rate after PDMP implementation is an economically significant reduction and demonstrates that PDMPs are an effective way at starting to combat this problem. Policymakers should consider improving funding for PDMPs and improving interstate operability. These results also suggest that other related efforts to combat the epidemic may also be worthwhile.

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Figure 1

A graph showing the number of states with an operational pdmp

Description automatically generated with low confidence

Figure 2

A graph showing the number of opioid overdose rate

Description automatically generated with low confidence

Figure 3

A picture containing text, plot, line, diagram

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Figure 4

A screenshot of a graph

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