



## Opioid Prescribing Practices in Montana, 2012-2017

**Background:** Drug overdose is the third leading cause of injury related death in Montana. To combat drug-related morbidity and mortality, the state's Department of Public Health and Human Services (DPHHS) partnered with the Montana Board of Pharmacy to analyze data from the Montana Prescription Drug Registry (MPDR) to assess opiate-related prescribing practices and to support policies and programs to promote appropriate prescribing of opiate medications.

**Methods:** MPDR data from 2012 to 2017 were analyzed with using SAS 9.4 with code provided by CDC's Opioid Overdose Indicator Support Toolkit (Version 2.0). Standardized dosage information was derived using the CDC-provided 2018 MME conversion file to calculate Morphine Milligram Equivalents (MME). Rates for drugs were calculated per 1,000 residents and broken down by age group and sex.

**Results and Conclusion:** From 2012 to 2017, an overall decrease in opioid prescribing was seen. On average, women were prescribed more opioids than men, though men were more likely to be prescribed a higher dosage than women. Older age groups were prescribed more opioids at higher dosages than younger age groups overall. The most commonly prescribed opioid was short-acting Hydrocodone, though starting in 2014 prescriptions have been in decline, while Tramadol prescriptions have increased proportionately. Buprenorphine prescriptions also saw a major increase in 2017. The proportion of patients on high doses of opioids (average daily Morphine Milligram Equivalents greater than 90) has declined between 2012 and 2017.

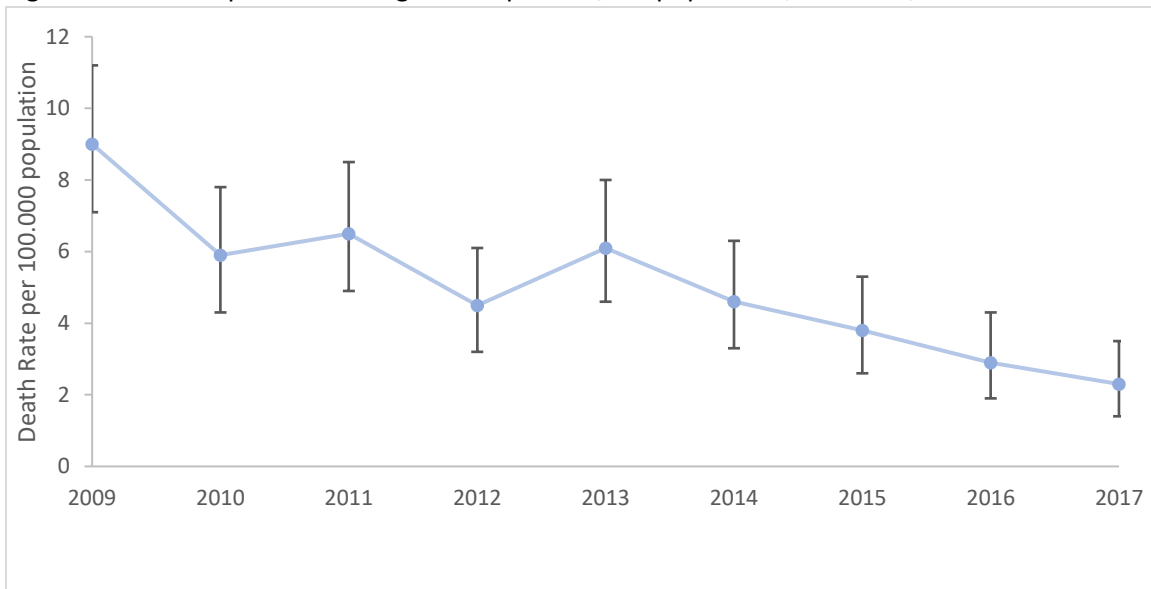




## Background

Drug overdose deaths are on the rise nationally and are the third leading cause of injury-related death in Montana, accounting for 345 deaths between 2015 and 2017. Twenty-five percent of these deaths were due to opioids. Unlike national trends, Montana’s death rate from opioid overdose has declined since peaking in 2009, from 8.9 deaths per 100,000 people to 2.3 deaths per 100,000 people in 2017 (Figure 1). Montana’s overall overdose death rate has remained relatively stable, with 11.7 drug overdose deaths per 100,000 people in 2017, this also was much lower than the overdose death rate of 21.7 per 100,000 people seen for the rest of the country.<sup>1</sup>

Figure 1. Rate of Opioid Poisoning Deaths per 100,000 population, Montana, 2009-2017

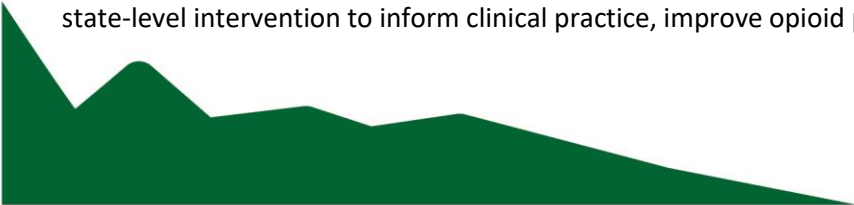


Though this downward trend has been occurring, it is important to remain aware of the dangers of opioids, especially as deadly fentanyl analogues have been detected in autopsies conducted by the Montana State Crime Lab in the last few years.

