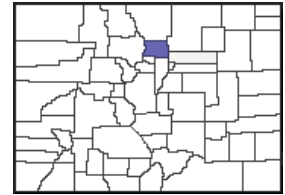


Boulder County Prescription Drug Profile

Population in 2015: 319,177

Health Statistics Region: 16

County Designation: Urban



Overview

Nationally and in Colorado, opioid use disorders have emerged as a significant public health concern. Nearly 224,000 Coloradans misuse prescription drugs each year. In nearly every year for the last 15 years, Colorado's drug overdose rate was significantly higher than the national rate and opioid related overdoses represent a large portion of those deaths. In Colorado, prescription opioid related overdoses have quadrupled since 2000.⁸

This profile summarizes controlled substance prescriptions that Boulder County residents received from 2014-2016, prescribing practices and patient behaviors, population-level healthcare encounters and deaths related to opioid overdose among Boulder County residents. This information is from several sources: The Colorado Prescription Drug Monitoring Program (PDMP), emergency department visit and hospital discharge databases and death certificates.

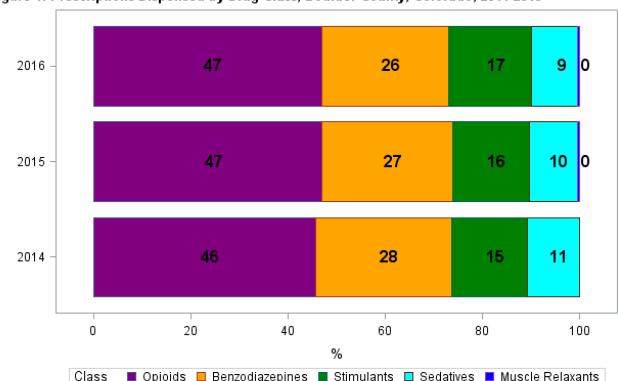
The Colorado PDMP is a secure database that collects information on schedule 2-5 controlled substance prescriptions dispensed by Colorado pharmacies. The PDMP compiles information on patients, prescribers, pharmacies, and the medications prescribed and dispensed. Prescribers and pharmacists registered with the Drug Enforcement Administration (DEA) and the PDMP can access patient information to make informed decisions and ensure appropriate prescribing and dispensing practices. The PDMP is available to the following Colorado licensed individuals: pharmacists, physicians, physician assistants, advanced practice nurses, dentists, podiatrists, optometrists and veterinarians.¹

In 2014, Colorado legislators passed a bill that aligned Colorado's PDMP with best practice strategies², such as mandating registration for prescribers and pharmacies, daily reporting by pharmacies for dispensed controlled substances, allowing prescribers to delegate access to PDMP records and allowing the Colorado Department of Public Health and Environment to access PDMP data to provide population-level results. In compliance with this legislation this report describes population-level data on the prescribing and dispensing of controlled substances, with a focus on opioid prescriptions (also known as opioid analgesics or pharmaceutical opioids), from the Colorado PDMP for Boulder County residents.

Dispensed Prescriptions

Controlled substances collected by the PDMP are categorized into five classes: opioids, benzodiazepines, stimulants, sedatives and muscle relaxants. Figure 1 illustrates the amount of schedule 2-4 controlled substances by drug class dispensed to Boulder County residents from 2014-2016. Opioids represented a majority of prescriptions dispensed, followed by benzodiazepine prescriptions. The percentage of benzodiazepine and sedative prescriptions decreased while the percentage of stimulant prescriptions increased in the three-year period.

Figure 1: Prescriptions Dispensed by Drug Class, Boulder County, Colorado, 2014-2016



Schedule 2-4 Controlled Substances
Muscle Relaxants were not included as a class in 2014
Data Source: Colorado Prescription Drug Monitoring Program, Colorado Department of Regulatory Agencies
Analysis by: Colorado Department of Public Health and Environment, 2016



Prescription Recipients

The attributes related to controlled substances differ greatly for each county due to variation in prescribing and dispensing practices within the state. Table 1 describes general characteristics of controlled substance prescriptions dispensed to Boulder County residents. In 2016, Boulder County prescribers wrote 75 percent of the prescriptions dispensed to county residents and 81 percent of prescriptions were dispensed within the state. However, the county of residence may differ from the counties where the prescriptions were obtained. The remaining prescriptions written to Boulder County residents were written and dispensed in neighboring counties.

