WCRI RESEARCH BRIEF:

INTERSTATE VARIATIONS IN DISPENSING OF OPIOIDS, 5TH EDITION

This study examines the prevalence and trends in dispensing of opioids in 27 state workers' compensation systems. It also monitors changes in prescribing patterns of pain medications and non-pharmacologic pain treatments. The measures are based on nonsurgical claims with more than seven days of lost time with injuries from October 1, 2011, through September 30, 2016, and medical treatment received through March 31, 2018, and paid under workers' compensation, which captures an average of 24 months of experience.

Research Questions:

- What was the recent trend in the dispensing of opioids in the 27 study states?
- How did opioid dispensing compare across states?
- What policy tools are available that might help reduce unnecessary opioid use?
- How did non-opioid pain treatments change over the same time?
- In which states were injured workers frequently receiving opioids on a chronic basis, at higher doses, and together with other sedating drugs?

Opioid overdose deaths continue to be a top priority public health problem in the United States. This public concern is shared by the workers' compensation community because injured workers are commonly prescribed opioids, despite guideline recommendations to avoid routine opioid prescriptions and to adopt non-opioid pain medications and non-pharmacologic treatment. In recent years, many states made legislative or regulatory changes, within and outside workers' compensation, to combat opioid overuse and misuse. Some policy changes were also made at the federal level, including the Centers for Disease Control and Prevention (CDC) guidelines for prescribing opioids for chronic pain.

Key Findings:

- Opioid prescribing declined substantially in most of the 27 study states, between 2012 and 2016 claims with 24 months of experience. The percentage of injured workers with prescriptions receiving opioids decreased by 8 percentage points (in Illinois) to 25 percentage points (in California) across the study states. Among injured workers receiving opioids, the average morphine milligram equivalent (MME) amount of opioids dispensed per worker in the first two years of a claim decreased in nearly all

study states, with larger reductions of 50–52 percent seen in California, Connecticut, and Kentucky. Seventeen other states had reductions of 30 percent or higher.

- Despite the declines, opioid dispensing continues to be prevalent in several states, and there remains substantial interstate variation at the end of the study period. The percentage of injured workers with prescriptions receiving opioids ranged from 32 to 70 percent across the 27 states, and the average MME per worker in Delaware, Louisiana, Pennsylvania, and New York continued to be the highest among the 27 study states. In Delaware and Louisiana, the average MME per claim was over 3,200 milligrams, which was more than three times the amount in the median (middle) state and over five times that in the state with the lowest amount, Missouri. New York and Pennsylvania also had higher average amounts of opioids dispensed in the first two years of a claim, 1,788 and 2,094 milligrams—79 to 110 percent higher than the median state.
- While significantly fewer injured workers received opioid prescriptions paid under workers' compensation, the increase in the percentage of workers receiving non-opioid pain medications did not fully offset the drop in opioids. Rather, over the study period, the percentage of injured workers receiving pain medication prescriptions decreased by 2 to 14 percentage points across the states. However, when injured workers were prescribed a pain medication, they were more likely to be prescribed a non-opioid pain medication such as a nonsteroidal anti-inflammatory drug (NSAID) in later years.
- The decrease in injured workers receiving pain medications may raise questions about whether injured workers did not receive medical attention for pain relief. The study shows that a similar proportion of injured workers received some form of pain treatment, either pain medications or non-pharmacologic pain treatment (e.g., physical medicine, chiropractic care, acupuncture), throughout the study period, but there was a shift in treatment patterns from prescribing pain medications (with or without non-pharmacologic pain treatments) to providing only non-pharmacologic pain treatments.

Data & Methods:

This study uses data comprising over 575,000 nonsurgical workers' compensation claims with more than seven days of lost time, and over 4.3 million prescriptions associated with these claims from 27 states. These claims had injuries arising between October 2011 and September 2016, and we observed their medical treatment for an average of 24 months postinjury. The sample of claims in the study represents 37–72 percent of workers' compensation claims in each state.

The 27 states in the study are Arkansas, California, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New Jersey, New York, North Carolina, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and Wisconsin.

Interstate Variations in Dispensing of Opioids

5th Edition

Vennela Thumula
Dongchun Wang
Te-Chun Liu

WCRI
Workers Compensation Research Institute

ABOUT THE INSTITUTE

OUR MISSION:

To be a catalyst for significant improvements in workers' compensation systems, providing the public with objective, credible, high-quality research on important public policy issues.

THE INSTITUTE:

Founded in 1983, the Workers Compensation Research Institute (WCRI) is an independent, not-for-profit research organization which strives to help those interested in making improvements to the workers' compensation system by providing highly regarded, objective data and analysis.

The Institute does not take positions on the issues it researches; rather, it provides information obtained through studies and data collection efforts, which conform to recognized scientific methods. Objectivity is further ensured through rigorous, unbiased peer review procedures.

The Institute's work includes the following:

- Original research studies of major issues confronting workers' compensation systems (for example, outcomes for injured workers)
- Studies of individual state systems where policymakers have shown an interest in change and where there is an unmet need for objective information
- Studies of states that have undergone major legislative changes to measure the impact of those reforms and draw possible lessons for other states
- Presentations on research findings to legislators, workers' compensation administrators, industry groups, and other stakeholders

With WCRI's research, policymakers and other system stakeholders—employers, insurers, and labor unions—can monitor state systems on a regular basis and identify incremental changes to improve system performance. This results in a more enduring, efficient, and equitable system that better serves the needs of workers and employers.

For more information and to view other WCRI studies, please visit our website: www.wcrinet.org

WCRI
Workers Compensation
Research Institute

INTERSTATE VARIATIONS IN DISPENSING OF OPIOIDS, 5TH EDITION

Vennela Thumula
Dongchun Wang
Te-Chun Liu

WC-19-26
July 2019

WORKERS COMPENSATION RESEARCH INSTITUTE
CAMBRIDGE, MASSACHUSETTS

ISBN 978-1-61471-586-3

Acknowledgments

We would like to thank the technical reviewers of this report, Frank Neuhauser and Dr. Jaymie Mai, whose thoughtful comments and suggestions not only helped us to improve the accuracy and clarity of the final report but are also valuable for our future research. Special thanks to Dr. Gary Franklin, Dr. Morgan Young, and Brian Chin for their insightful input on the measurement of non-pharmacologic treatments and on other aspects of this study. Several others provided valuable comments on the draft report, helping us to improve the usefulness of the final report. We wish to thank them all for their helpful feedback. This is an update of a previously published study, which reflects the contributions made by many people, most importantly the coauthors of the first edition of this study—Dr. Kathryn Mueller and Dr. Dean Hashimoto—and Dr. Rick Victor for his guidance during the early stages of the project. Critical to the study was the indispensable assistance provided by Milliman, Inc. and our colleagues at WCRI, Eric Harrison, Beth Heffner, Stacey O'Brien, Tom Landry, Karen Rothkin, and Roman Dolinschi. Their contributions, including data acquisition, database development, and quality assurance, made the study possible. We also thank Andrew Kenneally, the communications director at WCRI, for his efforts in disseminating the research findings. Thanks also go to Sarah Solorzano and Elizabeth Hopkins for their superior administrative assistance that helped to improve the readability and accuracy of the report, and Sarah Solorzano, who expertly managed the review and publication process.

Finally, our gratitude goes to Dr. John Ruser, president and CEO, and Ramona Tanabe, executive vice president and counsel of the Institute, for their invaluable input and guidance that shaped this report.

Any errors that remain in the report are the responsibility of the authors.

Vennela Thumula
Dongchun Wang
Te-Chun Liu

Cambridge, MA
July 2019

TABLE OF CONTENTS

List of Tables

List of Figures

EXECUTIVE SUMMARY

Opioid overdose deaths continue to be a top priority public health problem in the United States. This public concern is shared by the workers' compensation community because injured workers are commonly prescribed opioids, despite guideline recommendations to avoid routine prescriptions and to limit the use of opioids to more severe pain or pain refractory to other analgesics. To address the concerns, numerous legislative and regulatory changes have been implemented at the federal and state levels in recent years.[1] This study examines the interstate variations and trends in the dispensing of opioids and prescribing patterns of pain medications across 27 workers' compensation jurisdictions.[2] The measures are based on nonsurgical claims with more than seven days of lost time with injuries from October 1, 2011, through September 30, 2016, and prescriptions filled through March 31, 2018, and paid under workers' compensation, which captures an average of 24 months of experience. The key findings are as follows:

- Opioid prescribing declined substantially in most of the 27 study states over the study period. Fewer opioid prescriptions were dispensed per worker with prescriptions, and the average amount of opioids dispensed per worker decreased in nearly all study states.
- Despite the declines, opioid prescribing continues to be prevalent among nonsurgical claims with more than seven days of lost time in several states, and there remains substantial interstate variation in opioid dispensing.
- While significantly fewer injured workers received opioid prescriptions paid under workers' compensation, there was no proportional increase in the percentage of workers receiving non-opioid pain medications. Rather, at the end of the study period, fewer injured workers received pain medication prescriptions and prescriptions in general that were paid under workers' compensation. However, when injured workers were prescribed a pain medication, they were more likely to be prescribed a non-opioid analgesic in later years.
- Evidence suggests that a similar proportion of injured workers received some form of pain treatment, either pain medications or non-pharmacologic pain treatment, throughout the study period, but there was a shift in treatment patterns from prescribing pain medications to providing non-pharmacologic pain treatments.

This report should be useful for (1) state officials who wonder if injured workers in their state are receiving unusual amounts of opioids, (2) injured workers and worker advocates looking to understand the extent of the problem in their state, (3) providers who wonder what the prescribing norms in their state may be and if the state norms are unusual, and (4) payors and managed care companies looking to set priorities for targeting opioid management programs. This report also serves as a tool to monitor the results of the ongoing policy

[1] See Technical Appendix A for a discussion of the legislative, regulatory, and industry changes that address opioid prescribing and dispensing.

[2] The 27 states are Arkansas, California, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New Jersey, New York, North Carolina, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and Wisconsin. These states represent over two-thirds of the workers' compensation benefits paid in the United States.

changes that have been directed at opioid prescribing and dispensing.

SUMMARY OF FINDINGS

In the previous editions of this study, we reported noteworthy reductions in the amount of opioids received by injured workers in many states.[3] With three more years of data, opioid utilization continued to decrease in the majority of states. The decreases in frequency and amount of opioids dispensed to injured workers were substantial in several states, including California, Connecticut, Kentucky, and New York. The sustained reduction in opioid utilization may be associated with numerous changes in opioid policies in recent years. Following these reductions, the utilization of opioids varied substantially across the study states, and a few states continued to have higher amounts of opioids per injured worker.

TRENDS IN OPIOID DISPENSING

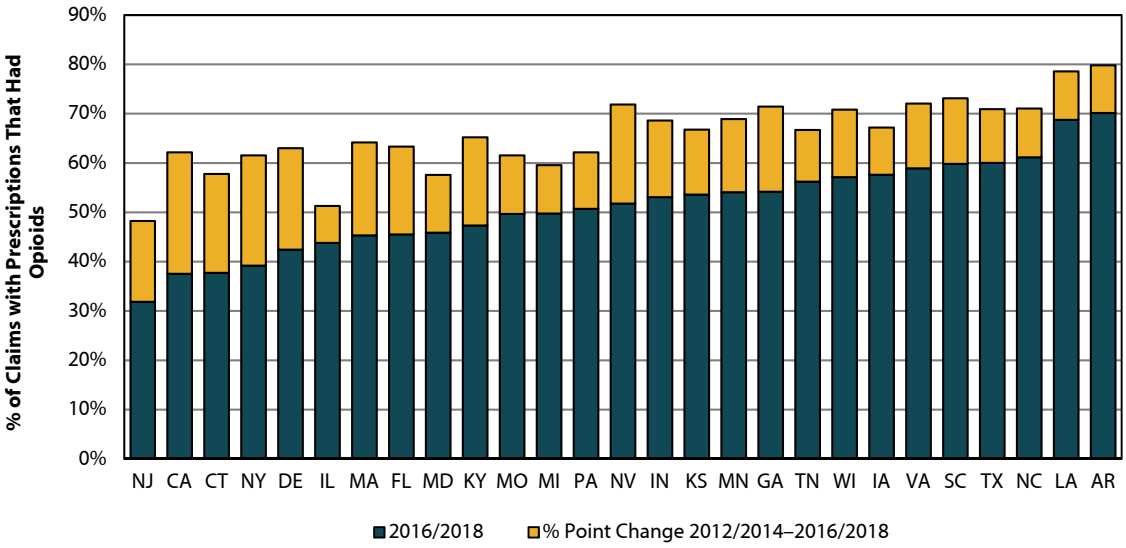
- Between 2012/2014 and 2016/2018,[4] opioid utilization among injured workers decreased substantially in most study states. Among nonsurgical claims with more than seven days of lost time, the percentage of injured workers with prescriptions receiving opioids decreased by 8 percentage points (in Illinois) to 25 percentage points (in California) across the study states (Figure A). In California, 62 percent of claims with prescriptions received opioids in 2012/2014, which was typical of the study states. This number dropped to 38 percent in 2016/2018, which was among the lower group of states. Larger reductions of 20–22 percentage points were also seen in Connecticut, Delaware, Nevada, and New York. Seven more states (Florida, Georgia, Indiana, Kentucky, Massachusetts, Minnesota, and New Jersey) had decreases of 15–19 percentage points. All other states had decreases of 8–14 percentage points.[5] In the 2017 edition of this study covering data from 2010/2012 to 2013/2015, the claim frequency of opioid dispensing had no material change in the majority of states while relatively moderate changes were seen in a few states.
- Over the study period, we observed a noticeable reduction in the percentage of nonsurgical claims with more than seven days of lost time that received at least one prescription paid under workers' compensation. This may have primarily occurred because of a drop in opioid prescriptions with no proportional increase in non-opioid prescriptions. Other less prominent factors that may have contributed to this trend include a shift toward prescriptions paid by non-workers' compensation payors or cash payments. See Chapter 6 for a more detailed discussion.

[3] The previous edition of this study covered data from October 2009 through March 2015, and we reported substantial reductions in the amount of opioids received by injured workers in several states over the study period. The qualitative findings on interstate variations have not changed for the overlapping period. See Thumula, Wang, and Liu (2017).

[4] 2016/2018 refers to nonsurgical claims with more than seven days of lost time with injuries from October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for 2012/2014.

[5] These changes were statistically significant at the 10 percent level. See Table SA.2.

Figure A Changes in the Percentage of Claims with Prescriptions That Had Opioids, 2012/2014–2016/2018



Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for other years.

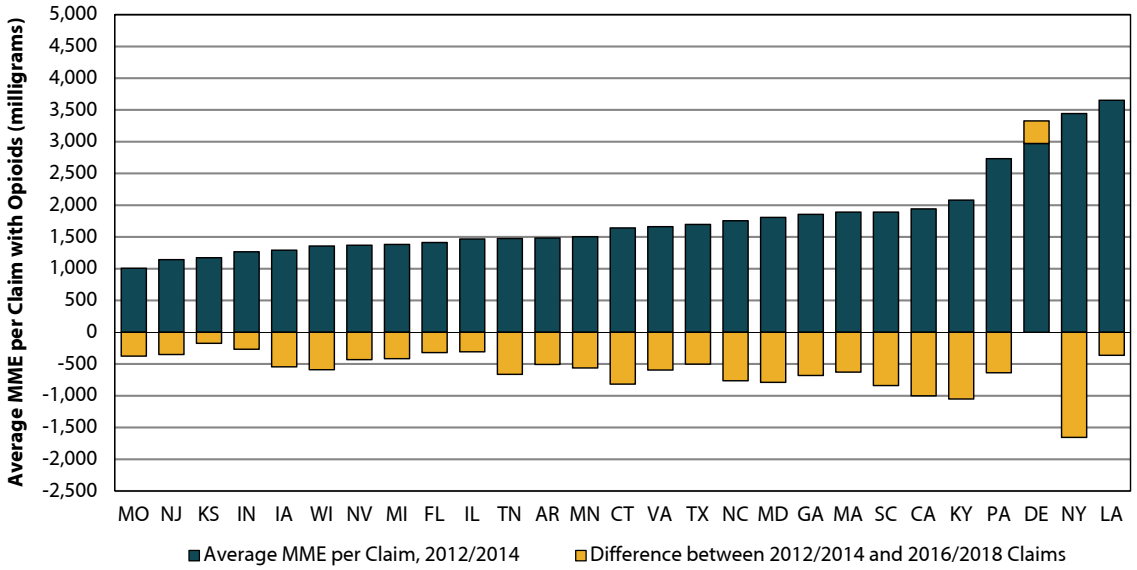
- Among injured workers receiving opioids, the average amount of opioids dispensed per worker also decreased in the majority of the study states over the four-year period from 2012/2014 to 2016/2018, continuing the downward trend seen in earlier editions of this study (see Figure B).[6,7,8] In California, Connecticut, and Kentucky, the average morphine milligram equivalent amount (MME) of opioids per claim decreased by 50–52 percent. Substantial decreases were seen in seven more states (Iowa, Maryland, New York, North Carolina, South Carolina, Tennessee, and Wisconsin), where the average MME per claim decreased by 42–48 percent. The decreases in the amount of opioids dispensed per claim were also considerable in Arkansas, Georgia, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New Jersey, Texas, and Virginia, with 30–37 percent reductions. Several other states (Florida, Illinois, Indiana, and Pennsylvania) saw noticeable decreases in the average MME per claim, with reductions of 21–23 percent.

[6] Throughout the report, we use the term *average amount of opioids received by an injured worker* or *average amount of opioids per claim* to refer to the average morphine milligram equivalent amount (MME) of opioids per claim with opioids. For each claim, a cumulative MME was calculated across the different opioid prescriptions received, taking into account the strength in milligrams of the prescribed opioid medication, the analgesic potency ratio between the specific opioid and morphine, and the quantity of the prescription. To illustrate, an MME of 3,600 milligrams per claim is equivalent to taking a 5-milligram Vicodin® tablet every four hours for nearly four months continuously, or a 120-milligram morphine equivalent daily dose for almost a month.

[7] The results reported are based on the amount of opioids per claim after excluding 0.0–0.6 percent of claims with unusually high amounts of opioids. Interstate variations are comparable including or excluding these claims. See Table TA.C6 for details.

[8] In a previous edition of the study (Thumula, Wang, and Liu, 2016), we highlighted trends between 2010/2012 and 2012/2014, and the average MME per claim decreased by nearly 20–30 percent in Maryland, Massachusetts, Michigan, North Carolina, and Texas.

Figure B Changes in Average MME per Claim with Opioids, 2012/2014–2016/2018



Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for other years.

Key: MME: morphine milligram equivalent amount.

Other studies focusing on trends in opioid prescribing in the general population also noted a reversal in trends of opioid prescribing over this period, after a consistent and rapid increase starting in the 1990s.[9] This turning point may be associated with the numerous changes made at the federal, state, and organization levels in recent years to combat opioid overuse and abuse. Some of the prominent evidence-based opioid policies that went into effect during the study period in states in this study include the following: (a) mandatory check of the state prescription drug monitoring program (PDMP) database at the point of prescribing and dispensing opioids (implemented in 15 states—Arkansas, Connecticut, Delaware, Illinois, Kentucky, Louisiana, Massachusetts, Nevada, New Jersey, New York, Pennsylvania, South Carolina, Tennessee, Virginia, and Wisconsin); (b) limits on the amount or duration of initial opioid prescriptions that may be prescribed and dispensed to patients for acute pain (went into effect toward the end of the study period in 14 states—Connecticut, Delaware, Indiana, Kentucky, Louisiana, Maryland, Massachusetts, Minnesota, Nevada, New Jersey, New York, North Carolina, Pennsylvania, and Virginia); and (c) drug formularies (were launched in California, Delaware, Nevada, and Tennessee; and in Texas, legacy claims were phased in during the study period). State agencies in several study states, including medical boards and workers' compensation agencies, also adopted or updated treatment guidelines for prescribing opioids and managing chronic opioid therapy during the study period. More recently, a number of states passed comprehensive legislation to address opioid overuse prevention in a coordinated way, including the creation of opioid task forces, which encourage inter-agency collaborations to address opioid issues in the state. Several other reforms (including mandating provider

[9] Guy et al. (2019), Guy et al. (2017), Dart et al. (2015), and Ahmedani et al. (2014).

education focusing on appropriate opioid prescribing and pain management, and laws regulating pain clinics and dispensing of opioids by physicians) were also implemented in some states. While determining key factors attributable to the changes we observed in this study requires more rigorous analysis, we note major legislative or regulatory policy changes addressing opioid prescribing and dispensing in Chapter 4 and Technical Appendix A, which provide context to the readers in interpreting the results.[10]

INTERSTATE VARIATIONS IN OPIOID DISPENSING

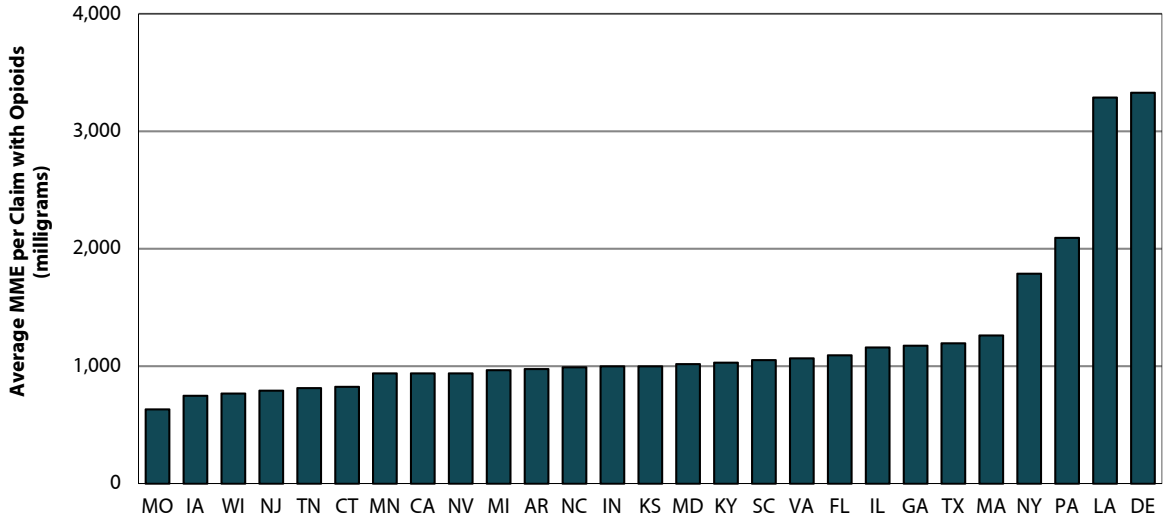
- Opioid use continued to be prevalent among nonsurgical claims with more than seven days of lost time. In 2016/2018, about 50 to 60 percent of these claims with prescriptions received opioids in a majority of states. The proportion was higher, at 70 percent, in Arkansas and Louisiana. On the lower end, one-third of injured workers with prescriptions received opioids in New Jersey.
- The average amounts of opioids received in Delaware, Louisiana, Pennsylvania, and New York continued to be the highest among the 27 study states for 2016/2018 claims with opioids (see Figure C).[11] Although New York is among the states with a higher-than-typical amount, it is important to note the substantial decrease in both the frequency and amount of opioids in New York over the four-year study period.

  In Delaware and Louisiana, the average MME per claim was over 3,200 milligrams, which was more than three times the amount in the median state and over five times that in the state with the lowest amount, Missouri. New York and Pennsylvania also had higher average amounts of opioids of 1,788 and 2,094 milligrams—79 to 110 percent higher than the median state. The extent of variation in the average amount of opioids received by injured workers in all other states was smaller. In 2016/2018, there was a two-fold variation across the 23 states other than Delaware, Louisiana, Pennsylvania, and New York. Considering our underlying sample of nonsurgical claims, the amount of opioids dispensed to the average injured worker in Delaware, Louisiana, Pennsylvania, and New York is striking.

[10] This report does not provide a comprehensive listing of federal, state, and organization efforts addressing prescription opioids. We focus on major state-level legislative and regulatory changes and workers' compensation-specific reforms because of our focus on workers' compensation policy issues. Medicaid and group health insurers also implemented programs aimed at reducing opioid prescriptions during this period, which may influence the prescribing practices of some physicians treating workers' compensation patients. The heightened awareness of the opioid epidemic may have resulted in changes in the practices of various entities in the health care delivery system (e.g., health care groups and pharmacy benefit managers), which may also contribute to the decreasing trend in opioid prescriptions.

[11] One may suspect that these states may have a different mix of cases or more injuries that are serious. However, we did a sensitivity analysis adjusting for differences across states in case mix and the comparative results did not change.

Figure C Average MME per Claim with Opioids,[a] 2016/2018



Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

[a] Reported are the mean values of MME per claim with opioids after excluding a small percentage of claims that had unusually high amounts of opioids. See Chapter 2 for a description of how we identified claims with unusually high amounts of opioids.

Key: MME: morphine milligram equivalent amount.

- There was substantial interstate variation in the average duration of opioid use, whereas the intensity of prescribed opioids (measured using the average morphine equivalent daily dose) varied little, based on the results from 22 states where the majority of claims had complete days of supply information for all opioid prescriptions (see Table 3.2).[12] The average duration of opioids per claim ranged from about 30 to 50 days across most states.[13] Consistent with the finding of a higher average amount of opioids per claim, we found that the average duration was higher in Delaware and Louisiana (78 and 115 days, on average, compared with 36 days in the 22-state median). The figure was also higher in New York, Pennsylvania, and Texas (50–55 days).

  Large differences were also seen in the frequency of claims receiving opioids on a chronic basis and

[12] The 22 states selected for reporting the measures of duration and daily dose of opioids are Arkansas, Delaware, Florida, Georgia, Indiana, Iowa, Kansas, Kentucky, Louisiana, Massachusetts, Michigan, Minnesota, Missouri, New Jersey, New York, North Carolina, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and Wisconsin. These 22 states are among the states with higher, typical, and lower frequencies and amounts of opioids based on the 27-state comparison. In these states, 63–81 percent of claims with opioids had days of supply information for all opioid prescriptions. Based on our bias analysis, the claims included are substantially representative of the claims that do not have complete information on days of supply. There were five states excluded from this analysis—California, Connecticut, Illinois, Maryland, and Nevada. In these five states, physician dispensing of opioids was prevalent, and days of supply information tended to be less complete for physician-dispensed prescriptions, or claims with days of supply were not representative of all claims with opioids. Readers interested in the interstate variations and trends in the dispensing of opioids on a longer-term basis may refer to the study *Longer-Term Dispensing of Opioids, 4th Edition* (Wang, 2017).

[13] Throughout the report, we use the term *average duration of opioids per claim* or *average number of opioid days per claim* to refer to the average number of days for which the injured worker was dispensed opioids.

at higher doses.[14] For 2016/2018 claims with opioids, 6–12 percent received at least 60 days of opioids supply over any 90-day period (our measure of *chronic opioid use*) in 15 of the 22 states. The proportion was higher in Louisiana (33 percent) and Delaware (28 percent). One in seven or more workers with opioids in Kentucky, Michigan, New York, Pennsylvania, and Texas (14–18 percent) received them on a chronic basis. Note that some of these injured workers could have had one such 90-day episode during which they received opioids for at least 60 days, while others could have had multiple episodes.[15]

A higher proportion of claims had initial opioid prescriptions exceeding 7 and 14 days of supply in the states with higher rates of chronic opioids, indicating that the receipt of longer duration opioid prescriptions initially may be correlated with the receipt of chronic opioids. In Delaware and Louisiana, for instance, 46 and 52 percent of claims with opioids had an initial opioid fill of greater than 7 days of supply, and 32 and 34 percent had more than 14 days of supply. Comparable numbers in the median state were 38 percent exceeding 7 days of supply and 18 percent exceeding 14 days of supply.[16]

A sizable proportion of Delaware claims also received high-dose opioids for at least 60 days during the study period. Among injured workers receiving opioids, 15 percent had a morphine equivalent daily dose (MED) exceeding 50 milligrams for at least 60 days during the study period, and 2.1 percent of injured workers had an MED exceeding 90 milligrams for at least 60 days. Higher-than-typical rates were also seen in Louisiana, New York, and Pennsylvania (4 percent with MED exceeding 50 milligrams).

Many factors may be associated with the interstate variations we observed, including workers' compensation policies for pharmaceuticals (e.g., pharmacy fee schedules, physician dispensing, provider choice, and treatment guidelines for pain management); policies outside workers' compensation (e.g., state PDMPs and state pain policies); and industry practices. While analyzing the impact of these factors is beyond the scope of this study, we provide some background information that may help the reader interpret the results (see Technical Appendix A). One may suspect that the interstate variations may be a reflection of the differences across states in the mix of cases and injury severity. However, adjusting for differences across states in demographics and injury/industry mix had little impact on interstate variations in opioid utilization.

NOTEWORTHY PRESCRIBING PATTERNS

- There were substantial interstate variations in the type of pain medications that were prescribed across the 27 study states, but the majority of pain medication prescriptions dispensed in 2016/2018 were for non-opioid analgesics in all study states. The percentage of all pain medication prescriptions for non-opioid analgesics varied from 54–55 percent in Arkansas and Louisiana to 76–77 percent in California,

[14] The metrics used to characterize *chronic opioid use* and *high-dose opioid use* are consistent with the measures proposed by the Washington State Dr. Robert Bree Collaborative and the Washington State Agency Medical Directors' Group. Chronic opioid use is defined as receiving opioids for at least 60 days over any continuous 90-day period, and high-dose opioid use is defined as receiving an opioid daily dose of more than 50 and 90 morphine equivalent milligrams for at least 60 days during the average 24-month observation period. See Chapter 2 for details.

[15] Table SA.5 provides the frequency of injured workers with multiple episodes of chronic opioid therapy. Among injured workers receiving opioids, we observed a relatively smaller interstate variation in those with only one 90-day period with chronic opioid therapy (3–14 percent) compared with those with multiple episodes (1–23 percent).

[16] The 2016 Centers for Disease Control and Prevention guidelines for prescribing opioids for chronic pain caution that longer-term opioid use begins with treatment of acute pain, and the guidelines include recommendations for the duration of opioids for acute pain; they state that three days or less is often sufficient and more than seven days is rarely needed. Other state-specific guidelines recommend less than 14 days.

New Jersey, and New York. Physicians in some states were more likely to prescribe opioids and stronger opioids, such as oxycodone, compared with their counterparts in other states.[17] In 2016/2018, for instance, pain medication prescriptions for oxycodone (Percocet® and OxyContin®) varied from 1 percent in California, Illinois, and Texas to 19 percent in Delaware. These prescribing patterns changed considerably over the study period between 2012/2014 and 2016/2018 in most states (see Table 5.2).

- The percentage of pain medication prescriptions for non-opioid pain medications increased over the study period, i.e., pain medication prescriptions for opioids decreased in all states. In 22 of 27 study states, increases of 10 percentage points or more were seen in the share of non-opioid pain medications.
- Over the four-year period, there was a noticeable decrease of 4 to 22 percentage points in the proportion of pain medication prescriptions for hydrocodone-acetaminophen (Vicodin®) in all study states, while the proportion of non-opioid pain medications increased. This change may be partly associated with the Drug Enforcement Administration (DEA) changing the schedule of hydrocodone-combination products from III to II in October 2014 and some states mandating prescribers to query the PDMP prior to prescribing hydrocodone-acetaminophen and other controlled substances. The largest drop of 22 percentage points in the proportion of pain medications for hydrocodone-acetaminophen was seen in Texas, the only state where the proportion of pain medication for other opioids (codeine-acetaminophen) increased considerably, by 11 percentage points. This shift in prescribing from hydrocodone-acetaminophen to codeine-acetaminophen predominantly occurred between 2014/2016 and 2015/2017, coinciding with the up-scheduling of hydrocodone-combination products. Our findings are consistent with other studies that reported a decrease in prescriptions for hydrocodone-combination products after the federal rescheduling.[18]
- The share of pain medication prescriptions for oxycodone decreased by 6 and 8 percentage points in Connecticut and Massachusetts, both states where oxycodone was the most frequently prescribed opioid at the beginning of the study period.
- The percentage of pain medication prescriptions for tramadol (Ultram® and Ultracet®) remained unchanged in most states, with sizable reductions of 5 and 7 percentage points in Florida and Delaware, respectively. Tramadol was the only opioid that was not scheduled at the federal level during part of the study period.[19] In August 2014, the DEA classified tramadol as a Schedule IV drug.[20]
- As noted above, the share of prescriptions for other categories of drugs used in pain management (such as nonsteroidal anti-inflammatory drugs [NSAIDs], anticonvulsants, corticosteroids, topical analgesics, antidepressants, compound drugs, and other analgesics) increased over the study period

[17] We refer to oxycodone as a *stronger* opioid in this study to convey the relative strength of oxycodone prescriptions compared with other commonly dispensed opioids like hydrocodone-acetaminophen and tramadol. It is possible that some injured workers were prescribed stronger doses and more pills of hydrocodone-acetaminophen and tramadol to achieve the same MME as oxycodone. However, in our study sample, the average morphine equivalent dose of oxycodone prescriptions was roughly 1.5–4.2 times higher than tramadol prescriptions and 1.6–4.0 times higher than hydrocodone prescriptions.

[18] See Jones, Lurie, and Throckmorton (2016).

[19] Some states proactively classified it as a controlled substance even though it was not controlled at the federal level.

[20] See DEA (2014) at https://www.deadiversion.usdoj.gov/fed_regs/rules/2014/fr0702.htm.

(see Table 5.3). Therefore, when physicians prescribed pain medications, they were more likely to be for one of these drug groups instead of opioids. The share of pain medication prescriptions for NSAIDs had increases of 5 percentage points or more in half of the study states. California and Connecticut were among the states with larger increases of 12 to 13 percentage points. Noticeable increases were also seen in the share of pain medication prescriptions for anticonvulsants in several states. There were no material changes in the share of prescriptions for all other categories of pain medications, with some exceptions. As of 2016/2018, NSAIDs accounted for more than one-third of pain medication prescriptions and anticonvulsants accounted for 1 in 10 or more pain medication prescriptions in at least half of the study states. However, these increases should not be interpreted as an absolute increase in prescriptions for these drug groups, as the prescribing of pain medications per claim dropped.

- Among injured workers with opioids, we observed concomitant use of other central nervous system depressant drugs like benzodiazepines (Valium® and Xanax®), centrally acting muscle relaxants (Soma® and Flexeril®), and sedatives (Ambien®). Concomitant use of opioids and other central nervous system depressants is associated with a heightened risk of respiratory depression and death.[21]
  - In 2016/2018, 30 to 45 percent of workers with opioids received at least one other central nervous system depressant prescription dispensed within one week of an opioid prescription fill in most study states.[22] In Louisiana, the rate was one in two (see Figure 5.1).
  - About 7 percent of injured workers with opioids in Delaware and Massachusetts filled a benzodiazepine prescription within one week of an opioid fill. The measure was 4–6 percent in nine other states. By contrast, the rate was less than 1 percent in Texas, where preauthorization has been required prior to prescribing benzodiazepines since the implementation of the Texas formulary.
  - We observed that opioids and centrally acting muscle relaxants were frequently filled concurrently across study states. Among injured workers with opioids, 24 percent (in New Jersey) to 48 percent (in Louisiana) filled a muscle relaxant prescription within one week of filling an opioid prescription.
  - Concurrent prescribing of opioids, benzodiazepines, and muscle relaxants was rare across the study states, with 1 to 2 percent of injured workers filling all three classes of medications within one week of each other in 2016/2018 in the majority of states (see Figure 5.2).
  - As expected, concomitant use of opioids and other drugs was more common among claims receiving opioid prescriptions on a chronic basis. However, claims without chronic opioids represented a larger absolute number of concomitant users.
  - We found a downward trend in the concomitant use of opioids and other central nervous system depressant drugs in most of the study states between 2012/2014 and 2016/2018. Reductions of 5 percentage points or more were seen in 18 of the 27 states. Contrary to the general trend, we found an increase of 4 percentage points in Delaware (see Figure 5.3).

[21] The Food and Drug Administration (FDA) started requiring boxed warnings on opioids, benzodiazepines, and other central nervous system depressants stating the serious risks when combining these medications. A complete list of these medications is available at http://www.fda.gov/Drugs/DrugSafety/ucm518473.htm. Several medical treatment guidelines, including the Centers for Disease Control and Prevention opioid guidelines, also caution against the combined use of opioids and other central nervous depressants, such as benzodiazepines.

[22] Central nervous system depressant drugs include the following classes of medications: benzodiazepines (Valium® and Xanax®), centrally acting muscle relaxants (Soma® and Flexeril®), sedatives (Ambien®), and anti-psychotics (Abilify® and Seroquel®).

- Concomitant exposure to opioids and anticonvulsants (Neurontin® and Lyrica®) is also associated with greater odds of opioid overdose deaths.[23] In 2016/2018, opioids and anticonvulsants were concurrently dispensed in 6 percent of Louisiana claims with opioids (see Figure 5.4). Seven more states had 4–5 percent of workers with opioids receiving anticonvulsants concomitantly. As prescribing of anticonvulsants for pain relief increased in workers' compensation over the study period, concomitant dispensing of opioids and anticonvulsants had a small but noticeable increase of 2 to 3 percentage points in a few states (Louisiana, Texas, and Virginia). Note that fewer workers received opioids in recent years, and those receiving opioids may have more severe injuries warranting the receipt of multiple classes of pain relief medications. Nevertheless, the trends should be closely monitored in light of the shifting pain medication prescribing patterns discussed above.

NOTEWORTHY TRENDS IN NON-OPIOID PAIN TREATMENTS

- As noted in the previous sections, significantly fewer injured workers received opioid prescriptions paid under workers' compensation in the latest study period. With the heightened awareness of the problems associated with unnecessary opioids and an increasing number of policies addressing opioid prescribing and dispensing, some physicians may have shifted their treatment patterns. For example, guidelines addressing opioid prescribing for acute, subacute, and chronic pain generally recommend non-opioid pharmacologic treatments and non-pharmacologic pain treatments prior to or adjunct to prescribing opioids.[24] If compliance with guidelines has increased in recent years, we would expect to see an increased use of these alternate treatments instead of prescribing opioids, which would have contributed to a reduction in opioid prescriptions. For these reasons, we track trends in alternate pain treatments.
- Among nonsurgical workers' compensation claims with more than seven days of lost time, between 2012/2014 and 2016/2018, the percentage of workers who received prescriptions for both opioid and non-opioid analgesics decreased considerably by 5 to 21 percentage points across the study states (see Table 6.1). Few injured workers received only opioids for pain relief, and the claim frequency of receiving only opioids decreased by 1 to 6 percentage points. Over the same period, the percentage of workers receiving non-opioid analgesic prescriptions (and no opioids) increased modestly by 0 to 10 percentage points across the states. In sum, the percentage of claims that received pain medication prescriptions decreased by 2 to 14 percentage points.
- Evidence suggests that a similar proportion of injured workers continued to receive some form of pain treatment—either pain medications or non-pharmacologic pain treatment—throughout the study period,[25] but the treatment patterns shifted over time. In most study states, the percentage of injured workers receiving both pain medications and non-pharmacologic treatments decreased, whereas the percentage of claims with only non-pharmacologic treatment increased (Table 6.2). The percentage of claims with pain medications without alternative treatment was low in several states at the start of the study period and decreased further. Overall, there were small net decreases in the percentage of claims

[23] See Gomes et al. (2017 and 2018).

[24] Table TA.B1 provides examples of guideline recommendations and state rules regarding non-opioid and non-pharmacologic alternative treatment to opioids.

[25] We examined changes in the proportion of nonsurgical workers' compensation claims with more than seven days of lost time that had at least one paid visit for physical medicine evaluation, active and passive physical medicine, manipulation, acupuncture, behavioral therapy, or interventional pain management.

that received either pain medications or non-pharmacologic treatment in some states.

DATA AND APPROACH

This study uses data comprising 575,431 nonsurgical claims with more than seven days of lost time that received at least one prescription paid under workers' compensation in 27 states.[26] There were more than 4.3 million paid prescriptions, which included both opioid and non-opioid pain medications, and all other classes of medications associated with these claims.[27] The claims represent injuries arising from October 1, 2011, to September 30, 2016, with prescriptions filled through March 31, 2018. The underlying data reflect an average of 24 months of experience. The data sources that underlie this study represent 37–72 percent of workers' compensation claims in each state.

In order to aggregate diverse opioid medications, we converted each opioid to the MME in milligrams that it represents. We compared the states based on the average MME amount of opioids per claim. We also analyzed a variety of metrics that signal higher use of opioids per claim, including the average number of opioid prescriptions per claim, the average number of opioid pills per claim, and the mix of different types of opioids prescribed. The utilization metrics also include duration of opioids per claim and average daily dose of opioids in 22 states with large samples of injured workers with complete days of supply information. In these 22 states, we computed the percentage of injured workers with opioids that received opioids on a chronic basis and at higher doses, which, if disproportionately higher, may serve as potential markers for the likelihood of future physical dependence, addiction, or diversion.

LIMITATIONS AND CAVEATS

Several limitations should be noted. First, the claims used for this study may not be representative of all claims in some states. For a few states, we did not obtain data from some payors with relatively large market shares.[28] Second, the data used for this analysis are based on an average of 24 months of experience, which is not necessarily sufficient to capture the full utilization of opioids. Certain types of opioids, especially long-acting opioids, are typically used more often at a later stage of medical treatment. Because of this, the reported utilization does not represent the overall utilization of opioids, especially for chronic pain cases. Third, the reader should be reminded that we report measures for nonsurgical claims with more than seven days of lost time that had prescriptions paid under workers' compensation at the time of evaluation.[29] These results cannot be simply extrapolated to all claims in a state because the exclusion of surgical cases may understate, and the

[26] We chose to focus on nonsurgical claims (claims that did not have a major surgery during the study period), claims with more than seven days of lost time, and claims with prescriptions paid under workers' compensation to make sure that the results of the interstate comparisons are meaningful. See Chapter 2 and Technical Appendix C for a discussion of this choice.

[27] *Pain medications* refers to prescription and over-the-counter strength medications indicated for pain relief, including opioids, NSAIDs, and acetaminophen, as well as adjuvant analgesics used for pain relief such as anticonvulsants, antidepressants, corticosteroids, dermatological agents, and compound drugs.

[28] We do not provide more detailed information regarding the states and data sources because of confidentiality concerns.

[29] There was substantial variation across states in the percentage of nonsurgical workers' compensation claims with more than seven days of lost time that received at least one prescription paid under workers' compensation across the study states, from 21 percent in Massachusetts to 65 percent in Florida in 2016/2018. See Technical Appendix C of this report for a discussion of the reasons underlying this variation and how this measure affects the interstate comparisons of prescription utilization.

exclusion of claims with seven or fewer days of lost time may overstate, the prevalence of opioid use and amount of opioids per claim to some extent. Moreover, the reader is reminded that opioid utilization measures reported are based on prescriptions paid under workers' compensation. We do not capture opioid prescriptions paid by non-workers' compensation payment sources, some or all of which may be used by injured workers for their work-related injury. Lastly, the interstate comparisons in this study were not adjusted for interstate differences in the mix of cases and injury severity. However, the differences in these factors are unlikely to be large enough to affect the results, based on the findings from the sensitivity analysis in Technical Appendix C and other Workers Compensation Research Institute (WCRI) studies that adjusted for these factors.[30] A more detailed discussion of these limitations can be found in Chapter 2 of this report.

[30] Adjusting for the mix of cases did not affect the characterization of states as higher, in the middle, or lower. We did not control for medical severity using administrative claims data. However, other WCRI studies reported small differences in injury severity across states.

1

INTRODUCTION

The dangers of opioid misuse resulting in death and addiction constitute a top priority public health problem in the United States. Since the late 1990s, the use of prescription opioids has continued to increase rapidly in the United States, coinciding with a sharp increase in unintended drug overdose deaths.[1] In 2011, the Centers for Disease Control and Prevention (CDC) declared opioid abuse an epidemic. According to a CDC report, overdose deaths due to opioid misuse and abuse exceed deaths due to traffic fatalities and non-prescription drug abuse (CDC, 2010). These public concerns regarding overuse and abuse are shared by the workers' compensation health care community. Opioids[2] have been widely prescribed for and filled by injured workers—about 32–70 percent of injured workers without a major surgery and out of work for more than seven days with prescriptions received opioids, despite medical recommendations to avoid routine prescriptions and to limit the use of opioids to cases with more severe pain or pain refractory to other analgesics.[3] Moreover, there is little evidence about the effectiveness of opioids for the treatment of chronic pain.[4]

The beginning of this decade marks the time when opioid utilization rates were at their peak in a number of states. In recent years, an increasing number of states have made legislative or regulatory changes, within and outside workers' compensation, to address issues related to overuse and misuse of opioids; and some policy changes were also made at the federal level (see Technical Appendix A for a detailed discussion of those changes). Examples of these efforts include the CDC guidelines for prescribing opioids for chronic pain, mandatory use of state prescription drug monitoring programs (PDMPs) to enable identification of potential drug abuse, provider education for controlled substance prescribers, and adoption of treatment guidelines to encourage appropriate use of controlled substances. Since then, a few studies have noted a decrease in opioid

[1] Ahmedani et al. (2014) reported that the rate of opioid pharmacy fills, quantity of opioids prescribed, and proportion of chronic opioid users increased consistently by more than two-fold between 1997 and 2011, with the exception of a one-time drop in 2010 that the authors attributed to the market withdrawal of propoxyphene. The CDC reported that the age-adjusted rate of drug overdose deaths increased from 6 to 15 per 100,000 population between 2000 and 2014, and the age-adjusted rate of drug overdose deaths involving opioids increased from about 3 to 9 per 100,000 population (Rudd et al., 2016a).

[2] The term *opioids* used in this report refers to prescription opioids for pain relief, including natural (codeine, morphine), semisynthetic (hydrocodone, oxycodone, etc.), and synthetic (methadone, fentanyl) opioids.

[3] Several guidelines address opioid prescribing for acute, subacute, and chronic pain. These guidelines generally recommend non-pharmacologic pain modalities and non-opioid pharmacologic treatment prior to or adjunct to prescribing opioids. See Technical Appendix B.

[4] Although several studies have documented some benefits of long-term opioid therapy for limited pain relief (see a more detailed discussion in Wang, Mueller, and Hashimoto, 2011), no studies have been published that support chronic opioid use for improved function or rapid return to work. For patients with occupational injuries, several studies found that a higher use of opioids may lead to addiction, increased disability or work loss, and even death (Kidner, Mayer, and Gatchel, 2009; Franklin et al., 2005; Volinn, Fargo, and Fine, 2009).

prescriptions in several states.[5] Similar changes were reported in some state workers' compensation systems.[6] By tracking changes in opioid utilization over time, this report provides an opportunity to monitor and evaluate these and other changes in policies aimed at controlling opioid prescribing and dispensing.

SCOPE OF THIS REPORT

This study is an update of previous WCRI studies,[7] with more recent pharmacy data and additional measures to characterize opioid utilization patterns of increasing concern, including chronic opioid use and concomitant use of opioids and other central nervous system depressant drugs. The report covers 27 states and prescriptions through March 2018.[8] In addition to documenting interstate variations in the frequency and amount of opioids, the study also examines changes in opioid utilization measures and prescribing patterns of opioids in each state over a four-year period from 2012/2014 to 2016/2018.[9]

Several important policy questions are not addressed in this report, including the following:

- What factors related to policies and practices explain the substantial interstate variations and trends in the use of opioids (e.g., state PDMPs and pain policies, guidelines for prescribing opioids, and workers' compensation system features). However, we highlight the changes in opioid policies that occurred in the states over the study period to help readers assess the possible factors influencing the changes in opioid utilization.
- Whether the interstate differences arise because the prescribing pattern of the typical provider differs across states, or whether the differences are attributable to a relatively small number of heavy prescribers that influence the overall use of opioids.
- How the use of opioids affects return-to-work outcomes.

ORGANIZATION OF THE REPORT

This report is organized into seven chapters. Chapter 2 describes the data and methods used in the analysis. Chapter 3 discusses major findings on the prevalence and overall use of opioids among the 27 states studied,

[5] Dart et al. (2015) examined trends in opioid abuse and mortality between 2002 and 2013 in the United States using data from IMS and Researched Abuse, Diversion, and Addiction Related Surveillance (RADARS) systems. They observed an increase in opioid prescriptions between 2002 and 2010 and a slight decrease in the measure from 2011 through 2013. The authors reported similar trends in other measures of opioid diversion, abuse, and opioid-related deaths. Florida also experienced a decrease in opioid overdose deaths after the pill mill legislation became effective, from an all-time high of 3,201 deaths in 2010 to 2,666 in 2012 (Johnson et al., 2014).

[6] Ireland, Young, and Swedlow (2014) and Thumula (2014).

[7] Thumula, Wang, and Liu (2017, 2016, and 2014) and Wang, Mueller, and Hashimoto (2011).

[8] The 27 states are Arkansas, California, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New Jersey, New York, North Carolina, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and Wisconsin. These states are geographically diverse and represent a significant share of the U.S. population, a wide range of industries, and a variety of benefit structures and policies for workers' compensation pharmaceuticals. The 27 states also represent a wide range of states where medical costs per claim were higher, lower, or typical compared with the national average and represent over two-thirds of the workers' compensation benefits paid in the United States.

[9] The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring from October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for other years.

highlighting the states where injured workers received unusually high amounts of opioids. Also included are measures of prevalence of chronic opioid use and use exceeding the guideline-recommended daily dose of 50 morphine equivalent milligrams.[10] Chapter 4 presents the trends in the use of opioids between 2012/2014 and 2016/2018 and highlights states with a rapid growth or decline in opioid use. Over the study period, the average amount of opioids per claim decreased by more than 30 percent in 20 of the 27 study states, with larger reductions in California, Connecticut, Kentucky, and New York. Chapter 5 focuses on the interstate variations and temporal changes in prescribing patterns of opioid pain medications, focusing on the type of opioids most frequently prescribed in each study state; the prescribing of long-acting Schedule II opioids; and the prescribing of benzodiazepines, sedatives, muscle relaxants, and anticonvulsants along with opioids. Chapter 6 examines the trends in non-opioid pain medications and non-pharmacologic treatments such as physical medicine services, behavioral treatments, and interventional pain management services. In Chapter 7, we discuss the implications of the results and the need for future studies. The statistical appendix provides additional data.

There are three technical appendices, which are included in the report as a convenient reference for methodological issues as well as state policies related to opioid use. Technical Appendix A provides a brief discussion of some key factors in the public policy environment that might influence the utilization and prescribing patterns of opioids, including PDMPs, treatment guidelines, and other state workers' compensation policies such as state-mandated drug formularies. This appendix provides background information on opioid policies that is helpful in interpreting the findings of this study. It is not our intention to discuss how each of these factors influences our results. Technical Appendix B discusses guideline recommendations for alternatives to opioids. Technical Appendix C provides the updated results from several sensitivity analyses to address some potential concerns about the validity of the results.

[10] These measures are reported for 22 of the 27 states for which we have information regarding the number of days for which each opioid prescription was written for a majority of claims in the state. See Chapter 2 for more details.

2

DATA AND METHODS

This chapter describes the data and methods we used for this study. For the reader who is interested in more detailed information about some specific aspects associated with our study, the technical appendices provide more details.

DATA AND REPRESENTATIVENESS

In this study, we include 575,431 nonsurgical claims with more than seven days of lost time that received at least one prescription paid under workers' compensation and more than 4.3 million paid prescriptions associated with those claims.[1,2] Those claims are from 27 states: Arkansas, California, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New Jersey, New York, North Carolina, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and Wisconsin.

