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Enhancing and Leveraging the West Virginia's Prescription Drug Monitoring Program (PDMP) for Public Health Surveillance and Clinical Decision Making: A Case Study

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Abstract

West Virginia (WV) has struggled with an overdose epidemic for many years and continues to have the highest overdose death rate in the nation. However, through successful collaboration between the WV Board of Pharmacy and the WV Department of Health via its Violence and Injury Prevention Program, WV has improved data quality, enhanced program development and implementation, and developed strategies to address the overdose epidemic. This multiagency collaboration plays an important role in addressing the overdose epidemic and promotes lasting interagency relationships. One strategy is overcoming barriers to maximizing and utilizing the Prescription Drug Monitoring Program, or PDMP. This strategy allows for better understanding of a patients' prescription history and ensures safer prescribing practices. Additionally, this strategic partnership facilitates the use of PDMP data for epidemiologic studies and public health surveillance, which results in sustainable analyses and dissemination of actionable data that is now driving public health action in WV.

Keywords

collaboration; PDMP; public health surveillance

The National Setting in 2020

During a twenty-one year time-period from 1999–2020, the United States (U.S.) saw a significant increase in drug-related overdose deaths, with 932 364 reported fatalities.[1] In 2020, there were a total of 91 799 drug overdose deaths in the U.S., a 30% increase from

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Conflicts of Interest

Authors declare no conflicts of interest

the 2019 total, marking a shift in the leading cause of deaths for Americans.[1,2] In fact, Americans were 2.1 times more likely to die from an opioid overdose than a motor vehicle crash in 2020.[3]

During this drastic increase in drug-related overdose deaths, there was a shift from prescription opioid-related deaths to illicit drug-related deaths. Prescription opioids contributed to a large proportion of overdose deaths early in the epidemic and through the early 2010's when it shifted to heroin and then to synthetic opioids like illicitly manufactured fentanyl in 2014.[4] This shift from prescription opioid-related deaths to illicit drug-related deaths is an issue across the country as almost every state has observed increases in mortality rates in the last nine years. As reported in 2016, several states in the Appalachia region (MD, KY, OH, PA, TN, WV) had age-adjusted drug overdose rates significantly higher than the national rate.[4] Despite this shift in the epidemic, prescription opioid misuse remains a critical driver within the epidemic and contributes significantly to the total death burden experienced in states.[2] Consequently, the ability to prevent overdose deaths by preventing inappropriate patient or prescriber behaviors is a critical intervention in reducing prescription opioid misuse/overdose.

A key strategy to combat the opioid overdose epidemic is the utilization of Prescription Drug Monitoring Programs (PDMP). Implemented in every state, PDMPs are secure online databases that track controlled substance prescriptions written by clinicians and dispensed by pharmacists in a state or jurisdiction. PDMP data can help identify outlier prescribing practices and patient behaviors that increase risk of accidental overdose.

Importance of the Problem in West Virginia

At the epicenter of the opioid overdose epidemic is West Virginia. Since 2013, West Virginia has led the nation in the rate of drug overdose deaths.[5] The age-adjusted rate for drug-related overdose death in West Virginia is nearly three times greater than the rate of the U.S. The rate increased from 32.2 per 100 000 population in 2013 to 81.4 per 100 000 population in 2020, a 152.8% increase as shown in Figure 1.[6]

Early in the opioid overdose epidemic, overdose deaths in West Virginia were driven primarily by prescription opioids. This issue gained national attention when the Charleston Gazette-Mail newspaper reported that from 2007 to 2012 drug wholesalers shipped 780 million hydrocodone and oxycodone pills to the state.[7] This publication was significant because it started a national conversation around prescriptions and their impact on the opioid crisis. Another article published by the Washington Post in 2019 stated that West Virginia had the highest number of pills per capita at 67 opioid pills per person during the same time period.[8]

Furthermore, illicit drug use in West Virginia continues to be a major contributor to opioid-related overdose deaths, driven primarily by illicitly manufactured fentanyl. From 2013 to 2020, among all overdose deaths, the percent of deaths attributed to illicit fentanyl use increased from 7% to 75% while heroin-related overdose deaths decreased from 27% to 11% respectively.[6]