To increase the state’s capacity to conduct opioid-related morbidity and mortality surveillance along with implementing interventions to address this issue, the Injury Prevention Program at Montana’s Department of Public Health and Human Services (DPHHS) was awarded a 3-year \$900,000 CDC grant for the Data-Driven Prevention Initiative. Primary grant activity included the development of a state strategic plan for combating substance use in the state. One goal within this plan included partnering with the Montana Board of Pharmacy to analyze data from the Montana Prescription Drug Registry (MPDR) to assess opiate-related prescribing practices and to support policies and programs to promote appropriate prescribing of opiate medications. MPDR data was provided to the Injury Prevention Program for analysis in 2018.

### *The Montana Prescription Drug Registry*

According to the CDC, Prescription Drug Monitoring Programs (PDMPs) like the MPDR represent a promising state-level intervention to inform clinical practice, improve opioid prescribing, and protect at-risk patients.





The MPDR was authorized by the Montana Legislature in 2011 and became functional in November 2012 as an online tool to provide a list of controlled substance prescriptions to health care providers to improve patient care and safety.<sup>2</sup> All pharmacies holding an active Montana license, both in state and out of state, are required to report to the MPDR. They must submit detailed prescription information on all controlled substances, Schedule II, III, IV and V drugs, dispensed to Montana patients.<sup>3</sup> As of September 2018, the information must be reported by close of the next business day of dispensing. Prior to this, reporting had to occur within 8 days of dispensing.<sup>4</sup> Pharmacies under the auspices of the Indian Health Service began voluntarily reporting filled prescriptions in 2014, and the Veterans Administration in April 2016.<sup>5</sup>

**Methods**

MPDR data provided by the Montana Board of Pharmacy were analyzed through a memorandum of understanding between DPHHS and the Department of Labor and Industry. All prescriptions dispensed by pharmacies licensed in Montana from 2012 through 2017 were included in the data.

A probabilistic linkage program developed by the Centers for Disease Control and Prevention, Link Plus (Version 2.0), was used to link MPDR records by patient name, sex, and birthdate. Cases that were not exactly matched were manually reviewed. Unique identifiers were then assigned to each individual.

Analyses were run using SAS 9.4 with code provided by CDC’s Opioid Overdose Indicator Support Toolkit (Version 2.0).<sup>6</sup>

Standardized dosage information was derived using the CDC-provided 2018 MME conversion file to calculate Morphine Milligram Equivalents (MME).<sup>7</sup>

Rates for drugs were calculated per 1,000 residents and broken down by age group and sex. Yearly population estimates for Montana residents were taken from the Bridged Race Population Estimates produced by the National Center for Health Statistics.<sup>8</sup>

- Data elements used (provided and derived)
- Patient ID
  - Patient birth date
  - Patient state
  - Patient zip code
  - Patient gender
  - Prescription fill date
  - Days of supply
  - Prescription metric quantity
  - Prescription drug name

**Results**

*Drug Types and Rates*

Montana saw an overall decrease of 4.1% from 2012 to 2017 in opioid prescription rates when excluding buprenorphine, which is predominantly used in the treatment of opioid use disorder and not as an analgesic (Table 1). This overall downward trend was most pronounced from 2012 to 2016; 2017 saw an increase in the prescribing rate for nearly all age groups and both sexes.

Across all years, older age groups had higher rates of opioid prescribing, with those 45+ years old filling more than one opioid prescription per person across all years recorded (Figure 2). Those in age group 55+ also had an overall increase in opioid prescription rate during the study period, while younger age groups had an overall decline (Table 1). The greatest decrease in opioid prescription rates was seen in the 18-24 age group.