The claims represent injuries occurring in five accident years from 2012 to 2016 (e.g., accident year 2012 covering claims with injuries from October 1, 2011, to September 30, 2012). Corresponding to each accident year, we included prescriptions filled through March 31 of each year from 2014 to 2018. This provides us with

[1] We chose to use claims with more than seven days of lost time for the analysis for several reasons. First, these claims received more prescriptions and experienced a wider range of opioid therapy compared with those that had only seven or fewer days of lost time. Focusing on these claims helped identify more meaningful interstate variations in the utilization and prescribing patterns of opioids. Second, the claims with more than seven days of lost time also accounted for the majority of workers' compensation medical costs, an area of greater policy implications. Third, because these claims provided a similar set of cases across states in terms of disability for work-related injuries, they helped to make the interstate comparisons of the utilization and prescribing patterns more meaningful. It is possible that selecting claims with more than seven days of lost time may filter in a subset of claims that may be more serious for some states and less serious for others. If that occurs, the results of interstate comparisons of the utilization of opioids may be biased. However, we did not see strong evidence suggesting that this was likely to occur in our data. See Technical Appendix C for a more detailed discussion.

[2] In this study, we also focus on nonsurgical claims because opioids may be prescribed to patients with surgery for different reasons, especially for post-surgical care. We defined nonsurgical claims as claims that did not have a major surgery during the study period. Major surgery is a WCRI-defined service group that is a subset of the surgery section of the Current Procedural Terminology (CPT®) manual. This service group includes invasive surgical procedures, as opposed to surgical treatments and pain management injections (which are also included in the surgery section of the CPT manual). The most frequent surgeries in this service group include (but are not limited to) arthroscopic surgeries of the shoulder or knee, laminectomies, laminotomies, discectomies, lumbar fusion, carpal tunnel surgeries, neuroplasty, and hernia repair. Evaluation of opioid use may need to take into account the timing in relation to surgery as well as injury severity and case experience. By focusing on nonsurgical cases, we make sure that the results that describe the use and prescribing of opioids are meaningful. However, in doing this, one may be concerned that states with higher surgery rates would have fewer serious cases among nonsurgical claims, thus distorting the comparisons. We assessed the extent of this potential concern and concluded that selecting nonsurgical cases is unlikely to bias the results of interstate comparisons. See Technical Appendix C for a more detailed discussion. Future studies may examine the use of opioids among surgical cases to provide a more complete picture.

an average of 24 months of experience for each accident year reported. Table 2.1 provides the number of claims and prescriptions by state that are included in the study. The table also shows that the insurance carriers and workers' compensation payors whose data underlie this study represent 37–72 percent of workers' compensation claims in each state.

The analysis data were extracted from the WCRI Detailed Benchmark/Evaluation (DBE) database, which includes detailed prescription transaction data that were collected from workers' compensation payors and their medical bill review and pharmacy benefit management vendors. For this report, we included transactions for prescription strength and over-the-counter strength medications, and compound drugs (referred to as *prescriptions* throughout the report).[3] These prescriptions could be filled or refilled by the injured worker at a pharmacy or physician's office and were paid under workers' compensation. We excluded prescription medications that were administered in a physician's office or a hospital (e.g., injections/infusions administered at a physician's office) and medical supplies or devices that were billed using National Drug Codes (NDCs).[4]

The data available for each prescription identify the specific medication prescribed, the date on which the prescription was filled, amounts charged and paid, the number of pills (for orally-administered opioids), the number of days for which the prescription was written (days of supply), and the strength of the medication in milligrams. The specific medication prescribed was identified by NDC. Completeness of days of supply has improved over the years, especially for pharmacy transactions. However, we continue to see missing days of supply for some opioid prescriptions. In 22 states, 63–81 percent of claims with opioids have days of supply information for all opioid prescriptions, and the claims with complete days of supply are representative of those that do not have complete days of supply information.

It is worth noting that the data on the dispensing patterns of opioids presented in this report are based on claims with prescriptions paid under workers' compensation. This is because the percentage of claims with at least one prescription varies widely across states and over time.[5] There are several possible reasons for the large variation. A likely main reason is that a certain percentage of prescriptions filled by injured workers were paid by non-workers' compensation payors.[6] Table 2.2 shows a large interstate variation in the percentage of claims with prescriptions and with opioid prescriptions paid under workers' compensation, for nonsurgical workers' compensation claims with more than seven days of lost time. With the percentage of the population with health insurance coverage provided in the table, it also shows that states with a lower percentage of claims with prescriptions tend to have a higher population coverage by non-workers' compensation insurance.

Ideally, one would use the percentage of claims that received opioid prescriptions to measure the frequency of injured workers receiving opioids. However, we do not observe opioid dispensing patterns for those opioid prescriptions filled by injured workers but not paid by workers' compensation payors. Neither can we

[3] Compound drugs were included in this edition of the report because they account for a noticeable share of prescription drugs in some states during the study period. Compound drugs were excluded in previous WCRI studies on pharmaceuticals because they were rarely dispensed to injured workers in earlier years. Compound drugs were predominantly identified using NDCs for bulk drugs, chemicals, and pharmaceutical adjuvants. We also used some data source-specific and state-specific codes to identify compounds.

[4] To identify injectables and medical supplies/equipment for exclusions, we mainly used Medi-Span® indicators that specified the types of products with NDCs as well as the route of administration.

[5] This large variation was observed in the data after our data quality assurance process, which includes steps to address potential missing data issues and intrastate comparison across data sources on the key data elements.

[6] Prescribing norms may vary from state to state, which might affect prescribing patterns within and outside workers' compensation to some extent. Other less important reasons include cash payments and over-the-counter medications that are out of pocket or paid by other insurers.

reasonably assume that the prescriptions paid by other payors were not for opioids. Because of this, we decided to report opioid dispensing metrics based on the prescriptions paid under workers' compensation. We believe that with this measurement the interstate comparison in opioid dispensing is unlikely to be distorted in terms of how states are being characterized as low, medium, or high on our key measures. See Technical Appendix C for a more detailed discussion.

Table 2.1 Claims and Prescriptions Included in the Study

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
% of all claims in each state represented by data sources included in the study	40%	47%	62%	50%	37%	41%	40%	52%	46%	41%	40%	46%	56%	43%	45%	45%	56%	49%	60%	44%	46%	40%	55%	51%	72%	58%	40%
Number of nonsurgical claims with more than 7 days of lost time that received prescriptions for …																											
Any medication	2,964	147,199	13,593	1,967	48,248	18,840	6,385	27,118	10,578	5,614	7,901	6,996	11,701	10,623	16,108	10,170	11,651	16,314	24,747	5,457	29,768	29,629	9,828	14,731	66,937	10,730	9,632
Pain medications	2,872	142,601	12,768	1,885	46,818	18,382	5,984	25,976	10,141	5,349	7,560	6,804	10,916	10,215	15,439	9,439	11,035	15,751	23,386	5,219	28,201	28,379	9,510	14,273	64,473	10,261	9,069
Opioids	2,231	76,684	6,675	1,058	26,910	12,266	4,022	13,196	6,572	3,480	4,282	5,212	6,823	5,584	8,958	6,384	6,755	11,155	10,157	3,466	15,012	17,301	6,760	9,220	44,718	7,083	6,238
Among nonsurgical claims with more than 7 days of lost time, number of prescriptions for …																											
Any medication	20,119	1,281,733	82,922	15,093	369,810	157,643	39,905	168,351	60,765	33,875	57,095	92,196	83,009	63,767	90,473	61,733	56,134	126,402	108,481	33,423	235,919	263,035	77,296	92,463	551,384	79,504	54,675
Pain medications	14,863	931,628	60,895	11,300	261,749	116,847	29,230	124,098	46,722	24,813	41,882	68,434	62,109	47,175	67,709	45,314	41,211	95,038	80,682	24,267	178,545	196,977	58,673	68,760	406,600	59,094	41,077
Opioids	7,513	295,998	23,049	4,875	86,750	46,724	12,720	44,519	21,334	11,326	16,564	34,445	25,853	17,602	27,721	19,679	18,097	42,390	25,506	10,982	59,035	78,392	25,651	29,143	178,913	24,563	19,214

Note: Underlying data are claims that had injuries arising from October 1, 2011, to September 30, 2016, and prescriptions paid for by a workers' compensation payor filled through March 31, 2018.

Definitions:

Pain medications: Prescription medications for pain relief, including opioid and non-opioid medications, including over-the-counter strength pain medications.

Opioids: Opioid analgesics that are often prescribed by physicians for pain relief. Unlike other non-opioid pain medications, opioids are classified at both the federal and state level as controlled substances because they have a potential for producing psychological or physical dependence.

Table 2.2 Percentage of Nonsurgical Claims with More Than 7 Days of Lost Time with at Least One Prescription and One Opioid Prescription Paid under Workers' Compensation, 2016/2018

	Health Insurance Coverage[a]	% of Claims That Had a Prescription	% of Claims That Had an Opioid Prescription
Arkansas	90%	47%	33%
California	91%	60%	22%
Connecticut	94%	41%	16%
Delaware	93%	45%	19%
Florida	85%	65%	29%
Georgia	85%	61%	33%
Iowa	95%	42%	24%
Illinois	92%	43%	19%
Indiana	91%	51%	27%
Kansas	91%	48%	25%
Kentucky	94%	43%	20%
Louisiana	88%	48%	33%
Massachusetts	97%	21%	9%
Maryland	93%	45%	21%
Michigan	93%	48%	24%
Minnesota	95%	34%	17%
Missouri	90%	46%	22%
North Carolina	88%	45%	27%
New Jersey	90%	41%	13%
Nevada	87%	61%	31%
New York	93%	28%	11%
Pennsylvania	94%	49%	24%
South Carolina	88%	45%	27%
Tennessee	89%	51%	29%
Texas	81%	59%	35%
Virginia	90%	46%	26%
Wisconsin	94%	36%	20%

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

[a] Showing the percentage of respondents with specified health insurance coverage in 2016. The sample is limited to civilian employed respondents who were at work. Source: Author's own estimates from the American Community Survey.

Unlike other WCRI benchmark reports, the claims included in this study may or may not necessarily be representative of the total population of claims in a few states. This occurs for two reasons. First, the reporting of detailed prescription data was less complete than other benchmarking data for a few data sources in some states, which resulted in additional exclusions of data sources when constructing benchmark metrics for this study. This occurred when a data source in a state did not have complete and adequate data on NDCs, quantities, and days of supply for prescriptions—data elements that are critical for constructing prevalence and amount of opioids metrics. Although the completeness of critical data elements related to drugs continued to improve over time, with only a small proportion of claims being excluded during the study period, the exclusions of some data sources may affect the representativeness of the data to the extent that the claims from those excluded data sources were very different in some way from those that were included. Second, we did not

obtain data from one or more important data sources for a few states, which may affect the representativeness of our data for these states.[7]

IDENTIFYING AND GROUPING OPIOID AND OTHER PAIN MEDICATION PRESCRIPTIONS

This report mainly focuses on characterizing opioid utilization, but it also provides limited but important measures of utilization of non-opioid pain medications. We used the therapeutic classification scheme provided by Medi-Span® to identify pain medication prescriptions and assign drugs into different pain medication categories: opioids, non-steroidal anti-inflammatory drugs (NSAIDs), other analgesics (acetaminophen), anticonvulsants, antidepressants, compound drugs, corticosteroids, and dermatological agents.[8] We refer to both non-opioid analgesics (such as NSAIDs and acetaminophen) and adjuvant analgesics (such as anticonvulsants, antidepressants, corticosteroids, dermatological agents, and compound drugs) as *non-opioid pain medications* in this study.

We identified the schedules associated with individual opioid prescriptions using an indicator in the Medi-Span® database. There are five schedules of controlled substances, classified by the Drug Enforcement Administration (DEA) under federal law, which are based on a drug's medical usefulness and abuse potential. Table 2.3 provides the definitions of the five schedules and examples of specific drugs classified in each schedule during the study period. For instance, oxycodone (OxyContin®) and oxycodone-acetaminophen (Percocet®) are classified as Schedule II opioids, and codeine-acetaminophen (Tylenol® with codeine) is classified as a Schedule III opioid.

Note that the federal classification of two of these drugs changed in 2014. The legislation, "Safe Prescribing Act of 2013," reclassified hydrocodone-combination products from Schedule III to Schedule II at the federal level, effective October 2014.[9] At the state level, hydrocodone-combination products have been considered Schedule II in New York since February 2013, prior to the federal change. In this study, hydrocodone-acetaminophen (Vicodin®) and other hydrocodone-combination products were classified as a Schedule II opioid throughout the study period.

In August 2014, the DEA classified tramadol as a Schedule IV drug.[10] Prior to that, tramadol (Ultram® and Ultracet®) was the only opioid that was not scheduled at the federal level. Some states had proactively classified it as a controlled substance even though it was not controlled at the federal level.

---

[7] We do not provide more detailed information regarding the states and data sources due to confidentiality concerns.

[8] According to Medi-Span®'s Therapeutic Classification System, a hierarchical classification scheme, the first two digits of the 10-digit Generic Product Identifier classifies general drug products. For example, we identified opioid prescriptions based on drug group 65 for opioid analgesics. See Medi-Span® (2005).

[9] Up-scheduling of hydrocodone-combination products to Schedule II would mean the requirement of a written prescription and no refills, which is likely to reduce the use of hydrocodone-combination products. Apart from the federal laws about prescribing Schedule II drugs, several states have additional rules limiting the quantity of Schedule II drugs to a 30-day supply or limiting the prescriptions to a specified period of time after which they expire.

[10] See DEA (2014) at https://www.deadiversion.usdoj.gov/fed_regs/rules/2014/fr0702.htm.

Table 2.3 Federal Classification of Controlled Substances

Schedule	Criteria for Classification	Examples of Specific Drugs
Schedule I	The drug or other substance has high potential for abuse and has no currently accepted medical use in treatment in the United States.	Heroin, marijuana,[a] lysergic acid diethylamide (LSD), and methaqualone
Schedule II	The drug or other substance has high potential for abuse, which may lead to severe psychological or physical dependence, and has a currently accepted medical use in treatment in the United States.	Morphine (Avinza®), fentanyl (Duragesic®), oxycodone HCL (OxyContin®), oxycodone-acetaminophen (Percocet®), hydrocodone (Zohydro®), hydrocodone-acetaminophen (Vicodin®, Lortab®),[b] and methadone[c]
Schedule III	The drug or other substance has less potential for abuse than the drugs or substances in Schedules I and II and has a currently accepted medical use in treatment in the United States. Abuse of the drug or substance may lead to moderate or low physical dependence or high psychological dependence.	Codeine-acetaminophen (Tylenol® with codeine) and buprenorphine (Suboxone®)
Schedule IV	The drug or other substance has a low potential for abuse relative to drugs in Schedule III and has a currently accepted medical use in treatment in the United States. Abuse of the drug or substance may lead to limited physical or psychological dependence relative to the drugs or other substances in Schedule III.	Propoxyphene-N w/APAP (Darvon®),[d] tramadol HCL (Ultram®),[e] and tramadol-acetaminophen (Ultracet®)[e]
Schedule V	The drug or other substance has a low potential for abuse relative to the drugs or other substances in Schedule IV and has a currently accepted medical use in treatment in the United States. Abuse of the drug or substance may lead to limited physical dependence relative to the drugs or substances in Schedule IV.	Cough medicine with codeine (Robitussin®AC)

[a] Marijuana is listed as a Schedule I controlled substance at the federal level, along with opioids that have high potential for abuse and are not for medical use. However, this drug has been recognized for medical use, by laws, in 33 states plus the District of Columbia in the United States (information available at http://medicalmarijuana.procon.org/view.resource.php?resourceID=000881).

[b] In October 2014, the Drug Enforcement Administration moved hydrocodone-combined products, including Vicodin® and Lortab®, to Schedule II, the category of medically accepted drugs with the highest potential for abuse, mainly because of the rise in hydrocodone abuse and trafficking in the last several years.

[c] Methadone may be prescribed as a Schedule II analgesic for chronic pain because it is inexpensive. However, its use has been discouraged because of a high risk of overdose death. The drug can also be used for weaning the patient from high-dose opioids, but it is less likely to be present in our data because, under the Controlled Substances Act, it is not lawful to prescribe opioid drugs for the purpose of detoxification of opioid addiction without being registered as a Narcotic Treatment Program (NTP). NTPs may only use drugs approved for this purpose, such as methadone, and must comply with federal and state methadone program regulations.

[d] Darvon® was voluntarily recalled from the market due to safety reasons in November 2010.

[e] In August 2014, the Drug Enforcement Administration scheduled tramadol products (including Ultram® and Ultracet®) as Schedule IV controlled substances.

Source: Drug Enforcement Administration, U.S. Department of Justice. 2017. Available at http://www.justice.gov/dea/pr/multimedia-library/publications/drug_of_abuse.pdf.

In this study, we further classified Schedule II opioids into two categories based on the formulation type—long-acting Schedule II and short-acting Schedule II. Long-acting Schedule II opioids are typically in sustained or controlled-release form with a higher dosage or strength that lasts longer and provides relatively more stable medication levels compared with short-acting opioids. There is no strong evidence to indicate that long-acting opioids are more effective than short-acting opioids of the same dose, while there is some evidence to indicate a higher overdose risk among patients initiating treatment with long-acting opioids compared with those initiating treatment with short-acting opioids (CDC, 2016). Most guidelines recommend short-acting opioids over long-acting opioids as first-line treatment for acute or chronic pain.[11]

[11] The CDC opioid guidelines recommend that when starting opioid therapy for chronic pain, clinicians should prescribe short-acting opioids instead of long-acting opioids. A summary of other guideline recommendations for short- versus long-acting opioids is provided in Table TA.B1 of the report *Longer-Term Dispensing of Opioids, 4th Edition* (Wang, 2017).

In Chapter 5, for the purpose of describing prescribing patterns, we categorize opioid prescriptions into the following categories: hydrocodone-acetaminophen (Vicodin®), oxycodone-containing products (OxyContin® and Percocet®), tramadol-containing products (Ultram® and Ultracet®), and all other opioids.[12]

IDENTIFYING NON-PHARMACOLOGIC PAIN MANAGEMENT SERVICES

In this report, we also examine the use of non-pharmacologic services that are recommended for pain management, including physical medicine evaluation, active and passive physical medicine, manipulation, acupuncture, behavioral therapy, and interventional pain management.[13] We identified these recommended services using Current Procedural Terminology (CPT®),[14] and Healthcare Common Procedure Coding System (HCPCS) codes, which are listed in Table 2.4.[15] We identified the non-pharmacologic pain treatment and evaluation services as those paid for by a workers' compensation payor regardless of whether the service was provided in a hospital or nonhospital setting.

[12] All other opioids include opioids that were infrequently prescribed to injured workers across the study states—propoxyphene, codeine, buprenorphine, fentanyl, morphine sulfate, hydromorphone, oxymorphone, tapentadol, and methadone. We grouped these opioids together in order to highlight trends in the prescribing of the most frequently prescribed drugs.

[13] Technical Appendix B provides a summary of the general recommendations about utilization of non-pharmacologic pain treatment from several widely accepted treatment guidelines at the national and state levels.

[14] CPT® is a registered trademark of the American Medical Association.

[15] We also used International Classification of Diseases (ICD) codes, hospital revenue codes, and some state-specific codes to identify non-pharmacologic services, which were used infrequently.

Table 2.4 Non-Pharmacologic Pain Treatments

Treatment Type	CPT and HCPCS
Active physical medicine	97110, 97112, 97113, 97116, 97150, 97530, 4242F, S9451, 97545, 97546, 97145, 97770, 97531–97533, 97537, 95992, 97720, 97721
Acupuncture	97780, 97781, 97810, 97811, 97813, 97814, S8930
Behavioral evaluation	90785, 90791, 90792, 90801, 90802, 90845, 96101–96105, 96110, 96111, 96116, 96118–96120, 96150, 96151, 96160, 99420, H0031, H0032
Behavioral treatments	90804–90819, 90821–90824, 90826–90829, 90832–90840, 90846, 90847, 90849, 90853, 90857–90876, 90880, 90882, 90887, 90899, 96152–96155, 99408, 99409, G0176, G0177, G0396, G0397, H0002, H0004, H0005, H0007, H0017–H0019, H0035–H0037, H0046, H0050, H2012, H2013, H2017–H2020, H2027, H2033, S9480, T1006, T2048
Chiropractic manipulations	98940–98943
Interventional pain management	
Discography and disc decompression	62287, 62290, 62291
Electrical stimulation implants	63650, 63655, 63661–63664, 63685, 63688
Epidural and adhesiolysis procedures	62263, 62264, 62310, 62311, 64479, 64480, 64483, 64484,
Facet and sacroiliac joint interventions	27096, 64470, 64472, 64475, 64476, 64490–64495, 64622, 64623, 64626, 64627, 64633–64636, 0216T, 0217T, 0218T
Intrathecal pump implants	62350, 62355, 62360–62362, 62365, 62367, 62368, 62370
Trigger point injections	20552, 20553
Vertebral augmentation procedures	22510–22515
Other injections and nerve blocks	00630, 00632, 00635, 00640, 00670, 00752, 01936, 01967, 01992, 11900, 20251, 20526, 20550, 20551, 20600, 20604–20606, 20610–20612, 26035, 27093, 27095, 30200, 61026, 62268, 62272–62282, 62288, 62289, 62292, 62298, 62303, 62304, 62318–62327, 64400, 64402, 64405, 64408, 64410, 64413, 64415, 64416, 64417, 64418, 64420, 64421, 64425, 64430, 64435, 64440–64450, 64455, 64463, 64486–64488, 64505, 64508, 64510, 64517, 64520, 64530,64600, 64605, 64610, 64612, 64620, 64630, 64640, 64680, 67500, 67515, 68200, 76000, 76005, 77003, 99144, 99602, 0228T, 0229T, 0230T, 0231T, 2044F
Passive manipulations	97124, 97140, 98925–98929, S9090
Passive physical medicine modalities	
Biofeedback	90901, 90902, 90904, 90906, 90908, 90910
Cold laser	97039, S8948
Other physical therapy	97016, 97022, 97034, 97036, 97139, 97750, 97799
Self-care	97535, 98960–98962, 99071, 99078, 4450F, G8780, S9445, S9446, S9454
Superficial heat	97010, 97018, 97020, 97024, 97026, 97028
Traction	97012, E0941
Transcutaneous electrical nerve stimulation (TENS)	64550, 97014, 97032, 0278T, A4595, E0720, E0730, E0770, G0281–G0283
Ultrasonography	97033, 97035
Physical medicine evaluation	95833, 95834, 95851, 97000–97006, 97161–97164, 97751, 97752, G8509, G8730, G8731, G8939

Key: CPT: Current Procedural Terminology; HCPCS: Healthcare Common Procedure Coding System.

IDENTIFYING DISPENSING POINT

Most of the benchmark metrics included in this study measure the utilization of opioids per claim regardless of who dispensed the opioid prescriptions. For the metric that measures the proportion of opioid prescriptions dispensed by physicians, we rely on the dispensing point identified in our drugs database. Physician-dispensed prescriptions were defined as those that were filled at the offices of independent practitioners, physician groups, or medical centers or clinics that may or may not have an on-site pharmacy. We consider prescriptions dispensed at and billed for by a medical center or clinic to be physician-dispensed prescriptions. This is because, although the medical center may have an on-site pharmacy that functions like a retail pharmacy, prescriptions dispensed and billed for by the medical center as a financial entity are often reimbursed differently compared with retail pharmacies.[16,17] Pharmacy-dispensed prescriptions were those dispensed at retail or mail-order pharmacies.

MEASURING UTILIZATION OF OPIOIDS

We measure the frequency of claims receiving opioid prescriptions paid under workers' compensation as the percentage of claims with prescriptions that received at least one opioid prescription. We also report the percentage of claims with prescriptions receiving two or more opioid prescriptions.[18] Claims with prescriptions paid under workers' compensation provide a reasonable and robust base to measure frequency of opioid dispensing. We do not use all claims as a base because the percentage of claims with a prescription paid under workers' compensation varies widely across states and over time, which may affect the interstate comparison on patterns of opioid dispensing. See discussions earlier in this chapter and in Technical Appendix C.

Among injured workers receiving opioids, the overall utilization of opioids is measured by the average morphine milligram equivalent amount (MME) per claim with opioids, which is referred to as the *amount of opioids per claim* throughout the report. This measure was constructed by applying a morphine equivalent equianalgesic conversion (described in the next section). We use this measure for interstate comparisons and examining trends because it standardizes both quantity and strength of different opioid medications. In this study, we report the mean values of this measure after excluding a small percentage of claims (0.0–0.6 percent

[16] We identified physician-dispensed prescriptions based on several critical data elements, including (1) the information provided by the data sources that indicates if a physician or pharmacy was the provider of the medication; (2) the Medi-Span® indicator that specifies repackaged drugs using the NDCs assigned for a repackaged drug by the Food and Drug Administration; and (3) the place of service. For prescriptions that did not have the above information but a unique provider identifier (tax ID or national provider identification number) was present, we derived the dispensing point based on the data elements above assigned to the same provider. Note that by our definition, prescriptions for repackaged drugs are considered physician-dispensed prescriptions. Based on the evidence we saw in our detailed data review and our understanding of the incentive mechanism in the business process, we believe that retail pharmacies rarely dispense repackaged drugs in practice.

[17] It should be noted that all prescriptions included for this study were identified as either physician- or pharmacy-dispensed prescriptions. Although more detailed data allow us to observe, as needed, some more details about dispensing entities that were associated with certain prescription transactions, it did not allow us to systematically differentiate between medical clinics with a pharmacy and independent pharmacies, or between medical clinics and physician groups. Throughout the report, we focus on both physician- and pharmacy-dispensed prescriptions for major findings, and occasionally, we discuss some observations about the types of dispensing entities to provide more detail for better understanding of what we see in the data.

[18] In previous editions of this report, we reported the percentage of claims with pain medications that had opioids and the percentage of claims with pain medications that had two or more opioid prescriptions. These two measures can be derived from the measures presented in Table 4.1.

of claims with opioids across the 27 states) that had unusually high amounts of morphine equivalent opioids per claim.[19] There is substantial variation in opioid use across individual claims within a state; relatively few claims account for most opioid use. This raises a concern that the average MME per claim may be skewed, even after excluding the claims with unusually high amounts, affecting the results of interstate comparisons. Based on our analysis of the comparative results for the same measure at the median and other selected percentiles higher than the median, we concluded that the results based on the mean value correctly characterize whether a state is higher, lower, or typical in terms of use of opioids. In Technical Appendix C, we report a measure for each state to enable interstate comparisons for readers concerned with the sensitive nature of the average MME per claim measure: the percentage of claims with opioids that had MME amounts greater than 2,500 milligrams, to summarize the number of individuals with relatively more use of opioids.[20] A detailed discussion and results are provided in Technical Appendix C.

Several other utilization metrics are also included in the analyses to help explain why a state might have higher or lower utilization of opioids or what might be the main reasons for trends. For example, since the higher utilization of opioids in a state could be due to more prescriptions filled per claim or more pills per opioid prescription, we include both measures in this study although they are imperfect measures for a comparative analysis.[21] Together with the frequency of dispensing opioids and stronger Schedule II opioids, these measures help us understand why a state had higher utilization of opioids per claim, such as (1) physicians wrote and injured workers filled more prescriptions per claim; (2) prescriptions were written for a higher number of pills; or (3) physicians were more likely to prescribe certain stronger Schedule II opioids, which have a higher morphine equivalent conversion factor.

In this edition, we include metrics of duration and morphine equivalent daily dose (MED) in order to highlight the patterns of chronic opioid use and high-dose use (i.e., use exceeding guideline-recommended doses). We constructed these measures using a subset of claims with complete days of supply in the most recent study year, 2016/2018. For 22 states, 63–81 percent of claims had complete days of supply information for all opioid prescriptions.[22] One may be concerned that claims with days of supply are different from claims without days of supply and may not represent all claims with opioid prescriptions in our sample. We tested the magnitude of the potential bias introduced by using claims with complete days of supply on metrics of duration and daily dose of opioids and found that it was unlikely to be material for the purpose of interstate

[19] This approach is somewhat different from what we used in the first edition of this study (Wang, Mueller, and Hashimoto, 2011). It helps smooth the trends observed so that the trend results are not unduly sensitive to the claims with extreme values. Although this change may result in some differences in the values on the amount of opioids per claim, the interstate comparison results are consistent for the states included in the two studies. See Technical Appendix C for a more detailed description and additional data on the amount of opioids per claim.

[20] We chose a fixed cut-off of 2,500 MME per claim based on the distribution of the measure across the 27 study states. Claims with MME amounts greater than 2,500 milligrams represent the top 5 percent of claims across most study states. These claims accounted for 15–70 percent of opioid prescriptions and 34–90 percent of total MME amounts across the 27 study states. Technical Appendix C provides a more detailed discussion.

[21] Conceivably, physicians in different states prescribe different quantities of opioids and/or prescribe the same quantities of opioid medications but at different strengths. If states vary systematically in these aspects, neither the average number of prescriptions nor the average number of pills per claim would accurately depict the level of utilization of opioids in a comparable way.

[22] The 22 states are Arkansas, Delaware, Florida, Georgia, Indiana, Iowa, Kansas, Kentucky, Louisiana, Massachusetts, Michigan, Minnesota, Missouri, New Jersey, New York, North Carolina, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, and Wisconsin. These 22 states are among the states with higher, typical, and lower frequencies and amounts of opioids based on the 27-state comparison.

comparisons.[23]

To examine workers with chronic opioid use and high-dose opioid use, we converted the opioid transactions into day-to-day utilization metrics based on the opioid fill date and days of supply of each opioid prescription. We counted each day the injured worker had an opioid supply and computed the morphine equivalent dose received on each day by adjusting for overlapping opioid prescriptions.

In this study, we define chronic opioid use as injured workers receiving opioids for at least 60 days during any continuous 90-day period over the average 24-month observation period.[24] Our definition allows for minor gaps between two subsequent fills during the 90-day episode because injured workers may be taking the opioid medication less frequently than prescribed. Considering each non-overlapping 90-day period where an injured worker received opioids for at least 60 days as a chronic opioid therapy episode, we measured the frequency of injured workers with multiple chronic opioid therapy episodes.[25]

We defined injured workers with high-dose opioids as those receiving an MED exceeding 50 and 90 milligrams for at least 60 days during the average 24-month observation period. CDC guidelines for prescribing opioids for chronic pain caution prescribers to reassess the risks and benefits to the patient when prescribing an MED exceeding 50 milligrams and to avoid an MED exceeding 90 milligrams; they recommend that prescribers discuss other treatments with the patient if pain and function do not improve at doses exceeding 90 milligrams MED and to taper opioids.[26]

Some other metrics reported in this study are based on prescriptions for pain medications (which consist of opioids and non-opioid pain medications) and non-pharmacologic pain management services. These measures help us identify states that have high or low use of non-opioid pain management services. All the utilization metrics in this study were constructed based on a weighting method, so the results reflect the claim experience in each state for all market segments included.

Differences across states in disability duration and claim maturities may also be reflected in the results of interstate comparisons. We also examined the amount of opioids per claim at different maturities and at different disability durations to see how the states compare when holding maturity or duration constant (see Technical Appendix C).

In this report, we chose to highlight comparative results where the differences are large enough to be potentially meaningful from the perspective of policymakers and other stakeholders. We also ensured that the comparisons with the 27-state median and trend results for the frequency and amount of opioid use we highlight in this report are statistically significant at the 10 percent level (see Tables SA.1 and SA.2).

---

[23] To test the bias we (1) compared the average MME across all claims in the state with the average MME among claims with complete days of supply and found small differences under 10 percent in almost all states; and (2) we computed the proportion of claims with more than 90 days of continuous opioid use across all claims with opioids by assuming much lower rates of chronic opioid use among claims for which we do not have complete days of supply (we reduced the rate of chronic use by a multiplier of the percentage difference in the average MME between claims with complete days of supply and all claims) and found that the characterization of states as higher, lower, or in the middle did not change.

[24] Characterization of states as having higher, typical, or lower percentages of claims with chronic opioid use does not change when we use alternative definitions to characterize chronic opioid therapy, including receiving more than 90 days of opioids during any 180-day period, receiving 45 days of opioids during any 90-day period, or having two or more quarters with more than 60 days of opioids.

[25] See Table SA.5 for interstate variations in the frequency of multiple chronic opioid therapy episodes.

[26] Higher daily dose limits are recommended by some other state guidelines, see Table TA.B1 for the maximum daily dose recommendations of select guidelines used in and outside workers' compensation. Higher limits recommended by other guidelines may understate the potential harm of high-dose opioid therapy in our population of injured workers without a major surgery evaluated at an average of 24 months' maturity.

MORPHINE MILLIGRAM EQUIVALENT EQUIANALGESIC CONVERSION

Opioid medications vary in their effectiveness for relieving pain (i.e., *analgesic potency* in medical terms). The same number of milligrams in the dosage for different opioids may indicate different strengths. For example, 1 milligram of oxycodone (OxyContin®) is equivalent to 1.5 milligrams of morphine, while 1 milligram of hydromorphone (Exalgo®) is equivalent to 4 milligrams of morphine. The effectiveness of opioid medications also depends on the route of administration. A medication will have a quicker onset action if given intravenously or by intramuscular injection than if administered orally. Once an opioid drug is determined to be beneficial for a patient, the physician often uses a morphine equivalent dose conversion table to determine the proper dosage and administrative route for the patient.

We measured the utilization of opioids based on the MME for specific opioid medications, which takes into account the differences in strength as well as the quantity of opioid medications received by injured workers. This way, the interstate difference in the utilization of opioids would not be affected by the difference in the strength of specific opioid medications. We first applied the morphine equivalent equianalgesic conversion factors from the CDC[27] at the prescription level to compute the morphine equivalent dose in milligrams for individual prescriptions.[28] The morphine equivalent dose for each opioid prescription was calculated as a product of the strength in milligrams of the prescribed opioid medication and the analgesic potency ratio between the specific opioid and morphine, multiplied by the number of pills (or quantity) of the prescription. A variable was created for each individual claim to capture the cumulative MME across different opioid medications received by the injured worker. The cumulative MME was further aggregated to the state level across all claims that received opioids in the state.

SENSITIVITY ANALYSIS FOR CLAIM SELECTION

The interstate comparisons in this report were made based on nonsurgical claims with more than seven days of lost time that received prescriptions and opioids. We chose this subset of claims for several reasons. First, the patterns of use of opioids are very different between surgical and nonsurgical claims, with surgical claims generally having higher frequency and amount of opioid use compared with nonsurgical claims. Examining patterns of use separately for surgical and nonsurgical claims helps to produce clinically meaningful results and makes the sample of claims underlying the measures more comparable in terms of mix of injuries and injury severity. Second, since nonsurgical claims are mostly claims with musculoskeletal injuries that tend to be less serious, with lower consensus regarding the need for opioids in pain management compared with surgical cases, analyzing nonsurgical claims helps identify potential issues with opioid utilization and helps monitor the results of opioid policy changes. In this report, we continue to focus on nonsurgical claims. Future studies may examine surgical claims to provide a full picture of opioid utilization. Third, claims with more than seven days of lost time are those that account for a small proportion of all claims but represent a large share of workers'

[27] The conversion factors compiled by the CDC for analytical purposes are available at https://www.cms.gov/Medicare/Prescription-Drug-Coverage/PrescriptionDrugCovContra/Downloads/Opioid-Morphine-EQ-Conversion-Factors-April-2017.pdf.

[28] Starting with the third edition of this study, we decided to use the conversion factors published by the CDC because of their widespread use. It should be noted that for a few opioid drugs (e.g., fentanyl and buprenorphine) that were relatively infrequently prescribed to injured workers, the conversion factors used for this report are different from those used in the first and second editions. See Thumula, Wang, and Liu (2014) for more details about the conversion factors used in the previous editions of this study.

compensation medical costs with significant implications for indemnity, total costs, and worker outcomes. Focusing on this set of claims also helps to capture interstate variations and identify states that are likely to have more prevalent opioid dispensing. Fourth, we focus on claims with prescriptions because a variable percentage of injured workers across states and over time did not have prescriptions paid under workers' compensation for reasons discussed earlier in this chapter.

Since the selection was based on three variables reflecting the differences across states in claim type and how medical services were being delivered to injured workers, one may be concerned that such a selection may bias the results of interstate comparisons if more severe cases were selected for some states and less severe cases were selected for others. One way to assess the existence and extent of this potential selection issue is to examine how a selection variable is correlated with key utilization measures among the subset of cases selected. The notion is that if the selection variable resulted in a different percentage of cases being selected for each state and the varying percentage is correlated with the utilization variable, this may suggest a potential bias. If this occurs, one has to assess how sensitive the results are to potential selection.

We looked at the correlation at three different points of selection: (1) claims with more than seven days of lost time, (2) nonsurgical claims, and (3) claims with prescriptions that received opioids. The results of our analysis suggest that the potential bias due to the selection of the subset of claims is unlikely to be a serious concern. We discuss this in detail in Technical Appendix C.

We also examined whether the interstate comparisons based on these claims are sensitive to differences in case mix across the states. To do this we estimated the utilization metrics while controlling for the differences in the worker's age, gender, and marital status; the type of injury the worker sustained; and the type of industry in which the injured worker was employed. The regression-based results are largely consistent with the results for the unadjusted measures (see Tables TA.C2–C5).

LIMITATIONS AND CAVEATS

Several limitations should be noted. First, the claims used for this study may not necessarily be representative of all claims in some states. This may occur because the reporting of pharmacy data, although improving, was less complete for several data sources, resulting in additional exclusions.[29] For a few states, we are missing data from some large regional insurers.[30]

Second, the data used for this analysis are based on an average of 24 months of experience, which is not necessarily sufficient to capture the full utilization of opioids. This is because certain types of opioid drugs, especially long-acting opioids, are typically used at a later stage of medical treatment.[31] As a result, we expect that in some states, the use of opioids would increase as claims age, especially in those states with higher proportions of injured workers with chronic opioid use compared with the median state. The reverse would be

[29] Although we made sure that the claims included for this study represented all claims from the same data sources, the additional exclusions (of data sources in some states) may affect the representativeness if the claims from those data sources were different or had different experiences.

[30] We do not provide more details because of confidentiality concerns.

[31] In a National Council on Compensation Insurance, Inc. (NCCI) study, the authors found that the opioid share of all prescriptions increased steadily when claims became more mature until about the eighth year postinjury (Lipton, Laws, and Li, 2009). The same study also looked at the opioid share by costs per opioid prescription, where the high-cost group would presumably include more prescriptions for stronger and long-acting opioids. The study found that the high-cost opioid prescriptions grew from 9 percent of all opioid prescriptions in the 1st year to 45 percent in the 12th year postinjury.

true for states with a lower-than-typical share of injured workers with chronic use. This may affect the ultimate rankings for some states.

Third, we report opioid utilization measures for nonsurgical claims with more than seven days of lost time that had prescriptions paid under workers' compensation at the time of evaluation.[32] While these claim selections for the analysis are unlikely to distort the results of interstate comparisons and trends in this report, we caution the reader not to simply extrapolate the results to all claims in a state. This is because excluding surgical claims from the analysis is likely to undercount the opioids dispensed to injured workers in the state. Whereas the exclusion of claims with seven or fewer days of lost time and claims with no prescriptions observed (either because they had no prescriptions or no prescriptions paid under workers' compensation) may overstate the prevalence of opioid use and amount of opioid use per claim. The combined effect may be different depending on the state. Moreover, the reader is reminded that opioid utilization measures reported are based on prescriptions paid under workers' compensation. We do not capture opioid prescriptions paid by non-workers' compensation payment sources, some or all of which may be used by injured workers for their work-related injury.

Lastly, for the interstate comparisons in this study, we did not adjust for interstate differences in case mix and injury severity. However, we did a sensitivity analysis adjusting for differences across states in the case mix, and the comparative results did not change.[33] Nonetheless, the reader should keep this in mind when interpreting the results.

[32] We chose to report the measures based on this subset of data for various reasons, including (1) opioids may be prescribed to patients with surgery for different reasons, especially for post-surgical care; (2) claims with more than seven days of lost time, representing a small percentage of all claims but a large share of workers' compensation medical costs, have significant implications for indemnity costs, total costs, and worker outcomes; and (3) a large proportion of nonsurgical claims with more than seven days of lost time did not have paid prescriptions in our data. The concerns about potential bias of these selections are briefly addressed earlier in this chapter.

[33] See a detailed discussion in Technical Appendix C. Several previously published WCRI studies also found that the usually small differences in case mix and injury severity across states are unlikely to affect interstate comparisons in a material way. See Savych and Thumula (2016) and Dolinschi and Rothkin (2016).

3

INTERSTATE VARIATIONS IN DISPENSING OF OPIOIDS

This chapter presents the key findings on the prevalence and use of opioids in the 27 states studied. It highlights which states had the highest prevalence of opioids and the highest amounts of opioids received per claim. As a brief reminder, the amount of opioids per claim (i.e., the average morphine milligram equivalent amount [MME] of opioids per claim) is used to quantify the utilization of opioids among injured workers who received opioids. This measure takes into account the differences across states in both quantity and strength of opioid drugs.[1] Several other utilization measures are also used in the analyses, including the average number of prescriptions and the average number of pills per claim for opioids, as well as the frequency of prescribing stronger opioids. We examine these measures to see what patterns are related to higher amounts of opioids per claim. In this edition, we measure the duration and morphine equivalent daily dose of opioids dispensed to injured workers for 22 states with adequate days of supply information for opioid prescriptions. We also report the percentage of claims receiving chronic opioids and high-dose opioids, which may serve as potential markers for the likelihood of future physical dependence and addiction. Note that, in this chapter, we report the mean values of the utilization measures after excluding claims that had unusually high amounts of opioids per claim.[2]

MORE FREQUENT USE OF OPIOIDS IN ARKANSAS AND LOUISIANA

In 2016/2018, we found large interstate differences in the frequency of prescribing opioids. Figure 3.1 illustrates that about 50 to 60 percent of injured workers with prescriptions received at least one opioid prescription in a majority of states. A higher proportion of injured workers with prescriptions in Arkansas and Louisiana (70 percent) received opioids. On the lower end, one-third of injured workers with prescriptions received opioids in New Jersey. For the most part, similar characterizations of states as higher, typical, and lower were seen across states in 2012/2014, but the frequency of opioid use decreased considerably by 8 to 25 percentage points in all study states. These trends are described in detail in Chapter 4.

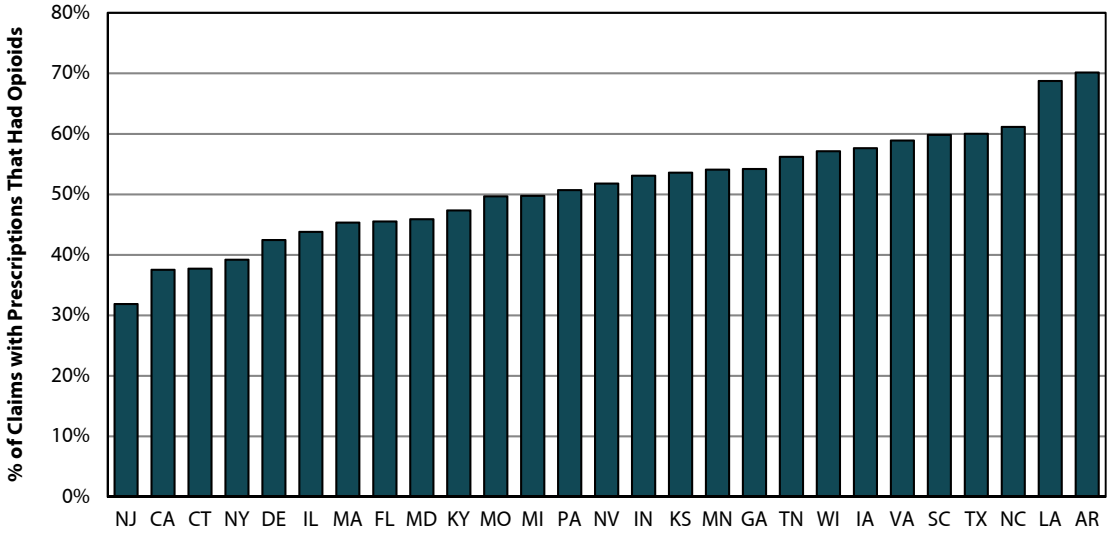
The variation across states in frequency of opioid use was larger among injured workers with continued use of opioids as opposed to those receiving a one-time opioid prescription. Figure 3.2 illustrates that the interstate differences were narrow in terms of the percentage of injured workers with prescriptions receiving only one opioid prescription (18 to 33 percent). Larger interstate differences were seen in the percentage of claims with prescriptions receiving two or more opioid prescriptions (13 to 48 percent). The percentage of

[1] See Chapter 2 for a detailed description of how the amount of opioids per claim was constructed.

[2] Technical Appendix C provides the interstate variations in the amount of opioids per claim with and without excluding the claims with extreme values (Table TA.C6). We also provide data for the amount of opioids per claim after excluding the extreme-value claims at the median and selected percentiles higher than the median (Table TA.C8).

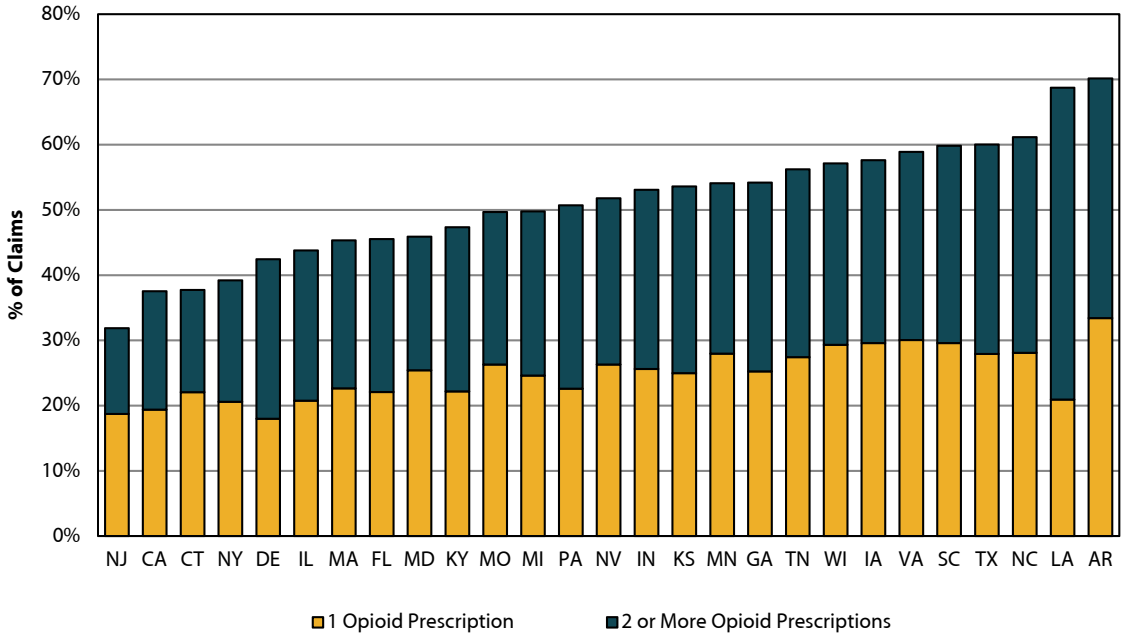
injured workers with prescriptions who received two or more opioid prescriptions was 48 percent in Louisiana—22 percentage points higher than the median state and nearly four times as frequent as the rate in New Jersey (13 percent) (Figure 3.2 and Table 3.1).

Figure 3.1 Percentage of Claims with Prescriptions That Had Opioids, 2016/2018



Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

Figure 3.2 Percentage of Claims with Prescriptions That Had Two or More Opioids, 2016/2018



Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

AMOUNT OF OPIOIDS PER CLAIM HIGHEST IN DELAWARE, LOUISIANA, NEW YORK, AND PENNSYLVANIA

We found substantial interstate variation in the amount of opioids received by injured workers. Among the 27 states included in the study, Delaware, Louisiana, New York, and Pennsylvania were the highest on the average MME of opioids per claim, among injured workers with more than seven days of lost time who did not have a major surgery but received opioids.[3] Note that although New York continued to be among the states with a higher-than-typical amount of opioids per claim, we observed a substantial decrease in both the frequency and amount of opioids in New York over the four-year study period. Over this same period, we observed relatively smaller changes in the average amount of opioids per claim in Delaware, Louisiana, and Pennsylvania.

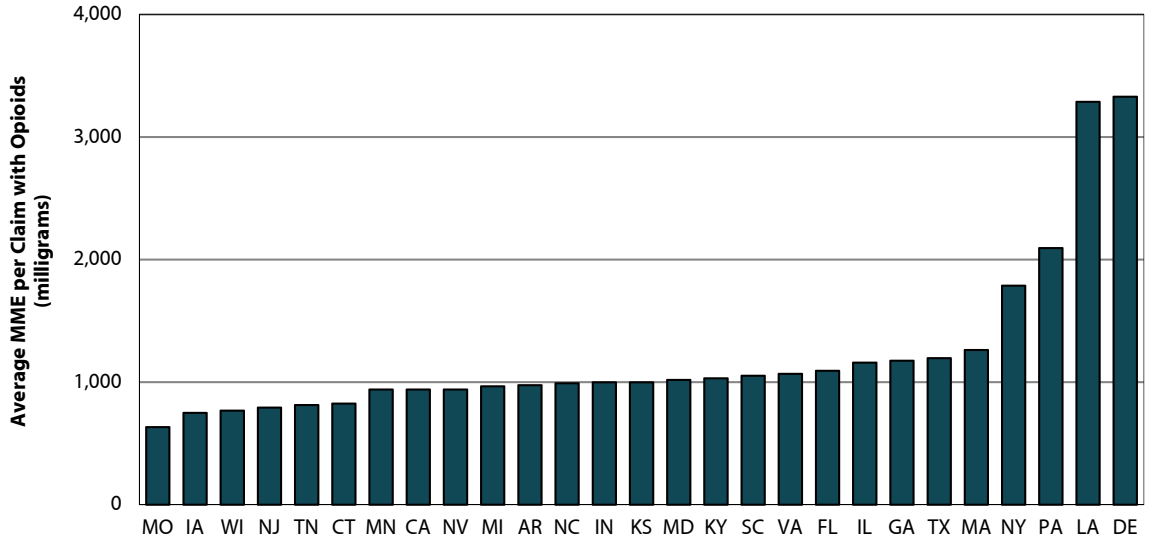
Considering our underlying sample of claims without a major surgery, the results for Delaware and Louisiana are particularly striking. With an average amount of opioids per claim of over 3,200 milligrams of morphine equivalents, the per-claim utilization of opioids in these two states was more than triple the amount in the median state and over five times the average amount of opioids received per claim in Missouri, the state with the lowest utilization among the study states (Figure 3.3).[4] An MME of over 3,200 milligrams per claim is fairly high. To illustrate, it is equivalent to an injured worker taking a 5-milligram Vicodin® tablet every four hours for 3.5 months continuously, or a 120-milligram morphine equivalent daily dose for almost a month. The utilization pattern we observed in Louisiana was mostly consistent with the former; the average number of days for which opioids were dispensed was over 100 days and the average daily dose of opioids received by Louisiana workers was 32 milligrams. New York and Pennsylvania also had higher average amounts of opioids of 1,788 and 2,094 milligrams, respectively—79 to 110 percent higher than the median state. The extent of variation in the average amount of opioids received by injured workers across all other states was smaller. In 2016/2018, there was a two-fold variation across the 23 states other than Delaware, Louisiana, New York, and Pennsylvania.

Certain patterns were associated with the higher utilization of opioids in these four states. In Louisiana, physicians may have written and injured workers may have filled more opioid prescriptions for more opioid pills. As Table 3.1 shows, on average there were 6.2 prescriptions for opioids, totaling 381 opioid pills per claim, compared with 2.8 prescriptions and 131 pills per claim for opioids in the median state. Similarly, in Delaware, the average number of opioid prescriptions per claim at 4.2 prescriptions and the average number of pills per opioid prescription were among the higher group of study states. Injured workers in Pennsylvania who had opioids received 3.8 prescriptions on average, totaling 213 opioid pills per claim. In New York, the average number of prescriptions per claim was 3.1, which was fairly similar to the 27-state median, whereas the average number of pills per prescription for opioids and the average MME of opioids per pill were higher than in other study states, contributing to the higher utilization of opioids (Table 3.1).

[3] One may suspect that these states may have more serious injuries or a different mix of cases. However, we did a sensitivity analysis adjusting for differences across states in the case mix and the comparative results did not change.