Not only is the opioid overdose epidemic affecting public health, but it is also creating an economic burden in the state. A study conducted by the American Enterprise Institute concluded that in 2016, West Virginia lost $4 793 per capita, nearly $8.8 billion in gross domestic product (GDP), due to the opioid crisis.[9] The burden on the economy continues to increase as the total number of deaths in the state rise. Just a year later in 2017, West Virginia had an estimated $7 247 per capita lost, which is just over $9.6 billion in GDP.[10]

Tackling the Opioid Overdose Epidemic: A Partnership of Federal and State Programs

In 2014, the Centers for Disease Control and Prevention's (CDC), National Center for Injury Control and Prevention (NCIPC) funded five states with the highest drug overdose burden in the U.S. for the Prescription Drug Overdose: Boost for State Prevention (BOOST) cooperative agreement (Figure 2). The West Virginia Violence and Injury Prevention Program (WVVIPP) received the CDC funding to address problematic opioid prescribing, diversion, and overdose. The aim of the cooperative agreement was to strengthen three prevention strategies: 1) enhance and maximize PDMPs, 2) improve public insurer mechanisms, and 3) evaluate state-level laws and policies around the opioid overdose epidemic (BOOST for States 2014).[11] Applicants were required to perform activities that supported at least two of the aforementioned three prevention strategies. West Virginia selected strategies 2 and 3, as the West Virginia Board of Pharmacy (WVBOP) was responsible for the governance of the PDMP not the West Virginia State Health Department.

Following BOOST funding, CDC expanded its investment in state-level interventions for preventing prescriptions drug overuse, misuse, abuse, and overdose through an additional funding opportunity, the Prescription Drug Overdose – Prevention for States (PDO-PfS)[12], in August 2016 (Figure 2). Under this new project, the enhancement and maximization of the PDMP was a required prevention strategy. This funding presented an opportunity for the WVVIPP to advance its surveillance efforts utilizing PDMPs to address the misuse and inappropriate prescribing of opioid pain relievers, as unsafe prescribing patterns were a known driver of the opioid crisis.[13]

Therefore, one of the initial goals required to meet the objectives of the CDC funding was to establish a relationship conducive to collaboration between WVVIPP and WVBOP. At first, the PDO-PfS Principal Investigator worked to create trust through multiple internal meetings and communications. These efforts served to establish a common language and understanding of each agency's goals and motivations, as well as secure commitments from the senior levels of both the West Virginia State Health Department, the Department of Health and Human Resources Bureau for Public Health (DHHRBPH), and the WVBOP. As a result, an alliance was established between the WVVIPP and WVBOP with strategic objectives that included building capacity for and championing the use of the PDMP for public health surveillance, making the PDMP easier to use, and utilizing the PDMP to inform clinical decision making.

As part of its formative evaluation, the WVVIPP identified several barriers that hindered the accomplishment of its public health goals. The first barrier was surveillance capacity with

regards to staffing and resources. The state did not have sufficient surveillance capability to determine where to focus its intervention efforts. This problem was not unique to West Virginia. According to a 2015 report by Safe States Alliance from 2009 – 2015, state injury and violence programs had reported a decrease in access to data professionals such epidemiologists and statisticians.[14] The second barrier was access to the PDMP. As established in the West Virginia Code, the PDMP authority was (and continues to be) held by the WVBOP; the WVVIPP did not have access to data contained within the PDMP database due to regulations placed by the state legislature. The third barrier was organizational capacity. The WVVIPP and the WVBOP were severely understaffed; WVVIPP had one full-time equivalent (FTE) staff and WVBOP had one FTE staff dedicated to this work.