Table 1: Characteristics of Controlled Substance Prescriptions Dispensed, Boulder County, Colorado, 2014-2016

Characteristics	2014	2015	2016
Number of Prescriptions Dispensed	377,938	379,148	366,614
Number of Unique Patients	74,753	75,328	74,175
Number of Unique Prescribers	8,930	9,683	9,772
Number of Unique Pharmacies	701	773	788
Estimated Median Distance Traveled by the Patient to the Prescriber (miles)	4.3	5.0	5.0
Estimated Median Distance Traveled by the Patient to the Pharmacy (miles)	2.1	2.1	2.3

Schedule 2-4 Controlled Substances

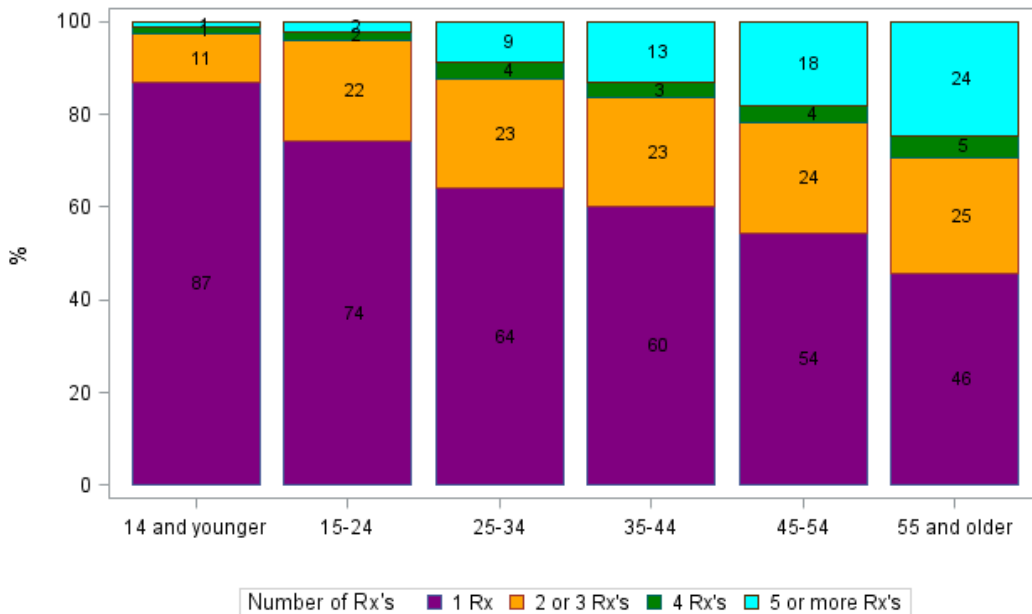
In 2014 NPI was used to identify unique prescribers and pharmacies as DEA numbers were not available until 2015

Data Source: Colorado Prescription Drug Monitoring Program, Colorado Department of Regulatory Agencies

Analysis by: Colorado Department of Public Health and Environment, 2016

Although some might have legitimate reasons for receiving multiple prescriptions, research has suggested that increasing numbers of prescriptions per individual are associated with increased risk of substance use disorders.³ Figure 2 describes the number of opioid prescriptions per patient, by age group. In 2016, the number of prescriptions per recipient ranged from 1 to 149 (median=1.0; mean=3.4) and the number of opioid prescriptions per patient increased with age.

Figure 2: The Number of Opioid Prescriptions Dispensed Per Patient by Age Group, Boulder County, Colorado, 2016