[4] Louisiana was also among the highest when we looked at the median values of the same measure and at different percentiles above the median (see Table TA.C8 in Technical Appendix C).

Figure 3.3 Average MME per Claim with Opioids,[a] 2016/2018



Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

[a] Reported are the mean values of MME per claim with opioids after excluding a small percentage of claims that had unusually high amounts of opioids. See Chapter 2 for a description of how we identified claims with unusually high amounts of opioids.

Key: MME: morphine milligram equivalent amount.

The average amount of opioids received by injured workers in Georgia, Illinois, Massachusetts, and Texas was 16–26 percent higher than the 27-state median (see Figure 3.3 and Table 3.1).[5] Compared with one of the states with the lowest amount of opioids (Missouri), the average amount of opioids received by injured workers in these four states was about 80–100 percent higher (Figure 3.3). Of these four states, Illinois also had a higher median amount of opioids per claim. In Georgia, Massachusetts, and Texas, the median amount of opioids per claim was similar to the typical study state. The higher average amount of opioids per claim in these three states may have been driven by injured workers receiving higher amounts of opioids (top 15 percent) (see Table TA.C8).

In three of the four states (Georgia, Massachusetts, and Texas), injured workers received more prescriptions for opioids, on average, compared with the median of the 27 states, which explains why the amount of opioids per claim was higher in these states (Table 3.1). Another factor contributing to the higher amount of opioids per claim in Massachusetts was the frequent prescribing of oxycodone products in the state, but it is important to note that oxycodone prescriptions decreased considerably over the study period (see Tables 5.1 and 5.2). Half of the opioids prescribed in Massachusetts were for oxycodone (OxyContin® and Percocet®) in 2016/2018, which was the second highest proportion among the 27 study states. Of the three most frequently prescribed opioids in our study population, oxycodone has higher potency compared with hydrocodone and tramadol products. However, more frequent prescribing of oxycodone is not always associated with higher average amounts of opioids per claim. For instance, physicians in New Jersey prescribed oxycodone more often than hydrocodone, but the amount of opioids per claim in New Jersey was among the lowest of the study states.

[5] Differences between these states and the 27-state median are significant at the 10 percent significance level (see Table SA.1). In this report we focus our discussion on states where the average amount of opioids per claim was more than 10 percent higher than the average amount in the median study state, but we provide the utilization measures for all 27 states in the study (Table 3.1).

Table 3.1 Interstate Comparisons of Utilization of Opioids, 2016/2018

	NJ	CA	CT	NY	DE	IL	MA	FL	MD	KY	MO	MI	PA	NV	IN	KS	MN	GA	TN	WI	IA	VA	SC	TX	NC	LA	AR	Median State
% of claims with Rx that had opioids																												
Mean value	32%	38%	38%	39%	42%	44%	45%	46%	46%	47%	50%	50%	51%	52%	53%	54%	54%	54%	56%	57%	58%	59%	60%	60%	61%	69%	70%	52%
% point above/below median	-20	-14	-14	-13	-9	-8	-6	-6	-6	-4	-2	-2	-1	0	1	2	2	2	4	5	6	7	8	8	9	17	18	

	NJ	CT	CA	NY	MD	MA	IL	MO	FL	DE	KY	MI	NV	MN	IN	WI	IA	PA	KS	TN	VA	GA	SC	TX	NC	AR	LA	Median State
% of claims with Rx that had 2 or more opioid prescriptions																												
Mean value	13%	16%	18%	19%	20%	23%	23%	23%	23%	24%	25%	25%	25%	26%	27%	28%	28%	28%	29%	29%	29%	29%	30%	32%	33%	37%	48%	26%
% point above/below median	-13	-10	-8	-8	-6	-3	-3	-3	-3	-2	-1	-1	-1	0	1	2	2	2	2	3	3	3	4	6	7	11	22	

Among claims that had opioids

	MO	IA	WI	NJ	TN	CT	MN	CA	NV	MI	AR	NC	IN	KS	MD	KY	SC	VA	FL	IL	GA	TX	MA	NY	PA	LA	DE	Median State
Average MME per claim in milligrams																												
Mean value	633	749	767	792	814	825	940	940	940	966	976	991	999	999	1,018	1,031	1,052	1,068	1,093	1,159	1,176	1,196	1,262	1,788	2,094	3,287	3,328	999
% above/below median	-37%	-25%	-23%	-21%	-19%	-17%	-6%	-6%	-6%	-3%	-2%	-1%	0%	0%	2%	3%	5%	7%	9%	16%	18%	20%	26%	79%	110%	229%	233%	

	CT	NJ	MN	NV	MO	WI	TN	IA	MA	VA	AR	TX	CA	MI	MD	NC	SC	GA	IN	KS	PA	FL	KY	NY	IL	DE	LA	Median State
Median MME per claim in milligrams																												
Mean value	225	250	250	250	280	290	300	300	300	300	300	300	300	300	300	300	300	325	338	350	375	400	400	400	450	473	765	300
% above/below median	-25%	-17%	-17%	-17%	-7%	-3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	8%	13%	17%	25%	33%	33%	33%	50%	58%	155%	

	NJ	MO	WI	MN	TN	CT	MD	NV	IA	IN	MI	FL	AR	VA	CA	IL	KY	KS	SC	NC	NY	GA	MA	TX	PA	DE	LA	Median State
Average number of opioid Rx per claim																												
Mean value	2.2	2.2	2.4	2.5	2.6	2.6	2.6	2.6	2.7	2.7	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.9	2.9	3.0	3.1	3.1	3.1	3.3	3.8	4.2	6.2	2.8
% above/below median	-20%	-19%	-13%	-10%	-8%	-7%	-7%	-6%	-3%	-2%	-2%	-1%	0%	0%	1%	2%	2%	3%	5%	7%	11%	13%	13%	20%	37%	53%	122%	

	MO	NJ	TN	WI	CT	MN	AR	NV	IA	IN	MD	NC	SC	VA	CA	MI	KY	FL	KS	MA	GA	IL	TX	NY	PA	DE	LA	Median State
Average number of opioid pills per claim																												
Mean value	93	97	104	105	110	111	111	114	120	125	128	128	130	131	131	135	137	138	142	150	154	156	180	182	213	271	381	131
% above/below median	-29%	-26%	-21%	-20%	-16%	-15%	-15%	-13%	-8%	-4%	-2%	-2%	-1%	0%	0%	3%	4%	5%	9%	15%	17%	19%	38%	39%	63%	107%	191%	

	AR	TN	MO	CT	NC	NV	WI	NJ	MN	IA	SC	IN	CA	VA	MA	KY	GA	MI	MD	KS	FL	TX	IL	PA	NY	LA	DE	Median State
Average number of pills per Rx for opioids																												
Mean value	40	40	41	43	43	44	44	44	44	44	45	46	47	47	48	48	49	49	49	50	50	54	55	56	59	62	64	47
% above/below median	-15%	-14%	-12%	-10%	-9%	-8%	-8%	-7%	-6%	-6%	-5%	-2%	-1%	0%	2%	3%	4%	5%	5%	5%	6%	15%	17%	19%	25%	31%	35%	

	MA	AR	NY	TX	MN	DE	NV	NC	IN	KY	PA	LA	SC	MI	MO	NJ	KS	WI	IA	VA	TN	CT	GA	FL	CA	IL	MD	Median State
% of opioid Rx that were physician-dispensed																												
Mean value	n/a	n/a	n/a	n/a	n/a	1%	1%	1%	2%	2%	2%	3%	4%	4%	5%	5%	6%	6%	7%	9%	10%	14%	18%	20%	20%	25%	30%	5%
% point above/below median	n/a	n/a	n/a	n/a	n/a	-5	-4	-4	-4	-3	-3	-2	-2	-1	-1	0	0	1	2	3	5	9	13	14	15	19	24	

	TX	FL	GA	CA	MD	IL	NJ	SC	IA	MO	CT	NV	AR	NC	MI	PA	TN	KS	NY	VA	IN	MA	KY	LA	WI	MN	DE	Median State
% of opioid Rx that were for Schedule II opioids																												
Mean value	25%	46%	47%	49%	50%	55%	57%	59%	59%	63%	63%	64%	64%	65%	65%	65%	66%	66%	67%	69%	69%	70%	73%	73%	75%	76%	78%	65%
% point above/below median	-40	-19	-17	-16	-15	-10	-7	-6	-6	-2	-2	-1	0	0	1	1	2	2	2	4	4	5	8	8	10	11	13	

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. For readers interested in this information sorted alphabetically by state, please see Table SA.3.

Key: MME: morphine milligram equivalent amount; n/a: not applicable; Rx: prescription(s).

In two of the four states (Georgia and Illinois), physicians dispensed a sizable share of opioid prescriptions, 18 percent in Georgia and 25 percent in Illinois. In a previous edition of this study, we observed higher rates of concomitant dispensing of opioids and muscle relaxants when injured workers were dispensed these medications at both physicians' offices and pharmacies compared with those who received opioids only at pharmacies or only at physicians' offices (Thumula, Wang, and Liu, 2017).

In Connecticut, Iowa, Missouri, New Jersey, Tennessee, and Wisconsin, the average amount of opioids per claim was nearly 20–40 percent lower than the median state. The median amount of opioids per claim was also lower in Connecticut and New Jersey.

LARGE VARIATION IN DURATION OF OPIOID USE, WHILE AVERAGE DAILY DOSE VARIED LITTLE

This section presents the key findings on variations in the duration and dose of opioids prescribed to injured workers across 22 states. We also report the characteristics of first opioid prescriptions and measures of frequency of injured workers receiving chronic opioids and higher-dose opioids.[6] The results are based on claims with complete days of supply associated with all opioid prescriptions across 22 states that have higher, typical, and lower frequencies and amounts of opioids.[7] As discussed previously, this claim selection is unlikely to bias interstate comparisons. Table 3.2 shows that among 2016/2018 claims with opioids, the average duration of opioids per claim ranged from 25 to 45 days across most states.[8] Consistent with the findings of a higher average amount of opioids per claim and a higher number of opioid prescriptions, we found that the average duration of opioids was also higher in Delaware, Louisiana, New York, and Pennsylvania. Louisiana workers received opioids for 115 days, on average, compared with 36 days in the 22-state median. Delaware, New York, and Pennsylvania also had higher-than-typical duration at 78, 55, and 50 days, respectively. The figure was also higher in Texas (52 days). The average MED varied little across the study states, from 27 to 40 milligrams.

Injured workers in some states received chronic opioids and high-dose opioids more frequently. In 2016/2018, 6–12 percent of injured workers with opioids received at least 60 days of opioids supply over any 90-day period (our measure of *chronic opioid use*) in 15 of the 22 states. The proportion was higher in Louisiana (33 percent) and Delaware (28 percent). One in seven or more workers in Kentucky, Michigan, New York, Pennsylvania, and Texas (14–18 percent) with opioids received them on a chronic basis (Table 3.2). Note that some of these injured workers could have had one such 90-day episode during which they received opioids for at least 60 days, while others could have had multiple episodes of chronic opioid therapy. Table SA.5 provides the frequency of injured workers with multiple episodes of chronic opioid therapy. Among injured workers receiving opioids, we observed relatively smaller interstate variation in those with only one 90-day period with chronic opioid therapy (3–14 percent) as opposed to those with multiple episodes (1–23 percent). A higher proportion of claims had initial opioid prescriptions exceeding 7 and 14 days of supply in these states with

[6] The opioid use metrics used to characterize first opioid prescriptions, chronic opioid use, and high-dose opioid use are consistent with the measures proposed by the Washington State Dr. Robert Bree Collaborative and the Washington State Agency Medical Directors' Group. Chronic opioid use is defined as receiving opioids for at least 60 days over any continuous 90-day period during the study period, and high-dose opioid use is defined as receiving an opioid daily dose of more than 50 and 90 morphine equivalent milligrams for at least 60 days during the observation period. See Chapter 2 for details.

[7] In the other five states, days of supply information was incomplete or claims with days of supply were not representative of all claims with opioids. Readers interested in the interstate variations and trends in the use of opioids on a longer-term basis across 26 states may refer to the study *Longer-Term Dispensing of Opioids, 4th Edition* (Wang, 2017). Opioid use on a longer-term basis is characterized as receiving opioids within the first three months after the injury and having three or more visits to fill opioid prescriptions between the 7th and 12th months after the injury.

[8] Throughout the report, we use the term *average duration of opioids per claim* or *average number of opioid days per claim* to refer to the average number of days for which the injured worker received opioids during the average 24-month observation period.

higher rates of chronic opioids. In Delaware and Louisiana, for instance, 46 and 52 percent of claims with opioids had an initial opioid fill of greater than 7 days of supply, and 32 and 34 percent had more than 14 days of supply. Comparable numbers in the median state were 38 percent exceeding 7 days of supply and 18 percent exceeding 14 days of supply.

The 2016 CDC guidelines for prescribing opioids for chronic pain caution that longer-term opioid use begins with treatment of acute pain, and the guidelines include recommendations for the duration of opioids for acute pain; they state that three days or less is often sufficient and more than seven days is rarely needed. Other state-specific guidelines recommend less than 14 days.[9] We found that receipt of longer duration opioid prescriptions initially is correlated with the receipt of chronic opioids. In states where a higher proportion of claims had the first opioid prescription exceeding 7 and 14 days of supply, the chronic opioid use rate was also higher.

A sizable proportion of Delaware claims received high-dose opioids for at least 60 days during the study period. Among injured workers receiving opioids, 15 percent had an MED exceeding 50 milligrams for at least 60 days during the study period, and 2.1 percent of injured workers had an MED exceeding 90 milligrams for at least 60 days. Higher-than-typical rates were also seen in Louisiana, New York, and Pennsylvania (4 percent with MED exceeding 50 milligrams). The frequency of injured workers receiving chronic and high-dose opioids during the same 90-day period was also higher in Delaware. Table 3.2 shows that 12 percent of injured workers receiving opioids in Delaware had more than 50 MED for at least 60 days over a 90-day period. The measure was 3 percent in Louisiana, New York, and Pennsylvania.

High-dose opioid dispensing was more frequent among workers receiving chronic opioids. Of the states with higher claim frequency of chronic opioid therapy (Delaware, Kentucky, Louisiana, Michigan, New York, Pennsylvania, and Texas), a higher proportion of workers received high-dose opioids in Delaware, New York, and Pennsylvania. In Delaware, 44 percent of workers with chronic opioids received an MED exceeding 50 milligrams for at least 60 days and 7 percent received an MED exceeding 90 milligrams. In New York and Pennsylvania, 22 percent received an MED exceeding 50 milligrams and 9–11 percent received an MED exceeding 90 milligrams for at least 60 days. These three states had a relatively higher frequency of use of stronger Schedule II opioids such as Oxycontin® and Percocet®. Relatively fewer workers receiving chronic opioids in Kentucky, Louisiana, Michigan, and Texas had high-dose opioids—5 to 12 percent exceeded 50 MED and 2 to 3 percent exceeded 90 MED for at least 60 days.

[9] Washington, Agency Medical Directors' Group, and California.

Table 3.2 Duration and Average Daily Dose of Opioids for Claims with Opioids, Interstate Comparisons, 2016/2018

	MO	IA	WI	NJ	TN	MN	MI	AR	NC	IN	KS	KY	SC	VA	FL	GA	TX	MA	NY	PA	LA	DE	Median State
Average MME per claim with opioids in milligrams																							
Mean value	633	749	767	792	814	940	966	976	991	999	999	1,031	1,052	1,068	1,093	1,176	1,196	1,262	1,788	2,094	3,287	3,328	1,015
% above/below median	-38%	-26%	-24%	-22%	-20%	-7%	-5%	-4%	-2%	-2%	-2%	2%	4%	5%	8%	16%	18%	24%	76%	106%	224%	228%	

Among claims with opioids that had days of supply populated for all opioid prescriptions

	MO	WI	MN	AR	TN	NJ	IN	IA	KS	VA	NC	FL	SC	MI	GA	MA	KY	PA	TX	NY	DE	LA	Median State
Average number of opioid days per claim																							
Mean value	22	22	26	26	28	28	28	31	32	34	35	37	38	39	41	43	43	50	52	55	78	115	36
% above/below median	-41%	-38%	-29%	-28%	-22%	-22%	-21%	-16%	-11%	-7%	-3%	3%	5%	7%	13%	17%	19%	38%	43%	52%	116%	218%	

	TX	MI	GA	LA	NY	KY	FL	SC	NC	MA	PA	AR	NJ	IA	VA	MO	TN	IN	WI	DE	MN	KS	Median State
Average MED per claim, milligrams																							
Mean value	27	30	30	32	32	32	32	32	32	33	33	34	34	34	34	35	35	36	38	38	39	40	34
% above/below median	-20%	-11%	-11%	-6%	-5%	-4%	-4%	-4%	-3%	-3%	0%	0%	0%	0%	1%	4%	5%	7%	13%	15%	18%	18%	

	TN	WI	MN	AR	KS	MA	MO	IN	SC	IA	NC	VA	NJ	FL	PA	GA	TX	DE	MI	KY	LA	NY	Median State
% of claims with opioid Rx with first opioid Rx for greater than 7 days of supply																							
Mean value	28%	28%	29%	31%	32%	34%	35%	36%	37%	37%	38%	39%	39%	39%	41%	45%	46%	46%	47%	48%	52%	55%	38%
% point above/below median	-10	-10	-9	-8	-6	-4	-3	-3	-1	-1	-1	1	1	1	2	7	7	8	8	10	14	17	

	WI	TN	MN	IA	KS	IN	AR	NC	MO	SC	VA	NJ	MA	FL	TX	PA	MI	GA	KY	DE	LA	NY	Median State
% of claims with opioid Rx with first opioid Rx for greater than 14 days of supply																							
Mean value	13%	13%	13%	14%	15%	16%	16%	16%	16%	17%	18%	19%	20%	22%	22%	24%	24%	26%	28%	32%	34%	38%	18%
% point above/below median	-6	-6	-5	-4	-4	-3	-3	-2	-2	-2	0	0	2	4	4	6	6	7	10	14	15	20	

	AR	IA	MO	WI	IN	KS	MN	TN	NJ	VA	NC	MA	FL	SC	GA	KY	MI	TX	PA	NY	DE	LA	Median State
% of claims with opioid Rx that had at least 60 days of opioids supply in any 90-day period																							
Mean value	6%	6%	6%	6%	7%	7%	7%	8%	8%	10%	10%	11%	12%	12%	12%	14%	14%	15%	17%	18%	28%	33%	11%
% point above/below median	-5	-5	-5	-4	-3	-3	-3	-3	-3	-1	-1	1	1	1	2	4	4	4	6	8	17	22	

	IA	MO	MI	WI	IN	AR	TN	FL	KS	NC	KY	NJ	GA	TX	VA	SC	MA	MN	PA	LA	NY	DE	Median State
% of claims with opioid Rx that had more than 50 MED of opioids supply for at least 60 days																							
Mean value	0%	0%	1%	1%	1%	1%	1%	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	4%	4%	4%	15%	1.6%
% point above/below median	-1.3	-1.2	-0.8	-0.8	-0.6	-0.5	-0.3	0	-0.1	-0.1	0.0	0.0	0	0.0	0.1	0.2	0.2	0.4	2.4	2.4	2.6	12.9	

	IA	AR	MO	KS	TX	NC	GA	TN	MI	WI	KY	IN	VA	FL	LA	MA	SC	MN	NJ	NY	PA	DE	Median State
% of claims with opioid Rx that had more than 90 MED of opioids supply for at least 60 days																							
Mean value	0.0%	0.0%	0.1%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.4%	0.4%	0.4%	0.4%	0.5%	0.6%	0.7%	0.7%	0.8%	1.2%	1.7%	1.9%	2.1%	0.4%
% point above/below median	-0.4	-0.4	-0.3	-0.1	-0.1	-0.1	0	-0.1	-0.1	0.0	0.0	0.0	0.0	0	0.2	0.3	0.3	0.4	0.8	1.3	1.5	1.7	

	IA	MO	MI	WI	KS	NC	TX	IN	TN	FL	AR	GA	VA	NJ	MA	KY	SC	MN	LA	PA	NY	DE	Median State
% of claims with opioid Rx that had more than 50 MED of opioids supply for at least 60 days during any 90-day period																							
Mean value	0%	0%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	2%	2%	3%	3%	3%	12%	1.2%
% point above/below median	-0.8	-0.8	-0.6	-0.4	-0.3	-0.3	-0.2	-0.2	-0.2	0	0.0	0	0.1	0.1	0.2	0.5	0.6	0.7	1.4	2.1	2.1	11.3	

	IA	KY	AR	TX	TN	MO	GA	NC	MI	WI	FL	IN	VA	KS	NJ	MN	LA	SC	MA	PA	NY	DE	Median State
% of claims with opioid Rx that had more than 90 MED of opioids supply for at least 60 days during any 90-day period																							
Mean value	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.3%	0.3%	0.3%	0.3%	0.3%	0.5%	0.5%	0.5%	0.6%	0.7%	1.1%	1.2%	2.1%	0.3%
% point above/below median	-0.3	-0.3	-0.3	-0.2	-0.2	-0.1	0	-0.1	0.0	0.0	0	0.0	0.0	0.0	0.2	0.2	0.2	0.3	0.5	0.8	1.0	1.8	

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. The 22 states included in this table are those for which the days of supply information is complete for all opioid prescriptions for a majority of claims in the state, and claims with complete days of supply are substantially representative of all claims with opioids. For readers interested in this information sorted alphabetically by state, please see Table SA.4.

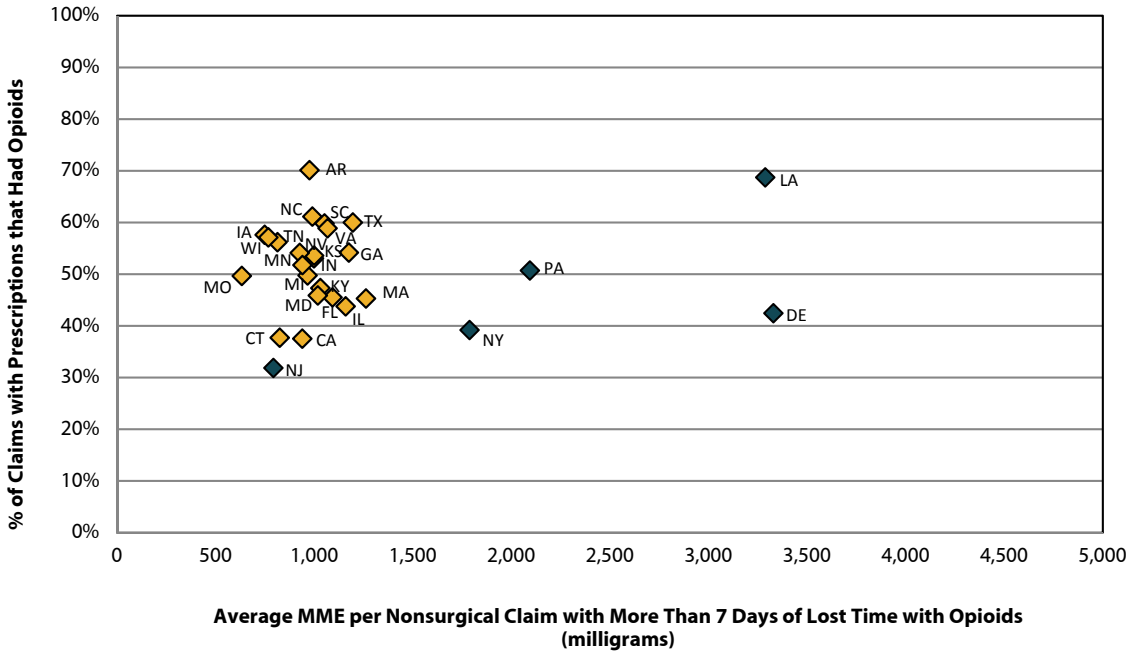
Key: MME: morphine milligram equivalent amount; MED: morphine equivalent daily dose in milligrams; Rx: prescriptions.

OVERALL, FREQUENCY OF OPIOID USE AND AMOUNT OF OPIOIDS PER CLAIM HIGHER IN LOUISIANA AND LOWER IN NEW JERSEY

As we have discussed, we saw substantial interstate variations in both frequency and amount of opioid dispensing. Combining these two measures, we observed that among the 27 study states, a higher proportion of Louisiana workers received opioid prescriptions, and the average amount of opioids dispensed per claim in Louisiana was also higher among the study states. Delaware, New York, and Pennsylvania had higher amounts of opioids per claim than other states, but the frequency of opioid use in these three states was similar to a majority of the study states. Although New York continued to be among the states with a higher-than-typical amount of opioids per claim, it is important to note the decreasing trend in both the frequency and the average amount of opioids received by New York injured workers over the study period, which moved New York closer to other study states in this analysis. Delaware was also among the states with a substantial decrease in the frequency of opioids received.

By contrast, injured workers in New Jersey had lower utilization of opioids among the study states. In New Jersey, frequency of opioid use was 20 percentage points lower than typical, and injured workers with opioids received a 21 percent lower-than-typical amount of opioids. In California and Connecticut, frequency of use was 14 percentage points lower than the median state, and Connecticut workers received a 17 percent lower-than-typical amount of opioids (Table 3.1 and Figure 3.4).

Figure 3.4 Frequency and Amount of Opioid Use, 2016/2018



Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

Key: MME: morphine milligram equivalent amount.

In some study states, a higher-than-typical amount of opioids may be associated with relatively fewer injured workers receiving opioids. If opioids are prescribed less often in a state, one could hypothesize that opioids are prescribed only for more serious cases and, therefore, the amount of opioids per claim with opioids would be higher in the state. For example, New York had a higher-than-typical amount of opioids per claim, but fewer nonsurgical claims with prescriptions had opioids (39 percent) compared with the median state (52 percent). Therefore, one could reason that the higher-than-typical amount of opioids per claim in New York was to some extent driven by more severe claims receiving opioids in New York compared with other states. By the same logic, one would expect that in states where injured workers are very likely to be prescribed opioids, opioid use per claim might be lower. But Louisiana had the second highest percentage of claims with prescriptions that received opioids, and the amount of opioids per claim and the average number of prescriptions per claim for opioids were among the highest of the 27 states. By contrast, Arkansas had the highest frequency of opioid dispensing, but the amount of opioids per claim was similar to the median state (Table 3.1).

It should be noted that area variation studies such as this one do not provide indications of whether or not the observed level of opioid use is medically necessary; however, this study does highlight the states that have higher or lower opioid use than the median state. The large interstate variations we saw in opioid utilization among injured workers are not likely to be solely a reflection of differences in case mix across states. Adjusting for differences across states in demographics and injury/industry mix resulted in a slight decrease in the range of claim frequency of receiving two or more opioid prescriptions and the average amount of opioids dispensed per claim, but large variations in opioid utilization across states were seen even after controlling for case mix. Moreover, the characterization of states as higher, in the middle, or lower did not change, with few exceptions.[10]

There are many factors that may explain the interstate variations we observed, including workers' compensation policies for pharmaceuticals (e.g., pharmacy fee schedule, physician dispensing, provider choice, and treatment guidelines for pain management), policies outside workers' compensation (e.g., state PDMPs and state pain policies), and industry practices. While analyzing the impact of these factors is beyond the scope of this study, we provide some background information about these possible factors that may help the reader to interpret the results (see Technical Appendix A).

Since the workers' compensation benefit structure and claims administration may influence claim development differently across the states, these may also explain some of the interstate differences in opioid use among the states. We found that among the states studied, a greater amount of opioids received per claim was associated with a higher proportion of claims that had longer disability duration (Table TA.C10). Among the states studied, Delaware, Louisiana, Massachusetts, Michigan, Pennsylvania, and Virginia are wage-loss states,[11] where the average duration of temporary disability was longer than in the other states (except in Michigan and Virginia). In New York, claims usually stay open for a longer period of time. One possible explanation for the higher utilization of opioids per claim in these states may be that more claims stayed open and still received medical services as claims became more mature. Alternately, opioids may have contributed to injured workers staying out of work longer. For instance, Savych, Neumark, and Lea (2018) reported that receipt of opioids on a longer-term basis resulted in three times longer disability duration among workers with low back pain, compared with those receiving non-opioid pain medications. Similar findings were reported in a prospective

[10] The average amount of opioids per claim in Massachusetts and Illinois was higher than that in the median state before case-mix adjustment. They became closer to the middle after adjusting for case mix. See Table TA.C5.

[11] Under a wage-loss benefit system, workers typically continue to receive temporary disability benefits so long as they experience wage loss because of the work-related injury. States with a wage-loss benefit structure are expected to have longer duration of temporary disability because most indemnity benefits are paid as temporary disability benefits.

study where, after controlling for injury severity and workers' self-reported pain and function, workers with back injuries receiving opioids for more than seven days within six weeks of the first medical visit were more likely to receive disability benefits one year after the injury compared with those without opioids.[12] That study also found that the odds of receiving disability benefits at one year were doubled when injured workers received two or more prescriptions compared with no opioid prescriptions. Early opioid prescriptions within 15 days of injury were found to be associated with continued opioid use and longer disability duration in another study.[13] We found that Delaware, Louisiana, New York, and Pennsylvania continued to be the states with the highest amounts of opioids per claim even after controlling for disability duration.[14] While a more rigorous analysis is needed to analyze the precise impact of longer disability duration on the use of opioids in these states, the sensitivity analysis suggests that it is unlikely to change how the states are characterized as higher or lower states in the use of opioids.

We also analyzed the patterns of opioid utilization at the end of each quarter postinjury and found that the amount of opioids per claim in the states with high use of opioids (Delaware, Louisiana, New York, and Pennsylvania) was already higher at the end of the second quarter postinjury (see Table TA.C9).

[12] Franklin et al. (2008).

[13] Webster, Verma, and Gatchel (2007).

[14] For more details, refer to the section "How Do States Compare on the Use of Opioids by Duration of Temporary Disability?" in Technical Appendix C.

4

TEMPORAL VARIATIONS IN DISPENSING OF OPIOIDS

In this chapter we highlight states with rapid increases or declines in the frequency of use of opioids and amount of opioids per claim between 2012/2014 and 2016/2018.[1] In the 2017 edition of this study covering data from 2010/2012 to 2013/2015, we reported noteworthy reductions in the amount of opioids dispensed per claim across a majority of study states, while only a few states had a considerable decrease in the percentage of claims with prescriptions that received opioids. With three more years of data, we continued to observe the downward trends in the amount of opioids dispensed to injured workers receiving opioids, and significant decreases were seen in the frequency of opioid dispensing in all states.

Changes in several utilization measures are reported in this section to decompose the change in the amount of opioids per claim in these states, including the average number of prescriptions and the average number of pills per claim for opioids, and the frequency of prescribing opioids by type of opioids (i.e., Schedule II opioids versus other opioids)[2] and dispensing point (i.e., physician- versus pharmacy-dispensed opioid prescriptions). It is beyond the scope of this study to tease out the exact factors that contributed to the changes we observed in each state. However, we provide background information about the major reforms adopted in the states addressing opioid prescribing as well as workers' compensation-specific changes that coincide with the trends observed, which may facilitate the interpretation of the results.

FEWER INJURED WORKERS RECEIVED OPIOIDS IN ALL STATES

Among injured workers with prescriptions paid under workers' compensation, noteworthy reductions of 8 percentage points (in Illinois) to 25 percentage points (in California) were seen over the study period in the percentage receiving at least one opioid prescription in all study states (see Table 4.1). In California, 62 percent of claims with prescriptions received opioids in 2012/2014, which was typical of the study states. This number dropped to 38 percent in 2016/2018, which was among the lower group of study states. Large reductions in the range of 20–22 percentage points were also seen in Connecticut, Delaware, Nevada, and New York. Seven more states (Florida, Georgia, Indiana, Kentucky, Massachusetts, Minnesota, and New Jersey) had decreases of 15–

[1] In this study, we report the amount of opioids per claim after excluding claims that had unusually high amounts of opioids. By doing so, we made sure that the trend results would not be unduly sensitive to claims with extreme values. See Technical Appendix C for more details.

[2] Schedule II opioids prescribed to injured workers across the 27 study states include oxycodone, hydrocodone, fentanyl, morphine, oxymorphone, hydromorphone, tapentadol, and methadone. Other opioids include tramadol, propoxyphene, codeine, and buprenorphine. We categorize hydrocodone-combination products as Schedule II throughout the study period for the purpose of this analysis, although they were moved from Schedule III to Schedule II in October 2014.

19 percentage points. All other states had decreases of 8–14 percentage points.[3]

Similar trends were seen in the frequency of claims with prescriptions receiving two or more opioid prescriptions. The percentage of injured workers with prescriptions that received two or more opioid prescriptions decreased by 7 percentage points (in Illinois and Louisiana) to 20 percentage points (in California).

Over this period, we observed a noticeable reduction in the percentage of nonsurgical claims with more than seven days of lost time that received at least one prescription.[4] This may have largely occurred because of a significant drop in opioid prescriptions and a smaller increase in workers receiving non-opioid prescription drugs (with or without opioids), as discussed in detail in Chapter 6 of this report. Table 4.1 allows readers to examine the year-to-year changes and shows that reductions in the frequency of opioid dispensing, as well as any prescription dispensing, occurred in more recent years between 2014/2016 and 2016/2018 in a majority of states.

[3] These changes were statistically significant at the 10 percent level. See Table SA.2.

[4] The shift toward fewer prescriptions occurred in more recent years. In the 2017 edition of this report, covering trends between 2010/2012 and 2013/2015, we did not see material changes in the percentage of injured workers that received a prescription and in the percentage with a prescription that received pain medications in most of the study states, indicating that many injured workers continued to receive medications for pain relief over that period, but some may have received non-opioid pain medications instead of opioids.

Table 4.1 Changes in Frequency of Use of Opioids, 2012/2014–2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
% of claims that had at least one Rx																											
2012/2014	60%	73%	47%	48%	71%	66%	49%	51%	61%	54%	55%	56%	28%	54%	53%	40%	52%	55%	45%	66%	36%	58%	52%	63%	67%	49%	40%
2013/2015	53%	70%	48%	52%	70%	65%	48%	49%	60%	53%	52%	54%	28%	53%	52%	38%	52%	53%	44%	66%	36%	57%	49%	60%	65%	48%	38%
2014/2016	56%	67%	47%	46%	70%	62%	46%	47%	58%	52%	47%	53%	26%	50%	53%	35%	50%	50%	43%	63%	34%	56%	49%	61%	63%	51%	38%
2015/2017	50%	63%	44%	45%	67%	60%	44%	45%	55%	50%	46%	50%	23%	47%	51%	33%	48%	49%	42%	60%	32%	51%	47%	57%	60%	46%	36%
2016/2018	47%	60%	41%	45%	65%	61%	42%	43%	51%	48%	43%	48%	21%	45%	48%	34%	46%	45%	41%	61%	28%	49%	45%	51%	59%	46%	36%
% point change from 2012/2014 to 2016/2018	-13	-13	-6	-3	-6	-5	-7	-8	-10	-6	-12	-8	-8	-8	-5	-6	-6	-10	-4	-5	-8	-9	-7	-12	-7	-3	-4
% of claims with Rx that had pain medications																											
2012/2014	97%	97%	95%	95%	98%	98%	94%	96%	96%	96%	97%	97%	94%	97%	97%	94%	95%	97%	95%	96%	95%	97%	97%	97%	97%	96%	95%
2013/2015	97%	97%	95%	96%	97%	98%	94%	96%	96%	96%	96%	98%	95%	97%	95%	93%	96%	97%	95%	96%	95%	96%	97%	97%	97%	95%	95%
2014/2016	97%	97%	95%	97%	97%	98%	94%	96%	96%	96%	95%	98%	93%	96%	96%	93%	95%	97%	95%	97%	95%	95%	97%	97%	96%	96%	93%
2015/2017	96%	97%	93%	97%	97%	98%	92%	95%	96%	96%	95%	97%	93%	96%	95%	93%	94%	96%	94%	95%	94%	96%	96%	96%	96%	95%	94%
2016/2018	96%	96%	93%	95%	96%	97%	93%	95%	95%	94%	94%	97%	92%	95%	95%	90%	94%	96%	93%	94%	94%	95%	97%	97%	96%	95%	93%
% point change from 2012/2014 to 2016/2018	-1	-1	-3	0	-1	-1	-1	-2	-2	-2	-3	-1	-2	-2	-2	-4	-1	-1	-1	-2	-2	-2	-1	0	-1	0	-2
% of claims with Rx that had opioids																											
2012/2014	80%	62%	58%	63%	63%	71%	67%	51%	69%	67%	65%	79%	64%	58%	60%	69%	62%	71%	48%	72%	62%	62%	73%	67%	71%	72%	71%
2013/2015	79%	60%	53%	56%	63%	71%	66%	51%	66%	67%	52%	75%	65%	55%	58%	67%	63%	71%	46%	71%	55%	62%	74%	64%	71%	67%	68%
2014/2016	75%	57%	52%	58%	60%	69%	63%	50%	64%	63%	52%	77%	58%	54%	59%	62%	60%	71%	43%	62%	47%	60%	71%	64%	69%	68%	65%
2015/2017	70%	45%	41%	46%	47%	61%	60%	46%	56%	58%	52%	73%	55%	47%	51%	62%	54%	68%	34%	61%	47%	56%	66%	61%	62%	63%	62%
2016/2018	70%	38%	38%	42%	46%	54%	58%	44%	53%	54%	47%	69%	45%	46%	50%	54%	50%	61%	32%	52%	39%	51%	60%	56%	60%	59%	57%
% point change from 2012/2014 to 2016/2018	-10	-25	-20	-21	-18	-17	-10	-8	-16	-13	-18	-10	-19	-12	-10	-15	-12	-10	-16	-20	-22	-11	-13	-11	-11	-13	-14
% of claims with Rx that had 2 or more opioid prescriptions																											
2012/2014	49%	38%	31%	39%	38%	44%	38%	30%	43%	38%	41%	55%	36%	32%	33%	38%	33%	44%	24%	43%	36%	37%	46%	41%	42%	42%	42%
2013/2015	46%	36%	28%	36%	37%	43%	39%	29%	41%	36%	30%	53%	36%	29%	32%	37%	31%	45%	21%	41%	29%	36%	46%	36%	41%	39%	38%
2014/2016	44%	32%	27%	31%	34%	40%	34%	29%	37%	35%	32%	54%	30%	28%	31%	35%	31%	42%	20%	33%	25%	35%	42%	35%	40%	37%	37%
2015/2017	39%	24%	20%	26%	26%	36%	31%	25%	31%	31%	29%	50%	29%	23%	28%	32%	27%	39%	15%	34%	24%	32%	38%	33%	35%	32%	33%
2016/2018	37%	18%	16%	24%	23%	29%	28%	23%	27%	29%	25%	48%	23%	20%	25%	26%	23%	33%	13%	25%	19%	28%	30%	29%	32%	29%	28%
% point change from 2012/2014 to 2016/2018	-12	-20	-16	-14	-15	-15	-10	-7	-15	-10	-16	-7	-14	-11	-8	-12	-9	-11	-11	-18	-18	-9	-16	-12	-10	-13	-14

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for other years. Percentage point changes shown may not agree with reported percentages due to rounding.

Key: Rx: prescription(s).

AMOUNT OF OPIOIDS PER CLAIM DECREASED IN THE MAJORITY OF STATES

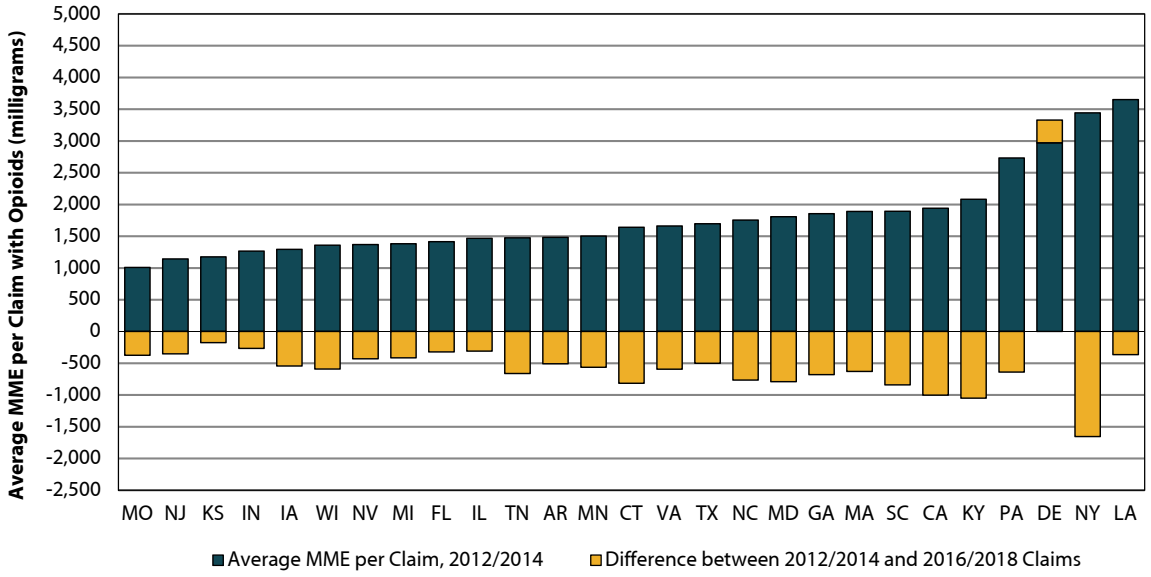
Over the study period from 2012/2014 to 2016/2018, the amount of opioids received by injured workers decreased in the majority of states. Figure 4.1 presents the average amount of opioids received per claim with opioids in 2012/2014 and the change in the same measure between 2012/2014 and 2016/2018. Table 4.2 provides the average amount of opioids per claim for the five injury years included in this study (2012/2014, 2013/2015, 2014/2016, 2015/2017, and 2016/2018) so that readers can observe the year-to-year changes. It also includes the changes in the amount of opioids per claim at the median and other select percentiles.

Between 2012/2014 and 2016/2018, the average MME of opioids per claim decreased steadily in all but one study state. California, Connecticut, and Kentucky had substantially larger reductions in the range of 50–52 percent. Substantial decreases were seen in seven more states (Iowa, Maryland, New York, North Carolina, South Carolina, Tennessee, and Wisconsin), where the average MME per claim decreased by 42–48 percent. The decreases in the amount of opioids dispensed per claim were also considerable in Arkansas, Georgia, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New Jersey, Texas, and Virginia, with 30–37 percentage point reductions. Several other states (Florida, Illinois, Indiana, and Pennsylvania) saw noticeable decreases in the average MME per claim, with reductions of 21–23 percent. These changes were statistically significant at the 10 percent level (see Table SA.2).

In most of these states with significant decreases in the average amount of opioids per claim, larger reductions were seen at higher percentiles (90th and 95th percentiles) than at the median, with the exception of Nevada where similar reductions were seen at the median and higher percentiles (Table 4.2). These results may suggest that the policies that contributed to the changes had a greater effect on injured workers receiving higher amounts of opioids compared with the typical worker.

Unlike the trend observed in the majority of states, the average amount of opioids received by injured workers changed little over the study period in Delaware (a 12 percent increase over the four-year period), Kansas (a 15 percent decrease), and Louisiana (a 10 percent decrease). These changes were not statistically significant at the 10 percent level, but the change in Louisiana was significant at the 20 percent level (see Table SA.2). Two of these states (Delaware and Louisiana) continued to be among the states with a higher amount of opioid use among the study states. Note that Delaware, with a 21 percentage point reduction, is among the states with a larger reduction in the frequency of opioid dispensing. It is conceivable that Delaware workers who continued to receive opioids in the most recent period experienced more severe injuries than those injured in earlier years, which may explain the small but statistically insignificant increase in the amount of opioids dispensed per claim. Kansas had a typical amount of opioids dispensed per claim and had experienced reductions in opioids before the current study period. In the 2017 edition of this report, we noted a 27 percent reduction in the average amount of opioids received by Kansas workers with opioids between 2010/2012 and 2013/2015, following the implementation of a PDMP in the state in April 2011.

Figure 4.1 Changes in Average MME per Claim with Opioids, 2012/2014–2016/2018



Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had opioid prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for other years.

Key: MME: morphine milligram equivalent amount.

We restricted the majority of our discussion in this chapter to states with larger and statistically significant changes in the average amount of opioids per claim, but we provide the trend data for all 27 states in the study (Tables 4.2 to 4.4). We highlight states where the reduction in the average amount of opioids per claim was more than 30 percent over the four-year study period and the change was statistically significant at the 10 percent level. Note that the claim frequency of opioid dispensing also decreased in all study states, as discussed above.

The changes in these states were briefly discussed in the executive summary, and here we provide more detailed descriptions of the changes and background information about state policies and initiatives addressing opioid prescribing.[5] For each of the states with significant changes, we examined changes in several utilization measures that are useful to decompose the change in the amount of opioids per claim, including changes in the use of Schedule II opioids, changes in opioid prescriptions dispensed by physicians, and changes in the number of prescriptions and the number of pills per claim, to see whether these components contributed to the steady decline in the amount of opioids per claim (Table 4.3). Table 4.4 presents the utilization measures categorized

[5] Several states are leveraging collaboration of multiple organizations to address the opioid epidemic in a comprehensive way. It is beyond the scope of this report to catalog all their efforts comprehensively. Table 11 of Rothkin (2018) provides information about interagency opioid task forces that were launched in several states. The information about major opioid policy changes provided here and in Technical Appendix A is intended to be used by the reader who would like to interpret the results in the context of policy changes. Investigation of the relationship between opioid policy changes and the amount of opioids received by injured workers is beyond the scope of this report.

by Schedule II and other opioids. General trends across most states show substantial reductions in the share of opioid prescriptions that were physician-dispensed and the share of Schedule II opioids, which will be discussed in greater detail in the state-specific discussion below. As we discuss in more detail in Chapter 5, we found a substantial reduction in hydrocodone-acetaminophen prescriptions in several states, coinciding with the up-scheduling of these products from Schedule III to Schedule II, for which refills are prohibited.

The state sections below are listed in descending order by the magnitude of reduction in MME per claim: California, Connecticut, Kentucky, New York, Tennessee, South Carolina, Maryland, North Carolina, Wisconsin, Iowa, Minnesota, Missouri, Georgia, Virginia, Arkansas, Massachusetts, Nevada, New Jersey, Michigan, and Texas.

California: Between 2012/2014 and 2016/2018, the average amount of opioids decreased steadily by 52 percent, and the median amount decreased by 33 percent;[6] larger reductions were seen among injured workers receiving higher amounts of opioids (top 10 percent). In terms of utilization, the decrease in the average amount of opioids per claim was due to fewer opioid pills per claim, which was the result of fewer opioid prescriptions per claim and a smaller number of pills per opioid prescription (Table 4.3). Large reductions were seen in the average number of Schedule II opioid prescriptions and pills per claim (e.g., hydrocodone-acetaminophen and oxycodone) as well as in all other opioid prescriptions (e.g., tramadol) (Table 4.4). Over this period, the proportion of opioid prescriptions dispensed by physician-dispensers decreased by 20 percentage points, from 40 percent to 20 percent, in the state. Several reforms implemented in California over this period may be associated with the decrease in the amount of opioids received by workers. California requires medical treatment provided to injured workers, including opioid prescribing, to be compliant with evidence-based guidelines and ensures compliance through mandatory utilization review. Over the study period, the state made legislative and regulatory changes to strengthen the guidelines and established an independent medical review (IMR) process for medical dispute resolution. Effective January 1, 2013, Senate Bill 863 called for an IMR process for medical treatment disputes for injuries on or after January 1, 2013, effective July 1, 2013.[7,8] In California, the chronic pain treatment guidelines were first adopted by the Division of Workers' Compensation (DWC) in 2009 and were subsequently revised.[9] In May 2018, the DWC revised the Medical Treatment Utilization Schedule (MTUS) to include the American College of Occupational and Environmental Medicine (ACOEM) Opioids Guideline and Pain Management Treatment Options that address, for the first time, opioids treatment recommendations for the full spectrum of pain (i.e., acute, subacute, postoperative, and chronic pain). Prior to this major revision, California adopted the Official Disability Guidelines (ODG) chronic pain treatment guidelines in July 2016 and the ACOEM chronic pain guidelines in May 2017. Evidence of opioid abuse prompted California to enact legislation mandating the adoption of an evidence-based workers'

[6] We report two sets of measures because the distribution of morphine equivalent amounts per claim is skewed by relatively few claims with very high use of opioids.

[7] The California Workers' Compensation Institute (CWCI) reported that nearly 50 percent of all IMR requests between January 2014 and June 2015 were related to prescription drugs, and one-third of these disputes were related to opioids. They found that the IMR physician upheld the decisions of the utilization review physician in 90 percent of the cases (David et al., 2015). Similar findings were reported in an earlier CWCI study covering data up to January 2014.

[8] Among Senate Bill 863's goals were to implement evidence-based medicine guidelines for treatment decisions and treatment dispute settlements by independent medical reviewers and to improve workers' access to network physicians.

[9] The DWC issued draft guidelines during the study period in April 2014, which were different from the final guidelines published in July 2016.

compensation drug formulary in the state by July 1, 2017.[10] In March 2017, the first draft of the MTUS drug formulary was released, and it was subsequently revised. The revised drug formulary took effect on January 1, 2018, toward the end of the study period. During the study period, California also enacted Senate Bill (SB) 670, which authorizes the Medical Board of California to impose limitations on prescribers suspected of overprescribing in cases of drug overdoses. In November 2014, the California Medical Board published revised guidelines for prescribing controlled substances for pain.[11] In September 2016, California passed a law mandating prescribers to check the Controlled Substance Utilization Review and Evaluation System (CURES), the state PDMP program, prior to prescribing opioids; this came into effect after the study period in October 2018 and may further reduce the amount of opioids prescribed to injured workers in the state. Moreover, the California Legislature passed several bills in 2018 to curb overprescribing of opioids by requiring electronic prescriptions, educating doctors about addiction risk associated with Schedule II drugs and treatment of opioid-dependent patients, and authorizing interstate data sharing of CURES. Harm reduction strategies with a focus on prevention of overdose deaths, such as expanding Medication Assisted Treatment (MAT) and naloxone access, were also passed.

Connecticut: The amount of opioids decreased steadily over the study period. Between 2012/2014 and 2016/2018, we found a 50 percent reduction in the average amount of opioids per claim and a 25 percent reduction in the median amount (Table 4.2). The average number of prescriptions per claim decreased steadily over the four-year period, while the average number of pills per prescription decreased between 2015/2017 and 2016/2018 (Table 4.3). Larger reductions were seen in the average number of Schedule II opioid prescriptions and pills per claim (e.g., hydrocodone-acetaminophen and oxycodone) compared with all other opioid prescriptions (e.g., tramadol) (Table 4.4). A report published by the Department of Public Health in June 2018 lists the laws enacted in Connecticut to reduce and prevent opioid abuse. Some laws addressing opioid prescribing and dispensing went into effect during the study period.[12] Effective July 2012, the Connecticut Workers' Compensation Commission created new medical protocols for prescribing opioids for acute and chronic pain. In addition, Public Act 13-172, signed into law on June 21, 2013, requires all prescribers to register with the state PDMP. More recently, in October 2015, Connecticut further strengthened the PDMP by requiring prescribers to check the state PDMP prior to writing the first prescription and every 90 days when prescribing continues. Effective July 2016, Connecticut became one of the earlier states that enacted legislation limiting first opioid prescriptions to a seven-day supply.[13] Connecticut's legislature also passed several laws aimed at reducing overdose deaths, such as expanding access to MAT and Good Samaritan laws.

Kentucky: Between 2012/2014 and 2016/2018, the average amount of opioids decreased by 50 percent while the median amount dropped by 24 percent (Table 4.2). A major factor for this reduction was the significant decrease in Schedule II opioid prescriptions dispensed per claim (which include hydrocodone-acetaminophen and oxycodone), whereas the number of prescriptions per claim for other opioids remained stable during this

[10] Assembly Bill (AB) 1124 required the DWC in California's Department of Industrial Relations to establish a drug formulary.

[11] The guidelines can be found at http://www.mbc.ca.gov/licensees/prescribing/pain_guidelines.pdf.