Initially, the WVBOP provided WVVIPP access to aggregate de-identified data because there was not sufficient manpower to analyze the data to report on indicators required by the cooperative agreement within the WVBOP. These indicators included: 1) number and rate of opioid prescriptions per 1 000 state residents, 2) percent of patients receiving greater than an average of 90 morphine milligram equivalents (MME) per day, 3) rate of patients seeing more than 5 doctors and going to more than 5 pharmacies within a 6-month period, 4) percent of patients who were opioid naïve and prescribed long acting opioids, 5) overlapping opioid prescriptions, and 6) overlapping benzodiazepine and opioid prescriptions. WVVIPP was only able to provide basic statistics which caused strain between the agencies because WVVIPP was unable to provide CDC with timely reports, and therefore was not able to evaluate the effectiveness of the reporting indicators.

After that, the WVVIPP and WVBOP, in partnership with the CDC, crafted an innovative staffing plan that addressed both agencies' needs. Utilizing federal funds, WVBOP and WVVIPP worked to increase their capacity by hiring two epidemiologists and a data analyst and were embedded in the WVVIPP within the DHHRBPH. These WVBOP employees work under the direct supervision of the Executive Director at the WVBOP but worked closely with the principal investor for the CDC cooperative agreement. This new paradigm has served to generate a strong symbiotic relationship between WVBOP and the DHHRBPH. This arrangement dramatically increased the analytic capability of both agencies and to this day, continues to underpin West Virginia's capacity to conduct internal analyses of PDMP data for public health surveillance and planning. Consequently, in 2017, the West Virginia Controlled Substance Monitoring Program (CSMP), West Virginia's PDMP, became the core component of the State's strategy to address prescription drug abuse and diversion (Figure 2).

Maximizing and Enhancing the Utility of PDMPs

Collaboration between the WVBOP and WVVIPP was vital to the enhancement and maximization of the PDMP in West Virginia. A major success of this collaborative partnership was making the PDMP easier to access and use. From 2014 to the end of 2018 there was a 364% increase in prescriber registration with the PDMP and a 187% increase among dispenser registration. This increase in access was a result of activities by both WVBOP and WVVIPP. The WVBOP was able to use the PDO-PfS funding to

enhance communications with providers through the PDMP vendor. Additionally, efforts by the WVVIPP Academic Detailing team may have had an impact in the increase in PDMP registrations, as the teams would provide education about the importance of using the PDMP for clinical decision making. Furthermore, utilization of the PDMP continued to grow as well. During 2014, there were almost 910 000 queries between prescribers and pharmacies, and just over 1 600 000 queries in 2018, a 76% increase. Then in 2019, West Virginia successfully implemented integration of Electronic Health Records with the PDMP (Figure 2). This drove the utilization of the PDMP substantially, with queries increasing 558% with over 10 million queries made from West Virginia providers in 2020.

Historically, the PDMP in West Virginia was used as a clinical tool by prescribers and pharmacies primarily for patient treatment. Now, it is being used as both a clinical and public health surveillance tool. Utilizing PDMP data to produce the CDC indicators from the PDO-PfS cooperative agreement provided a framework by which the WVBOP began assessing the opioid overdose epidemic. For example, the number of opioid prescriptions filled per 1 000 population showed an overall downward trend in the number of opioid prescriptions dispensed, with a substantial decrease from 2014 (the start of the project period) to 2020 (Figure 3). Despite opioids being the most prescribed controlled substance in the state (Table 1), there was a substantial decrease in opioid prescription dispensations as seen in Figure 3. Furthermore, using the PDMP as a public health surveillance tool allowed for analysis to be done at the county level to identify high-burden areas in the state. Figure 4 is an example of the type of data visualization the WVBOP began to develop and disseminate. It shows the high-burden areas of the state where there are higher rates (in red) of opioid prescriptions being dispensed per 1 000 population of each individual county. Likewise, heat maps were created for each of the six PDO-PfS indicators. Once high-burden counties were identified, WVVIPP Academic Detailing Team traveled to these areas to distribute clinically relevant and rigorously sourced information regarding CDC and state opioid prescribing guidelines and effective utilization of the PDMP.