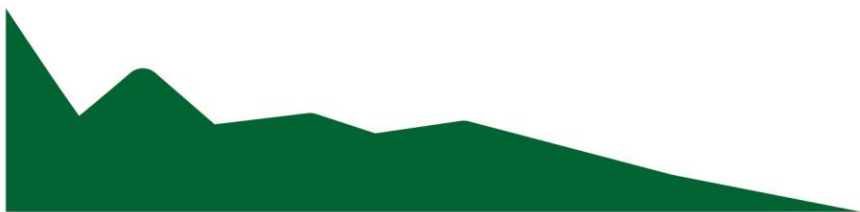
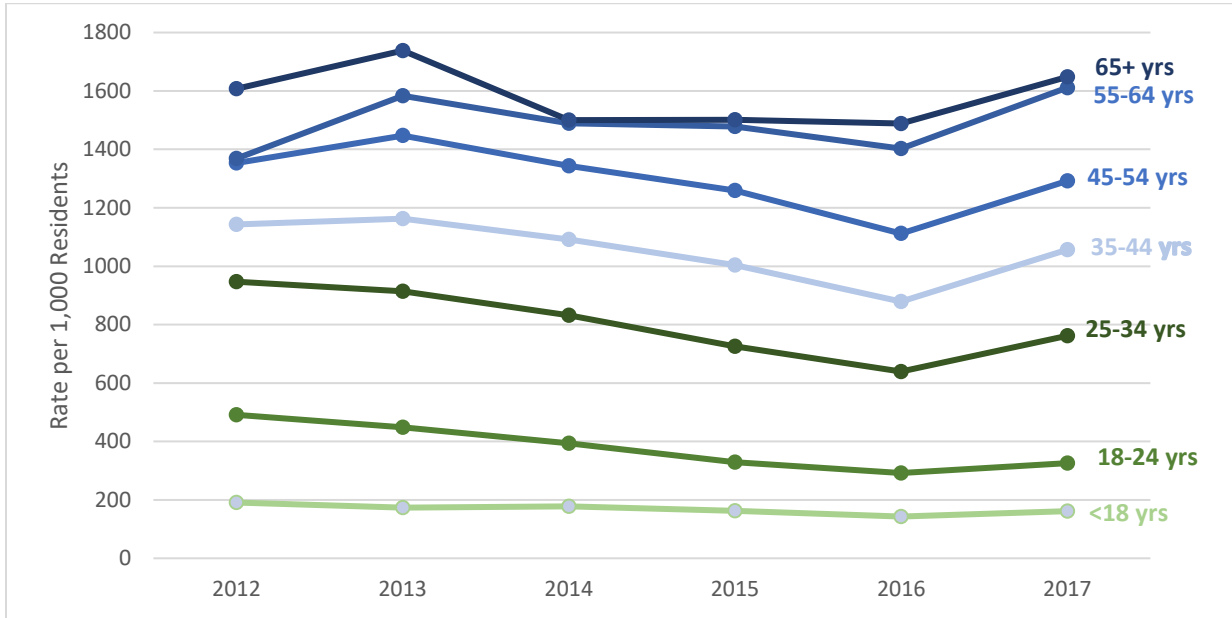
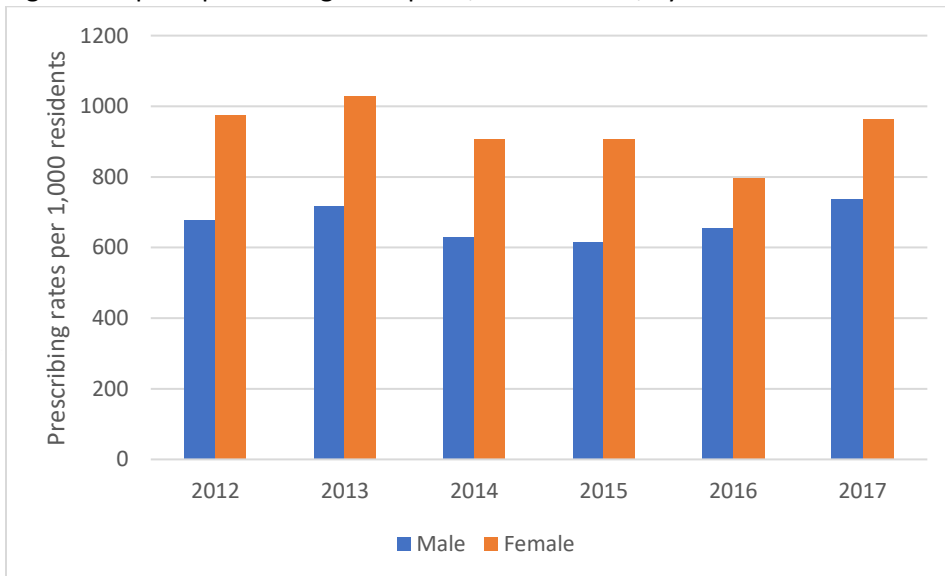


Figure 2. Opioid prescribing rates per 1,000 residents, by age group—Montana Prescription Drug Registry, 2012-2017



Women filled more opioid prescriptions than men, with an average of 259 more prescriptions per 1,000 residents filled each year from 2012 to 2017 (Figure 3). However, where women saw an overall decrease in prescription rates of 1.2% during the study period, men saw an increase of 8.7% (Table 1).

Figure 3. Opioid prescribing rates per 1,000 residents, by sex—Montana Prescription Drug Registry, 2012-2017