[12] Connecticut's Opioid Drug Abuse Laws (2018) can be accessed at https://portal.ct.gov/-/media/DPH/Connecticuts-Opioid-Drug-Abuse-Laws2018.pdf?la=en.

[13] The first state was Massachusetts, where the opioid limiting legislation took effect on March 14, 2016. New York passed legislation limiting initial opioid prescriptions to a seven-day supply on July 22, 2016.

time (Tables 4.3 and 4.4). Although physician dispensing of opioids was infrequent in Kentucky at the beginning of the study period, we observed a further decrease in the share of opioids dispensed at physicians' offices (Table 4.3). In the 2017 study, we noted that the average amount of opioids per claim peaked in 2011/2013 and decreased over the next two years. With three more years of data, we continued to observe a steady decrease in the amount of opioids. The decrease in opioid utilization may be associated with Kentucky implementing the comprehensive legislation House Bill (HB) 1, effective July 2012.[14] HB 1 established mandatory professional standards for prescribers and dispensers of controlled substances, including requiring all prescribers and dispensers to register with the state PDMP, the Kentucky All Schedule Prescription Electronic Reporting Program (KASPER), and query KASPER prior to prescribing Schedule II controlled substances and hydrocodone-combination products at specified intervals. Other provisions include limiting routine physician dispensing of Schedule II or Schedule III opioids to a 48-hour supply and requiring continuing education in pain management, addiction disorders, or electronic monitoring. The law also set ownership and oversight requirements for pain management facilities with criminal sanctions for violation of these requirements. Effective June 2017, Kentucky limits opioid prescriptions for acute pain to a three-day supply, with certain exceptions. More recently, the Kentucky Department of Workers' Claims promulgated rules to adopt a drug formulary based on ODG guidelines. The formulary will go into effect on July 1, 2019, for new prescriptions and on July 1, 2020, for prescription refills. In March 2018, the KASPER program was enhanced by the addition of a prescriber report card.

New York: The average and median amounts of opioids per claim decreased by 48 percent and 33 percent, respectively, over the four-year period. As noted in the 2017 edition of this study, a significant drop occurred between 2012/2014 and 2013/2015, and the amount continued to decrease year-to-year until 2016/2018 (Table 4.2). We observed reductions in both the average number of prescriptions per claim (30 percent) and the average number of pills per prescription (16 percent) during this period (Table 4.3). Larger drops were seen in the average number of pills per claim for Schedule II opioids, including hydrocodone-acetaminophen and oxycodone (46 percent), compared with all other opioids (18 percent) from 2012/2014 to 2016/2018. Concurrently, the average number of opioid prescriptions per claim fell by 33 percent (Schedule II opioids) and 10 percent (all other opioids) (Table 4.4). The trend in New York is consistent with a few policy initiatives implemented in the state in recent years. Effective February 2013, hydrocodone-combination products were moved from Schedule III to Schedule II in the state, ahead of the federal schedule change in October 2014. New York passed legislative mandates that require prescribers to check the PDMP database at the time of each opioid prescription. Starting in August 2013, practitioners are required to consult the PDMP when prescribing or dispensing controlled substances in Schedules II–IV, with limited exceptions.[15] Policy changes implemented during the study period also include the publication of non-acute medical treatment guidelines by the New York Workers' Compensation Board on December 15, 2014.[16] The board proposed draft regulations for the drug formulary in December 2017, and the third revision of the proposed regulations was made available for

[14] The full text of Kentucky's HB 1 is available at http://kbml.ky.gov/hb1/Documents/House-Bill-1.pdf. The full text of Kentucky's HB 217, a subsequent bill that clarifies and modifies certain provisions in HB 1, can be accessed at https://apps.legislature.ky.gov/record/13RS/hb217/bill.doc.

[15] Information about New York's I-STOP legislation can be found at http://www.ag.ny.gov/sites/default/files/press-releases/2012/ISTOP%20REPORT%20FINAL%201.10.12.pdf.

[16] The New York Workers' Compensation Board published the state non-acute pain medical treatment guidelines in an effort to address issues related to long-term opioid use in the state workers' compensation system.

public comment on April 17, 2019. To further address opioid prescribing in the state, electronic prescribing was mandated effective March 2016. Effective July 2016, New York passed the opioid limiting legislation, becoming one of the earlier states where practitioners were required to limit initial opioid prescriptions for acute pain to a seven-day supply.[17] Controlled substance prescribers in the state were also required to complete training in pain management by July 2017.[18]

Tennessee: The average amount of opioids per claim decreased in Tennessee by 45 percent, from 1,476 milligrams in 2012/2014 to 814 milligrams in 2016/2018. The median amount decreased by 14 percent, and larger reductions were seen at higher percentiles (Table 4.2). Contributing to the rapid decline, the number of opioid prescriptions per claim decreased on average between 2012/2014 and 2016/2018 (Table 4.3). Relatively larger drops were seen in the average number of Schedule II opioid pills per claim (37 percent) compared with other opioids (21 percent); see Table 4.4. In Tennessee, prescribers must check the PDMP database when first prescribing opioids and benzodiazepines for more than seven days and at least annually thereafter if prescribing continues.[19] In November 2012, Tennessee's legislature passed Senate Bill 3315, which amended the definition of utilization review (UR) to explicitly include Schedule II, III, and IV drugs being used for pain management. The provision requires the parties involved to participate in UR if opioids are prescribed for pain management to an injured or disabled employee for a period of time exceeding 90 days from the initial prescription. Effective October 1, 2013, new Tennessee legislation requires that a prescription for opioids or benzodiazepines may not be dispensed in quantities greater than a 30-day supply. In July 2014, the Tennessee Board of Medical Examiners voted to adopt as policy the Department of Health guidelines for chronic pain (Clinical Practice Guidelines for Outpatient Management of Chronic Non-Malignant Pain). The third edition of the guidelines was published in 2019. In 2016, the Bureau of Workers' Compensation adopted the ODG drug formulary as part of a comprehensive set of treatment guidelines adopted at the same time, which may have further impacted prescribing of opioids. New licensure procedures for pain management clinics also became effective in 2017. After the study period, effective July 2018, Tennessee enacted Public Chapter 1039, which laid out rules that limit the day supply and total amount for the initial opioid prescriptions. The legislation replaced the "seven-day treatment period" with a "three-day treatment period" and limited the total amount of opioids for the initial prescription to a total of 180 MME. The legislation also specifies other thresholds for certain circumstances to allow a 10-day supply with a total of 500 MME, and for rare situations, a 20-day supply with a total 850 MME and a 30-day supply with up to 1,200 MME.

South Carolina: We found steady decreases in the average and median amounts of opioids per claim (44 percent and 33 percent, respectively) over the study period starting in 2013/2015. A major factor in this reduction was the significant drop in the number of Schedule II opioid prescriptions and pills per claim (e.g., hydrocodone-acetaminophen and oxycodone) (Tables 4.3 and 4.4). Prescriptions and pills for other opioids also decreased but to a smaller extent. The trend in South Carolina may be associated with the opioid policies implemented in the state during this period. A series of changes were made to enhance the utilization of the

[17] Massachusetts was the first state to enact an opioid-limiting law, effective March 2016.

[18] For more details about laws and regulations regarding opioids, see https://www.health.ny.gov/community/opioid_epidemic/laws_and_regs.htm.

[19] See PDMP Center of Excellence at Brandeis University (2014b) and Clark et al. (2012).

state PDMP called South Carolina Reporting & Identification Prescription Tracking System (SCRIPTS).[20] Senate Bill 840, signed into law in June 2014, allowed authorized delegates to access SCRIPTS and required daily reporting by dispensers. The bill also required prescribers to complete continuous medical education related to controlled substances every two years. The state medical board approved pain management guidelines in November 2014. In May 2017, House Bill 3824 was signed into law; it requires practitioners to query SCRIPTS before issuing a Schedule II prescription. Schedule II opioids accounted for 59 percent of opioid prescriptions at the end of the study period; therefore, one might expect continued reductions in opioid prescriptions after the study period. South Carolina also enacted legislation in May 2018 limiting initial opioid prescriptions for acute and postoperative pain management to seven days of supply, which might further affect opioid prescribing.

Maryland: We saw a decrease in the average amount of opioids over the four-year period, from 1,808 milligrams in 2012/2014 to 1,018 milligrams in 2016/2018, a 44 percent reduction (Figure 4.1). The median amount of opioids per claim decreased by 25 percent. The decrease in the average amount of opioids per claim was driven by a steady decline in the average number of opioid prescriptions for Schedule II opioids (e.g., oxycodone and hydrocodone) received by Maryland workers (Table 4.3 and Table 4.4). We also found a 6 percentage point decrease in the share of opioid prescriptions that were physician-dispensed. Despite the 6 point decrease, the share of physician-dispensed opioid prescriptions was the highest (30 percent) among the study states as of 2016/2018. The decrease in the earlier years appeared to be consistent with the implementation of the state PDMP in December 2013 and a subsequent increase in registration with and use of the PDMP.[21] In 2016, Maryland passed legislation (House Bill 437) that requires practitioners authorized to prescribe controlled dangerous substances (CDS) in Maryland to be registered with the PDMP by July 1, 2017. On May 25, Governor Larry Hogan signed House Bill 1432, which requires medical professionals to prescribe the lowest effective dose of an opioid without explicit limits on days of supply. Beginning July 1, 2018, prescribers must, with some exceptions, query and review their patient's PDMP data prior to initially prescribing a CDS or benzodiazepine and at least every 90 days thereafter as long as the course of treatment continues to include prescribing an opioid or benzodiazepine.[22] If they have a reasonable belief that a patient is seeking the drug for any purpose other than the treatment of an existing medical condition, pharmacists must query and review patient PDMP data prior to dispensing any controlled substance. Beginning October 1, 2018, authorized providers in Maryland must complete a two-hour continuing medical education (CME) on opioid prescribing prior to applying for or renewing a CDS registration.

North Carolina: Between 2012/2014 and 2016/2018, the average and median amounts of opioids decreased by 44 percent and 33 percent, respectively. Noteworthy contributions to this result were decreases in the number of opioid pills and prescriptions per claim for both Schedule II and other opioids (Table 4.3 and 4.4). Physician dispensing of opioids was infrequent in North Carolina at the beginning of the study period, with only 6 percent

[20] Appendix A of *Opioid Prescriptions in South Carolina,* detailing the policy changes in the state that would impact the utilization of SCRIPTS, can be accessed at https://www.scdhec.gov/sites/default/files/media/document/Opioid_Prescription_in_South_Carolina_Oct-2018.pdf.

[21] The Maryland PDMP implementation and operations update can be accessed at http://bha.dhmh.maryland.gov/pdmp/Documents/BHA%20Prescription%20Drug%20Monitoring%20ProgramFinal%20Signed120815OGA1655.pdf.

[22] Prescribers must also document the PDMP data query and review in the patient's medical record.

of opioid prescriptions being physician-dispensed in 2012/2014. We observed a further decrease in the share of opioids dispensed at physicians' offices, to 1 percent, in 2016/2018 (Table 4.3). This trend is consistent with North Carolina limiting reimbursement for Schedule II and III opioids to an initial five days of supply when dispensed by outpatient providers other than a licensed pharmacist. Several notable reforms were implemented in the state after the study period and are expected to accelerate the downward trend reported in this study. The Strengthen Opioid Misuse Prevention (STOP) Act signed into law in 2017 is a comprehensive legislation aimed at reducing the supply of unnecessary opioids and encouraging the use of tools that prevent inappropriate prescribing. Several provisions of the STOP Act went into effect after the study period. Effective January 2018, practitioners are required to limit Schedule II and III opioids to a five-day supply for acute pain and to a seven-day supply for postoperative acute pain. North Carolina practitioners are required to prescribe all controlled substances electronically, effective January 2010. The STOP Act requires prescribers to review the patient's 12-month prescription history in the state PDMP, called the Controlled Substances Reporting System (CSRS), prior to the first opioid prescription and every 90 days afterwards if the prescription continues. Provisions mandating registration and use of CSRS were to go into effect after certain technical upgrades were completed. North Carolina's Rules for the Utilization of Opioids, Related Prescriptions, and Pain Management in Workers' Compensation Claims went into effect in May 2018. According to these rules, providers are required to query CSRS prior to prescribing controlled substances for injured workers starting in November 2018.

Wisconsin: Wisconsin was among the states with a lower amount of opioids per claim at the beginning of the study period; over the four-year study period, we observed a further decrease of 44 percent (Figure 4.1). While the median decreased by 13 percent, much larger decreases were seen among the top 10 percent of claims with opioids (Table 4.2). The substantial decrease was due to fewer prescriptions and pills of Schedule II and other opioids (Table 4.3 and 4.4). In the latest study period, between 2015/2017 and 2016/2018, the average amount of opioids per claim decreased by 26 percent, and a 15 percent reduction was seen between 2013/2015 and 2014/2016. These reductions coincided with several policy developments in Wisconsin over the study period. In 2013, the state PDMP program became operational, requiring daily reporting of opioid prescriptions dispensed by medical practitioners. Effective in April 2017, Wisconsin Act 266 requires all Wisconsin-licensed physicians and other prescribers to review a patient's records from the PDMP before issuing a prescription order for a monitored prescription drug, including opioids.[23] Rather than setting opioid limits in the statute, Wisconsin limited the initial opioid prescription through regulation, effective April 2018. In addition, in 2017, the Wisconsin licensing board required all Wisconsin-licensed physicians to complete two hours of continuing medical education on the Wisconsin Medical Examining Board's Opioid Prescribing Guideline. Similar requirements are in place for the 2018–2019 licensing period.[24]

[23] The PDMP was queried nearly 5 million times in 2017 versus 1.6 million in 2016—a 32.4 percent increase, which coincides with the passage of Wisconsin Act 266. See the American Medical Association's report on the trends in PDMP queries by state, between 2014 and 2017 (the report is available at https://www.end-opioid-epidemic.org/wp-content/uploads/2018/05/PDMP-registration-and-use-2014-to-2017-FINAL-updated.pdf).

[24] See https://www.wisconsinmedicalsociety.org/news/increased-pdmp-use-highlights-progress-in-fight-against-opioid-epidemic/.

Iowa: Over the four-year study period, the average amount of opioids per claim decreased by 42 percent (Figure 4.1). The amount of opioids received by the top 10 percent of claims decreased substantially while the median amount of opioids remained unchanged over the study period (Table 4.2). The substantial decrease was due to the decrease in the average number of Schedule II opioid prescriptions per claim (e.g., hydrocodone-acetaminophen and oxycodone) (Tables 4.3 and 4.4). The average number of all other opioid prescriptions and pills per claim changed little. Iowa's PDMP program became operational in 2009 prior to the study period, and in subsequent years, several initiatives were carried out leading to the comprehensive opioid policies that were put in place in 2018. For example, the Iowa Joint Opioid Epidemic Evaluation Study Committee comprehensively evaluated the state's response to the opioid epidemic and provided policy recommendations.[25] Effective July 2018, Iowa joined many other states to require practitioners to query the PDMP prior to prescribing and put mandatory registration provisions in place requiring prescribers and/or dispensers to register with the state PDMP.[26] The new licensing requirements in 2018 require opioid prescribers to receive CME regarding the CDC opioid prescribing guidelines as a condition to obtain their license.

[25] On August 1, 2017, the University of Iowa Injury Prevention Research Center (UI IPRC), along with several stakeholders, released a report titled, *The Prescription Opioid Crisis: Policy and Program Recommendations to Reduce Opioid Overdose and Deaths in Iowa.* The report includes policy recommendations such as (1) educating physicians, nurses, pharmacists and other practitioners to ensure a strong knowledge base in recognizing patients at high risk for opioid abuse and addiction; (2) providing evidenced-based physician training in pain management and opioid prescribing at the point of medical education; and (3) for current licensed professionals, developing a presentation that will provide a historical perspective with up-to-date epidemiological data focusing on evidence-based solutions to alter the course of the opioid epidemic.

[26] Iowa also changed the data reporting interval requirements in 2018 so that dispensing data is now required to be reported within one business day.

Table 4.2 Changes in Utilization of Opioids at Different Percentiles, 2012/2014–2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
Average MME for opioids per claim in milligrams (mean)																											
2012/2014	1,483	1,941	1,641	2,972	1,413	1,856	1,293	1,468	1,266	1,174	2,081	3,652	1,891	1,808	1,381	1,502	1,008	1,755	1,143	1,370	3,443	2,733	1,892	1,476	1,696	1,662	1,358
2013/2015	1,311	1,691	1,375	3,749	1,269	1,554	1,119	1,492	1,255	1,203	1,756	3,652	2,019	1,513	1,194	1,266	797	1,727	1,077	1,354	2,534	2,687	1,833	1,216	1,573	1,489	1,272
2014/2016	1,257	1,368	1,459	3,824	1,250	1,330	976	1,453	1,113	1,327	1,613	3,235	1,873	1,366	1,199	1,307	764	1,541	939	1,239	2,398	2,583	1,601	904	1,437	1,408	1,076
2015/2017	1,106	1,160	1,380	3,025	1,291	1,388	927	1,446	1,021	1,074	1,568	3,303	1,491	1,242	1,348	1,191	784	1,491	905	1,155	2,080	2,148	1,400	974	1,439	1,333	1,041
2016/2018	976	940	825	3,328	1,093	1,176	749	1,159	999	999	1,031	3,287	1,262	1,018	966	940	633	991	792	940	1,788	2,094	1,052	814	1,196	1,068	767
% change from 2012/2014 to 2016/2018	-34%	-52%	-50%	12%	-23%	-37%	-42%	-21%	-21%	-15%	-50%	-10%	-33%	-44%	-30%	-37%	-37%	-44%	-31%	-31%	-48%	-23%	-44%	-45%	-30%	-36%	-44%
MME for opioids per claim in milligrams (50th percentile)																											
2012/2014	400	450	300	525	375	400	300	450	375	338	525	750	338	400	300	300	300	450	300	400	600	400	450	350	375	375	334
2013/2015	350	450	300	500	350	375	335	450	375	300	450	800	369	380	300	300	300	450	250	318	450	450	450	300	350	350	310
2014/2016	350	338	300	450	375	350	300	450	325	300	500	750	300	340	300	300	300	400	263	325	450	435	420	300	338	338	350
2015/2017	338	300	300	450	450	375	300	450	350	375	450	863	300	368	393	300	300	390	270	330	450	410	390	300	300	300	300
2016/2018	300	300	225	473	400	325	300	450	338	350	400	765	300	300	300	250	280	300	250	250	400	375	300	300	300	300	290
% change from 2012/2014 to 2016/2018	-25%	-33%	-25%	-10%	7%	-19%	0%	0%	-10%	4%	-24%	2%	-11%	-25%	0%	-17%	-7%	-33%	-17%	-38%	-33%	-6%	-33%	-14%	-20%	-20%	-13%
MME for opioids per claim in milligrams (75th percentile)																											
2012/2014	1,050	1,500	900	1,800	1,000	1,300	900	1,200	1,050	900	1,660	3,413	1,115	1,000	930	850	800	1,225	750	1,200	2,100	1,450	1,248	1,005	1,138	1,125	900
2013/2015	975	1,350	900	2,850	1,000	1,138	750	1,200	1,020	788	1,350	3,388	1,125	1,035	900	700	720	1,150	600	990	1,480	1,425	1,275	800	1,050	965	900
2014/2016	1,013	1,050	825	2,100	1,000	975	675	1,200	900	825	1,400	2,700	900	900	900	800	675	1,110	600	900	1,500	1,450	1,100	710	1,000	1,000	900
2015/2017	815	905	825	1,800	1,110	1,070	750	1,200	900	925	1,260	3,600	803	900	1,000	700	630	988	630	875	1,350	1,317	1,075	788	950	885	900
2016/2018	630	825	543	2,700	900	900	675	1,050	705	805	975	3,070	788	750	900	600	600	795	600	629	1,125	1,350	750	645	870	750	600
% change from 2012/2014 to 2016/2018	-40%	-45%	-40%	50%	-10%	-31%	-25%	-13%	-33%	-11%	-41%	-10%	-29%	-25%	-3%	-29%	-25%	-35%	-20%	-48%	-46%	-7%	-40%	-36%	-24%	-33%	-33%
MME for opioids per claim in milligrams (90th percentile)																											
2012/2014	2,950	4,575	3,165	5,430	2,760	4,050	2,475	3,000	2,905	2,540	4,718	10,680	4,150	3,000	3,150	2,670	1,950	3,525	2,100	2,948	8,100	6,075	4,500	2,925	3,750	3,713	2,700
2013/2015	2,350	3,900	2,785	13,500	2,700	3,465	2,050	3,000	2,550	2,700	4,575	10,055	4,208	3,075	2,600	2,350	1,800	3,525	1,800	3,525	5,100	6,300	4,140	2,063	3,365	3,200	2,610
2014/2016	2,850	3,170	2,925	10,125	2,580	3,300	1,800	3,375	2,125	2,900	3,600	8,675	3,330	2,700	2,525	2,498	1,508	3,188	1,650	2,766	5,550	5,550	3,225	1,980	2,950	2,900	2,320
2015/2017	2,055	2,550	2,697	11,605	2,700	3,150	1,538	3,150	2,400	2,250	3,600	9,704	2,700	2,250	2,465	2,138	1,500	2,850	1,575	2,075	4,600	4,950	3,125	1,910	3,000	2,700	2,025
2016/2018	1,545	2,063	1,675	12,600	2,275	2,400	1,650	2,700	1,800	2,250	2,475	10,000	2,250	1,800	2,125	1,640	1,350	2,175	1,380	2,000	4,050	4,660	2,065	1,725	2,640	1,988	1,500
% change from 2012/2014 to 2016/2018	-48%	-55%	-47%	132%	-18%	-41%	-33%	-10%	-38%	-11%	-48%	-6%	-46%	-40%	-33%	-39%	-31%	-38%	-34%	-32%	-50%	-23%	-54%	-41%	-30%	-46%	-44%
MME for opioids per claim in milligrams (95th percentile)																											
2012/2014	6,645	8,263	7,148	16,200	5,250	8,205	5,175	6,000	5,175	4,650	8,580	18,353	8,100	7,450	6,500	6,114	3,375	7,350	4,088	6,010	17,388	13,275	9,000	5,400	7,950	7,050	6,275
2013/2015	5,913	7,200	6,075	24,180	4,935	6,575	3,700	6,000	4,800	4,950	8,115	18,000	9,390	6,750	4,900	4,440	3,050	7,125	3,388	6,225	11,430	12,900	9,174	4,575	7,300	6,700	4,783
2014/2016	5,740	5,920	5,880	19,150	4,800	6,070	3,600	6,225	3,625	6,960	7,200	14,665	7,795	5,400	4,500	5,100	2,550	6,475	3,255	6,600	11,475	12,375	6,852	3,405	6,185	6,225	4,388
2015/2017	3,668	4,860	5,723	17,873	4,590	5,350	3,429	5,450	3,750	4,450	6,750	15,338	5,490	4,660	5,580	4,425	2,700	5,468	2,995	4,390	9,050	10,375	6,090	3,600	6,480	5,400	3,750
2016/2018	3,113	3,630	3,090	16,875	3,975	5,093	2,550	4,500	3,425	4,050	3,760	16,170	5,600	3,600	4,030	2,975	2,110	3,900	2,535	3,813	7,958	9,700	3,660	2,850	5,015	4,360	3,000
% change from 2012/2014 to 2016/2018	-53%	-56%	-57%	4%	-24%	-38%	-51%	-25%	-34%	-13%	-56%	-12%	-31%	-52%	-38%	-51%	-37%	-47%	-38%	-37%	-54%	-27%	-59%	-47%	-37%	-38%	-52%
MME for opioids per claim in milligrams (99th percentile)																											
2012/2014	23,850	23,300	28,794	43,200	19,913	28,575	22,148	18,600	14,400	12,930	27,713	35,675	31,269	30,557	16,400	26,581	12,850	23,222	14,400	14,775	50,290	42,675	23,850	23,562	22,700	24,800	17,858
2013/2015	17,750	19,650	20,528	34,423	14,623	19,250	16,325	18,275	13,898	13,400	18,563	32,400	31,770	19,218	13,370	17,870	7,785	27,170	17,850	14,160	39,300	34,875	22,406	19,314	21,770	21,045	18,930
2014/2016	17,103	16,110	20,483	63,180	15,500	16,170	11,250	14,800	10,550	17,100	21,600	34,100	31,688	18,665	15,770	16,650	7,150	23,775	14,070	14,110	36,150	39,300	20,430	10,200	19,430	19,290	11,585
2015/2017	18,405	13,200	20,985	24,975	15,000	19,000	13,308	15,725	11,213	10,390	18,800	30,900	23,523	18,825	15,450	17,288	7,500	25,228	12,600	13,575	28,653	30,600	17,982	11,925	19,770	17,624	9,330
2016/2018	13,890	10,050	11,700	28,672	11,700	13,050	7,650	12,015	12,078	13,895	10,875	30,220	17,590	16,190	10,350	15,525	5,480	10,500	13,298	13,505	24,360	29,970	12,900	10,800	16,210	15,100	9,000
% change from 2012/2014 to 2016/2018	-42%	-57%	-59%	-34%	-41%	-54%	-65%	-35%	-16%	7%	-61%	-15%	-44%	-47%	-37%	-42%	-57%	-55%	-8%	-9%	-52%	-30%	-46%	-54%	-29%	-39%	-50%

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had opioid prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for other years.

Key: MME: morphine milligram equivalent amount.

The following discussions are focused on the 10 states with a 30–37 percent decrease in the average amount of opioids per claim over the study period.

Minnesota: We saw a 37 percent decrease in the average amount of opioids over the four-year period (Figure 4.1). Sizable drops were seen at the median and especially at the top percentiles (Table 4.2). The substantial decrease was due to fewer Schedule II prescriptions (e.g., hydrocodone-acetaminophen and oxycodone), as well as other opioid prescriptions (e.g., tramadol) (Table 4.3 and 4.4). The state PDMP was enacted in 2007 and became operational in 2010. Minnesota's legislation only mandated that prescribers in opioid treatment programs check the PDMP database initially, but in May 2016, Minnesota's legislature passed a law that requires more medical professionals in the state to sign up for the PDMP.[27] In 2010, the Minnesota Department of Labor and Industry (DLI) adopted rules governing prescription drugs including opioids that are used in an outpatient setting for workers' compensation injuries.[28] Effective July 2015, the DLI adopted administrative rules requiring compliance with a set of guidelines governing long-term treatment with opioid analgesic medication.[29] Minnesota's Opioid Prescribing Work Group (OPWG) played a crucial role in the state's response to the crisis of opioid overuse. In April 2014, the OPWG published A Protocol for Addressing Acute Pain, which provides guidelines for prescribing opioids.[30,31] A 2017 legislation in Minnesota limited opioid prescriptions for dental pain and pain from refractive eye surgery to a four-day supply.[32] In March 2018, the Minnesota departments of health and human services published their first edition of opioid prescribing guidelines covering opioid prescriptions for acute, post-acute, and chronic pain treatment.[33]

Missouri: In the current and previous editions of this study, the average amount of opioids per claim in Missouri was consistently lower than the other study states. Between 2012/2014 and 2016/2018, we observed a 37 percent decrease in the average MME per claim. The median amount of opioids per claim had no material change, while the amount of opioids received by the top 10 percent of claims had substantial reductions. In Missouri, the average number of Schedule II opioid prescriptions per claim decreased over this period by 29 percent (e.g., hydrocodone-acetaminophen and oxycodone), and other opioid prescriptions per claim (e.g., tramadol) decreased by 15 percent on average (Table 4.3 and 4.4). In the earlier part of the study period, 13 to 15 percent of opioid prescriptions were physician-dispensed; this decreased to 4–5 percent in 2015/2017 and 2016/2018. Missouri is the only state without a statewide PDMP, but the St. Louis County Department of Public

---

[27] See https://www.revisor.mn.gov/bills/text.php?number=SF1440&version=4&session=ls89&session_year=2016&session_number=0.

[28] See https://www.revisor.mn.gov/rules/?id=5221.6105.

[29] Minnesota's workers' compensation guidelines for chronic opioid management can be found at https://www.revisor.mn.gov/rules/?id=5221.6110.

[30] The protocol includes avoiding prescribing more than a three-day supply (or 20 pills) of low-dose, short-acting opioids in general; never prescribing long-acting/extended-release preparations for acute pain; and maximizing appropriate non-opioid therapies.

[31] More information about the OPWG and their initiatives can be found at https://mn.gov/dhs/partners-and-providers/news-initiatives-reports-workgroups/minnesota-health-care-programs/opioid-work-group/.

[32] A practitioner using his or her professional judgment can override this limit. Opioid prescriptions for other medical purposes are not subject to the limit. (Minn. Stat. § 152.11, subd. 4).

[33] Among others, the guidelines include recommendations for non-opioid medications and non-pharmacologic treatment as the first line for pain treatment. The guidelines also recommend limiting the entire opioid prescription for acute pain to 100 MME, not 100 MME per day, and checking the state PDMP database whenever prescribing opioids for acute pain. The opioid prescribing guidelines can be found at https://mn.gov/dhs/opip/opioid-guidelines/.

Health launched a PDMP during the study period in April 2017. The jurisdictions participating in the PDMP account for more than 80 percent of Missouri's population and 90 percent of providers, according to the Department's website. A report tracking the utilization of the St. Louis County PDMP showed a marked increase in patient searches per day, from 690 to 3,500 between May 2017 and 2018.[34] Missouri's prevention efforts aimed at reducing overdoses (including expanded naloxone access, Good Samaritan laws, and access to drug courts) went into effect in August 2017. Senate Bill 826, which was passed into law in August 2018, limits initial new prescriptions of opioids to no more than a seven-day supply for the treatment of acute pain. New opioid prescribing guidelines, which expand on the 2015 guidelines and encourage physicians to follow the CDC's guidance as the primary resource for prescribing opioids, went into effect in December 2018.

Georgia: Over the study period, the average amount of opioids dropped by 37 percent. While the median amount decreased by 19 percent, more significant drops were seen among claims with higher use of opioids (top 10 percent) (Table 4.2). The decline in the average amount of opioids occurred steadily over the study period. This decrease appears to be associated with a decrease in the number of Schedule II opioid prescriptions per claim. The average number of non-Schedule II opioid prescriptions per claim and the average number of pills per opioid prescription changed little over this period (Table 4.3 and 4.4). Georgia's PDMP law was enacted in 2011, and the state PDMP program became operational in 2013. On May 4, 2017, Governor Deal signed into law a comprehensive PDMP legislation as a result of House Bill 249. The law requires the enrollment of opioid prescribers to the state PDMP program and requires prescribers to review PDMP information on a patient when prescribing a Schedule II controlled substance or a benzodiazepine.[35]

Virginia: The average amount of opioids per injured worker receiving opioids decreased by 36 percent in Virginia. A 20 percent decrease was seen in the median amount of opioids per claim, and larger decreases were seen at higher percentiles (Table 4.2). This decrease appears to be driven by a decrease in the number of Schedule II and non-Schedule II opioid prescriptions per claim. Contrary to the trends in a majority of study states, the share of opioid prescriptions that were physician-dispensed remained unchanged at around 10 percent in Virginia over the study period. The majority of the drop in the average amount of opioids dispensed to Virginia workers with opioids occurred between 2015/2017 and 2016/2018. This is consistent with Virginia requiring prescribers to query the state PDMP prior to initiating treatment with opioids exceeding a seven-day supply, effective March 2015. The Virginia Board of Medicine adopted regulations limiting initial opioid prescribing for acute pain to a seven-day supply effective March 2017. The board's final regulations related to prescribing of opioids for acute and chronic pain, as well as for addiction treatment, became effective after our study period in August 2018 and replaced the March 2017 emergency regulations.

Arkansas: We saw steady year-to-year decreases in the average MME amount of opioids per claim in Arkansas totaling 34 percent between 2012/2014 and 2016/2018. The median amount of opioids per claim decreased by 25 percent. Over the four-year period, the average number of opioid prescriptions per claim decreased by 26 percent, and the average number of pills per prescription decreased by 7 percent. These changes in Arkansas

[34] The report is available at https://www.stlouisco.com/Portals/8/docs/document%20library/PDMP/Q1_2018_StLouisCounty.pdf.

[35] By January 1, 2018, every prescriber in Georgia who has a DEA registration number was required to enroll as a PDMP user. Prescribers obtaining DEA licenses after January 1, 2018, must enroll with the PDMP within 30 days.

may be associated with the reforms addressing opioid prescribing and dispensing that went into effect in the state during the study period. Recognizing the need for more comprehensive policies related to opioid misuse and abuse in the state, the 90th General Assembly introduced and passed several bills during the 2015 legislative session that complement existing law. For instance, Arkansas established the state PDMP in 2011, and the program was fully functioning in 2013. The 2015 legislation provided a comprehensive approach to the prevention and intervention of opioid overdoses, including expanding access to the state PDMP database for various stakeholders (prescribers and their employees, professional licensing boards, and certified law enforcement investigators), mandatory checks of prescription history, and checking the PDMP for chronic pain patients every six months. The legislation also addresses random urine drug testing and pill counts and requires all patients to be evaluated by a physician every six months. Effective August 2017, Arkansas' Act 820 requires prescribers to query the PDMP when prescribing Schedule II and III opioids every time and benzodiazepines for the first time. After the study period, the Arkansas Workers' Compensation Commission announced the adoption of a drug formulary to address all outpatient medications prescribed for workers' compensation injuries and illnesses occurring on or after July 1, 2018. Effective August 2018, the state medical board promulgated rules limiting initial opioid prescriptions for acute pain from an injury or surgery to a seven-day supply unless there is detailed medical documentation justifying longer duration.[36] The board's rules requiring at least one hour of continuing medical education regarding prescribing opioids and benzodiazepines also went into effect at the same time.

Massachusetts: Over the study period, the average amount of opioids dropped by 33 percent while the median amount decreased by 11 percent (Figure 4.1 and Table 4.2). More significant drops were seen among claims with higher use of opioids (top 10 percent). A possible factor in this trend was the significant drop in the number of opioid prescriptions per claim (24 percent) over the study period. The previous edition of the study showed that the amount of opioids per claim also decreased between 2011/2013 and 2012/2014 (Thumula, Wang, and Liu, 2017). In the current report, we found year-to-year fluctuations between 2012/2014 and 2014/2016, followed by significant drops between 2014/2016 and 2016/2018. The changes we observed in this study may be associated with the many reforms enacted in Massachusetts to address overuse of opioids over this period: (1) chronic pain treatment guidelines, which went into effect in March 2013; (2) the enhancement of the utility of the state PDMP by providing unsolicited reports of patient controlled substance use history to prescribers (pilot effective July 2013; fully effective December 2013); (3) effective January 2016, prescribers are required to check the PDMP database each time they prescribe certain Schedule II or III drugs; (4) in March 2016, the governor signed into law a landmark opioid legislation, which contains several provisions to address the prevention and intervention of opioid overdose, including limiting initial opioid prescriptions to seven days of supply; and (5) in June 2017, the Department of Industrial Accidents launched a two-year pilot program called the Opioid Alternative Treatment Pathway (OATP) for injured workers with settled claims that continue to be treated with opioids.[37]

[36] The guidelines can be accessed at http://www.armedicalboard.org/Professionals/pdf/Regulation%202%20Mark%20Up%202-2-28%20Revised.pdf.

[37] OATP offers an expedited hearing process to resolve medication disputes with insurers and assigns care coordinators to help guide workers toward alternative treatments for pain.

Nevada: The average and median amounts of opioids per claim decreased by 31 and 38 percent, respectively, over the four-year period (Table 4.2). The number of Schedule II opioid prescriptions per claim decreased over this period by 26 percent while the average number of non-Schedule II opioids did not change (Table 4.3 and 4.4). Note that opioid prescriptions dispensed by physicians decreased from 6 percent of all opioid prescriptions in 2012/2014 to 3 percent in 2013/2015 and remained unchanged over the remaining study period.[38]

Nevada was one of the states that participated in the National Governors Association (NGA) 2014 Prescription Drug Abuse Reduction Policy Academy, whose purpose was to assist in developing a tailored strategic plan to address prescription drug abuse in the state.[39] Following the recommendations of the task force, Nevada introduced and passed a comprehensive reform aimed at opioid overdose prevention, effective during our study period in October 2015. Senate Bill 459 mandated prescribers to check the state PDMP prior to prescribing initial opioid prescriptions.[40] The bill also requires controlled substance prescribers to complete at least one hour of continuing education related to controlled substances misuse and abuse during each licensure period. Nevada's Division of Industrial Relations adopted the ACOEM guidelines for chronic opioid management and evidence-based drug formulary for use in the state workers' compensation system in 2015. Assembly Bill 474 was signed into law on June 16, 2017, and set a 14-day initial limit on opioid prescriptions for acute pain, not to exceed 90 MME per day. The bill also established standards for appropriate opioid prescribing and mandated training on controlled substance misuse for Board of Medical Examiners licensees.

New Jersey: The frequency and average amount of opioids per claim were among the lowest of the 27 study states and continued to decrease. Between 2012/2014 and 2016/2018, we observed a 16 percentage point decrease in the percentage of claims with prescriptions that received opioids and a 31 percent reduction in the average amount of opioids among those receiving opioids. The share of opioid prescriptions that were physician-dispensed decreased by 9 percentage points, from 14 percent, during this time. The noticeable decrease in opioid prescriptions may be related to the heightened awareness of the problem since 2013, when New Jersey legislators put together 21 bills geared at tackling the state's prescription opioid crisis.[41] Several of the bills passed in 2014, including mandatory registration and a requirement for medical providers to educate the patient on the potential danger of opioid misuse and overdose when prescribing medication. Effective November 2015, New Jersey enacted a law mandating that prescribers use the PDMP before issuing the initial prescription and at least every 90 days thereafter if use continues. More recently, Senate Bill 3 was signed into law on February 15, 2017, and limits initial opioid prescriptions for acute pain to five days.

Michigan: Between 2012/2014 and 2016/2018, the average amount of opioids per claim decreased by 30 percent, but the year-to-year figures fluctuated over the study period, which may be tied to the steady decreases in the proportion of injured workers receiving opioids in the state (Tables 4.1 and 4.2). It is conceivable that if

---

[38] Nevada adopted reforms effective January 2016 limiting physician dispensing of certain opioids to a 15-day supply.

[39] Nevada's plan to address opioid abuse is discussed in detail in NGA's report available at http://dpbh.nv.gov/uploadedFiles/dpbhnvgov/content/Programs/ClinicalSAPTA/State%20of%20Nevada%20Plan%20to%20Reduce%20Prescription%20Drug%20Abuse.pdf.

[40] In 2009, Nevada was the first state to require prescribers to query the PDMP prior to the first prescription if the prescriber believed that the patient was seeking the medication for a nonmedical reason.

[41] For a brief description of the 21 bills, see http://www.nj.com/politics/index.ssf/2014/09/nj_legislature_tackles_addiction_list_of_bills_included_in_major_package.html.

fewer injured workers received opioids in recent years, the amount of opioids per claim with opioids may have increased to the extent that claims with greater injury severity were receiving opioids. The drop in the average amount of opioids per claim mainly occurred between 2015/2017 and 2016/2018 (28 percent). The median amount of opioids per claim did not change over the four-year period. We found that the average number of Schedule II opioid prescriptions per claim decreased between 2012/2014 and 2016/2018, contributing to the rapid decline in the amount of opioids per claim (Table 4.4). A significant drop in the physician dispensing share of opioid prescriptions was seen in Michigan, from 16 percent in 2012/2014 to 4 percent in 2016/2018.

Some important opioid-related policies became effective around this period in Michigan, which may have contributed to this decrease in opioid use. In December 2017, legislation was enacted to curb Michigan's persistent and increasing substance abuse and drug diversion problem. The 10-bill package represents a comprehensive approach to addressing the abuse and diversion issue.[42] The comprehensive legislations include a number of provisions. For example, beginning January 4, 2018, a licensed prescriber shall not prescribe a controlled substance listed in Schedules II to V unless the prescriber has established a bona fide prescriber-patient relationship with the patient. Beginning June 1, 2018, before prescribing or dispensing a controlled substance in a quantity that exceeds a three-day supply, a licensed prescriber shall register with the state PDMP program (a.k.a., MAPS) and obtain and review a MAPS report concerning that patient. Beginning July 1, 2018, if a prescriber is treating a patient for acute pain, the prescriber shall not prescribe the patient more than a seven-day supply of an opioid. The Michigan Workers' Compensation Agency amended the reimbursement rules for opioid prescriptions during the study period. Effective December 2014, the amended rules require that opioid treatment beyond 90 days for non-cancer-related chronic pain should not be reimbursed unless detailed physician reporting requirements and other processes are met. The new rules also provide incentives for compliance with the requirement—a provider may bill for the additional services required for reporting beyond 90 days and for accessing the state PDMP or other PDMPs in the treating jurisdiction.[43] Note that Michigan was the only study state that provides PDMP access to private payors, including workers' compensation payors.[44] PDMP access is likely to be helpful in the identification of potentially harmful utilization and prescribing trends in the state and in the development of appropriate interventions to ensure safe and effective utilization of opioids by injured workers. Michigan also developed resources to increase the awareness of opioid prescribing and pain management at the beginning of the study period.[45]

Texas: Over the four-year study period from 2012/2014 to 2016/2018, the average and median amounts of opioids dispensed to Texas injured workers that received opioid prescriptions decreased steadily by 30 and 20

[42] See Michigan opioid laws, frequently asked questions, which is available at https://www.michigan.gov/documents/lara/LARA_DHHS_Opioid_Laws_FAQ_05-02-2018_622175_7.pdf.

[43] For more details, please refer to the amended rules, which are available at http://www.michigan.gov/documents/lara/2014-029_LR_Final_Health_Care_Services_476952_7.pdf.

[44] Note that in Michigan, health care payment or benefit providers are allowed to access the state PDMP for the purpose of ensuring patient safety and investigating fraud and abuse as per the public health code, Act 368. Although this provision has been effective since 2002, the use of the state PDMP by workers' compensation payors and benefit providers may have increased over the study period due to increasing attention to the risks associated with opioids. Act 368 can be accessed at http://www.legislature.mi.gov/(S(nt1iemiav00ghrxwe32ov0sk))/mileg.aspx?page=getobject&objectname=mcl-333-7333a&query=on&highlight=7333a.

[45] In September 2013, Governor Rick Snyder issued a proclamation recognizing September as Pain Awareness Month. The Advisory Committee on Pain and Symptom Management (ACPSM) in Michigan, charged with studying pain issues in the state and making recommendations to improve the care of patients with pain, developed model core curricula, continuing education (CE) recommendations to provide guidance on required CE hours and content for competent prescribing for the state professional boards, and pain management tool kits, which are accessible on the agency website.

percent, respectively (Figure 4.1 and Table 4.2). The substantial decrease was due to fewer opioid prescriptions per claim, especially Schedule II opioid prescriptions, whereas the average number of pills per opioid prescription was unchanged (Table 4.3). The proportion of opioid prescriptions that were for Schedule II opioids decreased by 40 percentage points over the study period, from 65 percent in 2012/2014 to 29 percent in 2015/2017 and 25 percent in 2016/2018 (Table 4.4). In Texas, hydrocodone-acetaminophen accounted for almost all the opioids in this category, and this trend coincides with the up-scheduling of these products from Schedule III to Schedule II, for which refills are prohibited. As discussed in more detail in Chapter 5, we found a substantial reduction in the share of opioid prescriptions for hydrocodone-acetaminophen and an increase in codeine-acetaminophen in Texas. Two guideline-related changes also coincided with the downward trend we observed in Texas—(1) the Texas Division of Workers' Compensation phased in a closed pharmacy formulary based on ODG starting in September 1, 2011, and the formulary became fully effective during the study period on September 1, 2013).[46] Most recently, a new state law (Texas House Bill 2561), effective September 2019, requires Texas physicians to check the Texas PDMP database before prescribing opioids.[47] Physicians must check each patient's prescription history within the database for evidence of doctor shopping or drug diversion. A pharmacist is required to query the PDMP if he/she observes behavior by a patient indicating possible drug diversion or abuse based on the guidelines developed by the board.

Other noteworthy trends: The average amount of opioids in four states (Florida, Illinois, Indiana, and Pennsylvania) decreased by around 20 percent between 2012/2014 and 2016/2018. The median amount of opioids in these states changed little over this period, indicating that injured workers receiving higher amounts of opioids may underlie the reduction in the average amount of opioids per claim in these four states.

[46] According to a study by the Texas Department of Insurance (TDI), fewer opioids and other not-recommended drugs are being prescribed after the reform (TDI, Texas Workers' Compensation Research and Evaluation Group, 2013).

[47] The mandatory check includes prescriptions for hydrocodone, oxycodone, benzodiazepines, barbiturates, and carisoprodol, etc.

Table 4.3 Changes in Utilization of Opioids, 2012/2014–2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
Average MME for opioids per claim in milligrams (mean)																											
2012/2014	1,483	1,941	1,641	2,972	1,413	1,856	1,293	1,468	1,266	1,174	2,081	3,652	1,891	1,808	1,381	1,502	1,008	1,755	1,143	1,370	3,443	2,733	1,892	1,476	1,696	1,662	1,358
2013/2015	1,311	1,691	1,375	3,749	1,269	1,554	1,119	1,492	1,255	1,203	1,756	3,652	2,019	1,513	1,194	1,266	797	1,727	1,077	1,354	2,534	2,687	1,833	1,216	1,573	1,489	1,272
2014/2016	1,257	1,368	1,459	3,824	1,250	1,330	976	1,453	1,113	1,327	1,613	3,235	1,873	1,366	1,199	1,307	764	1,541	939	1,239	2,398	2,583	1,601	904	1,437	1,408	1,076
2015/2017	1,106	1,160	1,380	3,025	1,291	1,388	927	1,446	1,021	1,074	1,568	3,303	1,491	1,242	1,348	1,191	784	1,491	905	1,155	2,080	2,148	1,400	974	1,439	1,333	1,041
2016/2018	976	940	825	3,328	1,093	1,176	749	1,159	999	999	1,031	3,287	1,262	1,018	966	940	633	991	792	940	1,788	2,094	1,052	814	1,196	1,068	767
% change from 2012/2014 to 2016/2018	-34%	-52%	-50%	12%	-23%	-37%	-42%	-21%	-21%	-15%	-50%	-10%	-33%	-44%	-30%	-37%	-37%	-44%	-31%	-31%	-48%	-23%	-44%	-45%	-30%	-36%	-44%
Average number of opioid pills per claim (mean)																											
2012/2014	161	243	179	258	182	219	168	201	177	162	235	415	207	190	167	191	139	212	125	161	311	278	220	163	228	193	172
2013/2015	152	214	168	338	164	198	156	194	159	163	209	423	213	186	158	162	118	210	116	151	244	266	220	139	217	185	159
2014/2016	151	179	168	299	155	177	137	194	140	178	196	365	202	165	152	167	112	187	109	146	239	244	187	114	200	181	144
2015/2017	128	159	149	265	155	175	136	177	141	152	191	390	165	154	162	149	110	170	104	137	210	219	175	120	207	152	134
2016/2018	111	131	110	271	138	154	120	156	125	142	137	381	150	128	135	111	93	128	97	114	182	213	130	104	180	131	105
% change from 2012/2014 to 2016/2018	-31%	-46%	-39%	5%	-24%	-30%	-28%	-22%	-29%	-12%	-42%	-8%	-27%	-33%	-19%	-42%	-33%	-40%	-22%	-29%	-42%	-24%	-41%	-37%	-21%	-32%	-39%
Average number of opioid Rx per claim (mean)																											
2012/2014	3.7	4.5	3.8	4.1	3.5	4.4	3.6	3.6	3.7	3.5	4.4	6.9	4.1	3.4	3.3	3.9	3.0	4.2	2.7	3.4	4.4	4.5	4.3	3.7	4.2	3.8	3.5
2013/2015	3.5	4.2	3.6	5.5	3.3	4.0	3.4	3.5	3.5	3.3	3.9	7.1	4.0	3.3	3.1	3.4	2.8	4.2	2.6	3.3	3.7	4.5	4.3	3.3	4.0	3.7	3.3
2014/2016	3.5	3.6	3.6	4.7	3.2	3.7	3.0	3.4	3.0	3.5	3.7	5.9	3.8	3.1	3.0	3.5	2.7	3.7	2.5	3.2	3.7	4.2	3.7	2.9	3.7	3.5	3.0
2015/2017	2.8	3.2	3.2	4.0	3.0	3.6	2.8	3.1	3.0	3.0	3.4	6.2	3.2	2.9	3.1	3.0	2.5	3.5	2.4	2.9	3.4	3.8	3.5	2.8	3.6	3.1	2.8
2016/2018	2.8	2.8	2.6	4.2	2.8	3.1	2.7	2.8	2.7	2.9	2.8	6.2	3.1	2.6	2.7	2.5	2.2	3.0	2.2	2.6	3.1	3.8	2.9	2.6	3.3	2.8	2.4
% change from 2012/2014 to 2016/2018	-26%	-38%	-32%	3%	-22%	-28%	-25%	-21%	-26%	-19%	-36%	-11%	-24%	-25%	-18%	-35%	-26%	-30%	-18%	-23%	-30%	-16%	-33%	-31%	-21%	-27%	-32%
Average number of opioid pills per Rx (mean)																											
2012/2014	43	54	47	63	51	50	47	56	48	46	53	60	50	55	50	49	46	50	46	47	70	61	51	44	54	51	49
2013/2015	43	52	47	62	50	50	45	55	45	50	53	60	53	56	50	47	42	50	45	46	66	60	51	42	54	50	49
2014/2016	43	50	47	63	49	48	46	56	46	52	53	62	54	52	50	47	42	50	43	45	65	59	50	39	54	52	47
2015/2017	46	50	47	66	51	49	49	57	48	51	56	63	51	52	53	49	44	48	43	47	62	57	51	42	57	49	47
2016/2018	40	47	43	64	50	49	44	55	46	50	48	62	48	49	49	44	41	43	44	44	59	56	45	40	54	47	44
% change from 2012/2014 to 2016/2018	-7%	-13%	-10%	2%	-3%	-2%	-5%	-1%	-4%	8%	-9%	3%	-4%	-11%	-2%	-10%	-9%	-14%	-4%	-8%	-16%	-9%	-12%	-8%	1%	-8%	-11%
% of opioid Rx that were physician-dispensed																											
2012/2014	n/a	40%	19%	15%	30%	22%	12%	32%	20%	12%	5%	7%	n/a	36%	16%	n/a	14%	6%	14%	6%	n/a	23%	11%	15%	n/a	8%	7%
2013/2015	n/a	38%	22%	11%	32%	22%	10%	27%	18%	11%	3%	6%	n/a	36%	16%	n/a	15%	5%	16%	3%	n/a	24%	7%	11%	n/a	9%	5%
2014/2016	n/a	33%	21%	9%	31%	23%	9%	27%	12%	11%	2%	3%	n/a	31%	15%	n/a	13%	3%	11%	3%	n/a	14%	4%	10%	n/a	11%	4%
2015/2017	n/a	23%	12%	4%	20%	18%	8%	26%	3%	8%	2%	5%	n/a	27%	5%	n/a	4%	1%	2%	3%	n/a	2%	3%	6%	n/a	8%	5%
2016/2018	n/a	20%	15%	1%	20%	18%	7%	25%	2%	6%	2%	3%	n/a	30%	4%	n/a	5%	1%	5%	3%	n/a	2%	4%	10%	n/a	9%	6%
% point change from 2012/2014 to 2016/2018	n/a	-20	-5	-14	-10	-4	-4	-7	-18	-7	-3	-4	n/a	-6	-12	n/a	-9	-4	-9	-3	n/a	-20	-7	-5	n/a	1	0
% of opioid Rx that were for Schedule II opioids																											
2012/2014	78%	62%	73%	70%	47%	66%	68%	67%	71%	66%	82%	79%	80%	58%	67%	76%	68%	70%	62%	77%	71%	73%	72%	75%	65%	74%	80%
2013/2015	77%	58%	70%	71%	42%	60%	61%	66%	69%	63%	79%	74%	80%	52%	66%	76%	62%	70%	60%	78%	72%	71%	69%	76%	60%	69%	80%
2014/2016	76%	54%	69%	75%	42%	56%	61%	67%	67%	66%	77%	74%	76%	54%	66%	77%	60%	69%	61%	74%	70%	71%	68%	71%	52%	67%	80%
2015/2017	63%	49%	70%	77%	49%	51%	60%	61%	68%	70%	76%	69%	76%	59%	69%	80%	61%	68%	64%	71%	70%	68%	63%	73%	29%	71%	78%
2016/2018	64%	49%	63%	78%	46%	47%	59%	55%	69%	66%	73%	73%	70%	50%	65%	76%	63%	65%	57%	64%	67%	65%	59%	66%	25%	69%	75%
% point change from 2012/2014 to 2016/2018	-14	-13	-11	8	-1	-18	-9	-12	-2	0	-9	-6	-10	-8	-2	0	-5	-6	-5	-14	-4	-7	-13	-9	-40	-5	-5

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had opioid prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for other years.