Effective utilization of the PDMP can result in a reduction in potentially harmful prescribing patterns and can allow for opportunities for intervention. From September 2017 through 2018, the WVVIPP Academic Detailing Team conducted over 360 visits with 276 individual prescribers in 20 West Virginia counties. During 2019, 653 visits were conducted with 401 individual prescribers in 43 West Virginia Counties. Due to the COVID-19 pandemic in 2020, the Academic Detailing visits were done on a very limited bases and were done virtually. From April 1, 2020 to November 12, 2020, there were 117 visits completed. An analysis of preliminary data from these periods compared to the immediately preceding years indicates significant aggregate reductions in 1) total opioid doses; 2) the percentage of patients who received a high-dosage opioid prescription; and 3) the percentage of patients who received overlapping opioid and benzodiazepine prescriptions. Significant reductions in total opioid prescriptions, doses and average day supply have been noted as well but may be attributable to other programmatic changes.

Directional Strategies Leading to Implementation

The majority of PDMPs across the country employ a national vendor for their PDMP needs. West Virginia, however, employs a local provider. An advantage presented by having a homegrown vendor is the flexibility to access the full range of PDMP data in response to changing needs. Another key benefit is the relative ease in cooperative communication and the ability to create and subsequently analyze unique datasets from PDMP vendor servers. The relationship between WVBOP and the local PDMP vendor allows for timely access to data which enhances the ability to use the PDMP as a public health surveillance tool.

West Virginia's data quality has been more than adequate to effectively inform prescribing practice and serve as accurate indicators in epidemiological surveillance. The WVBOP epidemiologists utilize SAS coding developed and verified by CDC, which is also used across other states' PDMPs, to run the required indicators. To facilitate continuous quality improvement in West Virginia, the epidemiology team works closely with the PDMP vendor and provided feedback on any data issues that are discovered. These issues are promptly addressed which limits any potential delays in data dissemination. Moreover, empirical data informs ongoing assessment of the WVBOP/WVVIPP partnership's purpose, goals, and targets. For example, the findings from the analysis of the PDO-PfS indicators led to the development of monthly PDMP surveillance reports that are available on the WVVIPP and WVBOP websites, as well as annual profiles for each individual county in West Virginia. County profiles include data for the county and the state and shows how the counties rank compared to all other counties in the state as well as a narrative around what each indicator means. With data from 2014–2020, the county profiles are routinely disseminated to local health departments, the West Virginia Single State Authority for Substance Abuse Services, and State Prevention Lead Organizations.

Increasing the timeliness of actionable data, interdisciplinary communication, and data sharing clearly became strategic objectives of the DHHRBPH and WVBOP. Consequently, the West Virginia Legislature created the Office of Drug Control Policy (ODCP) within the West Virginia Department of Health and Human Resources in 2017. A primary function of the ODCP is to facilitate the exchange of necessary data and information with the various Departments/Bureaus within State Government, the Administrator of Courts, the Poison Control Center and the WVBOP for the purpose of making decisions regarding the allocation of public health and educational resources.

Accordingly, and in coordination with the ODCP, the WVBOP began linking PDMP data with health outcome data, i.e., emergency medical services (EMS) ambulance transports, to identify suspected non-fatal overdoses. Linkage and analyses continue to occur prior to this information being made available to inform the clinical decision making of end-users. Likewise, the WVBOP began to inform the policy and practice of state agencies to support more productive integration of PDMP and health outcome data into multifaceted environments of public health surveillance systems.

An example of the success of these partnerships was the development of the report titled, "*2016 West Virginia Overdose Fatality Analysis: Healthcare Systems Utilization, Risk*

Factors, and Opportunities for Intervention". In late 2017, Dr. Rahul Gupta, a former West Virginia State Health Officer, and Bureau for Public Health Commissioner, tasked the DHHRBPH Office of Maternal, Child and Family Health with leading a shared effort to gain new insight into overdose-related deaths and the relative risks faced by the state's different populations. This process involved the sharing of multiple health system data sources including PDMP, vital statistics, behavioral health, EMS, Medicaid eligibility/claims, and corrections. One of the purposes of this innovative epidemiological investigation was to identify opportunities for intervention.

As a result, the fatality analysis informed a rapid response plan for the West Virginia Governor and Legislature. This plan included activities for prevention, early intervention, treatment, overdose reversal, supporting families and recovery. Strategies specific to prescribing included:

- Expanding the authority of medical professional boards and public health officials to address inappropriate prescribing of pain medications, and
- Limiting the duration of initial opioid prescriptions.