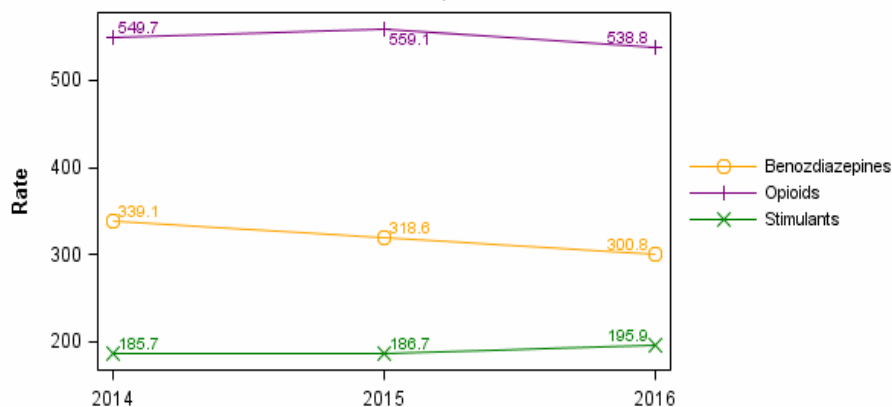
Schedule 2-4 Opioid Prescriptions

Data Source: Colorado Prescription Drug Monitoring Program, Colorado Department of Regulatory Agencies

Analysis by: Colorado Department of Public Health and Environment, 2016

Prescription rates indicate the volume of controlled substance prescriptions per 1,000 residents. Figure 3 shows prescription rates for three major drug classes by year and Table 2 shows aggregated state level data. Prescription rates in Boulder County generally mirrored state trends with opioid prescription rates peaking in 2015 and decreasing benzodiazepine prescription rates. Compared to the state, Boulder County had elevated stimulant prescription rates.

Figure 3: Prescription Rates per 1,000 Residents by Major Drug Class, Boulder County, Colorado, 2014-2016



Drug Class	2014	2015	2016
Opioids	754.2	795.7	765.4
Benzodiazepines	337.3	326.8	316.2
Stimulants	142.1	147.7	160.5

Schedule 2-4 Controlled Substances

*2016 population estimates were not available, therefore 2015 estimates were used

Source: Vital Statistics Program, Colorado Department of Public Health and Environment and the Colorado Prescription Drug Monitoring Program, Colorado Department of Regulatory Agencies
Analysis by: Colorado Department of Public Health and Environment, 2016

Population-Level Indicators of Prescribing Practices and Patient Behaviors

The information on controlled substances in the PDMP is useful in identifying prescribing practices and patient behaviors that can increase risk for overdose.^{2,4} According to the CDC, potential risk factors for prescription drug misuse include high-dose prescribing, multiple provider episodes, long duration opioids, and overlapping opioid and benzodiazepine prescriptions.⁴ Understanding these risk factors may help providers better assist their patients in pain management while also protecting their health and safety. These measures are provided in Table 3 and explained in further detail on the following page.

Table 3: High Risk Prescribing Practices and Patient Behaviors, 2014-2016

PDMP Indicator	2014		2015		2016	
	Boulder	CO	Boulder	CO	Boulder	CO
Percent of patients receiving more than 90 morphine milligram equivalents	11.8%	10.3%	10.55	8.9%	9.9%	8.7%
Percent of patients receiving more than 120 morphine milligram equivalents	7.3%	6.3%	6.5%	5.5%	6.0%	5.2%
*Rate of multiple provider episodes per 100,000 residents	20.6	60.8	15.8	43.1	11.0	32.0
Percent of patients prescribed long duration opioids who were opioid-naïve	21.2%	16.0%	20.9%	15.3%	20.2%	13.5%
Percent of patient prescription days with overlapping opioid prescriptions	25.0%	22.3%	24.1%	21.6%	23.5%	21.2%
Percent of patient prescriptions days with overlapping opioid and benzodiazepine prescriptions	11.4%	12.1%	11.5%	11.9%	10.9%	11.3%

Schedule 2-4 Controlled Substances

Excludes Buprenorphine and other drugs commonly used for treatment

*2016 rates are calculated with 2015 population estimates as 2016 estimates are not yet available

Annual rates are based on the average of two biannual rates; Annual percentages are based on average of quarterly percentages

Data Source: Vital Statistics Program, Colorado Department of Public Health and Environment and the

Colorado Prescription Drug Monitoring Program, Colorado Department of Regulatory Agencies

Data Analysis by: Colorado Department of Public Health and Environment, 2016

PDMP Indicator Definitions

Percent of Patients Receiving High Dosage Prescriptions

Morphine is considered the standard measure for managing pain and is therefore used as a reference for calculating opioid prescription doses. Higher dosages are associated with an increased risk of opioid use disorder and overdose.^{4,5} In 2014, the Colorado Quad-Regulator Boards of Dental, Medical, Nursing, and Pharmacy suggested limiting dosages to less than 120 mg morphine equivalents (MME) per day to reduce negative outcomes⁵, and in 2016, the Center for Disease Control and Prevention's (CDC) prescribing guidelines recommended opioid dosages should not exceed 90 MME per day.⁶ Although there is variability regarding safe dosage thresholds, assessing dosage can help to identify problematic prescribing practices and patients who may be at risk for substance use disorders.