Key: MME: morphine milligram equivalent amount; n/a: not applicable; Rx: prescription(s).

Table 4.4 Amount of Opioids per Claim, Overall and by Type of Opioids, 2012/2014–2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
Average MME for opioids per claim in milligrams (mean)																											
2012/2014	1,483	1,941	1,641	2,972	1,413	1,856	1,293	1,468	1,266	1,174	2,081	3,652	1,891	1,808	1,381	1,502	1,008	1,755	1,143	1,370	3,443	2,733	1,892	1,476	1,696	1,662	1,358
2013/2015	1,311	1,691	1,375	3,749	1,269	1,554	1,119	1,492	1,255	1,203	1,756	3,652	2,019	1,513	1,194	1,266	797	1,727	1,077	1,354	2,534	2,687	1,833	1,216	1,573	1,489	1,272
2014/2016	1,257	1,368	1,459	3,824	1,250	1,330	976	1,453	1,113	1,327	1,613	3,235	1,873	1,366	1,199	1,307	764	1,541	939	1,239	2,398	2,583	1,601	904	1,437	1,408	1,076
2015/2017	1,106	1,160	1,380	3,025	1,291	1,388	927	1,446	1,021	1,074	1,568	3,303	1,491	1,242	1,348	1,191	784	1,491	905	1,155	2,080	2,148	1,400	974	1,439	1,333	1,041
2016/2018	976	940	825	3,328	1,093	1,176	749	1,159	999	999	1,031	3,287	1,262	1,018	966	940	633	991	792	940	1,788	2,094	1,052	814	1,196	1,068	767
% change from 2012/2014 to 2016/2018	-34%	-52%	-50%	12%	-23%	-37%	-42%	-21%	-21%	-15%	-50%	-10%	-33%	-44%	-30%	-37%	-37%	-44%	-31%	-31%	-48%	-23%	-44%	-45%	-30%	-36%	-44%
% of opioid Rx that were for Schedule II opioids																											
2012/2014	78%	62%	73%	70%	47%	66%	68%	67%	71%	66%	82%	79%	80%	58%	67%	76%	68%	70%	62%	77%	71%	73%	72%	75%	65%	74%	80%
2013/2015	77%	58%	70%	71%	42%	60%	61%	66%	69%	63%	79%	74%	80%	52%	66%	76%	62%	70%	60%	78%	72%	71%	69%	76%	60%	69%	80%
2014/2016	76%	54%	69%	75%	42%	56%	61%	67%	67%	66%	77%	74%	76%	54%	66%	77%	60%	69%	61%	74%	70%	71%	68%	71%	52%	67%	80%
2015/2017	63%	49%	70%	77%	49%	51%	60%	61%	68%	70%	76%	69%	76%	59%	69%	80%	61%	68%	64%	71%	70%	68%	63%	73%	29%	71%	78%
2016/2018	64%	49%	63%	78%	46%	47%	59%	55%	69%	66%	73%	73%	70%	50%	65%	76%	63%	65%	57%	64%	67%	65%	59%	66%	25%	69%	75%
% point change from 2012/2014 to 2016/2018	-14	-13	-11	8	-1	-18	-9	-12	-2	0	-9	-6	-10	-8	-2	0	-5	-6	-5	-14	-4	-7	-13	-9	-40	-5	-5
Average number of pills for opioids per claim, by type of opioids																											
Schedule II opioids																											
2012/2014	145	230	169	279	154	197	147	190	160	146	225	383	189	205	169	163	132	175	126	141	298	251	191	144	209	161	155
2013/2015	141	201	156	379	133	175	123	188	147	138	191	367	195	175	168	136	113	176	124	139	238	245	187	126	194	152	142
2014/2016	136	170	164	356	134	152	116	187	131	155	177	319	180	171	162	145	98	156	113	133	234	234	157	103	170	141	132
2015/2017	118	152	132	321	126	150	108	163	126	130	179	340	158	151	154	141	94	146	96	121	201	200	148	109	279	131	122
2016/2018	107	126	95	299	104	135	93	145	112	108	125	363	143	109	124	104	83	107	90	94	161	202	114	91	245	115	91
% change from 2012/2014 to 2016/2018	-26%	-45%	-44%	7%	-32%	-32%	-36%	-24%	-30%	-26%	-44%	-5%	-24%	-47%	-26%	-36%	-37%	-39%	-29%	-33%	-46%	-20%	-40%	-37%	17%	-29%	-41%
Other opioids																											
2012/2014	98	150	119	123	142	137	123	138	115	112	122	208	142	122	99	157	94	152	84	113	191	178	138	104	148	143	133
2013/2015	88	139	120	151	135	134	140	127	104	132	147	250	142	141	88	146	83	141	74	93	164	170	139	88	152	146	133
2014/2016	98	123	113	120	123	127	115	122	90	134	140	229	161	118	88	137	87	135	73	100	166	148	134	78	150	159	103
2015/2017	90	118	121	103	129	125	122	126	105	115	130	239	113	113	104	102	90	121	81	101	153	151	128	82	147	115	105
2016/2018	76	100	98	110	123	118	117	116	93	147	106	202	110	116	98	88	75	105	77	99	157	142	97	82	134	104	99
% change from 2012/2014 to 2016/2018	-22%	-33%	-18%	-11%	-13%	-14%	-4%	-16%	-19%	32%	-13%	-3%	-23%	-5%	-1%	-44%	-20%	-31%	-7%	-13%	-18%	-20%	-29%	-21%	-9%	-27%	-26%
Average number of opioid Rx per claim, by type of opioids																											
Schedule II opioids																											
2012/2014	3.3	4.2	3.7	4.2	3.2	4.1	3.2	3.5	3.4	3.2	4.3	6.6	3.9	3.6	3.3	3.5	2.9	3.7	2.7	3.1	4.2	4.2	3.9	3.4	3.9	3.4	3.3
2013/2015	3.2	3.8	3.4	5.8	2.9	3.6	2.8	3.4	3.3	2.8	3.8	6.4	3.7	3.2	3.3	3.0	2.6	3.6	2.6	3.1	3.6	4.2	3.8	3.1	3.7	3.3	3.0
2014/2016	3.2	3.3	3.5	5.3	2.9	3.3	2.6	3.3	2.8	3.0	3.4	5.4	3.4	3.3	3.1	3.2	2.4	3.3	2.5	3.0	3.6	4.0	3.3	2.6	3.2	2.9	2.8
2015/2017	2.5	3.0	3.0	4.6	2.7	3.1	2.3	2.9	2.7	2.6	3.3	5.6	3.1	3.0	2.8	2.9	2.2	3.1	2.3	2.6	3.2	3.6	3.0	2.6	3.8	2.8	2.6
2016/2018	2.6	2.7	2.4	4.4	2.4	2.8	2.1	2.6	2.5	2.3	2.6	5.9	3.0	2.4	2.5	2.4	2.0	2.6	2.1	2.3	2.8	3.6	2.6	2.4	3.5	2.5	2.2
% change from 2012/2014 to 2016/2018	-22%	-36%	-34%	5%	-25%	-32%	-32%	-26%	-28%	-27%	-39%	-11%	-23%	-34%	-23%	-32%	-29%	-28%	-24%	-26%	-33%	-16%	-34%	-30%	-11%	-25%	-32%
Other opioids																											
2012/2014	2.3	2.9	2.4	2.3	2.6	2.5	2.6	2.4	2.3	2.4	2.2	3.0	2.7	2.3	2.0	2.7	2.0	2.7	1.9	2.1	2.7	2.7	2.5	2.2	2.7	2.4	2.5
2013/2015	2.1	2.8	2.3	2.8	2.6	2.6	2.9	2.3	2.3	2.6	2.4	3.7	2.6	2.5	1.8	2.6	2.0	2.6	1.8	2.0	2.5	2.8	2.6	2.0	2.8	2.5	2.4
2014/2016	2.0	2.6	2.3	2.3	2.4	2.5	2.4	2.2	1.9	2.6	2.4	3.3	2.8	2.2	1.9	2.7	2.0	2.4	1.7	2.1	2.5	2.5	2.5	2.0	2.8	2.7	2.0
2015/2017	2.1	2.4	2.3	2.0	2.3	2.6	2.3	2.2	2.1	2.1	2.1	3.5	2.3	2.0	2.0	2.1	2.0	2.3	1.9	2.1	2.4	2.6	2.4	1.9	2.9	2.1	2.1
2016/2018	2.0	2.2	2.1	2.3	2.2	2.4	2.6	2.2	2.0	2.6	2.1	3.2	2.3	2.2	2.0	1.9	1.7	2.2	1.7	2.1	2.5	2.6	2.2	1.9	2.8	2.0	2.0
% change from 2012/2014 to 2016/2018	-12%	-25%	-13%	-1%	-14%	-6%	-2%	-10%	-14%	10%	-3%	7%	-13%	-4%	-3%	-29%	-15%	-18%	-6%	1%	-10%	-4%	-13%	-15%	1%	-16%	-22%

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had opioid prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for other years. Percentage point changes shown may not agree with reported percentages due to rounding.

Key: MME: morphine milligram equivalent amount; Rx: prescriptions.

5

PRESCRIBING PATTERNS OF OPIOIDS

Many factors may influence a physician's choice to prescribe different types of pain relief medications,[1] including the physician's beliefs about the medical necessity, practice norms within a medical community, and the patient's preference. State PDMPs, state pain policies, treatment guidelines, formularies, and availability of safer formulations may also influence physicians' prescribing behavior. This chapter summarizes interstate variations and trends in the types of opioids and non-opioid analgesics prescribed for pain relief. To describe the prescribing patterns, we categorized pain medications into the following categories: hydrocodone-acetaminophen (Vicodin®), oxycodone-containing products (OxyContin® and Percocet®), tramadol-containing products (Ultram® and Ultracet®), all other opioids, and non-opioid pain medications.[2] We did this because hydrocodone-acetaminophen, oxycodone, and tramadol were the opioids most frequently prescribed to injured workers in all of the study states except Texas, accounting for nearly 90 percent or more of all opioid prescriptions in 2016/2018.

LARGE VARIATIONS ACROSS STATES IN THE TYPE OF OPIOIDS PRESCRIBED

Table 5.1 provides the share of pain medication prescriptions for opioid and non-opioid analgesics dispensed to injured workers across the 27 study states. We found large interstate differences in the types of pain medications commonly prescribed across states.

In 2016/2018, the majority of pain medication prescriptions dispensed were for non-opioid analgesics in all study states. The percentage of all pain medication prescriptions for non-opioid analgesics varied from 54–55 percent in Arkansas and Louisiana to 76–77 percent in California, New Jersey, and New York. The share of pain medication prescriptions for opioids varied from 23 percent to 46 percent.

[1] Stronger opioids such as oxycodone, less potent opioids such as tramadol, or non-opioid pain relievers such as NSAIDs or acetaminophen.

[2] All other opioids include propoxyphene, codeine, fentanyl, morphine sulfate, hydromorphone, oxymorphone, buprenorphine, and tapentadol. Non-opioid pain medications include NSAIDs, anticonvulsants, antidepressants, compound drugs, corticosteroids, dermatological agents, and other analgesics (acetaminophen). Note that we categorized adjuvant analgesics (such as anticonvulsants, antidepressants, corticosteroids, dermatological agents, and compound drugs) as pain medications. The primary indication for these drugs may not be pain relief but they provide analgesia for some conditions.

Table 5.1 Prescribing Pattern of Pain Medications, 2016/2018

% of pain medications that were for the drug

	NJ	DE	MD	NY	CT	MA	PA	FL	TX	CA	GA	VA	MN	NC	SC	IL	NV	MO	KY	TN	IA	WI	MI	KS	IN	AR	LA	Median State
Hydrocodone-acetaminophen	4%	4%	5%	6%	6%	7%	7%	8%	9%	10%	11%	13%	13%	14%	14%	16%	16%	16%	17%	17%	18%	18%	20%	20%	20%	21%	26%	14%
	TX	**IL**	**CA**	**MI**	**FL**	**GA**	**IN**	**SC**	**IA**	**KY**	**NV**	**LA**	**MO**	**KS**	**AR**	**TN**	**NC**	**VA**	**NY**	**NJ**	**MD**	**CT**	**WI**	**MN**	**PA**	**MA**	**DE**	**Median State**
Oxycodone HCL and oxycodone-acetaminophen	1%	1%	1%	3%	4%	4%	4%	5%	5%	5%	6%	6%	6%	6%	6%	7%	8%	9%	9%	9%	10%	10%	10%	12%	13%	14%	19%	6%
	DE	**NY**	**KY**	**MA**	**MN**	**WI**	**NJ**	**VA**	**CT**	**PA**	**CA**	**MI**	**LA**	**IN**	**NC**	**TN**	**AR**	**MO**	**NV**	**KS**	**IL**	**SC**	**FL**	**MD**	**GA**	**IA**	**TX**	**Median State**
Tramadol HCL and tramadol-acetaminophen	5%	7%	7%	7%	7%	8%	9%	9%	9%	9%	10%	10%	10%	10%	11%	12%	12%	12%	12%	12%	12%	13%	14%	14%	14%	15%	16%	10%
	KS	**TN**	**FL**	**CT**	**NJ**	**MO**	**MN**	**KY**	**IA**	**IN**	**SC**	**NV**	**NC**	**IL**	**CA**	**MA**	**NY**	**LA**	**WI**	**MD**	**MI**	**VA**	**PA**	**DE**	**GA**	**AR**	**TX**	**Median State**
All other opioids	1%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	4%	7%	13%	2%
	AR	**LA**	**IA**	**KS**	**WI**	**TX**	**TN**	**IN**	**MO**	**NC**	**NV**	**MN**	**MI**	**SC**	**VA**	**PA**	**GA**	**MD**	**KY**	**DE**	**IL**	**MA**	**CT**	**FL**	**NY**	**NJ**	**CA**	**Median State**
Non-opioid pain medications	54%	55%	59%	61%	61%	62%	62%	63%	64%	64%	64%	65%	65%	66%	66%	67%	67%	68%	68%	69%	69%	70%	73%	73%	76%	76%	77%	66%

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. For readers interested in this information sorted alphabetically by state, please see Table SA.6.

When a physician prescribes opioids for pain relief, the choice becomes whether to prescribe stronger opioid medications such as oxycodone or relatively less potent opioids such as tramadol.[3] We saw substantial variation in the types of opioids commonly prescribed to injured workers across the 27 states. Table 5.1 shows that the percentage of pain medication prescriptions for oxycodone (OxyContin®) and oxycodone-acetaminophen (Percocet®) varied from 1 percent in California, Illinois, and Texas to 19 percent in Delaware. Around 10 to 15 percent of pain medication prescriptions were for oxycodone and oxycodone-acetaminophen in Connecticut, Maryland, Massachusetts, Minnesota, Pennsylvania, and Wisconsin. Similarly, large variations were seen in terms of the rate of prescribing hydrocodone-acetaminophen, from 4 percent in Delaware and New Jersey (where oxycodone products were more frequently prescribed) to 26 percent in Louisiana (where hydrocodone-acetaminophen was prescribed more frequently than all other opioid analgesics combined). Relatively smaller variations were seen among the study states in the prescribing of tramadol and tramadol-acetaminophen. Five to 16 percent of pain medication prescriptions were written for tramadol across all states. All other opioids were prescribed infrequently across the study states except in Arkansas and Texas, where 7 and 13 percent of pain medication prescriptions were written for other opioid prescriptions. In Texas, codeine-acetaminophen accounted for 99 percent of prescriptions in this category; in Arkansas, codeine-acetaminophen and tapentadol were the prescriptions in this category. Note that oxycodone products were the most frequently prescribed opioids in the northeastern states included in this study and Delaware. Hydrocodone-acetaminophen accounted for the highest share of opioid prescriptions in a majority of states.

As we discussed earlier, many factors may influence a physician's choice to prescribe stronger or weaker opioids, including the opioid policies in the state, the physician's judgment as to the medical necessity for pain relief, practice norms within a medical community, and the patient's preference.[4] For instance, a few studies outside workers' compensation have found evidence of the impact of state PDMPs on physicians' prescribing of Schedule II opioids (Curtis et al., 2006a and 2006b, for example). However, we did not analyze the impact of these programs in this report.

While a comprehensive discussion of the reasons for the substantial variation in prescribing of different types of opioids is beyond the scope of this study, we observed that more frequent prescribing of oxycodone did not always imply an overutilization of opioids in a state. For example, physicians in Wisconsin were more likely to prescribe oxycodone medications compared with the prescribers in the median state—10 percent of pain medication prescriptions were for oxycodone in Wisconsin, 4 percentage points higher than the median of the 27 states. However, the average MME of opioids per claim in Wisconsin was 23 percent lower than the 27-state median. By contrast, physicians in Delaware and Pennsylvania prescribed these medications more often, and the average amounts of opioids received by injured workers in these states were 233 and 110 percent higher than the 27-state median.

[3] We refer to oxycodone as a *stronger* opioid in this study to convey the relative strength of oxycodone prescriptions compared with other commonly dispensed opioids like hydrocodone-acetaminophen and tramadol. It is possible that some injured workers were prescribed stronger doses and more pills of hydrocodone-acetaminophen and tramadol to achieve the same MME as oxycodone. However, in our study sample, the average morphine equivalent dose of oxycodone prescriptions was roughly 1.5–4.2 times higher than tramadol prescriptions and 1.6–4.0 times higher than hydrocodone prescriptions.

[4] In Technical Appendix A, we provide some background information about the policy environment that may influence physicians' prescribing behavior.

NOTABLE DECREASES SEEN IN PRESCRIBING OF HYDROCODONE-ACETAMINOPHEN, WHILE SHARE OF NON-OPIOID PAIN MEDICATIONS INCREASED IN ALL STUDY STATES

Prescribing patterns of the different types of pain medications changed considerably between 2012/2014 and 2016/2018 (Table 5.2).[5]

Over the four-year period, there was a noticeable decrease of 4 to 22 percentage points in the proportion of pain medication prescriptions for hydrocodone-acetaminophen (Vicodin®) in all study states, while the proportion of non-opioid pain medications increased. This change may be partly associated with the DEA changing the schedule of hydrocodone-combination products from III to II in October 2014 and with some states mandating prescribers to query the PDMP prior to prescribing hydrocodone-acetaminophen and other controlled substances. The largest drop of 22 percentage points in the proportion of pain medications for hydrocodone-acetaminophen was seen in Texas, the only state where the proportion of pain medication for other opioids (codeine-acetaminophen) increased considerably, by 11 percentage points. This shift in prescribing from hydrocodone-acetaminophen to codeine-acetaminophen predominantly occurred between 2014/2016 and 2015/2017, coinciding with the up-scheduling of hydrocodone-combination products. Our findings are consistent with other studies that reported a decrease in prescriptions for hydrocodone-combination products after the federal rescheduling.[6]

The share of pain medication prescriptions for oxycodone (Percocet®) decreased by 6 and 8 percentage points in Connecticut and Massachusetts, both states where oxycodone was the most frequently prescribed opioid at the beginning of the study period. The proportion of tramadol products among all pain medications remained unchanged in most states, with sizable reductions of 5 and 7 percentage points in Florida and Delaware, respectively. Tramadol (Ultram® and Ultracet®) was the only opioid that was not scheduled at the federal level during part of the study period. In August 2014, the DEA classified tramadol as a Schedule IV drug. In the 2017 edition of the report, we observed an increase in the proportion of tramadol products between 2010/2012 and 2013/2015 in five states, coinciding with the decreases in hydrocodone-acetaminophen and all other opioids, which includes propoxyphene. This raised questions about substitution of relatively stronger opioids, such as hydrocodone-acetaminophen, with tramadol by some practitioners. More recent trends suggest that the federal and state policies associated with reducing opioid prescribing may have resulted in substitution of opioids with non-opioid pain medications.

Coinciding with the substantial reductions in opioids prescribed to injured workers over the study period, we noticed an increase in how likely physicians were to prescribe non-opioid pain medications (such as NSAIDs, anticonvulsants, corticosteroids, topical analgesics, antidepressants, compound drugs, and other analgesics), when pain medications were prescribed. The percentage of pain medication prescriptions for non-opioid pain medications increased over the study period in all states. In 22 of 27 study states, increases of 10 percentage points or higher were seen in the share of non-opioid pain medications (Table 5.2). Among the various categories of non-opioid analgesics, noticeable increases were seen in the pain medication prescriptions written for NSAIDs and anticonvulsants (Table 5.3). The share of pain medication prescriptions for NSAIDs had increases of 5 percentage points or more in half of the study states. California and Connecticut were among the states with larger increases of 12 to 13 percentage points. Noticeable increases were also seen in the share of pain medication prescriptions for anticonvulsants in several states. Gabapentin, the most frequently prescribed

[5] The percentage of all prescriptions that were for pain medications changed little in all study states except Connecticut and Missouri, where we observed a 4 percentage point reduction between 2012/2014 and 2016/2018.

[6] See Jones, Lurie, and Throckmorton (2016).

anticonvulsant to injured workers, was classified as a Schedule V medication during the study period in Kentucky, and a few other states require reporting gabapentin prescriptions to the state PDMP (Peckham, Ananickal, and Sclar, 2018). The reclassification and monitoring requirements may partially explain the lesser increase in utilization. There were no material changes in the share of prescriptions for all other categories of pain medications, with some exceptions. As of 2016/2018, NSAIDs accounted for more than one-third of pain medication prescriptions and anticonvulsants accounted for one in 10 or more pain medication prescriptions in at least half of the study states. However, these increases should not be interpreted as an absolute increase in prescriptions for these drug groups, as the number of pain medication prescriptions per claim declined.

Table 5.2 Prescribing Pattern of Pain Medications, 2012/2014–2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
% of pain medications that were for the drug in 2012/2014																											
Hydrocodone-acetaminophen	31%	20%	14%	10%	12%	23%	24%	23%	30%	26%	30%	36%	13%	9%	25%	22%	26%	22%	8%	30%	13%	14%	25%	26%	30%	21%	26%
Oxycodone HCL and oxycodone-acetaminophen	5%	2%	16%	20%	4%	5%	6%	2%	5%	6%	7%	4%	21%	12%	3%	13%	6%	10%	13%	9%	12%	16%	6%	6%	1%	10%	13%
Tramadol HCL and tramadol-acetaminophen	10%	12%	11%	12%	19%	14%	13%	11%	14%	15%	7%	10%	7%	16%	12%	10%	14%	13%	12%	11%	10%	11%	12%	10%	16%	11%	8%
All other opioids	5%	3%	5%	6%	3%	3%	4%	3%	2%	3%	2%	3%	4%	5%	5%	3%	2%	3%	4%	3%	7%	4%	3%	3%	2%	4%	4%
Non-opioid pain medications	48%	64%	54%	54%	63%	55%	54%	62%	49%	50%	54%	46%	54%	58%	54%	52%	52%	52%	64%	48%	58%	56%	53%	54%	52%	54%	49%
% of pain medications that were for the drug in 2016/2018																											
Hydrocodone-acetaminophen	21%	10%	6%	4%	8%	11%	18%	16%	20%	20%	17%	26%	7%	5%	20%	13%	16%	14%	4%	16%	6%	7%	14%	17%	9%	13%	18%
Oxycodone HCL and oxycodone-acetaminophen	6%	1%	10%	19%	4%	4%	5%	1%	4%	6%	5%	6%	14%	10%	3%	12%	6%	8%	9%	6%	9%	13%	5%	7%	1%	9%	10%
Tramadol HCL and tramadol-acetaminophen	12%	10%	9%	5%	14%	14%	15%	12%	10%	12%	7%	10%	7%	14%	10%	7%	12%	11%	9%	12%	7%	9%	13%	12%	16%	9%	8%
All other opioids	7%	3%	2%	3%	2%	4%	2%	2%	2%	1%	2%	3%	3%	3%	3%	2%	2%	2%	2%	2%	3%	3%	2%	2%	13%	3%	3%
Non-opioid pain medications	54%	77%	73%	69%	73%	67%	59%	69%	63%	61%	68%	55%	70%	68%	65%	65%	64%	64%	76%	64%	76%	67%	66%	62%	62%	66%	61%
% point change from 2012/2014 to 2016/2018																											
Hydrocodone-acetaminophen	-10%	-10%	-8%	-5%	-4%	-12%	-6%	-8%	-10%	-6%	-13%	-10%	-7%	-4%	-6%	-9%	-10%	-8%	-4%	-14%	-8%	-7%	-11%	-9%	-22%	-8%	-8%
Oxycodone HCL and oxycodone-acetaminophen	1%	0%	-6%	-1%	0%	0%	-1%	0%	-1%	0%	-1%	2%	-8%	-2%	-1%	-1%	0%	-2%	-4%	-4%	-3%	-3%	-2%	1%	0%	-1%	-3%
Tramadol HCL and tramadol-acetaminophen	2%	-2%	-1%	-7%	-5%	0%	3%	1%	-3%	-3%	0%	0%	0%	-2%	-2%	-2%	-2%	-2%	-3%	1%	-3%	-1%	1%	1%	0%	-2%	0%
All other opioids	2%	0%	-3%	-2%	-1%	0%	-2%	0%	0%	-1%	0%	0%	-1%	-1%	-2%	-1%	0%	-1%	-2%	0%	-4%	-1%	-1%	-2%	11%	-1%	-1%
Non-opioid pain medications	5%	13%	18%	15%	10%	12%	6%	7%	13%	10%	15%	9%	16%	10%	10%	14%	12%	12%	13%	17%	18%	11%	12%	8%	10%	13%	12%

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for other years. Percentage point changes shown may not agree with reported percentages due to rounding.

Table 5.3 Changes in Frequency of Use of Pain Medications, 2012/2014–2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
% of pain medication Rx that were for opioids																											
2012/2014	52%	36%	46%	46%	37%	45%	46%	38%	51%	50%	46%	54%	46%	42%	46%	48%	48%	48%	36%	52%	42%	44%	47%	46%	48%	46%	51%
2013/2015	54%	35%	40%	49%	36%	43%	46%	37%	49%	48%	39%	53%	45%	39%	42%	45%	49%	48%	34%	50%	35%	42%	47%	44%	47%	42%	48%
2014/2016	51%	32%	39%	46%	35%	40%	42%	35%	45%	46%	37%	50%	43%	37%	42%	44%	45%	45%	33%	44%	31%	39%	46%	41%	44%	43%	47%
2015/2017	48%	27%	32%	38%	29%	38%	40%	34%	42%	42%	38%	49%	37%	34%	38%	42%	39%	43%	28%	41%	28%	37%	42%	41%	41%	38%	47%
2016/2018	46%	23%	27%	31%	27%	33%	41%	31%	37%	39%	32%	45%	30%	32%	35%	35%	36%	36%	24%	36%	24%	33%	34%	38%	38%	34%	39%
% point change from 2012/2014 to 2016/2018	-5	-13	-18	-15	-10	-12	-6	-7	-13	-10	-15	-9	-16	-10	-10	-14	-12	-12	-13	-17	-18	-11	-12	-8	-10	-13	-12
% of pain medication Rx that were for NSAIDs																											
2012/2014	25%	37%	34%	28%	38%	30%	25%	35%	29%	30%	27%	22%	25%	36%	33%	22%	31%	27%	39%	32%	27%	28%	27%	30%	33%	27%	24%
2013/2015	28%	38%	37%	27%	39%	32%	28%	35%	31%	31%	32%	23%	26%	37%	36%	25%	33%	28%	40%	30%	31%	29%	29%	31%	33%	28%	25%
2014/2016	27%	41%	35%	29%	40%	34%	28%	35%	30%	32%	32%	23%	26%	37%	36%	24%	33%	27%	40%	35%	32%	28%	29%	32%	35%	28%	25%
2015/2017	28%	47%	41%	28%	44%	36%	31%	37%	31%	34%	34%	25%	28%	39%	37%	23%	35%	29%	45%	36%	33%	29%	31%	33%	36%	28%	27%
2016/2018	28%	48%	47%	32%	44%	38%	34%	39%	30%	34%	34%	25%	31%	39%	37%	24%	38%	32%	47%	39%	36%	31%	34%	35%	38%	29%	28%
% point change from 2012/2014 to 2016/2018	3	12	13	4	6	9	10	4	1	4	7	3	6	3	4	2	6	5	8	7	9	3	7	5	5	2	4
% of pain medication Rx that were for anticonvulsants																											
2012/2014	10%	5%	6%	8%	5%	8%	9%	6%	7%	7%	13%	8%	12%	6%	7%	11%	6%	9%	6%	5%	11%	9%	10%	8%	8%	7%	9%
2013/2015	6%	5%	7%	7%	5%	8%	9%	7%	6%	6%	12%	9%	13%	7%	8%	13%	4%	8%	6%	6%	12%	10%	8%	8%	8%	10%	10%
2014/2016	8%	6%	8%	6%	5%	9%	11%	7%	8%	8%	14%	11%	13%	7%	7%	12%	5%	10%	7%	7%	14%	12%	9%	9%	8%	11%	9%
2015/2017	8%	6%	8%	9%	6%	8%	11%	7%	8%	8%	12%	11%	16%	7%	9%	14%	7%	11%	6%	8%	14%	12%	9%	9%	10%	12%	10%
2016/2018	10%	7%	8%	10%	6%	9%	8%	7%	11%	7%	15%	13%	19%	7%	10%	16%	6%	13%	7%	7%	15%	13%	9%	8%	10%	14%	12%
% point change from 2012/2014 to 2016/2018	1	2	2	3	1	1	-1	1	3	0	2	5	7	1	4	5	0	4	1	2	4	3	0	0	3	7	3
% of pain medication Rx that were for antidepressants																											
2012/2014	4%	4%	3%	5%	3%	5%	10%	4%	3%	5%	5%	7%	8%	4%	5%	8%	4%	5%	5%	3%	5%	4%	6%	4%	4%	7%	6%
2013/2015	2%	3%	4%	3%	2%	5%	6%	4%	3%	6%	5%	6%	6%	4%	5%	7%	3%	4%	3%	2%	6%	4%	4%	3%	4%	7%	6%
2014/2016	2%	3%	5%	3%	2%	4%	9%	4%	4%	5%	5%	6%	7%	5%	5%	9%	4%	5%	5%	3%	7%	5%	3%	4%	4%	6%	6%
2015/2017	2%	4%	5%	5%	2%	4%	7%	3%	5%	5%	4%	6%	6%	5%	5%	9%	6%	5%	5%	4%	8%	5%	4%	4%	4%	8%	4%
2016/2018	2%	4%	5%	5%	3%	4%	7%	3%	6%	5%	3%	6%	7%	5%	6%	11%	6%	7%	5%	5%	6%	5%	6%	5%	4%	9%	8%
% point change from 2012/2014 to 2016/2018	-2	-1	2	0	0	-1	-3	-1	3	0	-1	0	0	1	1	3	2	2	0	3	1	1	0	1	0	2	2
% of pain medication Rx that were for corticosteroids																											
2012/2014	5%	1%	3%	4%	5%	4%	4%	4%	5%	4%	4%	2%	3%	3%	4%	4%	4%	5%	5%	3%	3%	4%	4%	6%	4%	5%	4%
2013/2015	5%	1%	3%	3%	4%	4%	4%	4%	5%	4%	6%	2%	3%	4%	4%	4%	5%	5%	5%	4%	3%	4%	4%	7%	4%	5%	4%
2014/2016	5%	1%	3%	3%	5%	4%	5%	4%	5%	4%	6%	3%	4%	4%	4%	4%	5%	6%	6%	4%	3%	4%	4%	7%	4%	5%	5%
2015/2017	6%	2%	4%	4%	6%	5%	5%	5%	6%	4%	7%	3%	4%	4%	3%	5%	5%	6%	7%	3%	3%	4%	5%	7%	4%	6%	5%
2016/2018	6%	2%	5%	4%	6%	5%	5%	5%	6%	6%	7%	3%	4%	5%	5%	6%	6%	7%	7%	5%	4%	5%	5%	8%	4%	6%	6%
% point change from 2012/2014 to 2016/2018	1	1	1	0	1	1	1	1	2	2	3	0	2	2	1	2	1	1	2	2	1	1	2	2	1	2	2

continued

Table 5.3 Changes in Frequency of Use of Pain Medications, 2012/2014–2016/2018 (continued)

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
% of pain medication Rx that were for compound drugs																											
2012/2014	1%	3%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	1%	1%	1%	1%	2%	1%	0%
2013/2015	1%	3%	0%	2%	1%	1%	0%	2%	0%	0%	0%	0%	0%	1%	0%	0%	1%	1%	1%	0%	1%	2%	2%	1%	2%	1%	1%
2014/2016	2%	2%	1%	3%	1%	1%	0%	3%	1%	1%	0%	0%	1%	1%	1%	0%	0%	1%	1%	0%	2%	3%	1%	1%	3%	1%	0%
2015/2017	2%	1%	1%	3%	1%	1%	0%	2%	1%	0%	1%	0%	0%	0%	1%	0%	0%	1%	0%	0%	1%	3%	1%	1%	3%	0%	0%
2016/2018	1%	1%	0%	1%	1%	1%	0%	2%	1%	0%	2%	1%	1%	0%	0%	0%	0%	0%	0%	0%	1%	2%	0%	0%	2%	0%	1%
% point change from 2012/2014 to 2016/2018	0	-2	0	1	1	-1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	-1	0	1	0	0
% of pain medication Rx that were for dermatologicals, prescription strength																											
2012/2014	3%	3%	6%	7%	6%	3%	4%	4%	3%	3%	3%	2%	4%	3%	3%	4%	3%	3%	5%	4%	8%	6%	3%	3%	1%	5%	4%
2013/2015	3%	3%	6%	4%	6%	3%	5%	2%	2%	2%	4%	2%	4%	3%	3%	4%	3%	3%	5%	7%	9%	6%	3%	4%	1%	3%	5%
2014/2016	3%	3%	5%	5%	7%	3%	3%	2%	2%	3%	3%	3%	5%	3%	2%	3%	4%	3%	5%	5%	9%	5%	3%	3%	1%	4%	5%
2015/2017	5%	4%	6%	5%	8%	3%	3%	3%	3%	4%	3%	2%	5%	3%	3%	4%	4%	3%	5%	5%	9%	5%	3%	3%	1%	4%	5%
2016/2018	4%	4%	6%	7%	8%	4%	3%	4%	4%	5%	4%	3%	5%	3%	3%	5%	4%	3%	4%	5%	11%	7%	3%	3%	1%	4%	5%
% point change from 2012/2014 to 2016/2018	1	1	0	0	2	0	-2	0	2	2	1	1	1	0	1	1	1	0	-1	1	3	1	0	0	0	0	1
% of pain medication Rx that were for dermatologicals, OTC strength																											
2012/2014	0%	8%	0%	0%	4%	2%	0%	4%	1%	0%	1%	3%	0%	4%	2%	0%	1%	1%	2%	0%	2%	2%	1%	2%	1%	1%	0%
2013/2015	0%	8%	2%	2%	5%	3%	0%	7%	1%	1%	1%	2%	0%	4%	1%	0%	1%	1%	3%	0%	2%	3%	1%	2%	0%	1%	0%
2014/2016	0%	6%	3%	2%	4%	4%	0%	8%	1%	1%	0%	2%	0%	5%	2%	1%	1%	1%	2%	0%	1%	3%	2%	2%	0%	1%	0%
2015/2017	0%	4%	1%	5%	3%	5%	0%	7%	1%	1%	0%	2%	0%	7%	2%	0%	1%	1%	2%	1%	1%	2%	4%	1%	1%	1%	0%
2016/2018	1%	4%	1%	5%	2%	6%	0%	7%	1%	0%	1%	3%	0%	8%	2%	1%	1%	1%	2%	1%	1%	2%	4%	1%	1%	1%	0%
% point change from 2012/2014 to 2016/2018	1	-4	0	5	-2	3	0	2	0	0	0	0	0	4	0	1	0	0	0	1	-1	1	4	-1	0	0	0
% of pain medication Rx that were for other analgesics																											
2012/2014	1%	3%	1%	2%	2%	2%	1%	3%	2%	1%	1%	1%	1%	2%	2%	1%	2%	1%	2%	1%	1%	1%	2%	1%	1%	1%	2%
2013/2015	0%	3%	1%	3%	2%	2%	1%	2%	2%	2%	1%	1%	2%	1%	2%	2%	2%	1%	2%	1%	1%	1%	2%	1%	1%	2%	1%
2014/2016	1%	4%	1%	1%	2%	2%	1%	2%	3%	1%	2%	2%	2%	1%	2%	2%	2%	1%	3%	1%	2%	1%	1%	2%	1%	2%	1%
2015/2017	1%	6%	1%	2%	2%	2%	1%	2%	3%	2%	2%	2%	2%	2%	2%	3%	1%	1%	2%	1%	2%	1%	1%	1%	1%	2%	2%
2016/2018	1%	7%	1%	5%	2%	2%	2%	2%	3%	2%	3%	1%	2%	1%	2%	3%	3%	2%	3%	2%	2%	2%	3%	2%	1%	3%	2%
% point change from 2012/2014 to 2016/2018	0	4	0	3	0	-1	1	-1	2	1	2	0	1	-1	0	1	1	0	1	0	1	0	1	0	0	1	0

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for other years. Percentage point changes shown may not agree with reported percentages due to rounding.

Key: NSAID: nonsteroidal anti-inflammatory drug; OTC: over the counter; Rx: prescriptions.

CONCOMITANT USE OF OPIOIDS AND OTHER CENTRAL NERVOUS SYSTEM DEPRESSANTS SEEN IN MANY STATES

Among injured workers receiving opioids, we observed concomitant use of other drugs like benzodiazepines, sedatives, and muscle relaxants (Figure 5.1). Concomitant use of opioids and these other classes of medications with a sedating effect is associated with a heightened risk of respiratory depression and death. Several clinical guidelines, including the CDC guidelines for prescribing opioids for chronic pain, caution about the potential dangers of taking these medications together. The Food and Drug Administration (FDA) started requiring boxed warnings on opioids, benzodiazepines, and other central nervous system depressants stating the serious risks when combining these medications.[7]

Opioids and benzodiazepines: Concomitant use of opioids and benzodiazepines was shown to be associated with adverse patient outcomes.[8,9] In fact, benzodiazepines were involved in 31 percent of opioid overdose deaths in 2011.[10] CDC guidelines recommend that practitioners avoid prescribing opioids and benzodiazepines together when possible due to the heightened risk of potentially fatal overdoses. Despite the evidence, we observed that these two types of drugs were prescribed within one week of each other to at least 1 in 15 injured workers with opioids in Delaware and Massachusetts (Figure 5.1a). The measure was 4–6 percent in nine other states. By contrast, the rate was less than 1 percent in Texas, where preauthorization is required prior to prescribing benzodiazepines.[11]

Opioids and sedatives: Another combination of medications that we examined was the concomitant prescribing of opioids and sedatives (or sleep medications). Less than 1 percent of injured workers with an opioid prescription also filled a sedative within a week of the opioid prescription across a majority of the 27 states. In Delaware, the rate was 5 percent (Figure 5.1b).

Opioids and muscle relaxants: We observed that opioids and muscle relaxants were frequently filled concurrently by injured workers in all study states.[12] Among injured workers with opioids, 24 percent (in New Jersey) to 48 percent (in Louisiana) filled a muscle relaxant prescription within one week of filling an opioid prescription (Figure 5.1c).

Opioids and any central nervous system depressant drug: Overall, in 2016/2018, 30 to 45 percent of workers with opioids received at least one other central nervous system depressant prescription dispensed within one week of the opioid prescription fill in most study states.[13] In Louisiana, the rate was one in two. The measure was somewhat lower in New Jersey (26 percent) (Figure 5.1d). Further investigations are needed to better

---

[7] A complete list of the medications with boxed warnings is available at http://www.fda.gov/Drugs/DrugSafety/ucm518473.htm.

[8] Jones, Mogali, and Comer (2012).

[9] A Drug Abuse Warning Network (DAWN) report found that emergency department visits involving concomitant use of benzodiazepines and opioid pain relievers were associated with a 27 to 54 percent increase in the predicted risk of more serious outcomes such as hospitalization or death compared with emergency department visits involving benzodiazepines alone (Substance Abuse and Mental Health Services Administration, 2014).

[10] Jones and McAninch (2015).

[11] Under the Texas formulary, preauthorization has been required for prescribing benzodiazepines since September 2011 for injuries after September 2011 and since September 2013 for injuries before September 2011.

[12] In our study sample, cyclobenzaprine (Flexeril®) accounts for nearly half of the muscle relaxants concomitantly dispensed with opioids. Other muscle relaxants include tizanidine HCL (Zanaflex®), methocarbamol (Robaxin®), carisoprodol (Soma®), metaxalone (Skelaxin®), orphenadrine (Banflex®), and baclofen (Lioresal®).

[13] Central nervous system depressant drugs include the following classes of medications: benzodiazepines (Valium® and Xanax®), centrally acting muscle relaxants (Soma® and Flexeril®), sedatives (Ambien®), and anti-psychotics (Abilify® and Seroquel®).

understand the reasons underlying these variations in prescribing patterns.

As expected, concomitant use of opioids and other drugs is more frequent among claims with chronic opioid use (see Table SA.7). In 22 states with adequate data on days of supply, we were able to identify injured workers with at least 60 days of opioids supplied during any 90-day period. Among these workers, the prevalence of concomitant use of opioids with other central nervous system depressants was higher than the figure among all opioid users. As an example, in Delaware and Massachusetts, opioid and benzodiazepine prescriptions were seen together in 7 percent of all claims with opioids. The figure was 18 and 15 percent, respectively, among claims that received opioids for at least 60 days over any 90-day period. Although the prevalence of concomitant use was higher among claims receiving opioids on a chronic basis, they only accounted for about 1 in 10 injured workers receiving opioids in the majority of states. As a result, these claims represent a smaller absolute number of concomitant users compared with claims without chronic opioids. We caution the reader against making interstate comparisons of concomitant use among workers receiving chronic opioids using the data provided in Table SA.7 because of the substantial interstate variations in the claim frequency of chronic opioid use.

Figure 5.1 Percentage of Claims with Opioids That Had Concomitant Use of Central Nervous System Depressants, 2016/2018

Figure 5.1a Percentage of Claims with Opioids That Had Concomitant Useof Benzodiazepines, 2016/2018

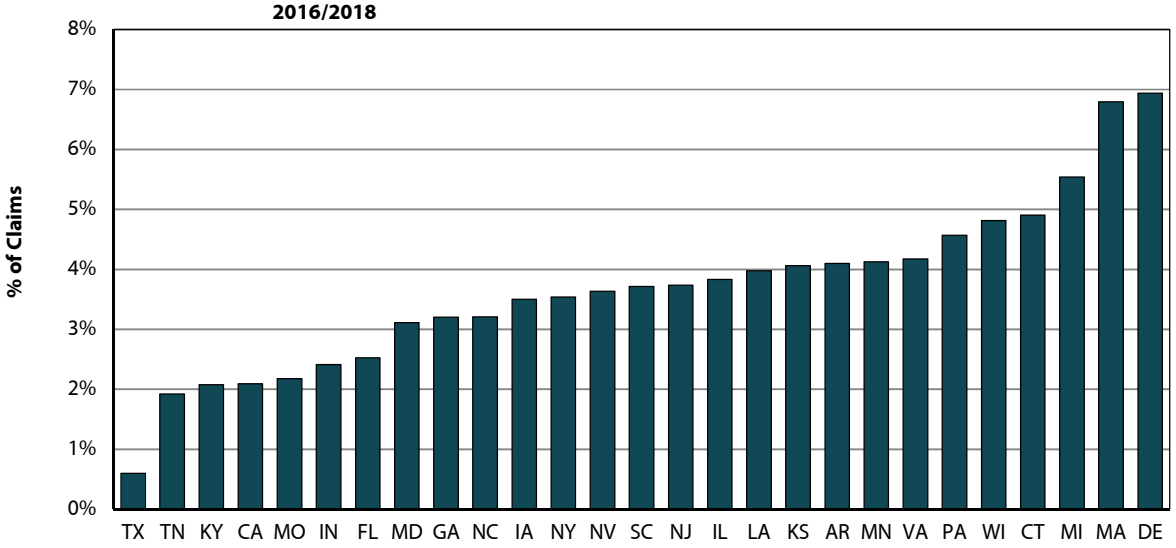
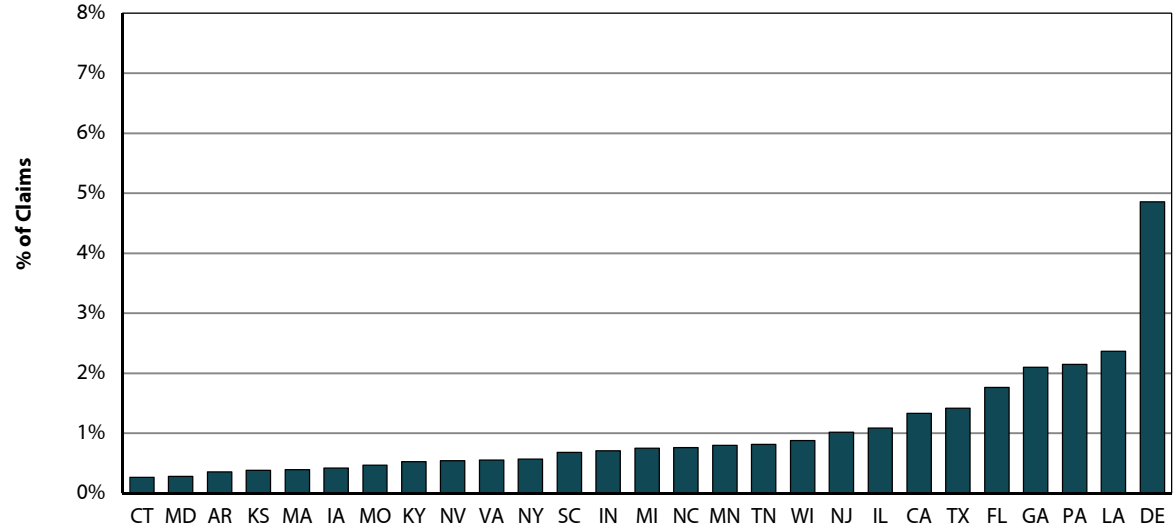


Figure 5.1b Percentage of Claims with Opioids That Had Concomitant Use of Sedatives, 2016/2018



continued

Figure 5.1 Percentage of Claims with Opioids That Had Concomitant Use of Central Nervous System Depressants, 2016/2018 (continued)

Figure 5.1c Percentage of Claims with Opioids That Had Concomitant Use of Muscle Relaxants, 2016/2018

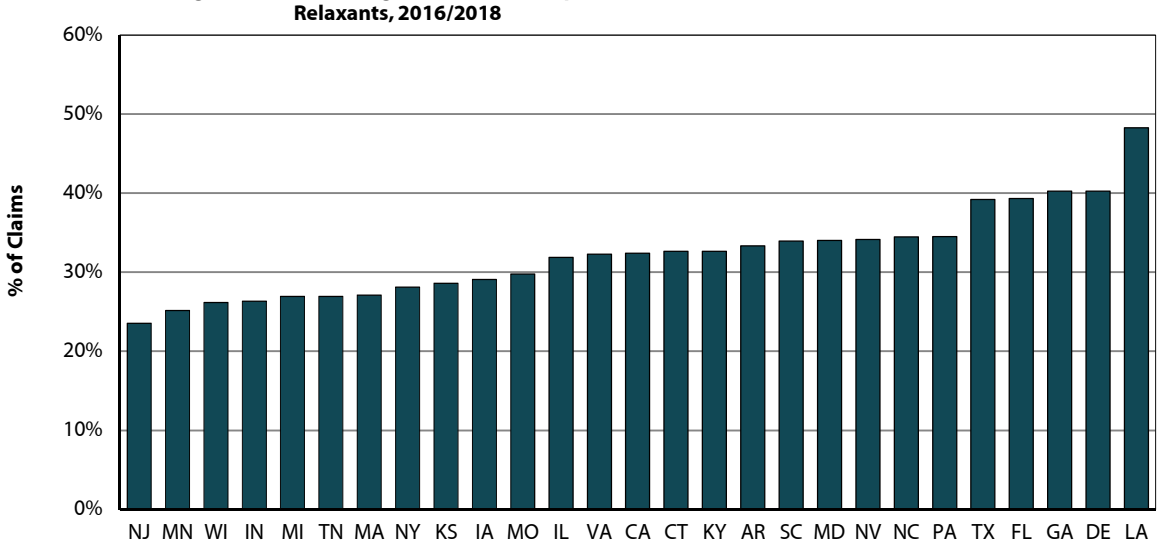
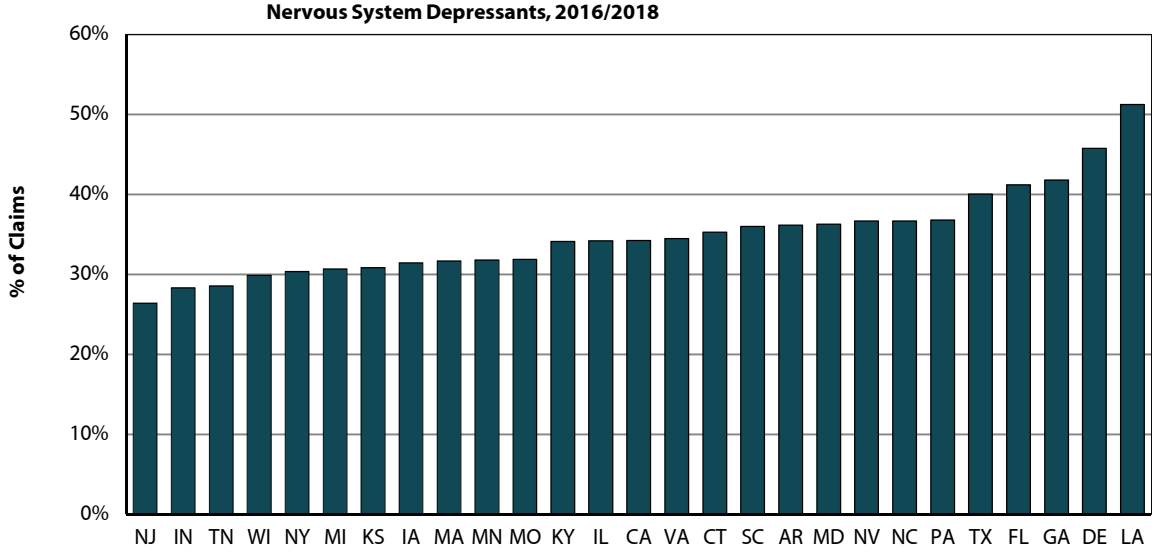


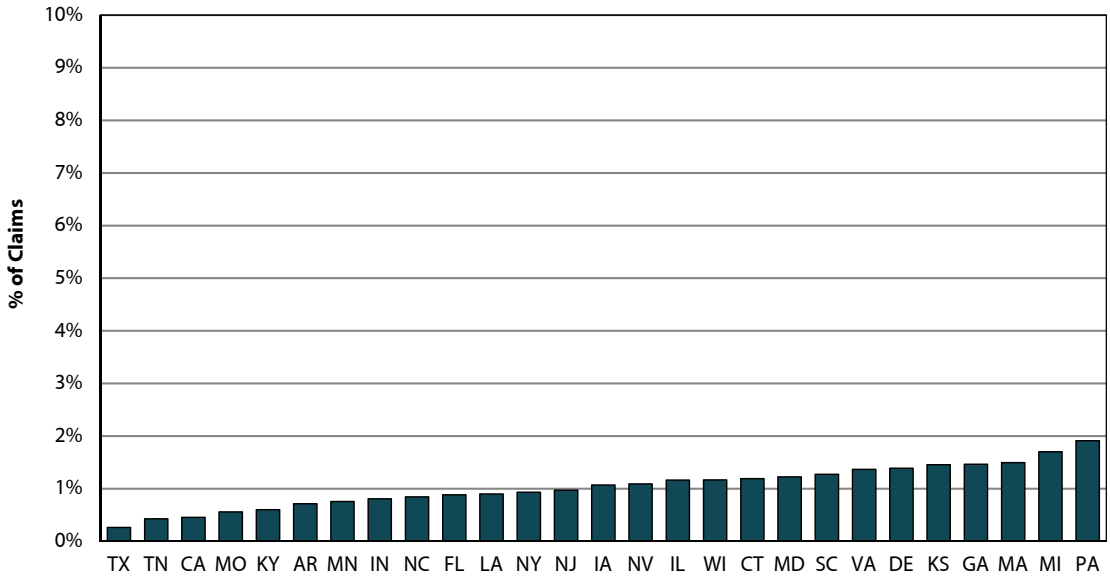
Figure 5.1d Percentage of Claims with Opioids That Had Concomitant Use of Central Nervous System Depressants, 2016/2018



Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. The numbers underlying these charts are in Table SA.7.