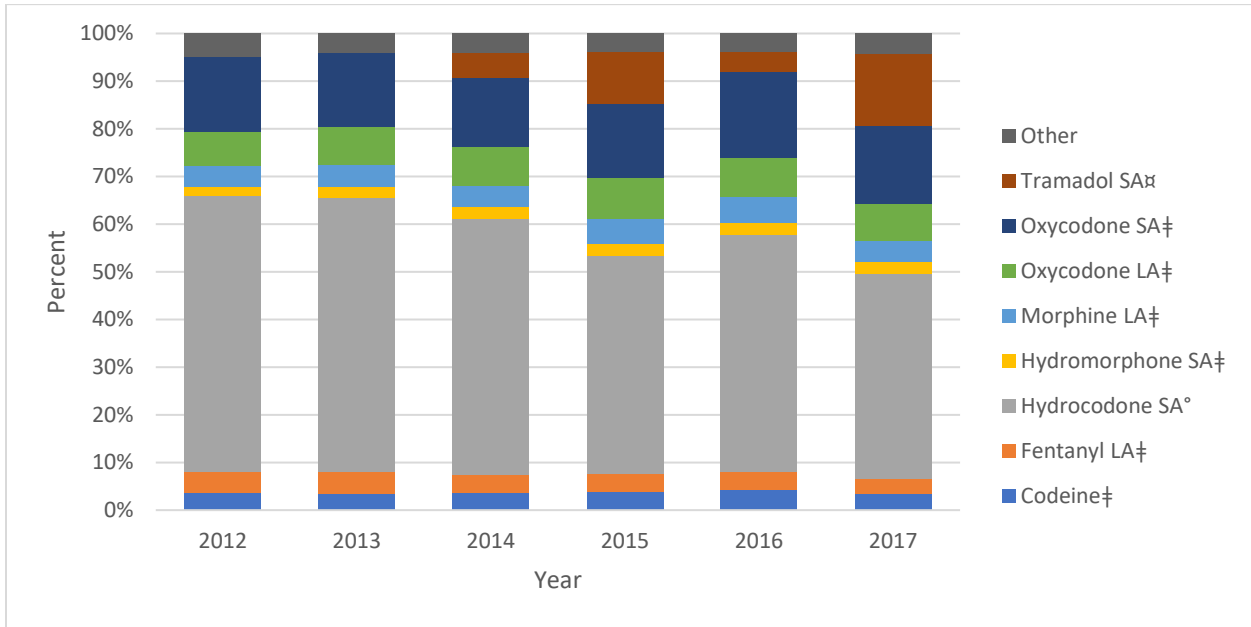


The most commonly filled opioid in Montana was short-acting Hydrocodone, though prescriptions dropped by 28% over the study period. In 2012, short-acting Hydrocodone represented 56% of opioid prescriptions, whereas it represented 40% of prescriptions in 2017. Starting in 2014, Tramadol prescriptions increased from 5% to 14% of all opioid prescriptions (Figure 4).



The only other drug with a noted change in number of prescriptions filled was Buprenorphine. While remaining relatively steady from 2012 to 2016, the number of Buprenorphine prescriptions increased dramatically in 2017 (Figure 5).

Figure 4. Distribution of opioid prescriptions, by type of drug\*—Montana Prescription Drug Registry, 2012-2017



**Abbreviations:** LA = long-acting opioid formulation; SA = short-acting opioid formulation.

“Other” includes types of opioids with minimal use (defined as <3% on average over 2012-2017). Includes Butorphanol, Fentanyl SA, Hydrocodone LA, Hydromorphone LA, Levorphanol, Meperidine, Methadone, Morphine SA, Opium, Oxymorphone LA, Oxymorphone SA, Pentazocine, Propoxyphene, Tapentadol LA, Tapentadol SA, Tramadol LA.

‡ Schedule II drug

° Schedule II drug, changed from Schedule III in 2014

⌘ Schedule IV drug

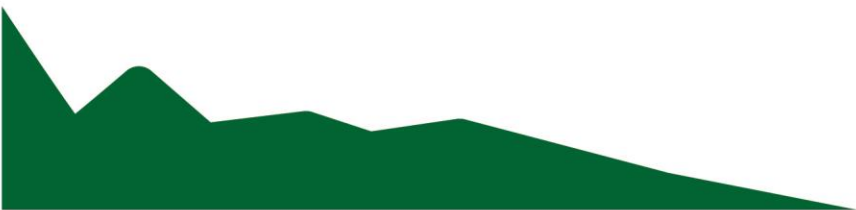
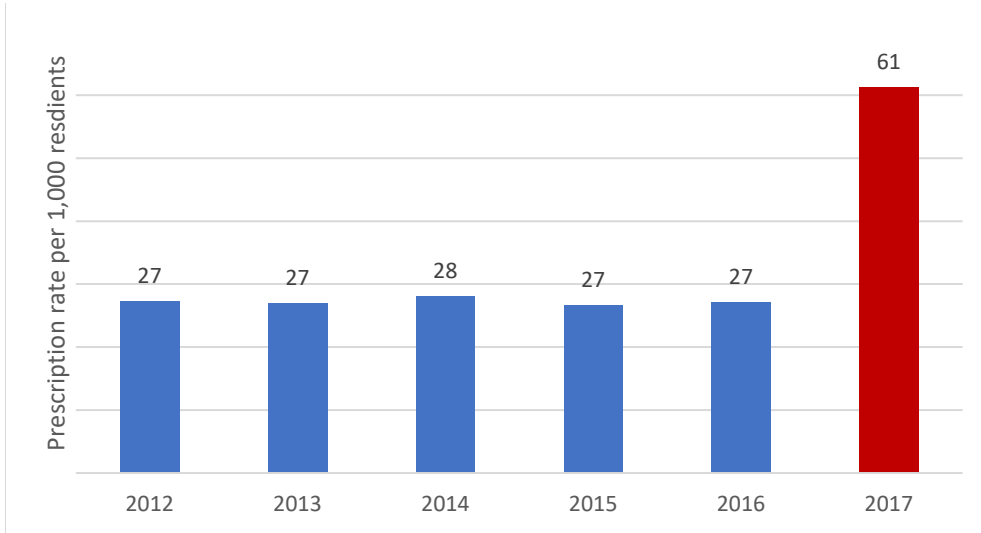




Figure 5. Buprenorphine prescription rate per 1,000 residents--Montana Prescription Drug Registry, 2012-2017



*Average daily MME and high MME*

In order to compare different opioids by a standard measure, researchers use “morphine milligram equivalents.” Morphine milligram equivalents (MME) are “the amount of morphine an opioid dose is equal to when prescribed, often used as a gauge of the abuse and overdose potential of the amount of opioid that is given at a particular time.”<sup>10</sup>