Table 4: Estimated Doses for Commonly Prescribed Opioids

	Oxycodone	Hydrocodone
90 MME	60 mg	90 mg
120 MME	80 mg	120 mg

Rate of Multiple Provider Episodes (MPEs)

The use of multiple prescribers and pharmacies is associated with high risk drug-related behaviors and adverse events. The number of prescribers and pharmacies a patient visits is often used as a proxy measure for “doctor shopping”.^{4,6} The CDC definition was used for this report which defines MPE as receiving opioid prescriptions from five or more prescribers and pharmacies in a six-month period.



Percent of Patients Prescribed Long Acting/ Extended Release (LA/ER) Opioids who were Opioid-Naïve

Opioid naïve patients may be more vulnerable to adverse effects of LA/ER opioids such as respiratory depression and overdose. For this metric, opioid naïve refers to patients who did not fill an opioid prescription in the previous 60 days. Time-scheduled opioids are associated with greater total average daily dosages and increased risk for long term use.^{4,6}



Percent of Patient Prescription Days with Overlapping Prescriptions

Both benzodiazepines and opioids are central nervous system depressants that can compromise the respiratory system. Benzodiazepines enhance the effects of opioids so the concurrent use of benzodiazepines and opioids can increase the risk of adverse events.^{4,6,7} This indicator measures the duration of overlapping prescriptions. Longer duration of overlapping prescriptions may raise concerns of the potential drug interactions and resulting side effects.



Morbidity and Mortality

While many people benefit from opioids for pain management, increased use of prescription pain relievers has led to increases in associated morbidities and mortalities, including opioid use disorder and overdose. Opioid overdose related emergency department (ED) visits, hospitalizations and fatal overdoses have increased nationally and in Colorado over the last decade.^{3,4,8}

Emergency Department Visits Related to Prescription Opioid Overdose

From 2012-2014, Coloradans made 2,404 visits per year to ED's related to prescription opioid poisoning.⁹ Throughout the state, ED visit rates per 100,000 county residents ranged from 4.1 in Routt County to 96 in Huerfano County (Figure 4). In Boulder County from 2012-2014, there were 87 ED visits involving prescription opioids. Of the 64 Colorado counties, 28 were suppressed due to small sample sizes. Boulder County had the one of the lowest ED visit rates in the state.