We also examined whether injured workers were receiving opioids, benzodiazepines, and muscle relaxants together.[14] Figure 5.2 shows that only 1 to 2 percent of injured workers filled all three classes of drugs within one week of each other in the majority of states. We caution readers that the actual prevalence of these combinations may be higher than observed because we only capture the medications paid for by workers' compensation payors.

Figure 5.2 Percentage of Claims with Opioids That Had Concomitant Use of Benzodiazepines and Muscle Relaxants, 2016/2018

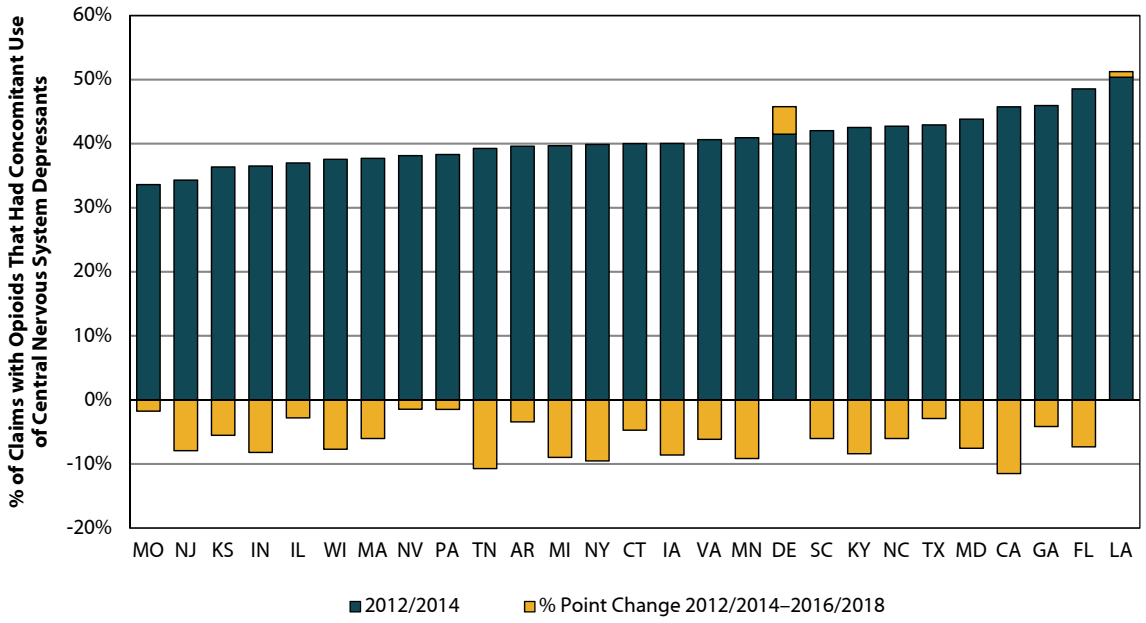


Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

We found a downward trend in the percentage of injured workers receiving opioids that had concomitant use of other central nervous system depressant drugs in most of the study states between 2012/2014 and 2016/2018 (Figure 5.3). Larger reductions of 5 percentage points or higher were seen in 18 of the 27 states. Contrary to the general trend, we found an increase of 4 percentage points in Delaware. One may wonder if the increase reflects a shift in severity of Delaware claims between 2012/2014 and 2016/2018. Since we observed fewer Delaware workers with prescriptions receiving opioids, it is possible that the 2016/2018 claims were, on average, more serious than the 2012/2014 claims, and were therefore in need of multiple medications. Nevertheless, similar reductions were seen in the claim frequency of receiving opioids in some other study states, but the claim frequency of concomitantly receiving opioids and other central nervous system depressants in these states also decreased.

[14] The combination of these three medications, referred to as the "holy trinity," is frequently abused as they are known to increase feelings of euphoria.

Figure 5.3 Change in Percentage of Claims with Opioids That Had Concomitant Use of Central Nervous System Depressants, 2012/2014 to 2016/2018



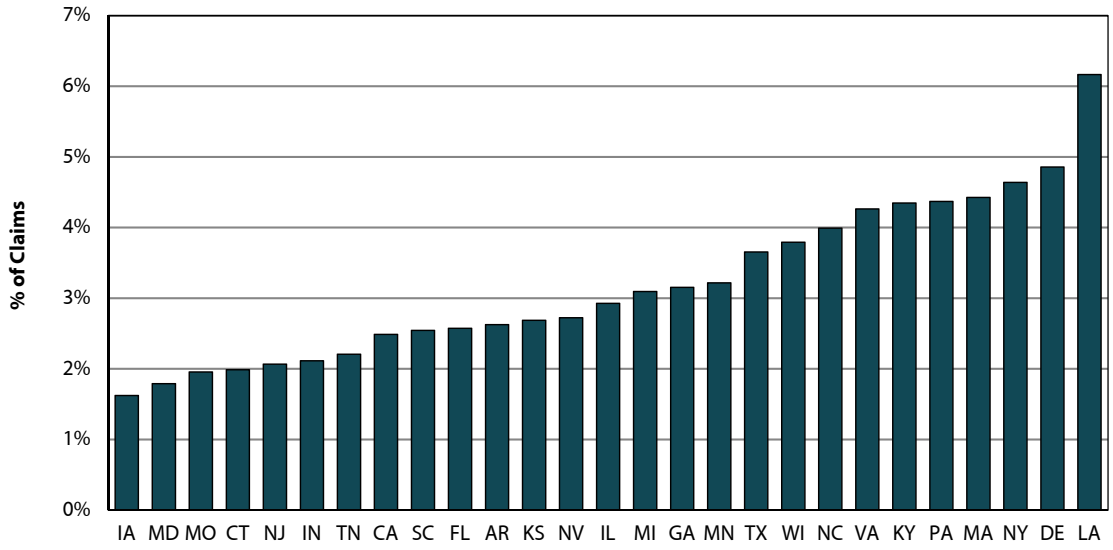
Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for other years.

Concomitant exposure to opioids and anticonvulsants (Neurontin® and Lyrica®) is also associated with greater odds of opioid overdose deaths.[15] Reports of the presence of gabapentin (Neurontin®) in a substantial number of opioid overdose deaths prompted Kentucky to classify gabapentin as a Schedule V medication during the study period. Some other states required reporting of gabapentin prescriptions to the state PDMP (Peckham, Ananickal, and Sclar, 2018). In 2016/2018, opioids and anticonvulsants (Neurontin® and Lyrica®) were concurrently dispensed in 6 percent of Louisiana claims with opioids. Seven more states had 4–5 percent of workers with opioids receiving anticonvulsants concomitantly (Figure 5.4). As prescribing of anticonvulsants for pain relief continued to increase in workers' compensation over the study period, concomitant dispensing of opioids and anticonvulsants had a small but noticeable increase of 2 to 3 percentage points in a few states (Louisiana, Texas, and Virginia); these trends need to be closely monitored.[16] Note that fewer workers received opioids in recent years, and those receiving opioids may have more severe injuries warranting the receipt of multiple classes of pain relief medications.

[15] See Gomes et al. (2017 and 2018).

[16] Almost all anticonvulsant prescriptions in our data are for gabapentinoids, gabapentin (Neurontin®), and pregabalin (Lyrica®). Pregabalin is classified as a Schedule V controlled substance at the federal level, and a few states classify gabapentin as a Schedule V controlled substance. Most treatment guidelines recommend the use of gabapentin and pregabalin for neuropathic pain or fibromyalgia.

Figure 5.4 Percentage of Claims with Opioids That Had Concomitant Use of Anticonvulsants, 2016/2018



Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

SMALL BUT SIZABLE PROPORTION OF INJURED WORKERS RECEIVED LONG-ACTING SCHEDULE II OPIOIDS IN SOME STATES

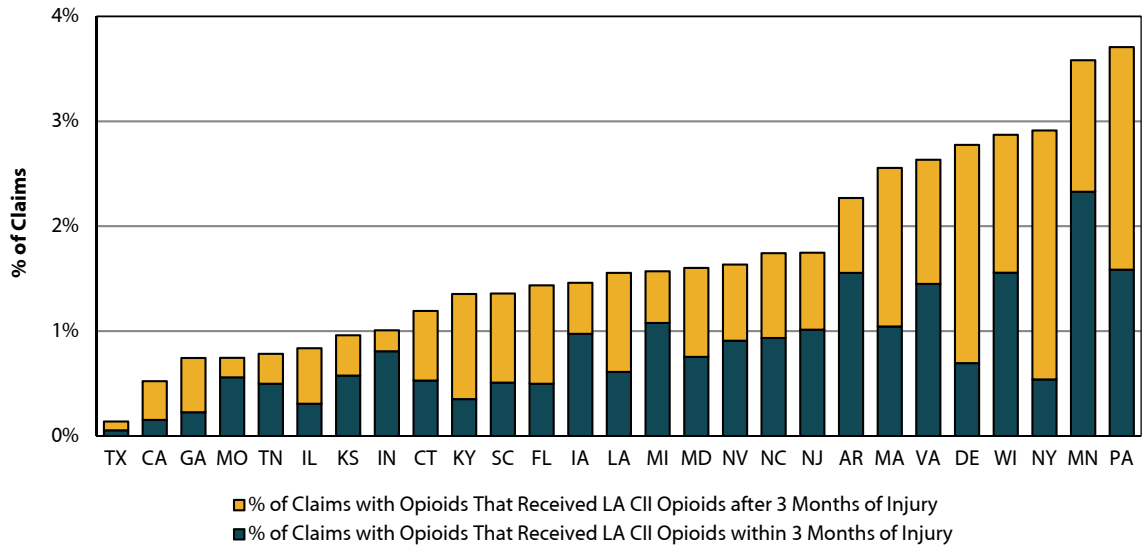
The frequency of prescribing long-acting Schedule II opioids was infrequent in a majority of study states. The percentage of claims with opioids that received a long-acting Schedule II opioid ranged from less than 1 percent in Texas to about 4 percent in Minnesota and Pennsylvania (Figure 5.5). Note that the data used for this analysis are based on an average of 24 months of experience, which is not necessarily sufficient to capture the full utilization of long-acting opioids as they are typically used at a later stage of medical treatment.[17] Despite the relatively short maturity of the data and the exclusion of surgical claims from this analysis, we found that the proportion of injured workers receiving long-acting Schedule II opioids in some states was non-trivial. This suggests that there may be a need for close monitoring of these high-risk claims.

We further examined if injured workers received long-acting Schedule II opioids early in the life of the claims (i.e., in the first three months of injury), as long-acting opioids are not recommended for the first-line treatment of acute or chronic pain.[18] Guidelines typically recommend starting opioid therapy with a short-term therapeutic trial of short-acting opioids. We observed that more than half of injured workers with long-acting Schedule II opioids received these medications within the first three months of injury in half of the 27 study states. Figure 5.5 provides the percentage of all injured workers with opioids that received a long-acting Schedule II opioid prescription as well as those that received a long-acting Schedule II opioid prescription within the first three months postinjury.

[17] Authors of a National Council on Compensation Insurance, Inc. (NCCI) study found that the share of high-cost opioid prescriptions (which presumably include stronger long-acting opioids) grew from 9 percent of all opioid prescriptions in the 1st year to 45 percent in the 12th year postinjury (Lipton, Laws, and Li, 2009).

[18] Technical Appendix B of *Longer-Term Dispensing of Opioids, 4th Edition* (Wang, 2017) provides a summary of the guideline recommendations for short- versus long-acting opioids.

Figure 5.5 Percentage of Claims with Opioids That Had Long-Acting Schedule II Opioids[a] in the First Three Months Postinjury, 2016/2018



Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

[a] Long-acting Schedule II opioids include long-acting or extended-release formulations of oxycodone (OxyContin®), hydrocodone (Zohydro®ER), tapentadol (Nucynta®ER), morphine (Kadian®), oxymorphone (Opana®ER), hydromorphone (Exalgo®), fentanyl (Duragesic®), and methadone (Dolophine®).

Key: LA CII: long-acting Schedule II.

6

RECENT TRENDS IN NON-OPIOID PAIN TREATMENT

Several guidelines addressing opioid prescribing for acute, subacute, and chronic pain generally recommend non-opioid pharmacologic treatments and non-pharmacologic pain treatments prior to or adjunct to prescribing opioids. Table TA.B1 provides examples of guideline recommendations and state rules regarding non-opioid and non-pharmacologic alternative treatment to opioids. With an increasing number of states adopting guidelines and other policies restricting opioid prescribing and dispensing, we track if there are significant changes in alternate treatments in this chapter.

FEWER INJURED WORKERS RECEIVED OPIOIDS WHILE FREQUENCY IN USE OF NON-OPIOID PAIN MEDICATIONS INCREASED TO A LESSER DEGREE

We noted in the previous sections that significantly fewer injured workers received opioid prescriptions for pain relief in the latest study period. If all or some of these injured workers had injuries or medical conditions that necessitate pain medications, we would expect to see prescribers switch opioid prescriptions with non-opioid pain medications. Table 6.1 shows trends in the claim frequency of pain medications, overall, and separately for claims that received opioids only, both opioid and non-opioid analgesics, and non-opioid analgesics only.[1] The results are based on nonsurgical workers' compensation claims with more than seven days of lost time, regardless of whether the claim had a prescription.

Between 2012/2014 and 2016/2018, as Table 6.1 shows, the percentage of injured workers who received prescriptions for both opioid and non-opioid analgesics decreased considerably by 5 to 21 percentage points across the study states. Few injured workers received only opioids for pain relief and the claim frequency of receiving only opioids decreased by 1–3 percentage points across most states. Over the same period, the percentage of workers receiving non-opioid analgesic prescriptions (and no opioids) increased by 0 to 10 percentage points across the states. As a result, we see sizable decreases, by 2 to 14 percentage points, in the percentage of claims that received pain medication prescriptions. The decreases are consistent with the trends we see in the percentage of claims receiving any prescriptions. These results suggest that a significant number of injured workers who would have received opioids in the earlier years were not prescribed opioids in the latest study period. Some of them may have received non-opioid prescriptions for pain relief, but many received neither opioid nor non-opioid pain medications.

[1] Non-opioid analgesics refer to analgesics such as NSAIDs and acetaminophen, as well as adjuvant analgesics such as anticonvulsants, antidepressants, corticosteroids, dermatological agents, and compound drugs. We use the terms *non-opioid pain medication* and *non-opioid analgesics* interchangeably throughout the report.

Table 6.1 Changes in Frequency of Use of Opioid and Non-Opioid Analgesic Rx, 2012/2014–2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
Among nonsurgical claims with more than 7 days of lost time																											
% of claims that had Rx for opioid analgesics only																											
2012/2014	16%	5%	8%	7%	7%	8%	12%	6%	12%	13%	10%	11%	6%	6%	8%	10%	11%	10%	6%	13%	6%	9%	9%	11%	12%	9%	10%
2013/2015	15%	5%	6%	6%	7%	8%	12%	6%	11%	12%	7%	9%	6%	7%	8%	9%	11%	9%	5%	12%	5%	8%	8%	10%	11%	8%	10%
2014/2016	14%	4%	7%	7%	7%	7%	11%	6%	12%	11%	7%	9%	6%	6%	9%	8%	10%	9%	5%	9%	4%	8%	9%	11%	11%	9%	9%
2015/2017	14%	4%	5%	6%	5%	6%	10%	6%	10%	11%	7%	8%	5%	5%	8%	8%	9%	9%	4%	9%	4%	8%	7%	10%	9%	8%	9%
2016/2018	11%	3%	5%	5%	5%	6%	10%	5%	9%	10%	7%	8%	3%	6%	7%	7%	8%	7%	4%	8%	3%	7%	7%	8%	9%	7%	9%
% point change from 2012/2014 to 2016/2018	-6	-2	-3	-2	-2	-2	-2	-1	-3	-3	-4	-3	-3	-1	-1	-3	-4	-3	-2	-5	-3	-2	-2	-3	-3	-3	-1
% of claims that had Rx for both opioid and non-opioid analgesics																											
2012/2014	31%	40%	19%	23%	38%	39%	20%	19%	30%	22%	25%	33%	12%	24%	23%	16%	20%	29%	16%	33%	16%	26%	29%	32%	35%	25%	18%
2013/2015	27%	36%	19%	22%	37%	39%	19%	19%	29%	23%	19%	31%	12%	22%	22%	15%	21%	28%	15%	35%	14%	26%	28%	28%	35%	23%	15%
2014/2016	27%	33%	17%	20%	35%	36%	17%	18%	25%	21%	18%	31%	10%	21%	22%	12%	20%	26%	13%	30%	12%	23%	26%	28%	33%	24%	15%
2015/2017	21%	24%	13%	15%	27%	30%	16%	15%	20%	17%	17%	28%	8%	17%	18%	11%	17%	24%	10%	27%	11%	20%	24%	25%	28%	20%	13%
2016/2018	22%	19%	11%	14%	25%	27%	13%	14%	17%	16%	13%	25%	6%	15%	16%	10%	15%	21%	9%	24%	8%	17%	20%	21%	27%	19%	11%
% point change from 2012/2014 to 2016/2018	-9	-21	-8	-9	-13	-11	-7	-5	-12	-7	-12	-7	-6	-9	-7	-6	-5	-9	-6	-10	-8	-8	-9	-11	-9	-5	-7
% of claims that had Rx for non-opioid analgesics only																											
2012/2014	10%	25%	18%	15%	24%	17%	13%	22%	17%	15%	17%	10%	8%	21%	20%	10%	17%	14%	20%	16%	12%	19%	13%	19%	17%	11%	9%
2013/2015	10%	25%	20%	20%	24%	17%	13%	22%	18%	15%	22%	12%	8%	22%	19%	10%	17%	14%	20%	16%	15%	19%	11%	20%	17%	13%	10%
2014/2016	12%	27%	20%	18%	25%	18%	14%	21%	18%	17%	20%	11%	9%	21%	20%	10%	17%	13%	21%	22%	16%	19%	13%	20%	17%	14%	11%
2015/2017	13%	32%	23%	23%	33%	22%	14%	22%	22%	18%	20%	12%	9%	23%	23%	10%	19%	14%	25%	21%	15%	20%	14%	20%	20%	15%	11%
2016/2018	12%	35%	23%	23%	33%	26%	15%	22%	21%	19%	19%	13%	9%	22%	22%	12%	20%	15%	25%	26%	15%	21%	16%	21%	21%	16%	13%
% point change from 2012/2014 to 2016/2018	2	10	5	8	9	9	2	-1	4	4	2	3	1	2	2	2	3	1	4	10	3	2	4	1	4	5	3
% of claims that had pain medications																											
2012/2014	58%	70%	45%	45%	69%	64%	45%	48%	58%	50%	53%	54%	26%	51%	51%	36%	48%	53%	42%	62%	34%	54%	50%	61%	64%	45%	37%
2013/2015	52%	66%	45%	49%	68%	63%	44%	46%	57%	50%	49%	52%	26%	51%	49%	34%	49%	51%	40%	63%	34%	53%	47%	58%	63%	44%	36%
2014/2016	53%	64%	44%	44%	67%	61%	43%	44%	55%	49%	45%	52%	24%	47%	51%	31%	47%	48%	39%	61%	32%	51%	48%	58%	61%	48%	35%
2015/2017	47%	60%	41%	44%	65%	59%	40%	43%	52%	47%	43%	48%	21%	44%	49%	29%	44%	47%	39%	57%	30%	47%	45%	55%	57%	42%	34%
2016/2018	45%	58%	38%	42%	62%	59%	38%	40%	48%	45%	39%	46%	19%	43%	45%	29%	42%	43%	38%	57%	26%	45%	43%	49%	56%	42%	33%
% point change from 2012/2014 to 2016/2018	-13	-13	-6	-2	-6	-5	-7	-7	-11	-5	-14	-8	-7	-8	-6	-7	-6	-10	-4	-5	-8	-9	-7	-12	-8	-3	-4

Notes: The underlying data include nonsurgical claims with more than seven days of lost time and prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for other years. Percentage point changes shown may not agree with reported percentages due to rounding.

Key: Rx: prescriptions.

To some extent, the decreases in the percentage of claims with pain medications might be a result of a shift in prescribing pattern for claims with acute pain from the injury that may have received a prescription initially but had no subsequent medical care. In 2012/2014, a small proportion of injured workers received only opioids (and no non-opioid analgesics), 5–16 percent across the states. The same measure ranged from 3 to 11 percent in 2016/2018. In most study states, the opioid-only prescribing pattern shifted down by 1–3 percentage points (Table 6.1). Conceivably, some doctors who were more likely to be prescribing opioids in 2012/2014 may have shifted toward prescribing stronger non-opioid pain medications in 2016/2018 in response to stricter regulations regarding opioid prescribing. This, if true, would help explain some of the increase in the percentage of claims that only received non-opioid pain medications. There may be other circumstances in which injured workers with identical injuries in 2012/2014 and 2016/2018 received an opioid prescription in 2012/2014 but did not receive any prescriptions in 2016/2018.

Another shift in prescribing pattern is evident from the decreasing trend in the percentage of injured workers receiving both opioid and non-opioid analgesic prescriptions coupled with the moderate increase in the percentage of injured workers receiving non-opioid analgesic prescriptions only. This pattern was likely because some injured workers who were prescribed both opioid and non-opioid pain medications in 2012/2014 did not receive an opioid prescription in 2016/2018 for identical injuries. If all injured workers who did not receive opioids needed pain relief medications, we would expect to see a larger increase in the claims with non-opioid analgesics. The net decreases in the percentages (5–21 percentage point decreases in the percentage of injured workers receiving both opioid and non-opioid analgesic prescriptions and 0–10 percentage point increases in the percentage of injured workers receiving non-opioid analgesic prescriptions only) suggest that a significant number of workers received neither opioid nor non-opioid analgesic prescriptions.

On average, we find that providers might be more likely to prescribe non-opioid analgesics to substitute for opioids for acute pain. This finding coincides with stricter opioid policies over the same period. However, non-opioid pain medication substitution does not fully offset the substantial decrease in the percentage of workers with opioids. In sum, we see a net decrease in the percentage of claims with pain medication across the states.

MOST INJURED WORKERS CONTINUE TO RECEIVE PAIN TREATMENTS IN THE FORM OF NON-PHARMACOLOGIC PAIN TREATMENTS

The fact that we see a net decrease in the percentage of claims with pain medications (Table 6.1) raises several questions: Why did these injured workers not receive pain medications in the later years? How many of these injured workers suffered from pain and needed medical attention for pain relief? If they did not receive medication therapy for pain relief, did they receive any non-pharmacologic services as an alternative treatment? Did the provision of non-pharmacologic treatment help some injured workers to avoid opioids? Although our data cannot answer all these questions, we see evidence that suggests that a majority of injured workers continued to receive some form of pain treatment. Table 6.2 provides results that track changes in the claim frequency of receiving pain medications and non-pharmacologic treatments.[2]

[2] Some non-drug medical transactions paid under workers' compensation may not have been captured in our data because our data capture medical bills that went through bill review systems of individual payors and not all bills are sent for bill review (Rothkin and Dolinschi, 2018). To ensure that the missing transactions do not bias the trends that are the focus of this analysis, we did a sensitivity analysis using a subset of claims with relatively complete bill review data (80 percent of claims across most states and valuations). The percentage point changes in all four measures shown in Table 6.2 remained unchanged in almost all states. For example, a maximum change of 3 percentage points was seen in the percentage of claims that had no pain medications or non-pharmacologic treatments in Nevada (from -1 to 2 percentage points), which doesn't change the qualitative findings for Nevada. Claim frequencies of different treatment patterns shown in Table 6.2 changed in the same direction in several states, but the comparative findings remain the same.

Table 6.2 Changes in Frequency of Use of Pain Medication Rx and Non-Pharmacologic Treatments, 2012/2014–2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
Among nonsurgical claims with more than 7 days of lost time																											
% of claims that had pain medications, no non-pharmacologic treatments																											
2012/2014	18%	11%	8%	7%	16%	14%	11%	9%	14%	13%	15%	25%	6%	10%	15%	8%	13%	14%	11%	19%	5%	13%	14%	15%	17%	12%	9%
2013/2015	15%	10%	7%	8%	16%	14%	10%	8%	14%	13%	12%	20%	6%	9%	13%	8%	12%	13%	9%	13%	5%	12%	13%	14%	16%	11%	8%
2014/2016	16%	11%	7%	7%	15%	13%	10%	8%	14%	13%	10%	14%	6%	8%	14%	7%	11%	12%	9%	12%	5%	12%	13%	14%	15%	14%	7%
2015/2017	15%	10%	6%	9%	15%	12%	9%	8%	13%	11%	11%	13%	5%	7%	13%	7%	11%	12%	9%	13%	5%	11%	12%	13%	13%	11%	8%
2016/2018	13%	10%	5%	8%	14%	13%	8%	7%	12%	11%	10%	11%	4%	8%	12%	6%	10%	10%	9%	10%	4%	10%	11%	13%	13%	12%	9%
% point change from 2012/2014 to 2016/2018	-5	-2	-2	1	-2	-1	-3	-2	-3	-2	-5	-13	-2	-1	-3	-2	-3	-4	-1	-8	-1	-3	-3	-2	-4	0	0
% of claims that had pain medications and non-pharmacologic treatments																											
2012/2014	39%	59%	37%	38%	53%	50%	34%	38%	44%	37%	38%	29%	20%	42%	36%	27%	35%	39%	31%	43%	28%	41%	36%	47%	47%	33%	29%
2013/2015	37%	56%	39%	41%	52%	49%	34%	38%	44%	37%	37%	32%	20%	41%	36%	26%	37%	37%	30%	50%	29%	41%	34%	44%	47%	33%	28%
2014/2016	38%	54%	37%	38%	52%	48%	33%	36%	41%	36%	34%	37%	19%	39%	37%	24%	36%	36%	30%	49%	27%	39%	35%	44%	46%	34%	28%
2015/2017	32%	50%	34%	35%	50%	47%	31%	35%	39%	37%	32%	35%	17%	37%	35%	22%	34%	35%	30%	43%	25%	37%	34%	42%	44%	31%	26%
2016/2018	31%	48%	33%	34%	48%	46%	30%	33%	36%	34%	29%	35%	15%	35%	33%	22%	32%	33%	28%	47%	22%	35%	32%	37%	44%	30%	25%
% point change from 2012/2014 to 2016/2018	-8	-11	-4	-4	-5	-4	-4	-5	-8	-3	-9	5	-5	-7	-2	-5	-4	-6	-3	3	-6	-6	-5	-10	-4	-3	-4
% of claims that had non-pharmacologic treatments and no pain medications																											
2012/2014	14%	12%	29%	26%	11%	13%	25%	24%	18%	21%	19%	9%	32%	22%	18%	30%	19%	16%	24%	16%	34%	20%	15%	17%	15%	21%	32%
2013/2015	19%	15%	29%	28%	11%	14%	25%	26%	20%	21%	23%	14%	33%	24%	20%	32%	21%	18%	27%	16%	36%	21%	18%	20%	17%	22%	34%
2014/2016	20%	16%	30%	28%	12%	15%	28%	27%	22%	22%	26%	19%	35%	26%	21%	34%	22%	19%	28%	20%	38%	21%	18%	20%	18%	20%	33%
2015/2017	23%	18%	31%	26%	13%	16%	27%	27%	22%	25%	27%	19%	35%	27%	20%	34%	23%	19%	28%	23%	39%	25%	21%	22%	20%	24%	34%
2016/2018	26%	19%	34%	27%	15%	17%	29%	28%	28%	26%	27%	21%	37%	29%	23%	35%	25%	22%	29%	22%	41%	27%	21%	25%	20%	25%	34%
% point change from 2012/2014 to 2016/2018	12	7	4	1	4	5	4	4	10	5	8	12	5	7	4	5	6	6	5	6	7	7	6	8	5	4	2
% of claims that had no pain medications nor non-pharmacologic treatments																											
2012/2014	28%	18%	26%	29%	21%	24%	30%	28%	24%	29%	28%	37%	42%	27%	31%	34%	33%	31%	34%	22%	32%	26%	34%	22%	20%	34%	31%
2013/2015	29%	19%	25%	24%	21%	23%	30%	28%	22%	29%	28%	35%	41%	26%	31%	34%	31%	31%	33%	20%	30%	26%	35%	23%	20%	34%	30%
2014/2016	27%	20%	26%	28%	21%	25%	29%	29%	23%	29%	30%	30%	41%	27%	29%	35%	31%	33%	33%	20%	30%	28%	35%	22%	21%	32%	32%
2015/2017	30%	22%	28%	30%	22%	26%	33%	31%	25%	28%	30%	33%	43%	29%	31%	37%	32%	34%	33%	20%	31%	27%	34%	23%	23%	34%	32%
2016/2018	30%	24%	28%	30%	23%	24%	33%	31%	24%	30%	34%	33%	44%	28%	32%	36%	33%	36%	33%	21%	33%	28%	36%	26%	24%	32%	32%
% point change from 2012/2014 to 2016/2018	1	5	2	1	2	0	3	3	1	1	5	-4	2	2	1	2	0	4	-1	-1	1	2	1	4	3	-1	2

Notes: The underlying data include nonsurgical claims with more than seven days of lost time and medical services received by those injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and medical services received through March 31, 2018. Similar notation is used for other years. Percentage point changes shown may not agree with reported percentages due to rounding.

Key: Rx: prescriptions.

Over the study period, some providers may have shifted their practice patterns from prescribing opioids to prescribing non-pharmacologic treatments to address pain relief. However, the results appear to be more consistent with providers switching from multi-pronged treatment, which involves pain medications (including opioids) and other restorative therapies, to excluding opioids and other pain medications and relying solely on non-pharmacologic treatments. These changes in treatment patterns conform to the recommendations of opioid prescribing and pain treatment guidelines and related policies implemented in an increasing number of states, which call for broad adoption of alternatives to opioids for treating acute and chronic pain.[3]

Specifically, the first two panels of Table 6.2 break up the percentage of claims that received pain medications with or without non-pharmacologic treatment. We see that a majority of claims with pain medications also received non-pharmacologic treatments. In 2012/2014, 20 to 59 percent of injured workers across the states received both pain medications and non-pharmacologic treatments and another 5 to 25 percent of injured workers received pain medications and no other pain treatments. We observed decreases in frequency in both subcategories and increases in injured workers who were treated with non-pharmacologic treatments only as well as those who received neither pain medications nor other pain treatments. The pattern was consistent in the latest two years of the study period, from 2014/2016 to 2016/2018, with larger reductions in claim frequency of receiving pain medications. For example, in New York, 27 percent of injured workers received both pain medications and non-pharmacologic treatments in 2014/2016. The same figure dropped to 25 percent in 2015/2017 and to 22 percent in 2016/2018. The percentage of claims with pain medications without alternative treatment was low in New York and remained at 4–5 percent. In New York over the same period, we saw that the percentage of claims with non-pharmacologic treatment and no pain medications increased by 3 percentage points. We also saw a 3 percentage point increase in the percentage of claims that received neither pain medications nor non-pharmacologic treatment. Similar patterns were seen in most other study states, with relatively larger reductions of 4 to 5 percentage points in receipt of any pain treatments between 2012/2014 and 2016/2018 in California, Kentucky, North Carolina, and Tennessee.

Overall, findings from Tables 6.1 and 6.2 suggest an important reason why we see a net decrease in the percentage of claims with pain medications. Some physicians may have changed their practice patterns in response to opioid prescribing and medical treatment guidelines and related policies. This would be consistent with the shift seen in claims from the pain medication categories to the category of non-pharmacologic treatment without pain medications. A less likely factor that might explain a part of the considerable net decrease in the percentage of claims with pain medications paid under workers' compensation could be that some pain medication prescriptions filled by injured workers in later years were paid by non-workers' compensation payment sources.[4] Some workers might have conditions that were manageable with over-the-counter medications that were paid out of pocket, without a need for additional medical intervention.

These results may raise questions about whether some injured workers might have received opioid prescriptions that were not necessary in earlier years due to lesser oversight, or that could be potentially substituted with alternative non-medication treatments with lower risk. If the alternative treatments were not sufficient in relieving pain for some workers, we would expect them to receive opioids subsequently to further treat their pain, but we see that fewer claims received opioids at the end of the study period. However, we cannot

[3] See Technical Appendix B for a description of policy changes in this area.

[4] This could be associated with increases in the population with health insurance coverage due to the Affordable Care Act or a shift in payments from workers' compensation to other payors because of tighter utilization controls in workers' compensation delivery systems.

rule out possible access barriers that might have been created by stricter policies.[5] This area needs to be further examined in future studies.

The discussion in this chapter mainly focuses on receipt of any non-pharmacologic treatment. Readers interested in the claim frequency in use of specific types of non-pharmacologic pain treatments and how they change over time may refer to Table 6.3.[6] It shows interstate variations and trends in the frequency in use of different types of alternative pain treatments, including physical medicine evaluation, active and passive physical medicine, manipulation, acupuncture, behavioral therapy, and interventional pain management, for claims with more than seven days of lost time.

In Table 6.3, we see large variations across states in the receipt of non-pharmacologic pain treatments, as was evident in pain medication prescribing practices. Workers' compensation policies governing non-pharmacologic pain treatments, such as reimbursement rules, as well as local practice norms may influence delivery of non-opioid treatments for injured workers. As of 2016/2018, notable interstate variations were seen in the percentage of claims receiving chiropractic manipulations and acupuncture. These services were rarely seen in most study states. California is the only state among the 27 study states that had double-digit claim frequency in acupuncture services at 15 percent. More than 1 in 10 workers had chiropractic manipulations in California, Delaware, Minnesota, and New York. The rate of use of physical medicine modalities such as TENS, varied from 30 percent in Texas to 56–59 percent in California, Delaware, Maryland, and Nevada. A similar magnitude of interstate variation was seen in the use of passive manipulations. The claim frequency of interventional pain management services was around 20 percent in most states, with a somewhat higher rate in Georgia (27 percent) and a lower rate in Massachusetts, Maryland, Michigan, and Texas (16–17 percent). Relatively smaller but considerable variations were seen across states in claims with physical medicine evaluations and active physical medicine treatments. Interstate variations in these non-pharmacologic pain services may help explain some of the variation in the frequency in use of opioids. For example, a higher level of involvement with chiropractic care in some states, as evident from interstate variations in claims receiving chiropractic manipulation services, may contribute to a lower rate of opioid use in the region at the aggregate level, as seen in other studies evaluating this relationship (Whedon et al., 2018; Weeks and Goertz, 2016; Lisi et al., 2019). Moreover, earlier involvement with manual therapy providers such as chiropractors or physical therapists resulted in a lower likelihood of receiving opioid prescriptions and other high-cost medical care compared with those who saw manual therapy providers later or never (Frogner et al., 2018; Azad et al., 2019).

[5] For example, Dowell, Haegerich, and Chou (2019) note that some policies and practices might have misapplied the CDC guidelines resulting in abrupt tapering of opioids.

[6] These measures are based on a subset of claims after excluding claims without relatively complete bill review data.

Table 6.3 Changes in Frequency of Use of Non-Pharmacologic Treatments, 2012/2014–2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
Among nonsurgical claims with more than 7 days of lost time																											
% of claims that had physical medicine evaluation																											
2014/2016	53%	54%	59%	56%	60%	62%	57%	57%	57%	53%	52%	47%	47%	59%	53%	49%	58%	53%	52%	66%	52%	50%	54%	60%	56%	51%	53%
2015/2017	49%	61%	59%	59%	61%	64%	55%	56%	57%	58%	53%	45%	47%	61%	53%	49%	58%	54%	53%	65%	54%	52%	56%	60%	57%	52%	51%
2016/2018	54%	59%	61%	53%	60%	63%	57%	57%	60%	58%	54%	46%	48%	59%	54%	50%	58%	54%	53%	66%	53%	52%	56%	59%	58%	54%	53%
% point change from 2014/2016 to 2016/2018	0	5	2	-3	0	1	0	0	3	6	1	-1	1	0	1	1	-1	0	1	0	1	2	1	-1	2	3	0
% of claims that had active physical medicine																											
2014/2016	54%	68%	62%	65%	62%	64%	58%	63%	59%	53%	54%	50%	49%	63%	55%	55%	60%	54%	54%	68%	59%	56%	55%	61%	61%	53%	57%
2015/2017	49%	68%	63%	64%	63%	66%	57%	63%	59%	60%	55%	49%	49%	64%	54%	54%	59%	55%	54%	66%	59%	57%	57%	62%	61%	53%	55%
2016/2018	53%	67%	65%	60%	62%	66%	58%	63%	62%	60%	56%	51%	50%	63%	56%	55%	59%	55%	55%	68%	58%	58%	57%	61%	62%	56%	57%
% point change from 2014/2016 to 2016/2018	-1	-1	2	-5	0	2	0	0	3	8	2	1	1	0	1	1	-1	0	1	0	-1	2	2	-1	1	3	0
% of claims that had passive physical medicine modalities																											
2014/2016	46%	62%	55%	65%	50%	51%	46%	48%	49%	46%	50%	51%	36%	61%	38%	45%	52%	47%	49%	60%	46%	50%	42%	46%	35%	45%	48%
2015/2017	40%	59%	52%	63%	48%	50%	44%	46%	47%	51%	46%	48%	33%	61%	39%	42%	50%	45%	49%	52%	44%	50%	43%	44%	33%	44%	47%
2016/2018	44%	57%	52%	58%	45%	47%	42%	43%	48%	45%	42%	49%	32%	59%	38%	39%	50%	44%	47%	56%	42%	50%	42%	41%	30%	46%	42%
% point change from 2014/2016 to 2016/2018	-1	-5	-2	-6	-6	-4	-5	-4	-1	-1	-7	-2	-4	-1	0	-7	-2	-3	-2	-4	-4	0	-1	-5	-6	0	-6
% of claims that had passive manipulations																											
2014/2016	25%	53%	50%	56%	42%	41%	45%	48%	40%	34%	36%	32%	39%	40%	42%	39%	41%	39%	39%	56%	45%	42%	35%	35%	35%	38%	40%
2015/2017	21%	55%	50%	53%	43%	43%	45%	48%	41%	36%	36%	32%	38%	41%	42%	37%	42%	40%	42%	56%	46%	43%	38%	37%	38%	39%	40%
2016/2018	24%	54%	52%	51%	42%	45%	47%	48%	43%	42%	39%	36%	40%	41%	44%	40%	43%	40%	42%	58%	46%	44%	39%	36%	39%	40%	41%
% point change from 2014/2016 to 2016/2018	-2	1	2	-5	0	4	2	0	3	8	3	4	1	0	2	2	2	1	3	3	1	2	4	1	4	3	1
% of claims that had chiropractic manipulations																											
2014/2016	1%	15%	7%	15%	1%	1%	3%	6%	1%	2%	4%	4%	8%	11%	2%	14%	1%	1%	1%	4%	14%	10%	0%	2%	2%	1%	12%
2015/2017	1%	14%	6%	11%	1%	1%	3%	6%	1%	2%	4%	5%	8%	11%	1%	13%	1%	1%	1%	3%	14%	9%	0%	1%	2%	1%	11%
2016/2018	1%	14%	7%	14%	1%	1%	2%	5%	0%	2%	4%	5%	7%	10%	1%	14%	1%	1%	1%	2%	14%	10%	0%	1%	1%	1%	10%
% point change from 2014/2016 to 2016/2018	0	-1	-1	-1	0	0	0	-1	0	1	0	1	0	-1	-1	0	0	0	0	-2	0	0	0	-1	-1	0	-2
% of claims that had acupuncture																											
2014/2016	0%	14%	1%	3%	0%	0%	0%	1%	0%	0%	0%	0%	1%	0%	0%	2%	0%	0%	0%	0%	3%	1%	0%	0%	0%	0%	0%
2015/2017	0%	14%	0%	1%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	2%	0%	0%	0%	0%	3%	1%	0%	0%	0%	0%	0%
2016/2018	0%	15%	1%	2%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	2%	0%	1%	0%	0%	4%	2%	0%	0%	0%	0%	0%
% point change from 2014/2016 to 2016/2018	0	1	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
% of claims that had behavioral evaluation																											
2014/2016	1%	4%	2%	2%	1%	1%	1%	1%	2%	1%	1%	3%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%	1%	1%	5%	1%	2%
2015/2017	1%	4%	2%	3%	1%	1%	1%	1%	3%	1%	1%	4%	1%	1%	2%	2%	1%	1%	1%	1%	2%	2%	1%	2%	5%	2%	2%
2016/2018	0%	4%	2%	4%	1%	1%	2%	1%	3%	2%	1%	4%	1%	1%	2%	2%	1%	1%	2%	2%	2%	2%	1%	1%	5%	2%	2%
% point change from 2014/2016 to 2016/2018	-1	0	0	2	0	0	0	0	0	1	0	1	0	-1	0	0	0	0	0	0	0	0	0	0	0	1	0

continued

Table 6.3 Changes in Frequency of Use of Non-Pharmacologic Treatments, 2012/2014–2016/2018 (continued)

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
% of claims that had behavioral treatments																											
2014/2016	1%	2%	1%	1%	1%	1%	1%	1%	1%	0%	1%	2%	1%	1%	1%	1%	0%	1%	1%	1%	1%	1%	1%	1%	2%	1%	1%
2015/2017	0%	2%	1%	1%	1%	0%	1%	1%	1%	0%	1%	2%	1%	1%	1%	1%	1%	1%	1%	1%	2%	1%	1%	1%	2%	1%	1%
2016/2018	0%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%	2%	0%	1%	1%	2%	1%	1%	1%	1%	1%	1%	1%	1%	2%	1%	2%
% point change from 2014/2016 to 2016/2018	-1	0	0	0	0	0	0	0	0	0	0	0	0	-1	0	1	0	0	0	-1	0	0	0	0	0	1	0
% of claims that had interventional pain management																											
2014/2016	20%	21%	23%	25%	24%	28%	22%	22%	25%	24%	22%	26%	16%	18%	19%	20%	19%	22%	21%	23%	25%	25%	24%	23%	17%	20%	21%
2015/2017	18%	19%	22%	22%	23%	28%	20%	21%	24%	23%	20%	26%	17%	17%	18%	20%	19%	23%	21%	22%	25%	24%	24%	21%	18%	19%	21%
2016/2018	18%	19%	21%	25%	23%	27%	22%	21%	25%	22%	19%	26%	17%	16%	17%	20%	18%	22%	20%	25%	26%	24%	23%	21%	17%	20%	21%
% point change from 2014/2016 to 2016/2018	-2	-2	-2	1	-1	-1	0	0	1	-1	-3	0	1	-2	-1	1	-1	0	-1	2	0	0	-1	-2	0	0	0

Notes: The underlying data include nonsurgical claims with more than seven days of lost time and medical services received by those injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and medical services received through March 31, 2018. Similar notation is used for other years. Percentage point changes shown may not agree with reported percentages due to rounding.

These measures are based on a subset of claims after excluding claims without relatively complete bill review data.

When discussing trend results on the various types of non-pharmacologic treatments in Tables 6.3 and 6.4, we focused on the time period from 2014/2016 to 2016/2018 for two reasons. First, in two states (California and Louisiana), there were significant changes in the percentage of claims with certain physical medicine services, between 2012/2014 and 2014/2016, resulting from coding changes; the changes in the percentage of claims with these services are unlikely to be a reflection of changing treatment patterns related to decreases in opioid prescribing.[7,8] Second, the decreases in the percentage of claims receiving pain medications occurred predominantly between 2014/2016 and 2016/2018 in most states. As seen in Table 6.2, in a majority of states, there were modest changes in the percentage of workers receiving non-pharmacologic treatments (with or without pain medications); there was a switch from receiving both pharmacologic and non-pharmacologic pain treatments to receiving non-pharmacologic treatments without pain medications. Consistent with these results, we saw little change in the rates of specific alternative pain treatments in most states (Table 6.3). Small increases of 5–6 percentage points were seen in the percentage of claims with physical medicine evaluations in California and Kansas. Kansas also experienced an increase in active physical medicine services. Modest increases exceeding 3 percentage points were seen in claims receiving passive manipulations in 10 study states.

Table 6.4 provides results on the same set of measures for non-pharmacologic treatment, separately for nonsurgical claims with more than seven days of lost time that received opioids. Among injured workers receiving opioids, we observed a substantial reduction in the average amount of opioids dispensed per worker. As a result, we might expect to see an increase in workers receiving non-pharmacologic treatments adjunct to opioid prescriptions. Between 2014/2016 and 2016/2018, we saw an increase in passive manipulations and interventional pain management in several states among injured workers receiving opioids. For example, the percentage of claims with opioids that received interventional pain management services increased by 4–7 percentage points in Delaware, Florida, Louisiana, Massachusetts, Nevada, and New York (Table 6.4).

[7] In California, for example, starting in 2014 and continuing with a four-year phase-in, sections of the Official Medical Fee Schedule (OMFS) were replaced with a new fee schedule based on Medicare's Resource-Based Relative Value Scale (RBRVS). This appears to have resulted in a change in the mix of physical therapy services that were billed before and after the fee schedule change. Using the provider payments data from 2013, the final year under the old fee schedule, and from 2014 and 2015, the first two years of the transition, a CWCI report (Jones, 2016) found that the total amount paid for physical medicine services increased 12.7 percent—a result of a 12 percent decrease in the total volume of physical medicine services and a 28.1 percent increase in the average amount paid per service. While the decrease in the volume was likely due to multiple procedure rules, a substantial increase in the unit price might have encouraged more frequent orders of certain types of physical medicine services (Exhibit 21 of the report). The same report found a large increase in the volume of acupuncture (increased by 75.2 percent) while the per unit price decreased by 38.2 percent.

[8] In Louisiana, the large increase in physical medicine services likely reflects the changes in the 2012 fee schedule in Louisiana (Telles, 2016). When we focused on the latest study years (2014/2016 to 2016/2018) with more substantial decreases in workers receiving pain medications, little change was seen in these alternative pain treatments.

Table 6.4 Changes in Frequency of Use of Non-Pharmacologic Treatments among Claimants Receiving Opioids, 2012/2014–2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
Among nonsurgical claims with more than 7 days of lost time that had opioids																											
% of claims that had physical medicine evaluation																											
2014/2016	60%	66%	75%	63%	72%	71%	64%	71%	67%	64%	65%	61%	67%	75%	65%	65%	71%	68%	66%	76%	70%	59%	67%	69%	65%	65%	67%
2015/2017	57%	74%	76%	65%	72%	74%	67%	69%	71%	67%	60%	60%	66%	73%	66%	64%	70%	69%	66%	73%	69%	61%	67%	71%	67%	65%	62%
2016/2018	61%	73%	78%	70%	73%	71%	70%	72%	68%	65%	63%	60%	71%	73%	67%	65%	72%	70%	67%	75%	71%	62%	70%	67%	68%	66%	62%
% point change from 2014/2016 to 2016/2018	1	7	4	7	1	-1	6	0	2	2	-2	-1	4	-2	2	-1	0	3	1	-1	1	3	3	-1	3	1	-5
% of claims that had active physical medicine																											
2014/2016	61%	80%	77%	79%	74%	74%	65%	80%	70%	64%	67%	64%	69%	78%	68%	70%	73%	68%	67%	78%	76%	66%	67%	70%	70%	67%	70%
2015/2017	55%	80%	79%	77%	74%	76%	69%	78%	72%	67%	62%	64%	68%	77%	67%	68%	71%	69%	66%	73%	75%	68%	68%	72%	73%	66%	66%
2016/2018	60%	80%	80%	77%	75%	74%	72%	81%	72%	68%	65%	68%	74%	77%	68%	68%	72%	72%	68%	76%	75%	70%	71%	68%	73%	67%	65%
% point change from 2014/2016 to 2016/2018	-1	0	4	-3	1	0	8	1	2	4	-2	4	5	-1	0	-2	0	4	1	-3	0	4	4	-1	3	0	-5
% of claims that had passive physical medicine modalities																											
2014/2016	53%	75%	69%	81%	61%	60%	57%	66%	58%	57%	62%	65%	54%	76%	51%	57%	65%	59%	61%	69%	62%	62%	53%	52%	45%	61%	61%
2015/2017	44%	72%	66%	79%	57%	61%	57%	64%	60%	59%	56%	63%	50%	74%	53%	52%	63%	59%	60%	61%	59%	63%	53%	53%	44%	57%	55%
2016/2018	51%	71%	65%	79%	55%	56%	53%	63%	58%	53%	54%	68%	52%	72%	53%	48%	63%	58%	60%	62%	60%	65%	56%	48%	40%	56%	47%
% point change from 2014/2016 to 2016/2018	-2	-4	-4	-2	-6	-4	-4	-4	0	-4	-9	3	-3	-4	2	-9	-2	-1	-1	-7	-2	3	2	-4	-5	-4	-13
% of claims that had passive manipulations																											
2014/2016	31%	65%	63%	70%	52%	49%	52%	64%	49%	43%	47%	41%	56%	51%	55%	49%	51%	50%	50%	65%	61%	52%	45%	42%	42%	51%	53%
2015/2017	26%	68%	66%	69%	52%	51%	59%	63%	53%	46%	40%	43%	56%	52%	55%	48%	52%	53%	53%	63%	60%	54%	49%	47%	48%	50%	49%
2016/2018	32%	68%	67%	70%	52%	53%	57%	66%	52%	51%	47%	49%	61%	52%	57%	51%	55%	54%	56%	65%	60%	56%	53%	45%	48%	51%	49%
% point change from 2014/2016 to 2016/2018	1	3	4	0	0	4	5	2	3	8	0	8	5	1	2	2	4	4	5	0	-1	3	7	3	6	-1	-5
% of claims that had chiropractic manipulations																											
2014/2016	1%	20%	9%	25%	1%	1%	3%	8%	1%	2%	4%	6%	12%	17%	3%	12%	1%	1%	1%	6%	20%	16%	0%	1%	2%	1%	14%
2015/2017	1%	20%	7%	17%	1%	1%	3%	8%	0%	2%	4%	6%	12%	17%	2%	11%	1%	1%	1%	4%	20%	16%	0%	1%	2%	2%	10%
2016/2018	1%	19%	7%	24%	1%	1%	1%	7%	0%	1%	5%	7%	11%	15%	2%	14%	0%	1%	1%	2%	22%	18%	0%	1%	2%	1%	8%
% point change from 2014/2016 to 2016/2018	0	-1	-2	-2	0	0	-2	-1	0	0	1	1	-1	-2	-1	3	0	0	0	-3	1	3	0	-1	0	-1	-6
% of claims that had acupuncture																											
2014/2016	0%	20%	1%	6%	0%	0%	0%	1%	0%	0%	0%	0%	1%	1%	0%	3%	0%	0%	0%	0%	5%	2%	0%	0%	0%	0%	1%
2015/2017	0%	20%	1%	1%	1%	0%	0%	1%	0%	0%	0%	2%	1%	0%	0%	4%	0%	1%	0%	0%	6%	3%	0%	0%	0%	1%	0%
2016/2018	0%	22%	1%	2%	0%	0%	0%	1%	0%	0%	0%	1%	1%	0%	1%	3%	0%	1%	0%	0%	6%	4%	0%	0%	0%	0%	0%
% point change from 2014/2016 to 2016/2018	0	2	0	-4	0	0	0	-1	0	0	0	1	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0

continued

Table 6.4 Changes in Frequency of Use of Non-Pharmacologic Treatments among Claimants Receiving Opioids, 2012/2014–2016/2018 (continued)

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
% of claims that had behavioral evaluation																											
2014/2016	2%	4%	2%	3%	1%	2%	2%	2%	3%	2%	2%	5%	2%	4%	3%	5%	1%	2%	2%	1%	5%	3%	1%	2%	8%	2%	3%
2015/2017	0%	5%	4%	5%	1%	2%	3%	1%	4%	1%	3%	7%	2%	1%	3%	5%	2%	2%	2%	2%	5%	3%	1%	3%	9%	2%	2%
2016/2018	0%	5%	3%	8%	1%	1%	3%	2%	5%	1%	2%	8%	3%	2%	3%	4%	2%	2%	3%	1%	5%	3%	2%	2%	9%	2%	3%
% point change from 2014/2016 to 2016/2018	-2	1	1	6	1	-1	1	0	2	0	0	3	1	-1	0	-1	0	0	1	0	0	0	1	0	1	0	-1
% of claims that had behavioral treatments																											
2014/2016	1%	2%	1%	2%	1%	1%	2%	1%	1%	1%	1%	4%	1%	2%	2%	3%	1%	1%	2%	1%	4%	1%	1%	1%	3%	1%	2%
2015/2017	0%	2%	1%	1%	1%	1%	2%	1%	1%	0%	1%	5%	1%	1%	2%	3%	2%	1%	2%	1%	4%	2%	1%	1%	3%	1%	2%
2016/2018	0%	2%	1%	3%	1%	1%	2%	1%	2%	1%	1%	4%	1%	1%	2%	3%	1%	1%	2%	1%	3%	1%	1%	1%	3%	1%	2%
% point change from 2014/2016 to 2016/2018	-1	0	0	1	0	0	0	0	1	0	0	1	0	-1	0	0	0	0	0	0	0	0	0	0	1	0	0
% of claims that had interventional pain management																											
2014/2016	28%	32%	42%	44%	34%	39%	30%	38%	34%	34%	37%	39%	33%	33%	27%	33%	30%	34%	36%	32%	47%	40%	34%	30%	25%	31%	34%
2015/2017	22%	32%	41%	34%	36%	41%	32%	36%	36%	32%	28%	43%	35%	30%	32%	34%	30%	34%	39%	32%	47%	41%	36%	29%	28%	32%	33%
2016/2018	27%	33%	42%	47%	38%	42%	33%	38%	37%	33%	34%	45%	38%	31%	30%	34%	32%	35%	36%	36%	51%	42%	33%	29%	27%	31%	31%
% point change from 2014/2016 to 2016/2018	-2	1	0	4	4	2	3	0	3	-1	-2	7	5	-1	3	1	2	1	0	4	4	2	-1	-1	2	0	-3

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that received opioid prescriptions and medical services received by those injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and medical services received through March 31, 2018. Similar notation is used for other years. Percentage point changes shown may not agree with reported percentages due to rounding.