Moreover, the fatality analysis played a significant role in the passage of two pieces of legislation during the 2018 legislative session, Senate Bills 272 and 273. Passage of these laws gave the WVBOP the authority to identify not only patient activity, but also problematic prescribing.

Epilogue and Future Directions

West Virginia was beginning to see some progress in combating the overdose epidemic when data on 2018 fatal drug overdoses indicated a slight decrease in the total number of overdose deaths for the first time since 2012. However, the rate increased slightly in 2019 and then substantially in 2020 with an increase of 54%. There are several factors that may have contributed to this significant increase, including the COVID-19 pandemic. This trend was not unique to West Virginia as many states across the country showed similar patterns. On December 20, 2020, CDC issued a Health Alert Network (HAN) advisory that described an increase in fatal drug overdoses across the U.S. during the COVID-19 pandemic, specifically with synthetic opioids. The study found that deaths attributed to synthetic opioids increased by 38.4% during the 12-month period from June 2019 to May 2020.[15] Additionally, cocaine-related deaths increased by 26.5% during the same time period.[15] Within this report, CDC offered four recommendations: 1) expand the provision and use of naloxone and overdose prevention education, 2) expand access to and provision for treatment for SUD, 3) intervene early with individuals at the highest risk for overdose, and 4) improve detection of overdose outbreaks for specific illicit drugs.[15]

One strategy that WVBOP had already developed before this CDC advisory was announced, specifically regarding the third recommendation, was the implementation of a suspected non-fatal overdose notification system within the PDMP in 2018 (Figure 2). When a patient is identified as having a suspected non-fatal overdose, information about the overdose incident including the date and county where the overdose occurred is added to the patient's PDMP profile. Additionally, WVBOP implemented an automated email notification in

January 2019 (Figure 2). Providers who issued any controlled substance during the 60 days prior to the overdose incident will receive an email notification informing them of their patients suspected non-fatal overdose. These notifications provide guidance for prescribers on how to appropriately take care of their patients. Rather than discontinue care for the patient, prescribers are encouraged to follow guidelines, including the CDC Opioid Prescribing Guidelines,[16] and the Safe and Effective Management of Pain Guidelines,[17] and provide options and referrals for treatment, for substance use disorder (SUD). The state of West Virginia has implemented the other recommendations in an effort to address and combat the overdose epidemic. Further investigation and study are needed to fully understand the impact COVID-19 may have had on fatal drug overdoses within the state.