Boulder County Opioid ED Visit Statistics

Rank: 30/36

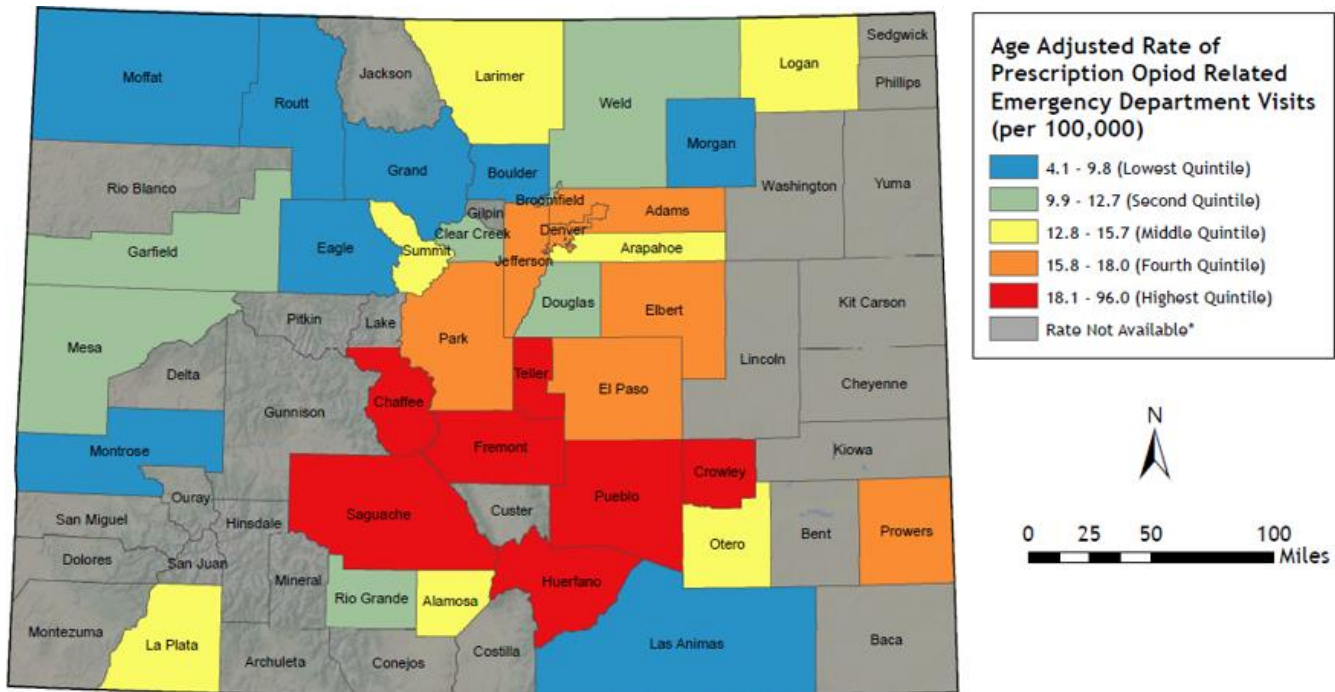
Count: 87

Crude Rate: 9.4

Age-Adjusted Rate (CI):
9.3 (7.3-11.3)

Colorado Age-Adjusted Rate (CI): 15.2 (14.6-15.8)

Figure 4: Age-Adjusted Opioid Analgesic ED Visit Rates by County, Colorado, 2012-2014



Hospitalization Data Related to Prescription Opioid Overdose

In 2013, 21 percent of the drug poisoning hospitalizations in Colorado were related to prescription opioid poisoning.⁹ Figure 5 shows hospitalization rates involving prescription opioid poisonings from 2012-2014. In Colorado, opioid related hospitalization rates per 100,000 county residents ranged from 5.1 in Clear Creek County to 59.7 in Huerfano County. Boulder County experienced 112 hospitalization visits related to prescription opioids in the three-year period. Excluding the 19 counties where data were suppressed, Boulder County ranked 37th out of the 45 remaining counties.