These measures are based on a subset of claims after excluding claims without relatively complete bill review data.

7

Implications and Conclusions

Since the late 1990s, the use of prescription opioids has increased very rapidly, coinciding with a sharp increase in the per capita death rate in the United States due to unintended drug overdoses.[1,2] For patients with occupational injuries, a higher use of opioids may also lead to addiction, increased disability or work loss, and even death.[3] The beginning of this decade marks the time when opioid utilization rates were at their peak in most states in the United States. In recent years, many states saw decreases in opioid prescriptions, which may be associated with opioid policies and initiatives in the past few years, at the federal, state, and organization levels, that were aimed at controlling inappropriate opioid prescribing and thereby reducing opioid misuse and abuse.[4,5,6,7] Over the study period, several such policies were adopted in the study states, including mandatory use of PDMPs by controlled substance prescribers, adoption of guidelines for prescribing opioids and managing chronic pain, regulation of pain clinics, implementation of drug formularies, and mandatory requirements for continuing medical education on appropriate opioid prescribing and pain management. This report serves as a tool to monitor the results of these ongoing policy changes on opioid utilization in 27 state workers' compensation systems.

Our study reports continued decreases in opioids dispensed to injured workers. Between 2012/2014 and 2016/2018, the average amount of opioids per claim decreased significantly in most study states. This follows significant reductions reported across multiple workers' compensation jurisdictions in previous editions of this report. The percentage of injured workers with prescriptions receiving opioids decreased by 8 percentage points

---

[1] The per capita death rate from unintentional drug overdoses involving opioids increased from 3 to 4 deaths per 100,000 population in the late 1990s to 9 deaths per 100,000 population in 2007 (Okie, 2010). Between 2000 and 2014, the age-adjusted rate of drug overdose deaths increased from 6 to 15 per 100,000 population, and the age-adjusted rate of drug overdose deaths involving opioids increased from about 3 to 9 per 100,000 population (Rudd et al., 2016a).

[2] Ahmedani et al. (2014) reported that the rate of opioid pharmacy fills, quantity of opioids prescribed, and proportion of chronic opioid users increased consistently by more than two-fold between 1997 and 2011, with the exception of a one-time drop in 2010 that the authors attributed to the market withdrawal of propoxyphene. The CDC reported that opioid-related overdose deaths increased for 11 consecutive years and reached 16,651 deaths in 2010 (CDC, 2012).

[3] See Kidner, Mayer, and Gatchel (2009) and Franklin et al. (2005).

[4] Dart et al. (2015) examined trends in opioid abuse and mortality between 2002 and 2013 in the United States using data from IMS and Researched Abuse, Diversion, and Addiction Related Surveillance (RADARS) systems. They observed an increase in opioid prescriptions between 2002 and 2010 and a slight decrease in the measure from 2011 through 2013. The authors reported similar trends in other measures of opioid diversion, abuse, and opioid-related deaths.

[5] Florida also reported a decrease in opioid overdose deaths after the pill mill legislation became effective, from an all-time high of 3,201 deaths in 2010 to 2,666 in 2012 (Johnson et al., 2014). Thumula (2014) found a 12 percent decrease in injured workers receiving opioids after Florida banned physician dispensing of certain opioids in the state.

[6] A study conducted by the Texas Department of Insurance (TDI) to evaluate the impact of the closed formulary in the state reported a decrease in total opioid prescriptions by 10 percent following the implementation of the formulary (TDI, 2013).

[7] Ireland, Young, and Swedlow (2014).

(in Illinois) to 25 percentage points (in California) across the study states. Larger reductions of 20–22 percentage points were also seen in Connecticut, Delaware, Nevada, and New York. The average amount of opioids received by injured workers also decreased in the majority of the study states over the four-year period from 2012/2014 to 2016/2018 (see Figure B). In California, Connecticut, and Kentucky, the average MME of opioids per claim decreased by 50–52 percent. Substantial decreases of 30 percent or more were seen in 17 more states. With states continuing to implement policies and initiatives addressing unnecessary opioid prescriptions in many states, we will continue to monitor the trends to see if the downward trends continue.

In this study, we also looked at trends more broadly to track possible shifts between opioids, non-opioid pain medications, and non-pharmacologic treatments. In recent years, an increasing number of states adopted opioid prescribing and pain treatment guidelines that recommend use of non-opioid analgesics and non-pharmacologic treatment as alternatives to opioids. Based on the trend results tracking the frequency in use of these types of services, we found that injured workers continued to receive treatments for pain relief at the same rate throughout the study period, but there was a shift in treatment patterns. There was evidence of a modest shift from prescribing opioids (with or without non-opioid analgesics) to non-opioid pain medications (without opioids). But we saw a noticeable decrease in injured workers receiving pain medications. This was coupled with an increase in the frequency of use of non-pharmacologic treatment, whereas in earlier years there was a higher rate of receiving non-pharmacologic treatment with pain medications in most study states. Some medical providers might have changed their prescribing and practice patterns in response to the changing policies governing treatment of pain, especially the adoption of opioid prescribing and pain treatment guidelines and related policies. Overall, there was a small net increase in the percentage of workers who received neither pain medications nor non-pharmacologic treatment in several states.

As a result of the substantial decreases in opioid use over the study period, the extent of interstate variations narrowed across most study states. However, we still saw unusually higher amounts of opioids prescribed to injured workers in some states in 2016/2018, the latest study year. Delaware, Louisiana, New York, and Pennsylvania continued to have a higher average amount of opioids per claim compared with the other study states. With a substantial decrease in the frequency and amount of opioids per claim, New York was not one of the highest states on opioid use (as it was in prior editions of this study), but it was still higher than the median of the 27 states. We also observed a considerable percentage of claims with opioids that were receiving chronic opioids (at least 60 days of opioids supply over any 90-day period) and at higher doses (average daily dose of opioids exceeding 50 and 90 MED). Given that these are nonsurgical claims, most of which had musculoskeletal injuries, opioid treatment for these injured workers could perhaps be better monitored.

We found that in a few states, the frequency of concomitant use of opioids and other central nervous system depressant drugs such as benzodiazepines (Valium® and Xanax®), muscle relaxants (Soma® and Flexeril®), sedatives (Ambien®), and anticonvulsants (Neurontin® and Lyrica®) were noticeably higher compared with the other study states. For example, at least 1 in 15 injured workers with opioids in Delaware and Massachusetts filled a benzodiazepine prescription within one week of the opioid fill. By contrast, less than 1 percent of injured workers with opioids received benzodiazepines in Texas, where preauthorization has been required prior to prescribing benzodiazepines since the implementation of the Texas formulary. Several clinical guidelines, including the CDC guidelines for prescribing opioids for chronic pain, caution about the potential dangers of taking these medications together. Although a small percentage of injured workers received some of these combinations in many states, the dangers of combined use of these drugs may put hundreds of injured workers at risk. Further investigations are needed to better understand the reasons underlying these variations in prescribing patterns.

Despite the reductions in opioids dispensed for the treatment of workplace injuries, recent trends in

opioid-related overdose deaths continue to worsen, according to reports published by the CDC.[8] Between 2013 and 2017, drug overdose deaths increased or remained the same across all states. Researchers are investigating the potential unintended consequences of public policies aimed at reducing opioid prescribing, and the evidence is conflicting about the association between opioid policies and increases in drug overdose deaths related to the use of non-prescription opioids (e.g., heroin and illicit fentanyl).[9,10] As a result, in the last few years, a growing number of states took a comprehensive approach to addressing opioid issues in a coordinated way, focusing on the prevention and treatment of opioid overdoses. While this report does not track all reforms aimed at overdose prevention and treatment, we plan to continue to track the results of primary prevention policies aimed at limiting unnecessary prescribing of opioids.

CONCLUDING REMARKS

By highlighting substantial interstate variations in the use of opioids across the states, this study may inform policymakers and stakeholders about the level of opioid use in their state and help them target their efforts to address issues related to prescription opioids in their state. This study may also be used as an important educational tool for the community of workers' compensation medical providers in each state to compare their practice patterns with the norms seen across the 27 study states. Some providers may subsequently modify their practice patterns after seeing the practice norms.

This study further serves as a tool to monitor changes in opioid utilization as states continue to implement policies addressing opioid overuse, although it does not provide insights as to which precise policies or initiatives are effective at reducing unnecessary use of opioids that may put some injured workers at risk of unnecessary harm. Limited in the scope of what policy questions this report can address, this update leaves many important policy questions unanswered. Future studies should focus on specific workers' compensation system features and opioid policies that lead to interstate variations in opioid use and establish causal relationships between specific opioid policies and trends in opioid use.

[8] Rudd et al. (2016b); and Scholl et al. (2019).

[9] Finklea, Sacco, and Bagalman (2014).

[10] Dowell et al. (2016); Patrick et al. (2016).

STATISTICAL APPENDIX

Table SA.1 Significance Tests for Interstate Comparisons in Utilization of Opioids, 2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI	Median State
% of claims with prescriptions that had opioids																												
Mean value	70%	38%	38%	42%	46%	54%	58%	44%	53%	54%	47%	69%	45%	46%	50%	54%	50%	61%	32%	52%	39%	51%	60%	56%	60%	59%	57%	52%
% point above/below median	18**	-14**	-14**	-9**	-6**	2**	6**	-8**	1	2	-4**	17**	-6**	-6**	-2**	2*	-2*	9**	-20**	0	-13**	-1	8**	4**	8**	7**	5**	
	AR	**CA**	**CT**	**DE**	**FL**	**GA**	**IA**	**IL**	**IN**	**KS**	**KY**	**LA**	**MA**	**MD**	**MI**	**MN**	**MO**	**NC**	**NJ**	**NV**	**NY**	**PA**	**SC**	**TN**	**TX**	**VA**	**WI**	**Median State**
Average MME per claim with opioids in milligrams																												
Mean value	976	940	825	3,328	1,093	1,176	749	1,159	999	999	1,031	3,287	1,262	1,018	966	940	633	991	792	940	1,788	2,094	1,052	814	1,196	1,068	767	999
% above/below median	-2%	-6%**	-17%**	233%**	9%**	18%**	-25%**	16%**	0%	0%	3%	229%**	26%**	2%	-3%	-6%	-37%**	-1%	-21%**	-6%	79%**	110%**	5%	-19%**	20%**	7%	-23%**	

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

Key: MME: morphine milligram equivalent amount; * statistically significant at the 20% level; ** statistically significant at the 10% level

Table SA.2 Significance Tests for Changes in Frequency of Use of Opioids, 2012/2014–2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
% of claims with prescriptions that had opioids																											
2012/2014	80%	62%	58%	63%	63%	71%	67%	51%	69%	67%	65%	79%	64%	58%	60%	69%	62%	71%	48%	72%	62%	62%	73%	67%	71%	72%	71%
2013/2015	79%	60%	53%	56%	63%	71%	66%	51%	66%	67%	52%	75%	65%	55%	58%	67%	63%	71%	46%	71%	55%	62%	74%	64%	71%	67%	68%
2014/2016	75%	57%	52%	58%	60%	69%	63%	50%	64%	63%	52%	77%	58%	54%	59%	62%	60%	71%	43%	62%	47%	60%	71%	64%	69%	68%	65%
2015/2017	70%	45%	41%	46%	47%	61%	60%	46%	56%	58%	52%	73%	55%	47%	51%	62%	54%	68%	34%	61%	47%	56%	66%	61%	62%	63%	62%
2016/2018	70%	38%	38%	42%	46%	54%	58%	44%	53%	54%	47%	69%	45%	46%	50%	54%	50%	61%	32%	52%	39%	51%	60%	56%	60%	59%	57%
% point change from 2012/2014 to 2016/2018	-10**	-25**	-20**	-21**	-18**	-17**	-10**	-8**	-16**	-13**	-18**	-10**	-19**	-12**	-10**	-15**	-12**	-10**	-16**	-20**	-22**	-11**	-13**	-11**	-11**	-13**	-14**
Among claims that had opioids																											
Average MME for opioids per claim in milligrams (mean)																											
2012/2014	1,483	1,941	1,641	2,972	1,413	1,856	1,293	1,468	1,266	1,174	2,081	3,652	1,891	1,808	1,381	1,502	1,008	1,755	1,143	1,370	3,443	2,733	1,892	1,476	1,696	1,662	1,358
2013/2015	1,311	1,691	1,375	3,749	1,269	1,554	1,119	1,492	1,255	1,203	1,756	3,652	2,019	1,513	1,194	1,266	797	1,727	1,077	1,354	2,534	2,687	1,833	1,216	1,573	1,489	1,272
2014/2016	1,257	1,368	1,459	3,824	1,250	1,330	976	1,453	1,113	1,327	1,613	3,235	1,873	1,366	1,199	1,307	764	1,541	939	1,239	2,398	2,583	1,601	904	1,437	1,408	1,076
2015/2017	1,106	1,160	1,380	3,025	1,291	1,388	927	1,446	1,021	1,074	1,568	3,303	1,491	1,242	1,348	1,191	784	1,491	905	1,155	2,080	2,148	1,400	974	1,439	1,333	1,041
2016/2018	976	940	825	3,328	1,093	1,176	749	1,159	999	999	1,031	3,287	1,262	1,018	966	940	633	991	792	940	1,788	2,094	1,052	814	1,196	1,068	767
% change from 2012/2014 to 2016/2018	-34%**	-52%**	-50%**	12%	-23%**	-37%**	-42%**	-21%**	-21%**	-15%	-50%**	-10%*	-33%**	-44%**	-30%**	-37%**	-37%**	-44%**	-31%**	-31%**	-48%**	-23%**	-44%**	-45%**	-30%**	-36%**	-44%**

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for other years. Percentage point changes shown may not agree with reported percentages due to rounding.

Key: MME: morphine milligram equivalent amount; * statistically significant at the 20% level; ** statistically significant at the 10% level

Table SA.3 Interstate Comparisons of Utilization of Opioids, 2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI	Median State
% of claims that had at least one prescription																												
Mean value	47%	60%	41%	45%	65%	61%	42%	43%	51%	48%	43%	48%	21%	45%	48%	34%	46%	45%	41%	61%	28%	49%	45%	51%	59%	46%	36%	46%
% point above/below median	1	15	-4	0	19	15	-3	-2	6	3	-3	3	-25	0	2	-12	0	0	-4	16	-18	3	-1	6	14	0	-9	
% of claims with Rx that had opioids																												
Mean value	70%	38%	38%	42%	46%	54%	58%	44%	53%	54%	47%	69%	45%	46%	50%	54%	50%	61%	32%	52%	39%	51%	60%	56%	60%	59%	57%	52%
% point above/below median	18	-14	-14	-9	-6	2	6	-8	1	2	-4	17	-6	-6	-2	2	-2	9	-20	0	-13	-1	8	4	8	7	5	
% of claims with Rx that had 2 or more opioid prescriptions																												
Mean value	37%	18%	16%	24%	23%	29%	28%	23%	27%	29%	25%	48%	23%	20%	25%	26%	23%	33%	13%	25%	19%	28%	30%	29%	32%	29%	28%	26%
% point above/below median	11	-8	-10	-2	-3	3	2	-3	1	2	-1	22	-3	-6	-1	0	-3	7	-13	-1	-8	2	4	3	6	3	2	
Among claims that had opioids																												
Average MME per claim in milligrams																												
Mean value	976	940	825	3,328	1,093	1,176	749	1,159	999	999	1,031	3,287	1,262	1,018	966	940	633	991	792	940	1,788	2,094	1,052	814	1,196	1,068	767	999
% above/below median	-2%	-6%	-17%	233%	9%	18%	-25%	16%	0%	0%	3%	229%	26%	2%	-3%	-6%	-37%	-1%	-21%	-6%	79%	110%	5%	-19%	20%	7%	-23%	
Median MME per claim in milligrams																												
Mean value	300	300	225	473	400	325	300	450	338	350	400	765	300	300	300	250	280	300	250	250	400	375	300	300	300	300	290	300
% above/below median	0%	0%	-25%	58%	33%	8%	0%	50%	13%	17%	33%	155%	0%	0%	0%	-17%	-7%	0%	-17%	-17%	33%	25%	0%	0%	0%	0%	-3%	
Average number of opioid Rx per claim																												
Mean value	2.8	2.8	2.6	4.2	2.8	3.1	2.7	2.8	2.7	2.9	2.8	6.2	3.1	2.6	2.7	2.5	2.2	3.0	2.2	2.6	3.1	3.8	2.9	2.6	3.3	2.8	2.4	2.8
% above/below median	0%	1%	-7%	53%	-1%	13%	-3%	2%	-2%	3%	2%	122%	13%	-7%	-2%	-10%	-19%	7%	-20%	-6%	11%	37%	5%	-8%	20%	0%	-13%	
Average number of opioid pills per claim																												
Mean value	111	131	110	271	138	154	120	156	125	142	137	381	150	128	135	111	93	128	97	114	182	213	130	104	180	131	105	131
% above/below median	-15%	0%	-16%	107%	5%	17%	-8%	19%	-4%	9%	4%	191%	15%	-2%	3%	-15%	-29%	-2%	-26%	-13%	39%	63%	-1%	-21%	38%	0%	-20%	
Average number of pills per Rx for opioids																												
Mean value	40	47	43	64	50	49	44	55	46	50	48	62	48	49	49	44	41	43	44	44	59	56	45	40	54	47	44	47
% above/below 25-state median	-15%	-1%	-10%	35%	6%	4%	-6%	17%	-2%	5%	3%	31%	2%	5%	5%	-6%	-12%	-9%	-7%	-8%	25%	19%	-5%	-14%	15%	0%	-8%	
% of opioid Rx that were physician-dispensed																												
Mean value	n/a	20%	14%	1%	20%	18%	7%	25%	2%	6%	2%	3%	n/a	30%	4%	n/a	5%	1%	5%	1%	n/a	2%	4%	10%	n/a	9%	6%	5%
% point above/below median	n/a	15	9	-5	14	13	2	19	-4	0	-3	-2	n/a	24	-1	n/a	-1	-4	0	-4	n/a	-3	-2	5	n/a	3	1	
% of opioid Rx that were for stronger Schedule II opioids [a]																												
Mean value	64%	49%	63%	78%	46%	47%	59%	55%	69%	66%	73%	73%	70%	50%	65%	76%	63%	65%	57%	64%	67%	65%	59%	66%	25%	69%	75%	65%
% point above/below median	0	-16	-2	13	-19	-17	-6	-10	4	2	8	8	5	-15	1	11	-2	0	-7	-1	2	1	-6	2	-40	4	10	

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

[a] Schedule II opioids prescribed to injured workers across the 25 study states include oxycodone, fentanyl, morphine, oxymorphone, hydromorphone, tapentadol, and methadone. Hydrocodone-combination products like hydrocodone-acetaminophen were not classified as stronger Schedule II opioids in this study because they were considered Schedule III opioids at the federal level during the time period covered by this study.

Key: MME: morphine milligram equivalent amount; n/a: not applicable; Rx: prescription(s).

Table SA.4 Duration and Average Daily Dose of Opioids for Claims with Opioids, Interstate Comparisons, 2016/2018

	AR	DE	FL	GA	IA	IN	KS	KY	LA	MA	MI	MN	MO	NC	NJ	NY	PA	SC	TN	TX	VA	WI	Median State
% of claims with opioid Rx that had days of supply populated on 100% of opioid Rx																							
Mean value	77%	67%	63%	64%	75%	74%	70%	72%	76%	81%	74%	69%	67%	65%	69%	79%	65%	69%	65%	79%	66%	77%	69%
Average MME per claim with opioids in milligrams																							
Mean value	976	3,328	1,093	1,176	749	999	999	1,031	3,287	1,262	966	940	633	991	792	1,788	2,094	1,052	814	1,196	1,068	767	1,015
Among claims with opioids that had days of supply populated for all opioid Rx																							
Average number of opioid days per claim																							
Mean value	26	78	37	41	31	28	32	43	115	43	39	26	22	35	28	55	50	38	28	52	34	22	36
% above/below median	-28%	116%	3%	13%	-16%	-21%	-11%	19%	218%	17%	7%	-29%	-41%	-3%	-22%	52%	38%	5%	-22%	43%	-7%	-38%	
Average MED per claim with opioids, milligrams																							
Mean value	34	38	32	30	34	36	40	32	32	33	30	39	35	32	34	32	33	32	35	27	34	38	34
% above/below median	0%	15%	-4%	-11%	0%	7%	18%	-4%	-6%	-3%	-11%	18%	4%	-3%	0%	-5%	0%	-4%	5%	-20%	1%	13%	
% of claims with opioid Rx with first opioid Rx for greater than 7 days of supply																							
Mean value	31%	46%	39%	45%	37%	36%	32%	48%	52%	34%	47%	29%	35%	38%	39%	55%	41%	37%	28%	46%	39%	28%	38%
% point above/below median	-8	8	1	7	-1	-3	-6	10	14	-4	8	-9	-3	-1	1	17	2	-1	-10	7	1	-10	
% of claims with opioid Rx with first opioid Rx for greater than 14 days of supply																							
Mean value	16%	32%	22%	26%	14%	16%	15%	28%	34%	20%	24%	13%	16%	16%	19%	38%	24%	17%	13%	22%	18%	13%	18%
% point above/below median	-3	14	4	7	-4	-3	-4	10	15	2	6	-5	-2	-2	0	20	6	-2	-6	4	0	-6	
% of claims with opioid Rx that had at least 60 days of opioids supply in any 90-day period																							
Mean value	6%	28%	12%	12%	6%	7%	7%	14%	33%	11%	14%	7%	6%	10%	8%	18%	17%	12%	8%	15%	10%	6%	11%
% point above/below median	-5	17	1	2	-5	-3	-3	4	22	1	4	-3	-5	-1	-3	8	6	1	-3	4	-1	-4	
% of claims with opioid Rx that had more than 50 MED of opioids supply for at least 60 days																							
Mean value	1%	15%	1%	2%	0%	1%	2%	2%	4%	2%	1%	2%	0%	2%	2%	4%	4%	2%	1%	2%	2%	1%	2%
% point above/below median	0	13	0	0	-1	-1	0	0	2	0	-1	0	-1	0	0	3	2	0	0	0	0	-1	
% of claims with opioid Rx that had more than 90 MED of opioids supply for at least 60 days																							
Mean value	0.0%	2.1%	0.5%	0.3%	0.0%	0.4%	0.3%	0.4%	0.6%	0.7%	0.3%	0.8%	0.1%	0.3%	1.2%	1.7%	1.9%	0.7%	0.3%	0.3%	0.4%	0.4%	0.4%
% point above/below median	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	
% of claims with opioid Rx that had more than 50 MED of opioids supply for at least 60 days during any 90-day period																							
Mean value	1%	12%	1%	1%	0%	1%	1%	2%	3%	1%	1%	2%	0%	1%	1%	3%	3%	2%	1%	1%	1%	1%	1%
% point above/below median	0	11	0	0	-1	0	0	0	1	0	-1	1	-1	0	0	2	2	1	0	0	0	0	
% of claims with opioid Rx that had more than 90 MED of opioids supply for at least 60 days during any 90-day period																							
Mean value	0.0%	2.1%	0.3%	0.2%	0.0%	0.3%	0.3%	0.0%	0.5%	0.7%	0.2%	0.5%	0.1%	0.2%	0.5%	1.2%	1.1%	0.6%	0.1%	0.1%	0.3%	0.3%	0.3%
% point above/below median	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. The 22 states included in this table are those where the days supply is complete for all opioids prescriptions for a majority of claims in the state and claims with complete days supply are representative of all claims with opioids.

Key: MED: morphine equivalent daily dose in milligrams; MME: morphine milligram equivalent amount; Rx: prescriptions.

Table SA.5 Frequency of Chronic Opioid Use, Interstate Comparisons, 2016/2018

	AR	IA	MO	WI	IN	KS	MN	TN	NJ	VA	NC	MA	FL	SC	GA	KY	MI	TX	PA	NY	DE	LA	Median State
Among claims with opioids that had days of supply populated for all opioid Rx																							
% of claims with opioid Rx that had at least 60 days of opioids supply in any 90-day period (chronic opioid use)	6%	6%	6%	6%	7%	7%	7%	8%	8%	10%	10%	11%	12%	12%	12%	14%	14%	15%	17%	18%	28%	33%	11%
1 episode of chronic opioid use	3%	4%	5%	4%	4%	4%	4%	4%	6%	6%	6%	5%	7%	7%	7%	8%	9%	7%	8%	10%	14%	9%	6%
2 or more episodes of chronic opioid use	3%	3%	1%	2%	3%	4%	3%	4%	2%	4%	4%	6%	5%	5%	5%	7%	5%	8%	8%	9%	15%	23%	4%
3 or more episodes of chronic opioid use	2%	2%	0%	0%	1%	3%	2%	2%	1%	2%	2%	4%	2%	3%	3%	3%	2%	5%	5%	5%	11%	16%	2%
4 or more episodes of chronic opioid use	1%	2%	0%	0%	1%	2%	0%	1%	1%	2%	1%	3%	2%	2%	2%	1%	1%	3%	3%	3%	6%	13%	2%

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. The 22 states included in this table are those for which the days of supply information is complete for all opioid prescriptions for a majority of claims in the state, and claims with complete days of supply are representative of all claims with opioids.

Key: MED: morphine equivalent daily dose in milligrams; Rx: prescriptions.

Table SA.6 Prescribing Pattern of Pain Medications, 2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI	Median State
% of claims with pain medications that had opioids																												
Mean value	73%	39%	41%	45%	47%	56%	62%	46%	56%	57%	50%	71%	50%	48%	52%	60%	53%	64%	34%	55%	42%	53%	62%	58%	63%	62%	61%	55%
% of pain medications that were for the drug																												
Hydrocodone-acetaminophen	21%	10%	6%	4%	8%	11%	18%	16%	20%	20%	17%	26%	7%	5%	20%	13%	16%	14%	4%	16%	6%	7%	14%	17%	9%	13%	18%	14%
Oxycodone HCL and oxycodone-acetaminophen	6%	1%	10%	19%	4%	4%	5%	1%	4%	6%	5%	6%	14%	10%	3%	12%	6%	8%	9%	6%	9%	13%	5%	7%	1%	9%	10%	6%
Tramadol HCL and tramadol-acetaminophen	12%	10%	9%	5%	14%	14%	15%	12%	10%	12%	7%	10%	7%	14%	10%	7%	12%	11%	9%	12%	7%	9%	13%	12%	16%	9%	8%	10%
All other opioids	7%	3%	2%	3%	2%	4%	2%	2%	2%	1%	2%	3%	3%	3%	3%	2%	2%	2%	2%	2%	3%	3%	2%	2%	13%	3%	3%	2%
Non-opioid pain medications	54%	77%	73%	69%	73%	67%	59%	69%	63%	61%	68%	55%	70%	68%	65%	65%	64%	64%	76%	64%	76%	67%	66%	62%	62%	66%	61%	66%

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

Table SA.7 Prevalence of Concomitant Use of Opioids and Other Central Nervous System Drugs among All Opioid Users and Chronic Opioid Users, 2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
Among claims with at least one opioid Rx																											
% of claims with concomitant use of opioids and other CNS depressants	36%	34%	35%	46%	41%	42%	31%	34%	28%	31%	34%	51%	32%	36%	31%	32%	32%	37%	26%	37%	30%	37%	36%	29%	40%	34%	30%
% of claims with concomitant use of opioids and benzodiazepines	4%	2%	5%	7%	3%	3%	4%	4%	2%	4%	2%	4%	7%	3%	6%	4%	2%	3%	4%	4%	4%	5%	4%	2%	1%	4%	5%
% of claims with concomitant use of opioids and sedatives	0%	1%	0%	5%	2%	2%	0%	1%	1%	0%	1%	2%	0%	0%	1%	1%	0%	1%	1%	1%	1%	2%	1%	1%	1%	1%	1%
% of claims with concomitant use of opioids and centrally-acting muscle relaxants	33%	32%	33%	40%	39%	40%	29%	32%	26%	29%	33%	48%	27%	34%	27%	25%	30%	34%	24%	34%	28%	34%	34%	27%	39%	32%	26%
% of claims with concomitant use of opioids and anticonvulsants	3%	2%	2%	5%	3%	3%	2%	3%	2%	3%	4%	6%	4%	2%	3%	3%	2%	4%	2%	3%	5%	4%	3%	2%	4%	4%	4%
% claims with opioid Rx that had at least 60 days of opioids supply in any 90-day period	**6%**	**n/a**	**n/a**	**28%**	**12%**	**12%**	**6%**	**n/a**	**7%**	**7%**	**14%**	**33%**	**11%**	**n/a**	**14%**	**7%**	**6%**	**10%**	**8%**	**n/a**	**18%**	**17%**	**12%**	**8%**	**15%**	**10%**	**6%**
Among claims with at least 60 days of opioids supply in any 90-day period [a]																											
% of claims with concomitant use of opioids and other CNS depressants	51%	n/a	n/a	78%	67%	67%	64%	n/a	56%	52%	69%	75%	56%	n/a	63%	58%	68%	60%	58%	n/a	54%	68%	61%	50%	73%	53%	70%
% of claims with concomitant use of opioids and benzodiazepines	8%	n/a	n/a	18%	8%	8%	7%	n/a	11%	15%	7%	9%	15%	n/a	15%	10%	9%	9%	9%	n/a	8%	10%	13%	10%	2%	9%	14%
% of claims with concomitant use of opioids and sedatives	0%	n/a	n/a	7%	5%	6%	2%	n/a	8%	4%	2%	6%	4%	n/a	4%	5%	5%	4%	6%	n/a	2%	5%	4%	1%	7%	4%	5%
% of claims with concomitant use of opioids and centrally-acting muscle relaxants	51%	n/a	n/a	67%	63%	64%	62%	n/a	52%	52%	64%	68%	45%	n/a	51%	50%	59%	56%	52%	n/a	52%	64%	57%	45%	72%	49%	63%
% of claims with concomitant use of opioids and anticonvulsants	18%	n/a	n/a	4%	7%	14%	7%	n/a	11%	4%	14%	12%	11%	n/a	8%	8%	5%	14%	10%	n/a	13%	13%	5%	9%	13%	16%	20%

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

[a] The 22 states included for these measures are those where the days of supply information is complete for all opioid prescriptions for a majority of claims in the state and claims with complete days of supply are substantially representative of all claims with opioids.

Key: CNS: central nervous system; n/a: not available; Rx: prescriptions.

TECHNICAL APPENDIX A:

A BRIEF SUMMARY OF FACTORS THAT MAY INFLUENCE THE PRESCRIBING OF OPIOIDS

The reader may want to know what might explain the results we observed in the use of opioids for each state. In this report, we do not identify and examine the impact of key factors underlying the utilization and prescribing patterns of opioids. Instead, we provide in this appendix some background information about several possible factors that may influence prescribing and utilization patterns of opioids, including information about the legal and regulatory environment for prescribing opioids for some state workers' compensation health care delivery systems. Our intention is to provide the reader with a policy context that may help facilitate the interpretation of the patterns observed.

The development of policies regarding controlled substances reflects a legislative and regulatory effort to strike a balance between providing necessary pain relief and minimizing the risk of abuse and diversion of opioids. In the past few years, there were numerous legislative and regulatory changes in opioid policies that were aimed at reducing unnecessary use of opioids. Some of the policy changes were at the federal level, including up-scheduling certain controlled substances[1] and Risk Evaluation and Mitigation Strategies (REMS) programs. Many changes are at the state level, in and outside workers' compensation systems. Most of the policy changes have been focused on changing provider behavior for safe opioid prescribing and dispensing. Numerous guidelines have also been adopted by different agencies to address not only the management of chronic opioid use but also opioid prescribing for acute and subacute pain. More recently, an increasing number of states took a comprehensive approach to addressing opioid issues in a coordinated way, focusing on the prevention and intervention of opioid overdoses. The policy discussion we provide in this appendix is focused on the prevention of prescription opioid misuse and abuse.

STATE-LEVEL POLICIES AND INITIATIVES AIMED AT REDUCING UNNECESSARY OPIOID PRESCRIPTIONS

At the state level, the legal and regulatory environment aimed at preventing the abuse and diversion of opioids includes, but is not limited to, statewide PDMPs, mandatory provider education and physician licensing, opioid prescribing and pain policies, and state workers' compensation laws and regulations for pharmaceuticals. Detailed information about state policies on opioids and prescription drugs implemented as of January 1, 2018, is available in WCRI's prescription drug inventory.[2] In this section, we focus our discussion on major state-level legislative and regulatory changes that were implemented during the study period in several states.

[1] Examples include the change of hydrocodone-combined drugs from Schedule III to Schedule II and the change of tramadol from unscheduled to Schedule IV.

[2] Rothkin (2018).

PRESCRIPTION DRUG MONITORING PROGRAMS

PDMPs are statewide electronic databases of prescriptions dispensed for controlled substances and other drugs of concern. Information collected by PDMPs may be used to support access to legitimate medical use of controlled substances; identify or prevent drug abuse and diversion; facilitate identification of prescription drug-addicted individuals and enable intervention and treatment; outline drug use and abuse trends to inform public health initiatives; or educate individuals about prescription drug use, abuse, and diversion.[3] As of today, all states but Missouri have enacted PDMP legislation. The state PDMPs vary widely with respect to what information is contained in the database, who should report to the system and in what time frame, who can and should access the database for what purposes, and whether the information can be shared with other state PDMPs. Table TA.A1 provides a summary of some key features of state PDMPs for the states included in this study.

The PDMP Training and Technical Assistance Center at Brandeis University (PDMP TTAC) and the PDMP Center of Excellence at Brandeis University (PDMP COE) provide a useful resource to track state PDMPs over time.[4] In recent years, an increasing number of states made legislative mandates requiring prescribers to register and use the PDMP database. According to the PDMP TTAC, 42 of 49 states with PDMPs require mandatory registration with the state PDMP, as of January 2019. Prior to 2012, only Arizona and Utah required prescribers to register with the PDMP, without mandating the use of the PDMP database. In 2009, Nevada's legislation required use of the PDMP with a more subjective trigger of "reasonable belief that the patient may be seeking the controlled substances." Oklahoma in 2010 required a prescriber to check the PDMP only when prescribing or dispensing methadone. Since 2012, mandates for use of state PDMPs have accelerated with more obligatory requirements for prescribers to check the prescription history in the PDMP database at the initial and continued prescribing of opioids. Kentucky was the first state to adopt a comprehensive mandate that requires all prescribers to check a patient's prescription history. Nevada and Oklahoma expanded their mandates of checking the state PDMP database in 2015. As of January 2019, 42 states mandate prescribers to query the PDMP, although the states vary with regard to the comprehensiveness of its application.[5] During the study period, 15 states included in this study implemented comprehensive mandates, while a couple of states required prescribers to check the PDMP under limited circumstances. Prescriber PDMP use mandates went into effect in California, Florida, Georgia, Iowa, Maryland, Michigan, North Carolina, and Texas after the study period.

The PDMP COE reports noted that a rapid increase in mandatory use of PDMP databases coincided with decreases in opioid prescriptions and multiple provider episodes in states that implemented comprehensive mandates early on.[6] For example, Kentucky observed an 8.5 percent decline in opioid doses dispensed in the first year after requiring prescriber enrollment and use of KASPER. New York also observed a 9.5 percent

---

[3] See Finklea, Sacco, and Bagalman (2014).

[4] The PDMP COE has published three editions of a briefing that describes the development of state PDMP programs and documents evidence on the effectiveness of PDMPs across states. The original edition of the briefing was published in November 2013, focusing on data and experience in Kentucky. The second edition of the briefing, *Mandating PDMP Participation by Medical Providers: Current Status and Experience in Selected States*, was published in 2014. In its third edition, the PDMP COE's briefing describes the recent history and current status of prescriber mandates, as well as outcomes in selected states. It also discusses policy and implementation issues for states considering mandates. See the third edition, *PDMP Prescriber Use Mandates: Characteristics, Current Status, and Outcomes in Selected States*, published in May 2016, at http://www.pdmpassist.org/pdf/COE_documents/Add_to_TTAC/COE briefing on mandates 3rd revision.pdf.

[5] PDMP TTAC (2019).

[6] The PDMP COE's 2016 report also provides information on the implementation and impact of the PDMP use mandates on health care practices, prescriptions of specific drugs, and outcomes.

decrease in opioid prescriptions between the fourth quarters of 2012 and 2013 after implementing the I-STOP legislation in July 2013. In a study covering 38 states, Dowell et al. (2016) showed positive results of reforms mandating that prescribers review the state PDMP. The authors observed substantial reductions in the amount of opioids and opioid overdose deaths in states that simultaneously implemented PDMP prescriber mandates and regulated pain clinics, compared with states without these reforms. Reduction in opioid prescriptions, especially high-risk opioid prescribing patterns were echoed in several recent studies (Buchmueller and Carey, 2018; Haffajee et al., 2018).

In a report jointly prepared by PDMP COE and the Pew Charitable Trusts, the researchers describe evidence-based practices that were shown to increase prescriber utilization of PDMPs.[7] The report noted that prescriber use mandates were one of the important features of PDMPs, associated with a rapid increase in PDMP utilization. Other practices include allowing delegates to access the PDMP, unsolicited reporting of at-risk patients, enhanced user interfaces, and integration of PDMPs with health information exchanges, among others—all features that make it easier for prescribers to utilize the information. The authors reported wide variations in the status of the adoption of these evidence-based practices and noted wide variations in PDMP utilization by prescribers of controlled substances across the 49 states with PDMPs.[8]

[7] The information on state regulations mandating the enrollment and use of PDMPs is from the 2016 report published by the Pew Charitable Trusts, *Prescription Drug Monitoring Programs: Evidence-Based Practices to Optimize Prescriber Use.* The report showed that, as of December 2014, there was substantial variation across states in prescribers' enrollment and utilization of PDMPs, with several states experiencing increases in PDMP utilization in recent years. See Appendix A of that study.

[8] In the 2017 edition of this study, we assessed the correlation between PDMP enrollment and utilization in 2014 and changes in the frequency of opioid use over the study period between 2010/2012 and 2013/2015. We found a strong positive correlation between PDMP utilization and the decrease in frequency of opioid use. PDMP enrollment was also correlated with the change in frequency of opioid use over the study period, to a lesser extent.

Table TA.A1 State Prescription Drug Monitoring Programs [a]

State	Year Current Program Operational	Year Initial Program Operational	Year Enacted	Frequency of Reporting	Prescribers Required to Check Prior to Prescribing in Certain Conditions	Schedule of Drugs Covered	Drugs of Concern Covered	Data Collected from Dispensing Practitioners
Arkansas	2013	2013	2011	Daily	Yes, effective August 2017	II, III, IV, V	Yes (nalbuphine)	No
California	2005 (CURES)	1939	1939	Weekly	Yes, effective October 2018	II, III, IV	No	Yes
Connecticut	2008	2008	2006	Daily	Yes, effective October 2015	II, III, IV, V	Yes	Yes
Delaware	2012	2012	2010	Daily	Yes, effective April 2017 for more than 7-day supply	II, III, IV, V	Yes	Yes
Florida	2011	2011	2009	Daily	Yes, effective July 2018	II, III, IV, V	No	Yes
Georgia	2013	2013	2011	Daily	Yes, effective July 2018 for Schedule II drugs of more than 3-day supply or 26 pills	II, III, IV, V	Yes	No
Illinois	2011	1968	1961	Daily	Yes, effective January 2018 for Schedule II drugs of more than 7-day supply	II, III, IV, V	Yes	Yes
Indiana	2008 (INSPECT)	1998	1997	Daily	Yes, required for opioid treatment programs. Effective January 2021 for all practitioners	II, III, IV, V	Yes	Yes
Iowa	2009	2009	2006	Daily	Yes, effective July 2018	II, III, IV	No	No
Kansas	2011	2011	2008	Daily	No	II, III, IV, V	Yes	Yes
Kentucky	2005 (KASPER)	1999	1998	Daily	Yes, effective July 2012	II, III, IV, V	Yes	Yes
Louisiana	2009	2008	2006	Daily	Yes, effective August 2014 for Schedule II drugs	II, III, IV, V	Yes	Yes
Maryland	2013	2013	2011	Daily	Yes, effective July 2018	II, III, IV, V	No	Yes
Massachusetts	2010	1994	1992	Daily	Yes, effective January 2016	II, III, IV, V	Yes	No
Michigan	2003	1989	1988	Daily	Yes, effective June 2018 for more than 3-day supply	II, III, IV, V	No	Yes
Minnesota	2010	2010	2007	Daily	Yes, required for treatment of opioid use disorders	II, III, IV, V	Yes	Yes
Missouri	No statewide prescription drug monitoring program							
Nevada	1997	1996	1995	Daily	Yes, effective November 2015	II, III, IV, V	No	Yes
New Jersey	2011	2011	2008	Daily	Yes, effective October 2015	II, III, IV, V	Yes	No
New York	2013	1973	1972	Daily	Yes, effective June 2013	II, III, IV, V	Yes	Yes
North Carolina	2007 (CSRS)	2007	2005	Daily	Yes, effective November 2018 for injured workers	II, III, IV, V	No	Yes
Pennsylvania	2014	1973	1972	Daily	Yes, effective June 2015	II, III, IV, V	No	Yes
South Carolina	2008	2008	2006	Daily	Yes, effective May 2017 for Schedule II drugs	II, III, IV	No	Yes
Tennessee	2013	2006	2003	Daily	Yes, effective April 2013	II, III, IV, V	Yes	Yes
Texas	2008	1982	1981	Daily	Yes, effective September 2019	II, III, IV, V	No	No
Virginia	2006	2003	2002	Daily	Yes, effective March 2015	II, III, IV, V	Yes (gabapentin, naloxone)	Yes
Wisconsin	2013	2013	2010	Daily	Yes, effective April 2017	II, III, IV, V	Yes	Yes

[a] Information included is primarily based on state profiles, which are available at http://www.pdmpassist.org/content/state-profiles. Multiple sources were used to obtain the effective dates for prescriber mandates to check PDMP.

Definition: Operational: Program is currently collecting prescription data and can respond to requests for reporting by those authorized to make these requests.

Key: CSRS: Controlled Substance Reporting System; CURES: Controlled Substance Utilization Review and Evaluation System; INSPECT: Indiana Scheduled Prescription Electronic Collecting & Tracking; PDMP: prescription drug monitoring program; WC: workers' compensation.

Because of the dynamic nature of PDMP policy changes, research that evaluates the impact of PDMPs has been evolving. Some earlier evidence suggested that PDMPs had a positive impact on reducing "doctor shopping" (see a review article by Worley, 2012) and slowing down the rapid growth of misuse and abuse (as reported in Reifler et al., 2012, for example). Other researchers found limited effectiveness of PDMPs partly due to the diversity of key program features of the state PDMPs as well as certain confounding factors, including differences in prescribing practices and economic conditions across states (see a review article by Finklea, Sacco, and Bagalman, 2014).[9] However, studies using data that are more recent are reporting the effectiveness of PDMPs in reducing opioid utilization as well as opioid overdose deaths. Bao et al. (2016) used National Ambulatory Medical Care survey data from 2001 to 2010 across 24 states that implemented a PDMP during the study period. They found an immediate decrease in the rate of prescribing opioids, especially Schedule II opioids, by 30 percent. Patrick et al. (2016) found that PDMPs resulted in 1.12 fewer opioid overdose deaths per 100,000 people on average in the year following the implementation of the PDMPs, using data from 1999 to 2013 across 35 states that adopted a PDMP during the study period. Greater reductions were seen in states that monitored more schedules of drugs and updated the PDMP at least weekly compared with states that did not have these characteristics. Pardo (2017) found that robustness of PDMPs matters, with states in the third quartile in terms of PDMP strength being associated with an 18 percent reduction in opioid overdose deaths compared with states without a PDMP. A systematic review of studies published as of December 2017 examining the association between PDMPs and drug overdoses concluded that there is insufficient evidence about the impact on nonfatal overdoses, and low strength evidence suggesting a reduction in fatal overdoses (Fink et al., 2018). The authors noted that a few studies reported an increase in heroin-related overdoses following the implementation of a PDMP.

STATE LAWS AND REGULATIONS LIMITING INITIAL OPIOIDS

Using opioids to treat acute pain can lead to long-term use of opioids. The likelihood of long-term use increases based on the length of the initial prescription, according to a 2017 CDC study.[10] Since 2016, many states have taken a direct approach to regulate opioid prescribing by limiting supply for initial opioid prescriptions, to three to seven days. The opioid-limiting approach has attracted much attention as a central component of legislations that help fight the opioid epidemic.

Table TA.A2 provides information obtained from various sources for the 27 states included in our study. Effective March 14, 2016, Massachusetts became the first state to pass legislation limiting the supply for initial opioid prescriptions; the limit was set to seven days of supply. On July 1, 2016, Connecticut enacted a similar law limiting initial opioid prescriptions to seven days for adults (and five days for children). Since then, an increasing number of states have enacted opioid-limiting laws and regulations to lessen the potential for opioid overuse, dependence, and other related issues. In 2017, 17 states passed opioid-limiting laws and rules, 11 of which are included in our study (Arkansas, Delaware, Indiana, Kentucky, Louisiana, Maryland, Minnesota,

[9] For example, a study by Brady et al. (2014) reported that the implementation of state PDMPs did not show a significant impact on annual morphine milligram equivalents dispensed per capita. However, the data used for that study only captured the state PDMPs up to 2008. Since 2008, several of the 31 states included in that analysis have made significant improvements to their PDMPs. Based on a review of 47 PDMP websites for overdose contents from December 2012 to October 2013, Green et al. (2015) found that most PDMPs did not provide relevant tools and materials to address overdose and related issues. Green et al. recommended a more comprehensive public health orientation for PDMPs that explicitly and publicly articulates their application and role in overdose prevention, which may increase PDMP effectiveness and use.

[10] *Characteristics of Initial Prescription Episodes and Likelihood of Long-Term Opioid Use—United States, 2006–2015* (Shah, Hayes, and Martin, 2017). The report is available at https://www.cdc.gov/mmwr/volumes/66/wr/mm6610a1.htm.

Nevada, New Jersey, Pennsylvania, and Virginia). Arizona (not included in this study), Florida, Michigan, Missouri, North Carolina, South Carolina, Tennessee, and Wisconsin passed similar limits on the days of supply for initial opioid prescriptions in 2018. The legislative trend continued in 2019 with Montana and Wyoming (not included in this study) becoming new states with laws limiting initial opioid prescriptions.

Among the states with opioid limits, a few specified the maximum daily dose while several states allow the lowest effective amount. North Carolina limits opioids to a 5-day supply of up to 50 MME per day. Nevada has a 14-day supply limit with a maximum of 90 MME per day. Tennessee's statute limits acute pain prescriptions to 3 days and a maximum 180 MME, which may be extended under certain conditions to a 10-day supply of a total 500 MME and further extended to a 30-day of supply with a total MME limited to 1,200 MME.

Early evidence evaluating state laws limiting opioids for treatment of acute pain shows immediate compliance with the reforms resulting in significant decreases in opioid prescriptions (Reid et al., 2018 and 2019). However, because the majority of these reforms were passed in 2017 and after, there is limited research examining their effectiveness and any unintended negative outcomes associated with these policies.

Table TA.A2 State Laws Limiting Days of Supply for Initial Opioid Prescriptions

State	State Laws and Regulations Limiting Initial Opioid Prescriptions, as of May 2019	Effective Date	Number of Days of Supply Limit	Limits Apply to All Opioids Unless Specified	Professional Judgment Exception	Surgical Pain Exception
Arkansas[a]	Yes	August 2018	7			
California	No					
Connecticut	Yes	July 1, 2016	7		Yes	No
Delaware	Yes	April 1, 2017	7		Yes	No
Florida	Yes	July 1, 2018	3 or 7	Schedule II	[b]	-
Georgia	No					
Illinois[c]	No					
Indiana	Yes	July 1, 2017	7		Yes	No
Iowa	No					
Kansas	No					
Kentucky	Yes	June 29, 2017	3		Yes	Yes
Louisiana	Yes	August 1, 2017	7		Yes	No
Maryland	Yes	May 25, 2017	[d]		No	No
Massachusetts	Yes	March 14, 2016	7		Yes	No
Michigan	Yes	July 1, 2018	7		-	-
Minnesota	Yes	July 1, 2017	4 [e]	Schedule II–IV	Yes	No
Missouri [a,c]	Yes	August 2018	7			
Nevada	Yes	June 16, 2017	14 [f]	Schedule II–IV	Yes	No
New Jersey	Yes	May 16, 2017	5		No	No
New York	Yes	July 22, 2016	7	Schedule II–IV	No	No
North Carolina	Yes	January 1, 2018	5	Targeted CS[g]	No	Yes (7-day)
Pennsylvania	Yes	January 3, 2017	7 [h]		Yes	No
South Carolina	Yes	May 15, 2018, signed into law	7		-	-
Tennessee	Yes	July 1, 2018	[i]	Opioids or benzodiazepines	No	No
Texas	No					
Virginia[a]	Yes	March 15, 2017	7 [j]	Schedule II–IV	Yes	Yes
Wisconsin[a]	Yes	April 19, 2018	3–5			

Note: Multiple sources were used to obtain information presented in this table, including Davis et al. (2019), Bateman (2016), and several online news reports and articles. We only documented opioid-limiting legislations and regulations recognizing that some carriers/payors may also have implemented similar policies at the company level.