In the 2016 guidelines put forth by the CDC on opioid prescribing, clinicians were recommended to prescribe the lowest effective dose of an opioid and were cautioned against increasing dosages to  $\geq 90$  MME/day without careful justification. There is “now an established body of scientific evidence showing that overdose risk is increased at higher opioid dosages.”<sup>11</sup>

Overall, the average daily MME prescribed to Montanans declined from 2012 to 2017 by 22.6% (Table 2). Average daily MME was highest among older age groups, likely reflecting patients who have been on opioids for longer periods of time or individuals with a larger burden of chronic diseases than younger age groups (Figure 6). The MPDR includes prescriptions filled for individuals in palliative care and cancer treatment who tend to be older and may have higher MMEs. Though women receive more opioid prescriptions, men have on average higher daily MMEs prescribed (Figure 7). This may be due to men, on average, being larger than women, and thus needing higher dosages to have the same degree of pain relief. A greater decrease in MME/day was seen among men than women, with declines of 25.5% vs 20.6% respectively (Table 2).

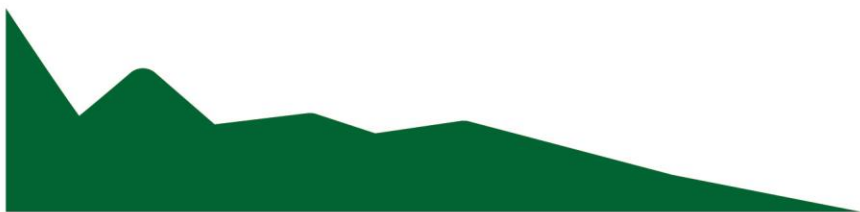




Figure 6. Mean daily MME by age—Montana Prescription Drug Registry, 2012-2017

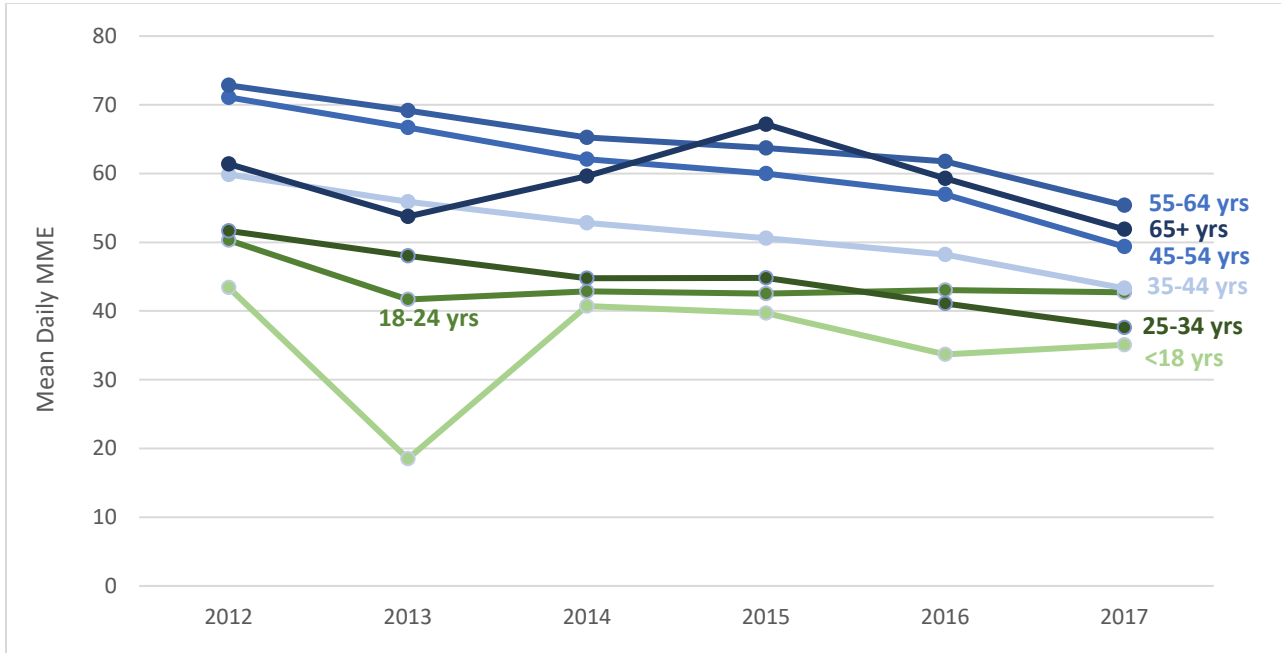
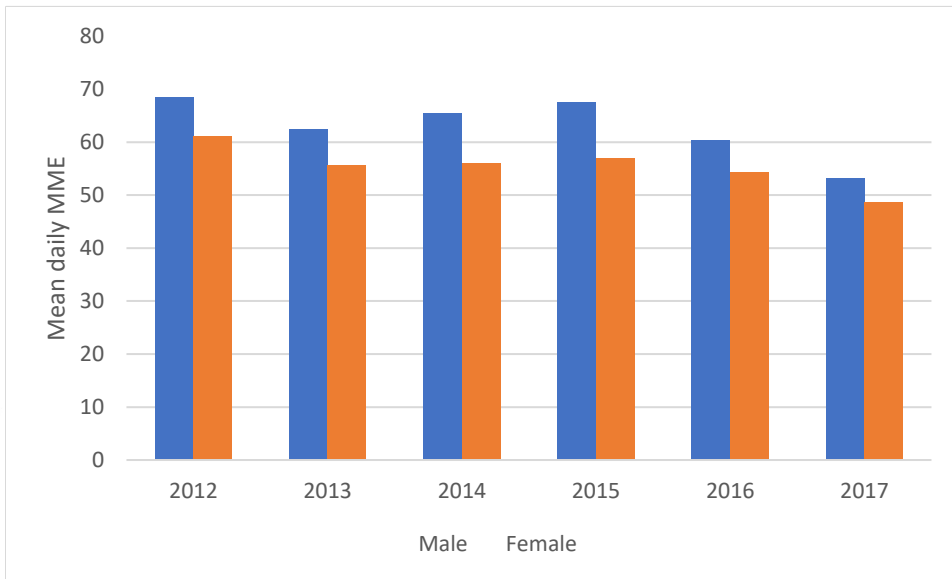