Boulder County Opioid Hospitalization Statistics

Rank: 37/45

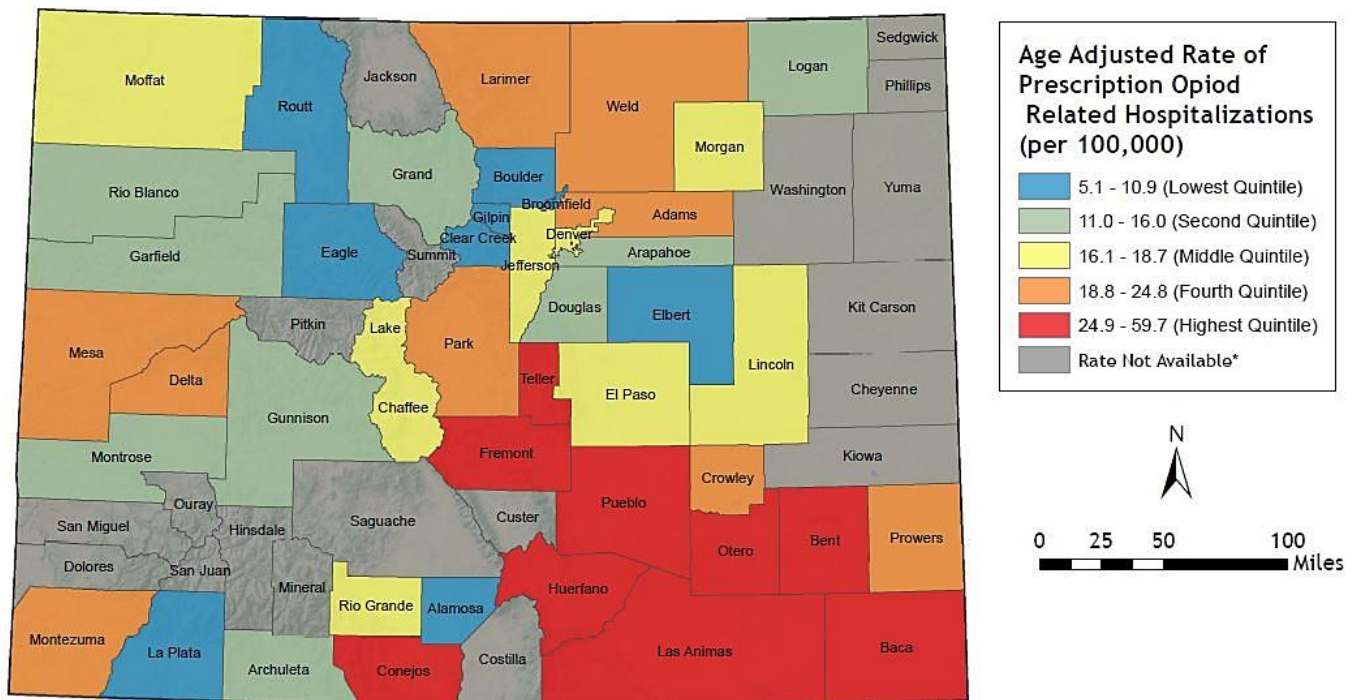
Count: 112

Crude Rate: 12.1

Age-Adjusted Rate (CI): 10.9 (10.0-14.1)

Colorado Age-Adjusted Rate (CI): 18.6 (18.9-20.1)

Figure 5: Age-Adjusted Opioid Analgesic Hospitalization Rates by County, Colorado, 2012-2014



Death Certificate Data Related to Prescription Opioid Overdose

In Colorado in 2013, 35 percent of all drug poisoning deaths involved prescription painkillers. Opioid related poisoning deaths have tripled from 1.9 in 2000 to 5.8 per 100,000 in 2015.^{8,9}

Figures 6 and 7 describe prescription opioid mortality rates in Colorado from 2013-2015. Opioid mortality rates ranged from 2.7 per 100,000 in Park County to 13.5 per 100,000 in Las Animas County (Figure 6). Boulder County was one of 26 counties where data were available. Boulder County had the 18th highest opioid-related death rates placing it in the second quintile.

Boulder County Opioid Death Statistics

Rank: 18/26
 Count: 43
 Crude Rate: 4.6
 Age-Adjusted Rate (CI): 4.3 (3.0-5.6)
 Colorado Age-Adjusted Rate (CI): 5.8 (5.4-6.1)

Figure 6: Age-Adjusted Opioid Analgesic Death Rates by County, Colorado, 2013-2015