Conclusion

West Virginia continues to be at the forefront of the opioid crisis in the nation. Establishing and maintaining state-level collaborations and partnerships is essential to effectively address public health emergencies, which are often overlapping, as with the overdose epidemic and the COVID-19 pandemic. Utilizing funding made available by CDC, the WVVIPP facilitated the necessary connection and collaborative relationship with the WVBOP that was needed to identify high-risk prescribing and patient behaviors that drive overdose deaths. Some of these prescriber and patient behaviors that can be captured utilizing PDMP data include but are not limited to identifying abnormal opioid prescribing or dispensing, identifying patients who may be doctor shopping, identifying patients who have overlapping opioid and benzodiazepine prescriptions, or flagging opioid prescriptions for high doses. Consequently, West Virginia substantially increased its capacity to combat the overdose epidemic. Because much of the work is done behind the scenes, it is sometimes difficult to measure the true impact of the WVBOP/WVVIPP partnership. Nonetheless, this strategic alliance facilitates the use of PDMP data for epidemiologic studies and public health surveillance. Moreover, relevant and sustainable analyses and dissemination of actionable data is now driving public health action in West Virginia and continues to inform the design of algorithms for identifying high-risk prescribing activity in the state, which has been made possible by establishing effective collaborations and state-level partnerships.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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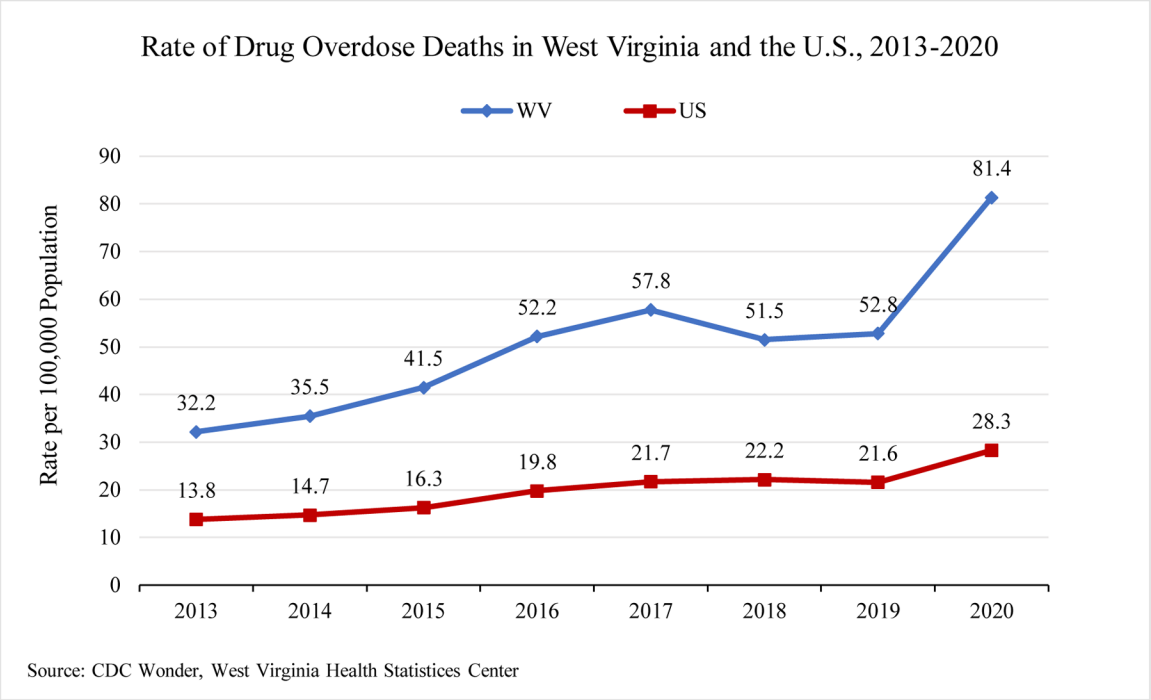