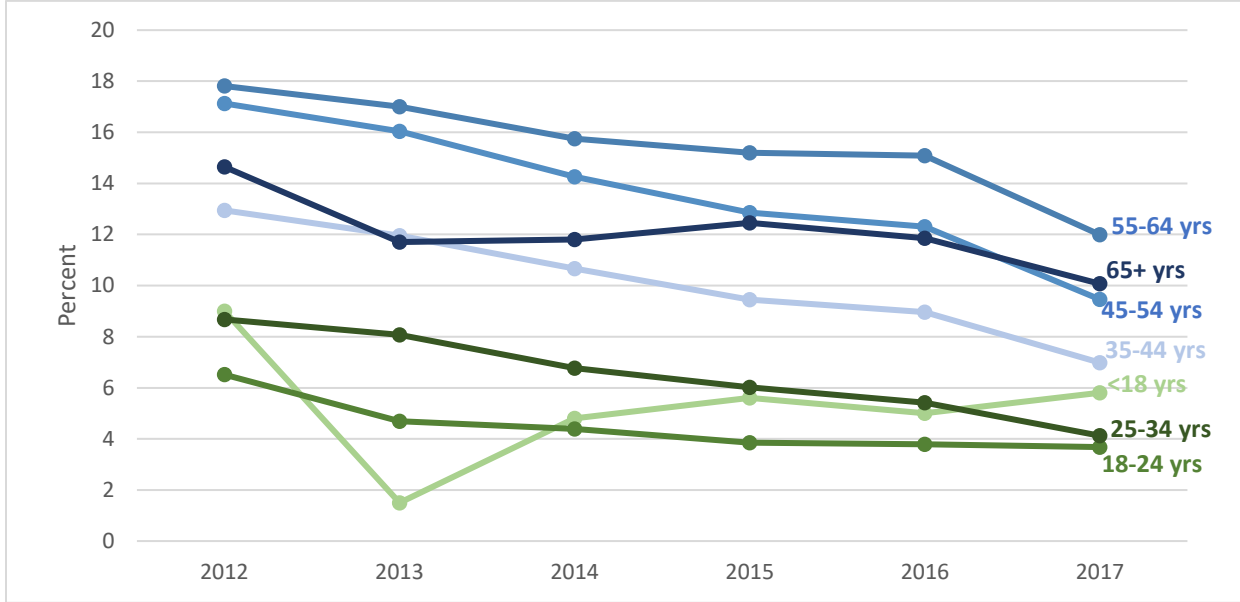
Figure 7. Mean daily MME by sex—Montana Prescription Drug Registry, 2012-2017



Percentages of patients with high and very high MMEs ( $\geq 90$  MME and  $\geq 180$  MME, respectively) follow the trend seen in rate of prescriptions for opioids; older age groups have higher percentages of patients on high doses than in younger age groups, with the noted exception of the youngest age group (<18). This age group is also the only group that ultimately shows a slight upward trend for both percentages of high and very high MMEs during the study period (Figure 8, Table 3). Overall, there has been a marked decrease in patients on high and very high mean MME/day, with declines of 35.5% and 40.7%, respectively (Table 3).