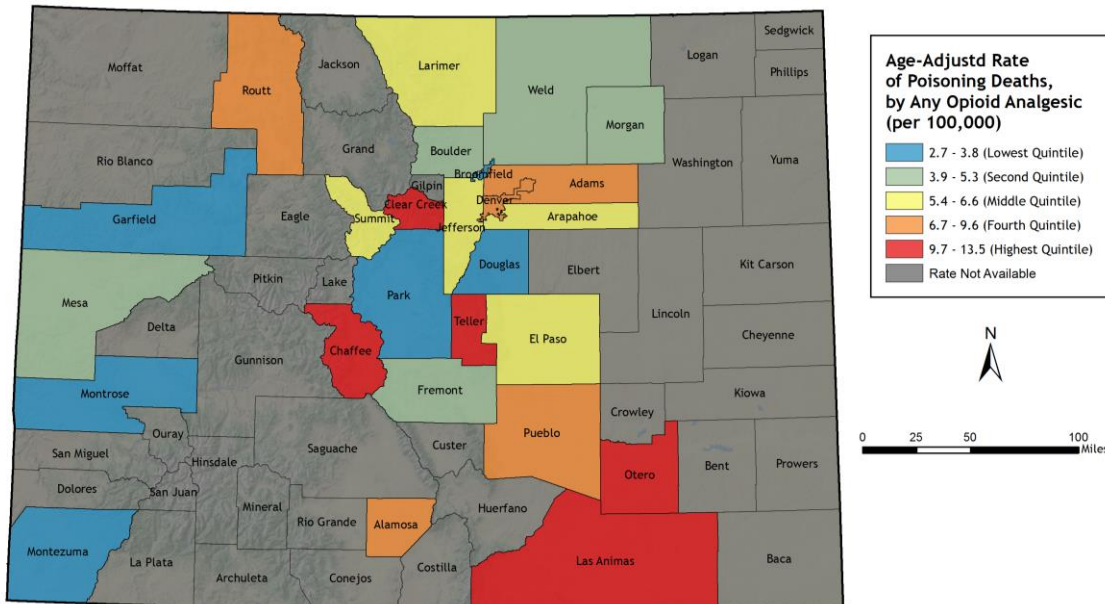
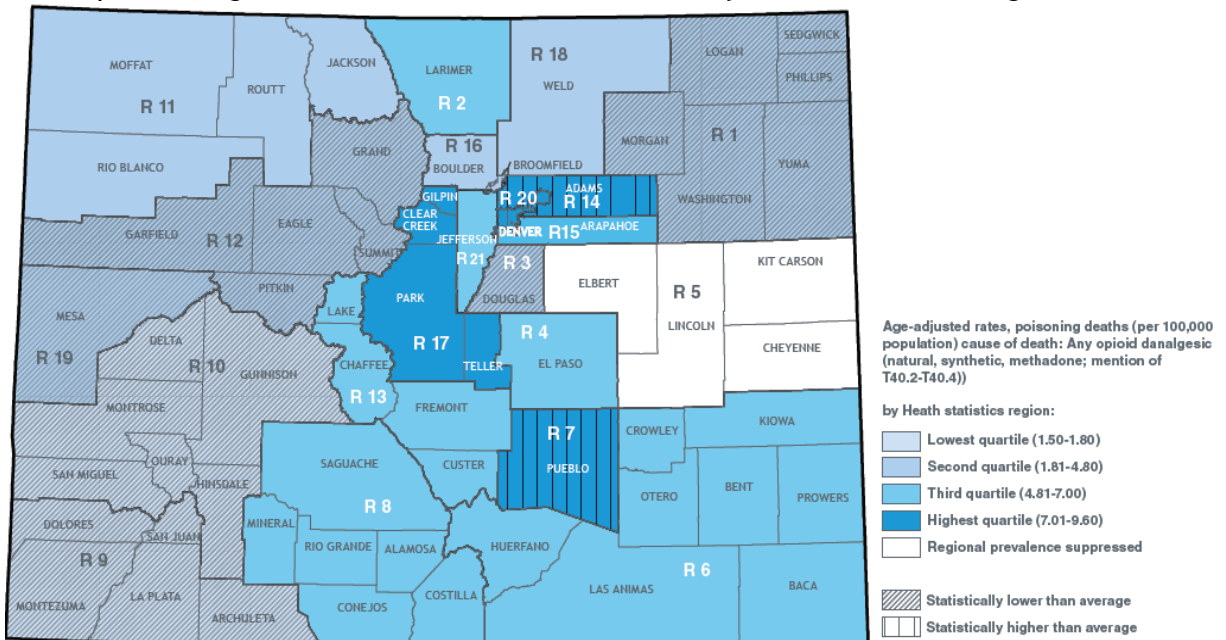


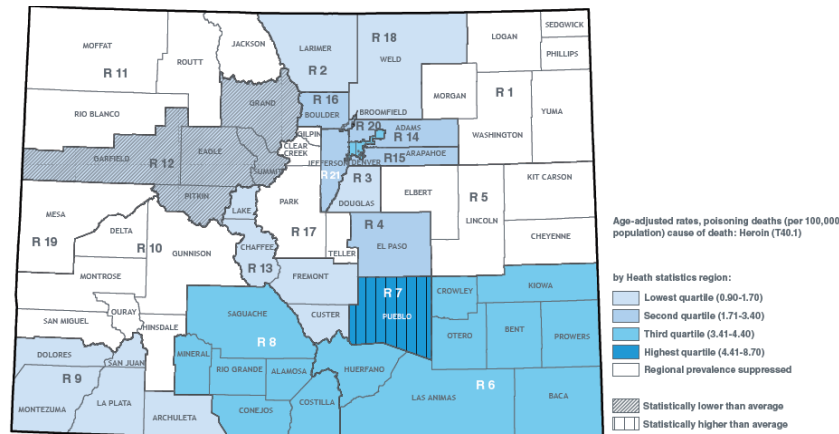
Figure 7: Age-Adjusted Opioid Analgesic Related Overdose Death Rates by Health Statistics Region, Colorado, 2013-2015