Figure 1.
Rate of Drug Overdose Deaths in West Virginia and the US, 2013–2020

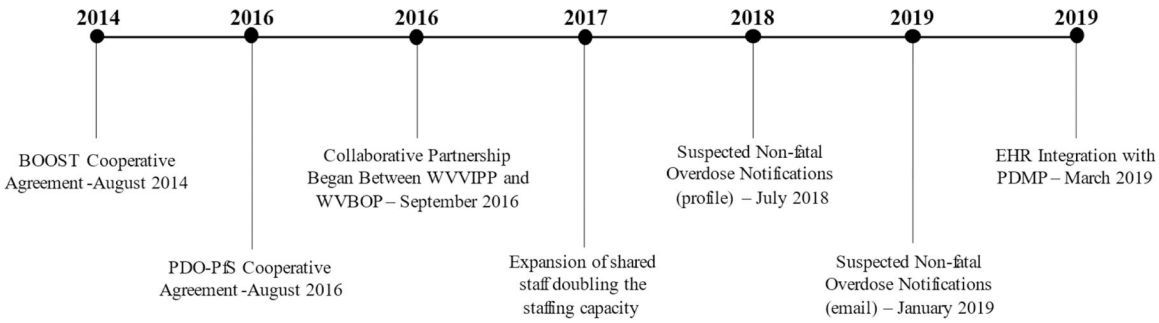

Figure 2.
Timeline of collaborative partnership between the WVBOP and WVVIPP

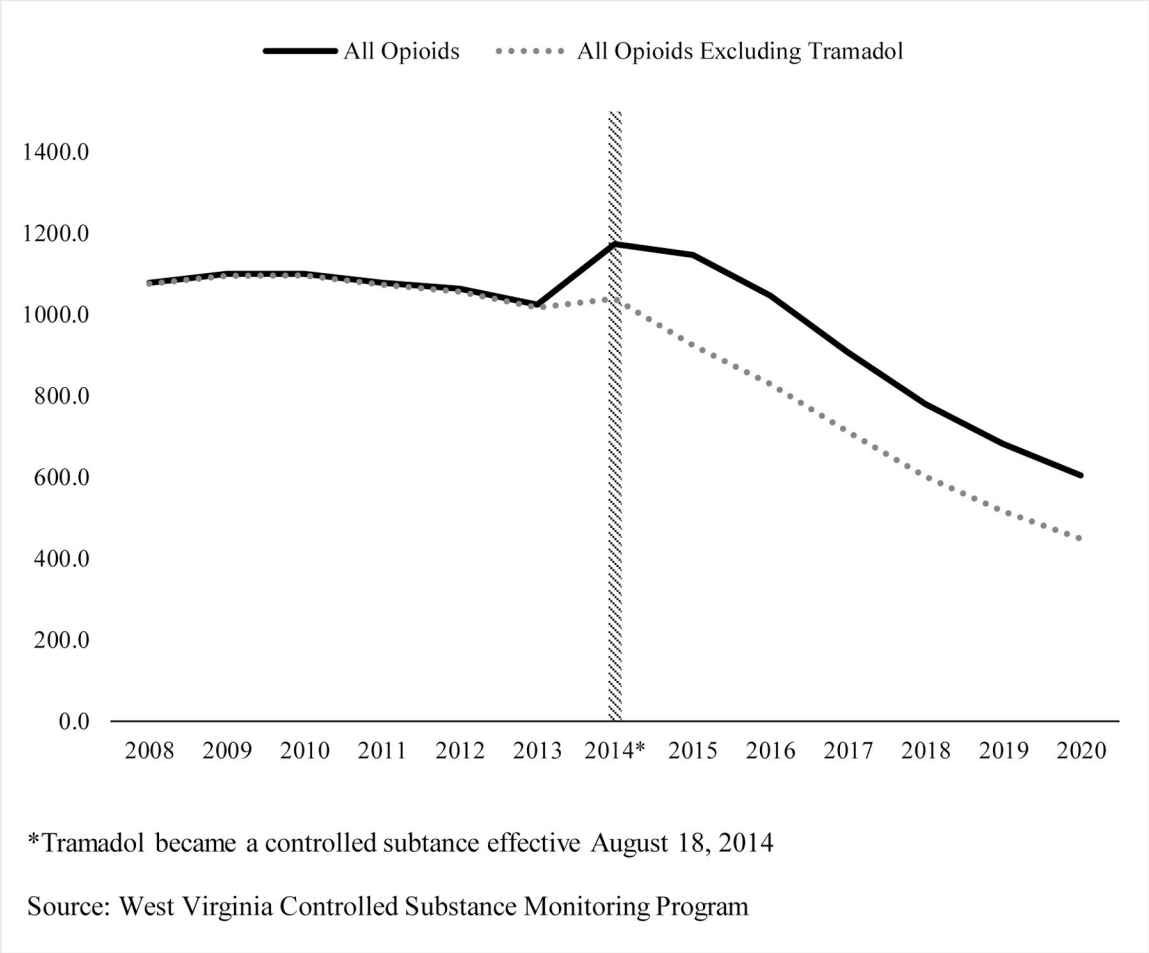

Figure 3:
Rate of opioid prescriptions filled per 1,000 population, WV, 2008–2020

Table 1.

Distribution of prescriptions filled by drug category/type, West Virginia, 2020

Drug Category	*n*	%	Rate per 100,000 population
Opioids	1,125,582	23%	63,065.34
Benzodiazepines	897,432	19%	50,282.30
Gabapentin	602,362	12%	33,749.80
Buprenorphine	574,229	12%	32,173.53
Other	495,504	10%	27,762.64
Stimulants	386,905	8%	21,677.94
Zolpidem	179,928	4%	10,081.20
Total	**4,261,942**		

Source: West Virginia Controlled Substance Monitoring Program