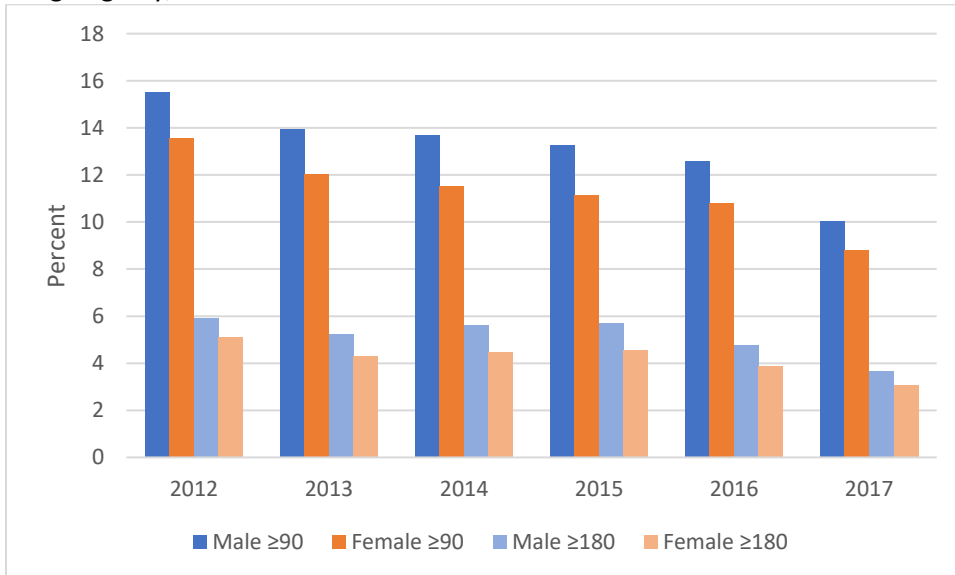


Figure 8. Percentage of patients with high ( $\geq 90$  MME) doses, by age group—Montana Prescription Drug Registry, 2012-2017



As well as having higher daily average MME, men were more likely than women to be prescribed  $\geq 90$  MME and  $\geq 180$  MME per day (Figure 9). Both men and women have had similar rates of decline across the time period; the percent of patients declined by about 35% for high MMEs and 39% for very high MMEs (Table 3).

Figure 9. Percentage of patients with high ( $\geq 90$  MME) and very high ( $\geq 180$  MME) doses, by sex—Montana Prescription Drug Registry, 2012-2017







## Limitations

While preparing the data for analysis, there were instances where errors could have been introduced into the process. During the process of assigning unique identification numbers to each patient who filled a prescription, there were cases that were not able to be matched even after manual inspection. These individuals were excluded from the dataset.

Patient gender is not a required field in the MPDR, and though it was reported around 90% of the time, those who did not have a reported gender or had a gender listed as ‘unknown’ were not included in gender-stratified analyses.

CDC’s provided SAS code identified prescriptions by using their National Drug Code (NDC), which is a 10- or 11-digit 3-segment number that is a universal product identifier for drugs in the United States. This number provides information on the specific strength, dosage form, and formulation of a prescription.<sup>12</sup> Montana’s Prescription Drug Registry automatically recodes the NDC number into these variables, so to use the CDC SAS code, NDCs had to be re-assigned to each prescription. During this process, there was a possibility of misrepresenting the NDC or missing it entirely, leading to underreporting.

Prescriptions written by a veterinarian and dispensed from Montana pharmacies are also included in the MPDR, though the number of opioid prescriptions associated with animals is expected to be small.

The MPDR reached full functionality as of November 2012. The inclusion of Indian Health Service data in 2014 and Veterans Administration data in 2016 may have also had an effect on overall trends, as both of these providers represent a significant proportion of the population of the state.

## Conclusions

Montana has seen an overall decline in the number of opioids prescribed as well as the strength of prescriptions from 2012 to 2017. We suspect that the slight increase seen in prescription numbers in 2017 may be due to the addition of VA data to the state PDMP—with 2017 being the first full year with Department of Veterans Affairs (VA) prescriptions included. Montana had one of the highest per capita veteran populations in the country at 9.4% by the beginning of 2017; subsequently, nearly 5% of Montanans are enrolled in the VA.<sup>9</sup>

While women receive a higher number of prescriptions than men, the data showed that men tend to have higher dosages. Older age groups also are prescribed greater rates of opioids than younger age groups, as well as tend to have higher dosages. People 55+ had higher rates of opioid prescribing in 2017 compared to 2012, while younger age groups showed a decline overall. This may reflect a reduction in prescribing opioids to young opioid-naïve individuals while continuing to provide prescriptions to older patients with an established history of chronic pain and stable opioid use.

Even prior to the CDC’s published guidelines for opioid prescribing in 2016, which recommended against maintaining patients on high daily MMEs, declines in in the percentage of Montana residents on high ( $\geq 90$  MME) and very high ( $\geq 180$  MME) doses were seen. The low MME amounts seen in age group  $<18$  for the year 2013 is unexplained at this time.

From 2012-2017:

- The overall rate of opioid prescriptions declined
- The overall average daily MME declined
- Women received higher rates of opioids than men
- Men received greater average daily MMEs than women
- Younger age groups had lower prescription rates than older age groups
- The percentage of patients with high ( $\geq 90$  MME) and very high ( $\geq 180$  MME) doses declined





The most commonly prescribed opioid in Montana across all years analyzed was short-acting Hydrocodone. After a change from Schedule III to Schedule II in 2014, there has been a marked decline in short-acting Hydrocodone prescription rates. Tramadol, a Schedule IV drug, is increasing in prescription rates as short-acting Hydrocodone decreases. The only other opioid to have a change in prescribing is Buprenorphine. Buprenorphine is used primarily in the treatment of opioid use disorders, and prescribers need to be trained and obtain an x-waiver. As of 2016, a major effort to increase the number of x-waivered Buprenorphine prescribers across the state has taken effect with great success and is reflected in the MPDR data. This suggests that more people are in treatment for opioid use disorder.