Heroin-Related Overdose Death Rates

The prevalence of heroin, an illicit opiate, is also increasingly prevalent in Colorado. As heroin use increases, so do the adverse effects associated with heroin use and addiction. The rate of heroin related deaths has increased from 0.8 deaths per 100,000 in 2000 to 2.9 per 100,000 in 2015. According to the Denver Metro Treatment Client Survey, 70 percent of survey respondents reported that prescription painkillers played a role in their decision to use heroin.¹⁰ Figure 8 shows heroin related mortality rates in Colorado by Health Statistics Region from 2013 to 2015⁸.

Figure 8: Age-Adjusted Heroin Related Overdose Death Rates by Health Statistics Region, Colorado, 2013-2015



Data Limitations

Data in this report should be interpreted with caution for several reasons. First, the accuracy of the indicators based on PDMP data is limited by the completeness and quality of the data when entered into the system. Another limitation of using the PDMP for population-level analyses is that it does not include provider type or information on the patient's medical condition. In addition, the indicators do not capture whether the dispensed medications were taken as prescribed or taken by the prescribed patient. This report references specific thresholds for indicators using absolute values which results in identifying patients at risk for substance use disorder or overdose, whether or not that is true. It should be noted that not all individuals who breach the threshold are at risk for substance use disorder or overdose and those below the threshold may still be at risk. Therefore, interpretation of these measures are limited due to the lack of contextual information regarding the prescriptions. A more comprehensive approach and complete evaluation of the economic, environmental and societal influences is necessary to appropriately interpret PDMP data and put the opioid epidemic into context.

Hospitalization and emergency department data are obtained through medical billing codes, which vary in their completeness. These records may not provide all information regarding the specific drug or drugs that were associated with a non-fatal overdose. Further, the required billing codes for hospitalization and emergency department visits changed in 2015, and as CDPHE continues to refine the case definitions with the new coding scheme, only 2012-2014 data were used in these analyses. These data represent health care encounters, not individuals.

Lastly, limitations of death certificate data may result in reporting bias. Deaths reported as multi-drug toxicity lack the specificity to know exactly what substance caused death. CDPHE does not collect toxicology reports for unintentional overdose deaths and therefore cannot determine whether drugs that were not indicated on the certificate represent negative test results or whether the drug was not part of the testing.

Conclusion

The PDMP is a critical tool in the fight to protect health and safety of Coloradans while supporting clinical practice. Although use of the PDMP is not mandatory for prescribers, in 2014 Colorado physicians queried 414,549 patient records. In 2016, the number of queries increased 64 percent to 681,348, demonstrating the value of the PDMP as a clinical decision making tool.

Prescription drug misuse is a public health crisis and the PDMP is one tool that can be used to evaluate initiatives designed to change patient and provider behavior to reduce prescription drug misuse and the associated adverse health outcomes. However, the misuse of prescription drugs is a multidimensional problem. A balanced approach to this work includes an understanding of the need to preserve access to medications for the management of care and meeting patient expectations while decreasing the misuse and diversion of controlled substances.

Additional Data Resources

Violence and Injury Prevention Network: <http://vipreventionnetworkco.com/p/prescription-drug-overdose.html>
Colorado Consortium for Prescription Drug Abuse Prevention: <http://www.corxconsortium.org/>
Colorado Prescribing Guidelines: https://www.colorado.gov/pacific/dora/Medical_News
CDC Prescribing Guidelines: <http://dx.doi.org/10.15585/mmwr.rr6501e1>
Take Meds Seriously: <http://takemedseriously.org/>
Rise Above Colorado: <https://www.riseaboveco.org/>

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Contact Information

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