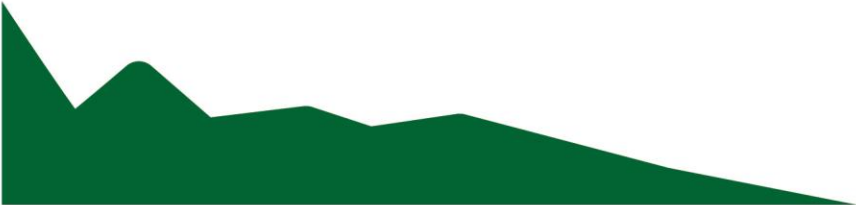




Table 1. Opioid prescription rates per 1,000 residents by age and sex—Montana Prescription Drug Registry, 2012-2017

	Year						Percent Change
	2012	2013	2014	2015	2016	2017	2012 to 2017
<b>Overall</b>	952	1011	923	883	824	948	-0.4
Excluding Buprenorphine	925	984	895	856	797	887	-4.1
<b>Sex</b>							
Male	677	717	628	616	655	736	+8.7
Female	975	1029	909	907	798	963	-1.2
<b>Age (years)</b>							
<18	72	64	65	62	54	61	-15.3
18-24	491	449	394	329	292	325	-33.8
25-34	947	914	832	725	639	761	-19.6
35-44	1143	1163	1091	1003	879	1056	-7.6
45-54	1353	1447	1344	1259	1112	1292	-4.5
55-64	1369	1584	1489	1479	1402	1511	+10.4
65+	1607	1738	1501	1501	1489	1648	+2.6

Table 2. Mean daily MME by age and Sex—Montana Prescription Drug Registry, 2012-2017

	Year						Percent Change
	2012	2013	2014	2015	2016	2017	2012 to 2017
<b>Overall</b>	64.2	57.5	58.3	59.9	55.7	49.7	-22.6
<b>Sex</b>							
Male	71.3	62.3	65.4	67.4	60.3	53.1	-25.5
Female	61.2	55.5	55.9	56.8	54.3	48.6	-20.6
<b>Age (years)</b>							
<18	43.4	18.5	40.7	39.7	33.7	35.1	-19.1
18-24	50.3	41.7	41.9	42.5	43.1	42.7	-15.1
25-34	51.7	48.0	44.8	44.8	41.1	37.6	-27.3
35-44	59.9	55.9	52.8	50.6	48.2	43.3	-27.7
45-54	71.1	66.7	62.1	60.0	57.0	49.4	-30.5
55-64	72.8	69.2	65.2	63.7	61.8	55.4	-23.9
65+	61.4	53.8	59.6	67.2	59.3	51.9	-15.5

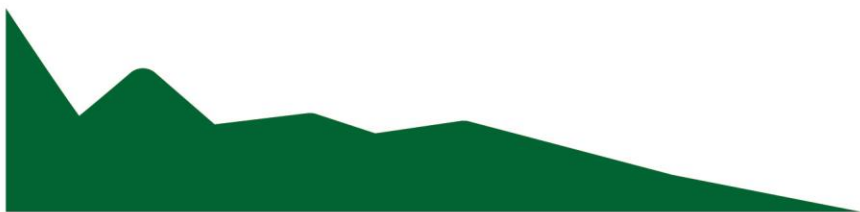




Table 3. Percent of patients on high ( $\geq 90$ ) MME, and super high ( $\geq 180$ ) MME--Montana Prescription Drug Registry, 2012-2017

90 MME	Year						Percent Change 2012 to 2017
	2012	2013	2014	2015	2016	2017	
<b>Overall</b>	14.1	12.4	11.9	11.5	11.2	9.1	-35.5
<b>Sex</b>							
Male	15.5	13.9	13.7	13.3	12.6	10.0	-35.5
Female	13.6	12.0	11.5	11.2	10.8	8.8	-35.3
<b>Age (years)</b>							
<18	9.0	1.5	4.8	5.6	5.0	5.8	-35.6
18-24	6.5	4.7	4.4	3.8	3.8	3.7	-43.1
25-34	8.7	8.1	6.8	6.0	5.4	4.1	-24.4
35-44	12.9	12.0	10.7	9.5	9.0	7.0	-45.7
45-54	17.1	16.0	14.3	12.9	12.3	9.5	-42.9
55-64	17.8	17.0	15.7	15.2	15.1	12.0	-32.6
65+	14.6	11.7	11.8	12.5	11.8	10.1	-30.8

180 MME	Year						Percent Change 2012 to 2017
	2012	2013	2014	2015	2016	2017	
<b>Overall</b>	5.4	4.6	4.8	4.9	4.1	3.2	-40.7
<b>Sex</b>							
Male	6.0	5.3	5.6	5.7	4.8	3.7	-38.3
Female	5.1	4.3	4.5	4.6	3.9	3.1	-39.2
<b>Age (years)</b>							
<18	6.0	0.2	3.0	3.7	3.1	3.7	-38.3
18-24	1.8	0.5	1.0	1.0	0.9	1.0	-44.4
25-34	2.5	2.3	2.1	1.7	1.2	0.9	-64.0
35-44	4.7	4.3	4.0	3.5	2.9	2.1	-55.3
45-54	7.2	7.0	6.0	5.3	4.4	3.0	-58.3
55-64	7.3	6.9	6.6	6.4	5.7	4.2	-42.5
65+	5.1	3.9	4.7	5.6	4.6	3.9	-23.5





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