[a] In Arkansas, Missouri, Virginia, and Wisconsin, new regulations were implemented by different state agencies that specified the limit for initial opioid prescriptions.

[b] Florida limits initial opioid prescriptions to three days of supply or seven days if the provider determines that there is a lack of available alternative treatment.

[c] Illinois and Missouri had limits of 30 days of supply in earlier years, which were not part of the legislative trend on limiting initial opioid prescriptions.

[d] In Maryland, the law requires prescribing opioids with the lowest effective dose, without limiting the number of days of supply.

[e] Minnesota has a four-day limit only for dental and refractive surgery pain.

[f] Nevada limits opioids to 14 days of supply, 90 MME per day.

[g] The "targeted controlled substances" are Schedule II and III opioids and narcotics per the North Carolina Controlled Substances Act, specifically those listed in N.C. Gen. Stat. § 90-90(1), (2) or 90-91(d). This provision does not apply to opioid prescriptions administered in a hospital, nursing home, hospice facility, or residential care facility.

[h] Pennsylvania's seven-day supply limit is for emergency department visits, urgent care, and hospital observation patients only.

[i] Tennessee has a cascading limit for initial opioid prescriptions. For pain, the limit is 10 days of supply with a maximum amount of 500 MME. For post-surgical pain, 20 days of supply with a maximum amount of 850 MME. If there is well justified medical need, the limit is 30 days of supply, with a maximum total of 1,200 MME.

[j] Virginia limits initial opioids to 7 days of supply, or 14 days for post-surgical pain.

Key: CS: controlled substances; MME: morphine milligram equivalent amount.

PROVIDER EDUCATION

Mandatory provider education for safe opioid prescribing is among the policy initiatives aimed at preventing misuse and overuse of opioids. Many states require continuing medical education (CME) on opioid prescribing and chronic pain management as part of the criteria for license renewal. A systematic review of CME requirements by Davis and Carr (2016) stated that only seven states required CME in pain management prior to 2012 (prior to the study period). Their review concluded that only five states have comprehensive CME requirements for most or all prescribers while less than half the states required CME from any prescriber as of December 2015. According to the Federation of State Medical Boards board-to-board review, 39 states and the District of Columbia adopted CME requirements for opioid prescribing and/or chronic opioid management as of April 2019.[11] States differ on the number of hours and frequency of training, as well as the types of doctors that require pain management CME. Several states also encourage prescriber education for pain management by providing online courses and resources for responsible opioid prescribing and by recognizing the credits earned through training. Some states (e.g., Florida, Kentucky, Massachusetts, New Jersey, and Texas) adopted legislation or regulations mandating CME on pain management for licensees.

OTHER POLICIES

State laws also address the prevention of prescription drug overdose, including regulating pain clinics,[12] limiting physician dispensing of controlled substances, and prohibiting doctor shopping.[13] For example, Florida's 2011 legislation regulates pain clinics and bans physicians from dispensing Schedule II and III opioids. Kentucky's 2012 rule change limited physician dispensing of Schedule II and III opioids to 48 hours of supply and also set ownership and oversight requirements for pain management facilities. Several state reports showed positive results of these state opioid policies. For example, previous WCRI studies found decreases in opioid prescriptions dispensed to injured workers after the implementation of the Florida and Kentucky laws (Thumula, 2014; Thumula, 2017). Johnson et al. (2014) reported a 27 percent decrease in opioid overdose death rates in Florida between 2010 and 2012, after a series of changes regulating the use of opioids in the state during 2010 and 2011. Lyapustina et al. (2015) reported that Texas' pill mill law was associated with declines in the average morphine equivalent daily dose and monthly opioid prescriptions. The reductions were more pronounced among prescribers and patients with higher rates of prescribing and utilization prior to the law. In workers' compensation jurisdictions, issues with opioid prescribing and dispensing are typically addressed in reimbursement rules, treatment guidelines, and drug formularies, which are described in the following section.

There has been an ongoing effort to evaluate state policies related to opioid prescribing and pain management to identify best practices. The Trust for America's Health published a report in 2013 that provided ratings on state opioid policies.[14] The ratings were based on the status of opioid policies in individual states, capturing opioid policies in 10 main areas, including the existence of state PDMPs, mandatory use of PDMPs, doctor shopping laws, policies expanding the coverage of substance abuse services (e.g., Medicaid expansion),

---

[11] See http://www.fsmb.org/siteassets/advocacy/key-issues/continuing-medical-education-by-state.pdf.

[12] Laws regarding pain clinic regulation include state oversight of pain management clinics and specific requirements for licensure or ownership of a pain management clinic. See the CDC guidelines.

[13] All states have a "general" fraud statute that adopts verbatim or with slight alteration the provision in the Uniform Narcotic Drug Act of 1932 or the Uniform Controlled Substances Act of 1970. These statutes prohibit obtaining drugs, including through "doctor shopping," by any or all of the following means: fraud, deceit, misrepresentation, subterfuge, or concealment of material fact. This resource distinguishes between general statutes and laws categorized as "specific" doctor shopping laws. See the CDC guidelines.

[14] See *Prescription Drug Abuse: Strategies to Stop the Epidemic* (Trust for America's Health, 2013).

prescriber education, good Samaritan laws to provide immunity from criminal charges for individuals seeking help for themselves or others experiencing an overdose, support of rescue drug use, physician exam requirement, laws requiring an ID prior to dispensing a controlled substance, and pharmacy lock-in programs. More recently, the National Safety Council (NSC) tracked states progress on implementing six key strategies which include mandating prescriber education, implementing opioid prescribing guidelines, integrating PDMP into clinical settings, improving data collection and sharing, and treatment of opioid overdose and opioid use disorders. As of December 2017, the report noted that all states implemented at least one of these key actions and three states met all six.[15] The National Governors Association also made an effort to evaluate the effectiveness of different opioid policies and provide recommendations to participating states to address opioid issues in a comprehensive and coordinated way.[16] Their recommendations align with the key prevention strategies recommended by the CDC's Prevention for States (PfS) program, which include enhancing PDMPs, implementing opioid prescribing interventions for insurers, and adoption of evidence-based opioid prescribing guidelines, among others (Robinson, Christensen, and Bacon, 2019). The PfS program provides funding to 29 state departments to implement key evidence-based prevention strategies and/or to evaluate these policies.

TREATMENT GUIDELINES FOR PRESCRIBING OPIOIDS AND PAIN MANAGEMENT

A number of treatment guidelines for prescribing opioids and pain management have been developed at the national and state levels. The widely-accepted national guidelines include the CDC guidelines for prescribing opioids for chronic pain, the general treatment guidelines by the American Pain Society and the American Academy of Pain Management, the occupational medical treatment guidelines by the American College of Occupational and Environmental Medicine (ACOEM), and the Official Disability Guidelines (ODG). The Federation of State Medical Boards (FSMB) also published the Model Policy on the Use of Opioid Analgesics in the Treatment of Chronic Pain to provide a resource for use by state medical boards in educating their licensees about appropriate opioid prescribing and avoiding over- and under-treatment of patients with pain.[17]

At the state level, many states, within and outside workers' compensation systems, either developed proprietary guidelines or adopted existing guidelines or a modified version to address the state's specific needs.

Several workers' compensation jurisdictions adopted the ODG (e.g., Arizona, Kansas, Kentucky, New Mexico, Ohio, Oklahoma, Tennessee, and Texas) or ACOEM guidelines (e.g., Nevada).[18] A number of states we studied, including Connecticut, Louisiana, Massachusetts, Minnesota, and New York, have adopted separate guidelines for chronic pain and opioid management during or prior to the study period. Massachusetts had a major update to the Chronic Pain Treatment Guidelines in 2012, and the guidelines were further updated in May 2016. In Massachusetts, the regulation requires that the chronic pain treatment guidelines be used in drug utilization review. The New York State Workers' Compensation Board adopted non-acute pain medical treatment guidelines effective December 2014 in an effort to address issues related to long-term opioid use in the state workers' compensation system. Connecticut updated its medical treatment protocols in July 2012. In 2016, California had a major update to the Chronic Pain Medical Treatment Guidelines first published in 2009

[15] See *Prescription Nation 2018* (National Safety Council, 2018).

[16] See several reports published by the National Governors Association (2012, *Six Strategies for Reducing Prescription Drug Abuse*; 2014, *Reducing Prescription Drug Abuse: Lessons Learned from an NGA Policy Academy*; 2016, *Finding Solutions to the Prescription Opioid and Heroin Crisis: A Road Map for States*).

[17] The Model Policy was published in 2013, and updates were published in 2014 and 2017. The 2017 Model Policy is available at https://www.fsmb.org/siteassets/advocacy/policies/opioid_guidelines_as_adopted_april-2017_final.pdf.

[18] California's Medical Treatment Utilization Schedule (MTUS) incorporated the ACOEM Opioids Guideline.

and adopted its first Opioids Treatment Guidelines to address opioid prescribing. Washington State and Colorado, not included in the study, were the first states that had guidelines for chronic opioid management.[19] Long-term use of opioids has long been controversial. The Cochrane reviews[20] pointed out that the evidence in support of opioid use for chronic non-cancer pain is weak or questionable.[21] Numerous guidelines that were developed, within and outside workers' compensation, to assure appropriate use and management of chronic opioid therapy advise similar approaches. Patients should be carefully screened for signs of aberrant drug behavior and other risk factors such as comorbid psychiatric conditions. Chronic opioid management should only be offered after other therapies have failed and the patient has moderately severe pain from a defined physical condition. Wang (2017) provides a summary of the guideline recommendations for chronic opioid management in several selected key areas including baseline screening, type of opioids during initial trials, use of the PDMP, maximum daily dose recommendations, and drug testing.

Recognizing the potential impact of early opioid prescriptions on chronic use of opioids, an increasing number of states adopted/developed or updated opioid guidelines to address the full spectrum of pain treatment covering acute, subacute, chronic, and postoperative pain. For example, the ACOEM guidelines and several state guidelines (for example, California, Connecticut, Pennsylvania, and Washington) include recommendations about prescribing opioids for acute and subacute pain). For example, the Washington guidelines recommend the lowest necessary dose of immediate-release opioids for the shortest duration (less than two weeks) for acute pain.[22] The 2016 CDC guidelines for prescribing opioids for chronic pain also include recommendations for the duration of opioids for acute pain; the guidelines state that three days or less is often sufficient and more than seven days is rarely needed. Since then, several states have enacted legislation related to limits on initial opioid prescriptions, as discussed in the previous section. Several states established workers' compensation-specific opioid prescribing and pain treatment guidelines (e.g., California and Pennsylvania), while other states rely on opioid prescribing guidelines adopted by the state medical boards or other agencies. In Nevada, for example, the state medical board adopted opioid guidelines by referencing the Model Policy for the Use of Controlled Substances for the Treatment of Pain while the state workers' compensation jurisdiction adopted ACOEM guidelines. Table TA.B1 provides examples of guideline recommendations and state rules regarding duration and dosage limits and non-opioid pain treatments.

The impact of medical treatment guidelines on opioid use has been examined with some mixed results (see Haegerich et al., 2014, for a systematic review). In recent years, as discussed above, several states have updated their guidelines or adopted new ones with recommended opioid dose and duration limits covering acute, subacute, chronic, and postoperative pain. Bohnert et al. (2018) examined changes in opioid prescribing following the release of the 2016 CDC guidelines using an interrupted time series analysis and found that the guidelines accelerated the already decreasing opioid prescribing rate. The overall opioid prescribing rate, which

[19] The Washington State guidelines for prescribing opioids have also been used by the CDC to advise prescribing physicians on the use of opioids for treating pain. We have used these guidelines as a reference in our analysis.

[20] Cochrane Reviews provide systematic reviews of primary research in evidence-based health care and health policy. Published online in The Cochrane Library, Cochrane Reviews investigate the effect of interventions for prevention, treatment, and rehabilitation. They also assess the accuracy of a diagnostic test for a given condition in a specific patient group and setting. See more details at http://www.cochrane.org/evidence.

[21] According to a Cochrane study, there is only weak evidence suggesting that patients on long-term opioid therapy experience clinically significant pain relief. However, multiple side effects are common, causing many patients to discontinue use. It is unclear whether this type of therapy functionally benefits most patients. See Noble et al. (2010). Most studies show that only around 50 percent of patients tolerate the side effects of opioids and related medications well and benefit from opioid therapy for pain relief. Depending on the diagnoses and other agents available for treatment, the incremental benefit of chronic opioid use can be small (Cepeda et al., 2007; Laudau et al., 2007; and Noble et al., 2010).

[22] See "Part II. Prescribing Opioids in the Acute and Subacute Phase" of the Washington Agency Medical Directors' Group Interagency Guideline on Prescribing Opioids for Pain.

was at 6,577 prescriptions per 100,000 persons in January 2012, decreased by 23.5 prescriptions per month before the guidelines and by 56.7 per month after. Several studies examined the impact of Washington's opioid dosing guideline and found a decrease in opioid use after its implementation. For example, Garg et al. (2013) reported a 53 percent decrease in chronic opioid users between the first quarter of 2004 and the fourth quarter of 2010, after the implementation of the state opioid dosing guidelines on safe prescribing for chronic non-cancer pain. The authors also reported that these chronic opioid users were 35 percent less likely to receive a dosage greater than a 120-milligram morphine equivalent daily dose in the post-guideline period compared with the pre-guideline period. Similar findings were reported in Franklin et al. (2012).

STATE WORKERS' COMPENSATION DRUG FORMULARIES AND OTHER RELEVANT LAWS AND REGULATIONS

Workers' compensation laws and regulations that are likely to influence prescribing behavior and impact the use of opioids include, but are not limited to, pharmacy fee schedules, physician dispensing restrictions, pharmacy formularies, provider choice laws, preauthorization requirements, and drug utilization review. Readers interested in learning more about state strategies used to control prescription drugs in workers' compensation may refer to WCRI's national prescription inventory (Rothkin, 2018). Here, we provide a few examples to illustrate approaches that workers' compensation communities use to deal with issues related to opioid utilization.

Based on the experience of states with drug formularies such as California, Ohio, Texas, and Washington, evidence-based formularies are expected to have a significant impact on use of opioids. Washington was the first workers' compensation jurisdiction to mandate a drug formulary in 2004. Over the past decade, 15 other states (Arizona, Arkansas, California, Delaware, Indiana, Kentucky, Montana, Nevada, New York, North Dakota, Ohio, Oklahoma, Tennessee, Texas, and Wyoming) have implemented drug formularies, and a growing number of states are considering them.[23] Nine of these states (Arkansas, California, Delaware, Indiana, Kentucky, Nevada, New York, Tennessee, and Texas) are included in this study.

Ohio, a single payor state like Washington, implemented a formulary effective September 1, 2011, and the state Bureau of Workers' Compensation reported that the formulary resulted in a 25 percent decrease in opioid prescriptions between fiscal years 2011 and 2014.[24] Texas was the first multi-payor state to adopt a closed formulary in the workers' compensation system. The Texas Division of Workers' Compensation adopted a closed pharmacy formulary based on ODG. The formulary went into effect on September 1, 2011, for new claims with dates of injury on or after that date, and became effective on September 1, 2013, for legacy claims with dates of injury before September 1, 2011. According to a recent study by the Texas Department of Insurance (TDI), fewer opioids and other not-recommended drugs are being prescribed after the reform (TDI, Texas Workers' Compensation Research and Evaluation Group, 2013). More recently, California's formulary, created by the California Division of Workers' Compensation to coordinate with the ACOEM Treatment Guidelines, went into effect in January 2018. CWCI reported that the share of non-exempt drugs under the formulary decreased by 7.8 percentage points between the first half of 2017 and 2018, with opioids accounting for more than half of the decrease (Hayes and Swedlow, 2019).

Another regulatory strategy used by states is to implement specific rules for utilization review of opioids in

[23] See Table 10 of *Workers' Compensation Prescription Drug Regulations: A National Inventory, 2018* for detailed information about formularies implemented as of January 2018. Formularies in Arkansas, Indiana, and Kentucky went into effect after the study period.

[24] Ohio Bureau of Workers' Compensation (2015).

workers' compensation. For example, earlier in November 2012, Tennessee's legislature passed Senate Bill 3315, which amended the definition of utilization review to explicitly include Schedule II, III, and IV drugs being used for pain management. The provision requires the parties involved to participate in utilization review if opioids are prescribed for pain management to an injured or disabled employee for a period of time exceeding 90 days from the initial prescription. Effective October 1, 2013, a new Tennessee legislation requires that a prescription for opioids or benzodiazepines may not be dispensed in quantities greater than a 30-day supply. The new law also encourages mandatory urine drug testing of patients on long-term drug therapy.

Effective December 26, 2014, the amended rules by Michigan's Workers' Compensation Agency require that opioid treatment beyond 90 days for non-cancer related chronic pain not be reimbursed unless detailed physician reporting requirements and other processes are met. The new rules also provide incentives for compliance with the requirement—a provider may bill for the additional services required for reporting beyond 90 days and for accessing the state PDMP (a.k.a., MAPS) or other PDMPs in the treating jurisdiction.[25]

Several states changed reimbursement rules to limit physician dispensing of opioid prescriptions. The earliest example is Florida's 2011 legislation that prohibits physicians from dispensing Schedule II and III opioids. Since then, Indiana, Kansas, Kentucky, North Carolina, and Pennsylvania have introduced restrictive rules. In Pennsylvania, reimbursement for physician-dispensed opioids is limited to a one-time 7-day supply, and one additional 15-day supply may be dispensed following a medical procedure or surgery. In North Carolina, reimbursement for Schedule II and III opioids is limited to an initial 5 days of supply when dispensed by outpatient providers other than a licensed pharmacist. In Tennessee, physician dispensing of opioids is not permitted, with the exception of a 72-hour maximum dose supply of a Schedule IV or V controlled substance at no charge. As reported in previous WCRI studies, these reforms directly influence the frequency of physician dispensing of opioids.[26]

Across the states studied, we also see a whole spectrum of policies regarding provider choice, which is expected to have an impact on overall medical care and opioid use.[27] Many states allow injured workers to choose their providers with or without limitation, which include, among the states studied, Illinois, Louisiana, and Maryland (with strictly employee choice) and California, Georgia, New York, and Pennsylvania (with limited employee choice of providers). It is worth noting that two of the three states with strictly employee choice were among the lowest on the frequency of use of opioids.

[25] For more details, please refer to the amended rules, which are available at http://www.michigan.gov/documents/lara/2014-029_LR_Final_Health_Care_Services_476952_7.pdf.

[26] Thumula and Liu (2018); Thumula (2014); Wang, Thumula, and Liu (2017).

[27] See Rothkin (2019).

FEDERAL LAWS REGARDING PRESCRIPTIONS OF OPIOIDS

The federal Controlled Substance Act (CSA),[28] as Title II of the Comprehensive Drug Abuse Prevention and Control Act of 1970, established a classification structure by categorizing controlled substances into five schedules based on their medicinal value and potential for abuse, addiction, and dependency. Controlled substances in Schedules II through V can be used for medical purposes. Table 2.3 in Chapter 2 provides the definition of each schedule and examples of specific opioid medications that are classified in each schedule. Prescribing and dispensing of controlled substances in each of these schedules is regulated under federal law. For example, refills are prohibited for substances in Schedule II, whereas prescription drugs in Schedules III–V can be refilled. In 2014, the DEA reclassified two opioids that are among the drugs most frequently prescribed to injured workers, hydrocodone-acetaminophen and tramadol. Effective October 2014, hydrocodone-combined products were rescheduled from Schedule III to the more restrictive Schedule II. Tramadol, which was not previously scheduled, was reclassified to Schedule IV effective August 2014. Jones, Lurie, and Throckmorton (2016) found that dispensing of prescriptions of hydrocodone-combination products decreased by 22 percent in the 12 months after the rescheduling compared with the 12 months prior to rescheduling. Considering the implementation of these federal rule changes toward the end of the study period, we may observe the full impact of the up-scheduling of these two drugs when we update the analysis with more recent data.

REMS programs are another key policy tool at the federal level aimed at mitigating the risk of misuse and abuse of opioid medications while ensuring the accessibility of those drugs to patients who may need them. REMS programs are developed by drug sponsors, and the FDA reviews and approves these programs. For example, in April 2011, the FDA announced REMS programs for all long-acting opioids and oral fentanyl products. The REMS program for transmucosal immediate-release fentanyl (TIRF), consisting of oral fentanyl products, was approved in December 2011. Under the TIRF REMS Access program, prescribers are required to have a special certification to continue prescribing oral fentanyl products, which is likely to result in a reduction of prescriptions for oral fentanyl products, such as Actiq® and Fentora®.[29] The REMS program for long-acting and extended-release opioids (ER/LA REMS) was originally implemented in July 2012 and later broadened to include immediate release opioids.[30] The key components of this program are (1) prescriber training, (2) medication guide and new drug labeling, (3) patient education, and (4) evaluation of collected program data. While prescriber training is on a voluntary basis and physicians can continue to prescribe opioids without the additional training, the implementation of the program may help raise awareness and, therefore, reduce inappropriate prescribing of opioids, to some extent. Some recent studies provided evidence suggesting that some REMS programs were effective in improving prescribers' knowledge, attitudes, and self-reported clinical practice in safe opioid prescribing (Alford et al., 2015; Donovan et al., 2016; Rollman et al., 2019). However, Rollman et al. (2019) noted high rates of off-label use of TIRF 60 months after the REMS program for TIRF was implemented.

---

[28] The CSA requires any pharmacy, hospital, physician, manufacturer, or distributor that works with any of the substances listed under the CSA to register with the DEA. The DEA has the authority to regulate transactions and monitor the movement of controlled substances from manufacturer and wholesale distributors to the retail level. The transaction data are available for use in investigations of illegal diversions from manufacturers and wholesalers to retail distributors, such as physicians and pharmacists, who receive unusual quantities of certain drugs. See United States General Accounting Office (2002) and Kraman (2004).

[29] Please see FDA (2017), available at https://www.accessdata.fda.gov/drugsatfda_docs/rems/TIRF_2017-09-07_REMS_Document.pdf.

[30] Please see FDA (2018), available at https://www.accessdata.fda.gov/drugsatfda_docs/rems/Opioid_analgesic_2018_09_18_FDA_Blueprint.pdf.

MEDICAL PRACTICE AND HEALTH CARE DELIVERY SYSTEM

Geographic differences in medical practice and health care delivery systems may also play an important role in shaping interstate variations in opioid use. Multiple studies reported that higher concentrations of active physicians and surgeons in a region are strongly correlated with the amount of opioids prescribed (Curtis et al., 2006a; Han et al., 2012; McDonald et al., 2012). Some states or regions may also have a higher concentration of pain clinics and doctors who specialize in pain treatment than others. In states where patients have easier access to clinics specializing in the treatment of pain, the prescribing patterns may differ from states where there are few pain clinics. For example, some occupational medicine clinics are affiliated with academic medical centers that also have pain clinics. This arrangement facilitates referrals of patients to providers who specialize in pain treatment. As the rate of opioid prescribing is higher among pain specialists compared with non-specialists, this could increase the use of opioids in these regions (Levy et al., 2015). On the other hand, a higher level of involvement with chiropractic care may contribute to a lower rate of opioid use in the region at the aggregate level partly because chiropractors cannot prescribe medications. Similarly, higher availability of physical therapists and other practitioners with restricted prescribing authority in the region may result in fewer opioids. Moreover, earlier involvement with manual therapy providers such as chiropractors or physical therapists resulted in a lower likelihood of receiving opioid prescriptions compared with those who saw manual therapy providers later or never (Frogner et al., 2018; Azad et al., 2019).

In states where more workers' compensation medical care is provided by hospital-affiliated clinics, the prescribing patterns may be influenced indirectly by certain requirements of the Joint Commission on Accreditation of Healthcare Organizations,[31] which regulates hospital accreditation. Doctors who practice in hospital-based or hospital-affiliated programs may be more likely influenced by these requirements compared with doctors who are in private practice or those who work for commercial occupational medicine networks.

Opioid prescribing patterns may also be influenced by programs implemented by Medicaid and group health insurers, especially when the same doctors are treating patients with different types of insurance. For example, Blue Cross Blue Shield, the largest group health insurer in Massachusetts, implemented a program aimed at reducing the risk of opioid addiction in 2012.[32] While this policy change influenced the prescribing behaviors of the doctors who treated the patients covered by the group health policy, the same doctors may also have changed their prescribing practice when treating workers' compensation patients. Similar policies limiting the duration of opioid prescriptions were also implemented by several other large group health payors and pharmacy benefit managers (PBMs) (Chua, Brummett, and Waljee, 2019). CVS pharmacy also adopted an initiative to manage opioid utilization by limiting opioids related to certain acute conditions to a seven-day supply, effective February 2018.[33] Workers' compensation PBMs also report offering a number of services to help payors manage the utilization of pharmaceuticals, especially opioids, which may also influence the use of opioids. In recent years, Medicaid programs also implemented various opioid harm reduction strategies, which

[31] The Joint Commission is an independent not-for-profit organization that accredits and certifies more than 20,000 health care organizations and programs in the United States. More information can be found at www.jointcommission.org.

[32] Under the Blue Cross Blue Shield (BCBS) program, first prescriptions of short-acting opioids are limited to a 15-day supply and prescriptions written for longer than a 30-day supply must be accompanied by a medical authorization before coverage is approved. Preauthorization is also required before prescribing long-acting opioids for the first time. See http://www.bluecrossma.com/bluelinks-for-employers/whats-new/special-announcements/opioid-management.html. Since the inception of the program in 2012, BCBS found an 18 percent decline in opioid doses prescribed and a 50 percent reduction in the prescriptions for long-acting opioids such as OxyContin®. Similar programs were implemented by BCBS of Michigan and BCBS of Tennessee.

[33] Other aspects of CVS's initiative to address opioid abuse are detailed in https://cvshealth.com/newsroom/press-releases/cvs-health-fighting-national-opioid-abuse-epidemic-with-enterprise-initiatives.

may have had a spill-over effect on the opioids prescribed to injured workers. Medicaid fee-for-service programs in a majority of states implemented various opioid management strategies, including quality limits, prior authorization requirements, etc. Twelve states required prescribers to check PDMPs before prescribing opioids as of fiscal year 2015.[34] Since these state-level and local policies tend to be different in different states, the extent of the impact on opioid prescriptions may vary across states.

It is worth noting that workers' compensation coverage policies such as fee schedules, utilization limits, and prior authorization requirements for non-pharmacologic pain treatments may also have an indirect impact on the utilization of opioids. For example, if payment policies incentivize the provision of restorative and behavioral therapies, then some providers and injured workers might consider non-pharmacologic treatments rather than opioids.

[34] See Table 19 in the Kaiser Family Foundation/National Association of Medicaid Directors report *Implementing Coverage and Payment Initiatives Results from a 50-State Medicaid Budget Survey for State Fiscal Years 2016 and 2017* (2016).

TECHNICAL APPENDIX B:

GUIDELINE RECOMMENDATIONS ON OPIOID ALTERNATIVES

Many opioid prescribing and pain treatment guidelines call for broad adoption of alternatives to opioids for treating acute and chronic pain. These alternatives to opioids include non-opioid medications (e.g., NSAIDs and non-opioid analgesics) and non-pharmacologic treatment (e.g., active and passive physical medicine, chiropractic care, acupuncture, and cognitive behavioral health services). Several states that do not have guidelines in place also address alternative treatment through administrative or reimbursement rules. Table TA.B1 provides examples of guideline recommendations and state rules regarding non-opioid and non-pharmacologic alternative treatment to opioids.

Table TA.B1 Guidelines and Rules That Address Non-Opioid and Non-Pharmacologic Alternative Treatment to Opioids

Guidelines	Coverage	Non-Opioid Medications	Non-Pharmacologic Treatment	Opioid Prescription (prerequisite)	Risk Assessment/ Screening	PDMP	Duration or Days of Supply Limit	Dosage Limit
CDC Guideline for Prescribing Opioids for Chronic Pain — United States (2016)	Chronic pain	Non-opioid medications as alternatives to opioids or in conjunction with proper use of opioids for chronic pain	Non-pharmacologic therapy as alternatives or used in conjunction with opioids for chronic pain	Consider opioid therapy only if expected benefits for both pain and function are anticipated to outweigh risks to the patient	Recommend use of risk assessment tool, but the effectiveness of existing tools are not clear	Review the patient's history of controlled substance prescriptions using state PDMP data to assess risk for overdose; review PDMP data when starting opioid therapy for chronic pain and periodically during opioid therapy for chronic pain	For acute pain, 3 days or less will often be sufficient; more than 7 days will rarely be needed	Lowest effective dosage; reassess benefits/risks if increased to ≥ 50 MME/day; should avoid ≥ 90 MME and justify use if needed
American College of Occupational and Environmental Medicine (ACOEM): ACOEM Opioids Guidelines (April 20, 2017) ACOEM Chronic Pain Guidelines (May 15, 2017) (California Medical Treatment Utilization Schedule [MTUS] largely ACOEM; Nevada adopted ACOEM guides)	Acute, subacute, postoperative, and chronic	Begin with weaker acetaminophen-combination products. Only progress when necessary.	Physical restorative approaches, behavioral interventions, self-applied modalities, as well as non-opioid medications recommended for subacute and chronic pain to facilitate functional restorations	Opioids only recommended to treat acute, severe pain (e.g., crushing injury, large burn, fracture); opioid trial if other alternative approaches have been used with inadequate improvement in function	Substance abuse screening and psychiatric evaluation for most cases	Recommend check prescription drug monitoring programs	Recommend tapering off in 1–2 weeks, if used for acute pain; if longer than 3 weeks with opioids over 50 mg, recommend tapering and transition to an NSAID or acetaminophen	50 MEQ Taper if above 50 MEQ
Colorado ACEP (American College of Emergency Physicians) 2017 Opioid Prescribing and Treatment Guidelines (2017)	Emergency clinicians	Opioid alternatives should be used to manage patients with acute low back pain	Non-pharmacologic therapies should be used to manage patients with acute low back pain	Opioids should be prescribed only after alternative treatments have failed; opioids should be avoided for most chronic pain in emergency settings	Risk assessment, before initial Rx, to screen for abuse potential and medical comorbidities, using Opioid Risk Tool	Frequently consult Colorado's PDMP to assess for a history of prescription drug abuse, misuse, or diversion	Lowest possible effective dose in the shortest appropriate duration (e.g., < 3 days)	Lowest possible effective dose
Connecticut Medical Protocols for Non-acute Pain (2012) The opioid management protocol (created in 2012, latest update in 2017) The psychological pain assessment and treatment protocol was created February 5, 2016	Non-acute pain	Not directly addressed in opioid protocols	Not directly addressed in opioid protocols	During the first two weeks postinjury, low dose, short-acting opioids may be appropriate for those with more severe injuries	Screening for potential comorbidities such as opioid addiction, drug/alcohol problems, and depression	Physicians prescribing opioids required to register with the state PDMP (the Connecticut Prescription Monitoring and Reporting System [CPMRS]); if beyond 4 weeks, prescribers are recommended to check the patient's records in the CPMRS	Connecticut law limits initial prescriptions to a 7-day supply for adults; exceptions are allowed for patients with chronic pain or acute pain that will last beyond 7 days with appropriate chart documentation	90 MEQ A second opinion from an expert in pain management is recommended, if contemplating raising/maintaining the dose above 90 MED
MA Department of Industrial Accidents Opioid/Controlled Substances Protocol (May 2016)	Acute, subacute, chronic pain	Recommends (but does not require) non-opioid medication prior to prescribing opioids	Recommend non-pharmacologic alternative treatment, including but not limited to home exercise, chiropractic treatment, physical therapy, and psychological treatment	Opioid medication should only be used when the severity of the pain warrants that choice, and after other non-opioid pain medication or non-pharmacologic therapies are determined to not provide adequate pain relief	Assess risk factors, including medical and psychiatric co-morbidities, emotional/physical trauma, inconsistency in prescription monitoring, and personal or family history of substance abuse, etc.	Review patient's controlled substance history using the state PDMP database; PDMP review when starting opioid therapy for chronic pain and periodically during opioid therapy for chronic pain, ranging from every prescription to every 3 months	Patients with acute pain treated with continuous opioids over 50 mg MED for longer than 3 weeks duration may benefit from brief tapering over 3 to 7 days	50 mg MED

continued

Table TA.B1 Guidelines and Rules That Address Non-Opioid and Non-Pharmacologic Alternative Treatment to Opioids (continued)

Guidelines	Coverage	Non-Opioid Medications	Non-Pharmacologic Treatment	Opioid Prescription (prerequisite)	Risk Assessment/ Screening	PDMP	Duration or Days of Supply Limit	Dosage Limit
Michigan Reimbursement for Opioid Treatment for Chronic, Non-Cancer Pain (R 418.101008a) (opioids addressed through reimbursement rules instead of guidelines)	Chronic pain (reimburse-ment for opioid treatment beyond initial 90 days)	Non-opioid part of alternative conservative care	Requires document by the attending physician stating that alternative conservative care was tried but ineffective or contraindicated	Submit a written report no later than 90 days after the initial opioid prescription fill for chronic pain and every 90 days thereafter (CPT 99215), including a summary of conservative care rendered and statement indicating that conservative care is ineffective or contraindicated	Medical history, including any consultations that have been obtained	Review of data received from an automated PDMP in the treating jurisdiction, such as the Michigan Automated Prescription System (MAPS) for history of narcotic use and any concurrent prescriptions	Opioids beyond 90 days	n/a
Minnesota Opioid Prescribing Guidelines, First Edition (2018)	Acute, post-acute, chronic pain	Utilize alternatives to opioid analgesics for mild-moderate acute pain; consider non-opioid pain management when opioids are prescribed	Introduce multi-model therapies to all patients in the post-acute pain period; consider (therapeutic neuroscience) pain education for all patients in post-acute and chronic periods; multidisciplinary approach to treatment of chronic pain	Pain management and patient education begins with first opioid prescriptions		PDMP query; encourage disclosure of information or discussion of care with other prescribers identified in the PDMP database	Four days of supply only for dental and refractive surgery pain	100 MME/day For acute and post-acute pain, avoid prescribing opioids of 700 MME cumulative amount in order to reduce the risk of chronic opioids and related harm
Minnesota Workers' Compensation Treatment Parameters in the Administrative Rules for Acute (5221.6105), Long-term (5221.6110), Other Treatment Modalities (5221.6020)	Acute and chronic pain	Non-opioid analgesics for mild-moderate acute pain; consider non-opioid pain management when opioids are prescribed	Allowed treatment modalities include active and passive treatment modalities, injections, durable medical equipment, surgery, and chronic management	4-day supply limit for dental pain and refractive; opioid prescriptions for other medical purposes are not subject to the limit	Assess risk and potential harm using risk assessment tools	State laws require PDMP registration but do not mandate querying the PDMP database when prescribing opioids	Prescriptions within the first 4 weeks after injury are limited to 2 weeks of medication per Rx; beyond 4 weeks, limited to one month of medication per Rx. More than 12 weeks is governed by the long-term treatment parameters	For patients prescribed opioids for 90 days or more, lowest effective dose; referral to a pain medicine specialist is required if the patient is taking more than 120 morphine-equivalent milligrams per day or if the patient is at high risk for dependence or abuse
New York Workers' Compensation Board Non-Acute Pain Medical Treatment Guidelines, First Edition (2014)	Non-acute pain	Recommended that patients with non-acute pain be maintained on drugs that have the least serious side effects; provides a list of non-opioid medications as pain management options	No specific recommendations on non-pharmacologic alternative treatment. When clinically indicated, should follow the recommendations in the relevant Medical Treatment Guidelines. Consider functional restoration approaches and independent self-management	Opioids should be considered only when the potential benefits are likely to outweigh potential harm and the clinician is willing to commit to continue monitoring the effects of treatment including a plan to discontinue opioid therapy if necessary	Periodic evaluation, risk assessment, and encourage active therapeutic exercise	Prescribing physicians must comply with I-STOP and other related statutes and regulations	Requires trial and transitioning period before long-term opioid therapy; follow-up every 7–10 days is advised to titrate dosage and assess clinical efficacy	Recommend trial opioid therapy, starting with a low dosage, increase gradually and monitor opioid effectiveness until optimal dose is attained; lowest possible effective dose for long-term use
North Carolina Rules for the Utilization of Opioids, Related Prescriptions, and Pain Management in Workers' Comp Claims (2018)	Acute and chronic pain	Encourage transition from opioids to non-opioid treatment at the earliest time	Non-pharmacologic modalities are preferred to opioids, including physical therapy, chiropractic services, acupuncture, massage, cognitive behavioral therapy, biofeedback, and functional restoration programs	Yes if document provider's medical opinion that non-pharmacologic and non-opioid therapies are insufficient to treat the employee's pain	Risk assessment based on history and prior use of controlled substances	Required to check NC Controlled Substance Reporting System	5-day supply for acute pain; 7-day supply for postoperative pain	Lowest dosage necessary to treat pain, not exceeding 50 MME with exceptions; for chronic pain, dosage > 90 mg MED/day must seek preauthorization from carrier

continued

Table TA.B1 Guidelines and Rules That Address Non-Opioid and Non-Pharmacologic Alternative Treatment to Opioids (continued)

Guidelines	Coverage	Non-Opioid Medications	Non-Pharmacologic Treatment	Opioid Prescription (prerequisite)	Risk Assessment/ Screening	PDMP	Duration or Days of Supply Limit	Dosage Limit
Official Disability Guidelines (as of July 12, 2019)[a]	Acute, subacute, postoperative, and chronic pain	Acetaminophen and NSAIDs recommended as an initial choice for acute pain; muscle relaxants also recommended as 2nd line options for short-term (< 2 weeks) treatment of pain	Non-pharmacologic therapy and modalities (e.g., physical medicine, chiropractic care, massage therapy) may be considered before opioid prescriptions or and for tapering	Opioids should not be prescribed until the patient has failed a trial of non-opioid analgesics; set functional goals—continued use of opioids should be contingent on meeting the goals. Opioids may be recommended as a 2nd or 3rd line treatment for pain, with caution.	Screen for risk of addiction; assess the likelihood of abuse or an adverse outcome. Check use of alcohol, illegal drugs, other Rx and OTC drugs. Check history of personal and/or family substance abuse.	No specific entry in the ODG guidelines regarding PDMP query	For acute pain, 3–7 days of supply; if severe condition requiring longer use, 6 weeks with weaning	The lowest effective dose for acute pain. For chronic pain, color-coded dosing range: - Caution for < 50 MME/day (yellow flag) - High Risk 50–75 MME/day (orange flag) - Extreme Risk 75–100 MME/day (red flag) - Limit exceeded > 100 MME/day (black flag)
PA Treatment of Pain in an Emergency Setting (2018)	Acute and chronic pain	Non-opioid options should be considered as first line treatment	In ED settings, only if opioids are clearly indicated, and injured worker should be referred to a workers' compensation provider within 72 hours		Patients should be screened to identify increased risk of harm	PA law requires prescribers to obtain and review a report from the PDMP before prescribing any controlled substance	Discharge prescriptions for opioids should not exceed a 7-day supply	Daily doses of greater than 90 (MME/D) associated with an increased risk of toxicity and accidental overdose deaths
PA Safe Prescribing for Workers' Compensation (2018)	Acute, subacute, postoperative, chronic	Recommend a variety of non-opioid medication treatment options (NSAIDs, non-opioid analgesics)	Physical and other pain treatment modalities, e.g., patient reassurance, music, physical therapy, exercise, chiropractic treatment, cognitive-behavioral therapy, neurostimulators, massage, and acupuncture	May be necessary to treat moderate to severe acute pain	Screen patients for risk of substance use disorder, concurrent use of benzodiazepines, and patients at increased risk for respiratory compromise	Should query the PDMP and complete a patient assessment	Initial prescription of opioids should not exceed a 7-day supply for acute and subacute pain; 15-day extension for medical procedures/surgery	MEDD doses no greater than 90 mg
Tennessee Department of Health Clinical Practice Guidelines for Outpatient Management of Chronic Non-Malignant Pain (2014)	Chronic pain	Both pharmacologic and non-pharmacologic treatments should be used in conjunction or as an alternative before initiating opioid therapy for chronic pain		Assess needs, benefit, and risk for prescribing opioids; consider surgery option before prescribing opioids	Screening to assess the patient's risk for misuse, abuse, and addiction using a validated risk assessment tool	Required to check the state Controlled Substance Monitoring Database (CSMD) if prescribing 10 or more days of supply (with specified total MME)	Initial 3 days up to 180 MME; if not sufficient, 10 days up to 500 MME requiring document of alternative treatment and why opioid used; if still not sufficient, consider 3 days up to 1,200 MME	MEDD doses no greater than 90 mg; patient with > 120 MED should be referred to a pain specialist
Utah Clinical Guidelines on Prescribing Opioids for Treatment of Pain (2018)	Opioid prescribing	Non-opioid analgesics, adjuvant analgesics, and non-pharmacologic therapies should be used in combination with opioid treatment	Use of adjunctive medications, as well as other therapies, such as physical therapy, exercise, stretching, and other alternative therapies	Consider patient risks; counsel patients on the risks of opioids	Screening for substance abuse and consultation if psychological issues	Check the Utah Controlled Substance Database	Prescribe/dispense medication for limited periods of time (e.g., every 2 weeks)	The lowest effective dose
Washington State Interagency Guideline on Prescribing Opioids for Pain (2015)[b]	Acute, subacute, chronic, and postoperative	Detailed description of several non-opioid analgesic options for pain management	Explore non-opioid alternatives for treating pain and restoring function; consider behavioral interventions, such as cognitive behavioral therapy, mindfulness-based stress reduction (MBSR), yoga, various forms of meditation, and chronic pain self-management	Reserve opioids for acute pain resulting from severe injuries or medical conditions, surgical procedures, or when alternatives (non-opioid options) are ineffective or contraindicated	Screening for substance abuse and psychological conditions and referrals for treatment as needed	Check the state's PDMP to ensure controlled substance history is consistent with prescribing record, at the acute, subacute, and chronic phases	For acute pain, the lowest necessary dose at the shortest duration (< 14 days)	120 MED

continued

Table TA.B1 Guidelines and Rules That Address Non-Opioid and Non-Pharmacologic Alternative Treatment to Opioids (continued)

Guidelines	Coverage	Non-Opioid Medications	Non-Pharmacologic Treatment	Opioid Prescription (prerequisite)	Risk Assessment/ Screening	PDMP	Duration or Days of Supply Limit	Dosage Limit
Wisconsin Medical Examining Board Opioid Prescribing Guideline (2019)	Acute, postoperative, and chronic pain	Opioids should not necessarily be the first choice in treating acute or chronic pain; use non-pharmacologic therapies (such as yoga, exercise, cognitive behavioral therapy, and complementary/alternative medical therapies) and non-opioid pharmacologic therapies (such as acetaminophen and anti-inflammatories) for acute and chronic pain		Opioids should not be prescribed unless there is a medical condition expected to cause pain severe enough to require an opioid; requires a dedicated provider to provide all opioids used in treating a patient's chronic pain, with pain contracts being honored	Special consideration for patients unwilling to accept non-pharmacologic and/or nonnarcotic treatments	Review the patient's history of controlled substance prescriptions using the state PDMP data to manage the risk; WI law requires prescribers to review the PDMP before prescribing any controlled substance for greater than a three-day supply	For acute or postoperative pain, less than 3 days in most cases, rarely more than 5 days	For acute, postoperative, and chronic pain, the lowest possible dose. For chronic pain, precautions required for daily dose reaching 50 MME; ≥ 90MME strongly discouraged

[a] ODG treatment guidelines address a whole range of opioid treatments for different conditions of pain. All the chronic conditions are covered in the pain chapter and the acute pain recommendations are covered in different body part chapters. Several states have adopted ODG treatment guidelines, including Arizona, Kansas, New Mexico, Ohio, Oklahoma, Tennessee, and Texas.

[b] https://innovations.ahrq.gov/qualitytools/interagency-guideline-prescribing-opioids-pain.

Key: CDC: Centers for Disease Control and Prevention; CPT: Current Procedural Terminology; ED: emergency department; MED: morphine equivalent dose; MEDD: morphine equivalent daily dose; MEQ: morphine equivalent; MME: morphine milligram equivalent; NSAID: nonsteroidal anti-inflammatory drug; PDMP: prescription drug monitoring program; Rx: prescription(s).

The CDC chronic pain guidelines (2016) provide recommendations for the prescribing of opioid pain medication for pain conditions that typically last more than three months or past the time of normal tissue healing in outpatient settings outside of active cancer treatment, palliative care, and end-of-life care. The guidelines recommend use of non-opioid pain medications and non-pharmacologic treatment as alternatives to opioids or in conjunction with appropriate use of long-term opioid therapy. Non-opioid medications include acetaminophen, NSAIDs, antidepressants, and anticonvulsants, and non-pharmacologic treatment alternatives to opioids include cognitive behavioral therapy (CBT), exercise therapy, interventional treatments, and multimodal pain treatment. These recommendations are based on extensive evidence that suggests some benefits of non-pharmacologic and non-opioid pharmacologic treatments compared with long-term opioid therapy, with less harm. Several state guidelines are similar to the CDC guidelines, including New York and Washington. Recognizing the likely impact of opioid prescriptions for acute pain on chronic opioid use, the CDC guidelines state that three days or less of supply is sufficient for acute pain, and more than seven days will rarely be needed. The guidelines also recommend that the physician choose the lowest effective dosage when opioids are prescribed, reassess benefits/risks if the dosage increases to more than 50 MME per day, and avoid (or adjust if needed) a dosage greater than 90 MME.

The ACOEM published its practice guidelines in 2014 targeting the working-age population. The guidelines provide recommendations for acute, subacute, chronic, and postoperative opioid use, based on a systematic review of evidence. The ACOEM guidelines recommend alternative treatment be first utilized, such as physical restorative approaches, behavioral interventions, self-applied modalities, non-opioid medications,[1] and functional restoration. For acute pain patients with opioids over 50 milligrams MED for longer than three weeks, tapering over three to seven days and transitioning to only an NSAID or acetaminophen or complete cessation of analgesics is recommended. For chronic pain, the guidelines recommend tapering and transitioning to non-opioid alternatives if opioid use is above 50–100 milligrams MED on a long-term basis. The 2017 revisions to the ACOEM Chronic Pain Guideline that was released in May 2017 include an extensive section on behavioral health, the role of psychology, and recommendations to integrate psychological principles in chronic pain.

Several states either adopted ACOEM guidelines (e.g., Nevada) or established their own guidelines incorporating ACOEM guideline recommendations. For example, California's Medical Treatment Utilization Schedule (MTUS) incorporated the ACOEM Opioids Guideline, with similar recommendations for use of non-opioid medications and non-pharmacologic alternative treatments to opioids. California also implemented the MTUS Drug List, using the Special Fill provision to allow a four-day supply of appropriate opioids to treat acute, severe pain.[2] Nevada has adopted the ACOEM guidelines, including the drug formulary.

The ODG guidelines are another national-level guideline targeting the working-age population. The guidelines address a whole range of opioid treatments for different conditions of pain, with chronic pain treatment covered in the pain chapter and the acute pain recommendations included in different chapters by body part. The ODG guidelines also recommend non-opioid analgesics and NSAIDs before prescribing opioids, which may be prescribed for severe pain with the lowest daily dose at a three- to seven-day duration. For chronic pain, non-pharmacologic therapies and modalities are also recommended prior to opioid trials and/or after

[1] Non-opioid medications include NSAIDs, acetaminophen, topical agents, norepinephrine adrenergic reuptake blocking antidepressants or dual reuptake inhibitors; also antiepileptic medications particularly for neuropathic pain (Hegmann et al., 2014).

[2] The ACOEM Opioids Guideline does have guidance relating to the number of days of supply and dosage limits when opioids are prescribed.

tapering. ODG guideline recommendations on the daily dose follow a color-coded system that assigns the level of risk at each threshold (see Table TA.B1). Several state workers' compensation jurisdictions have adopted ODG guidelines, including Arizona, Kansas, Kentucky, New Mexico, Ohio, Oklahoma, Tennessee, and Texas.

A number of states established or updated their own guidelines to address alternative treatment to opioids. For example, the 2015 update of the Interagency Guideline on Prescribing Opioids for Pain developed by the Washington State Agency Medical Directors' Group (AMDG) in collaboration with an expert advisory panel, actively practicing providers, public stakeholders, and senior state officials, offers a comprehensive and balanced approach to pain management for prescribing opioids for acute, subacute, perioperative, and chronic pain. The guideline provides detailed recommendations for non-opioid and non-pharmacologic alternative treatment options to opioids, as first-line treatment options and for tapering opioids.[3]

The Pennsylvania Department of Health (DOH) published recommended safe prescribing guidelines for workers' compensation on July 16, 2018. The guidelines recommend a variety of non-opioid medication treatment options as well as physical and other supportive pain treatment modalities such as patient reassurance, music, physical therapy, chiropractic treatment, cognitive behavioral therapy, neuro-stimulators, massage, and acupuncture. These services are reimbursable with the presumption that all prescribed treatments are reasonable and necessary unless deemed otherwise by a utilization review.[4] For acute, subacute, and postoperative pain, the guidelines recommend the initial prescription of opioids not exceed a seven-day supply. For chronic pain, DOH's guidelines recommend the dosage not exceed 90 milligrams MED and recommend a prescription of naloxone for patients receiving an MED of more than 50 milligrams. Pennsylvania has opioid guidelines for pain treatment in an emergency setting (described below).

In January 2019, the Wisconsin Medical Examining Board published its own Opioid Prescribing Guideline, based on the CDC guidelines and other existing guides. The purpose of the guidelines is to help providers make informed decisions about acute, postoperative, and chronic (non-cancer) pain. The Wisconsin Medical Examining Board Opioid Prescribing Guideline is used by the licensing board for the two-hour mandatory CME on responsible opioid prescribing for license renewal.[5]

Several states also address opioid alternatives through utilization management and reimbursement rules. For example, North Carolina's Rules for the Utilization of Opioids, Related Prescriptions, and Pain Management in Workers' Compensation Claims encourage transition from opioids to non-opioid treatment at the earliest time, and non-pharmacologic modalities are preferred to opioids, including physical therapy, chiropractic services, acupuncture, massage, cognitive behavioral therapy, biofeedback, and functional restoration programs. Michigan's reimbursement rule for opioid treatment (which covers chronic, non-cancer pain beyond 90 days) recommends conservative care prior to prescribing opioids. In Minnesota, the administrative rules, covering acute and chronic pain treatment, allow treatment modalities including active and passive treatment modalities, injections, durable medical equipment, surgery, and chronic management as alternatives to opioid prescriptions.

There have been new guidelines addressing opioid prescribing and alternative treatment in an emergency setting. For example, Colorado ACEP (American College of Emergency Physicians) 2017 Opioid Prescribing

[3] The Washington opioid guidelines provide a set of specific recommendations for non-opioid medications and non-pharmacologic alternative treatment to opioids. The guidelines are available at http://www.agencymeddirectors.wa.gov/Files/2015AMDGOpioidGuideline.pdf.

[4] The Pennsylvania Workers' Compensation Act does not require providers to utilize a specific set of treatment or prescribing guidelines. The Act's Medical Cost Containment regulations do require utilization reviewers to cite "generally accepted treatment protocols and medical literature as appropriate" in their reports (34 Pa. Code, Section 127.472).

[5] See https://wi.cme.edu/CourseMaterial.aspx for more detail.

and Treatment Guidelines require the use of opioid alternatives and non-pharmacologic therapies as the first-line treatment, and opioids should be prescribed only after alternative treatments have failed. Pennsylvania published its guidelines for emergency physicians in 2018, stating that non-opioid options should be considered as first-line treatment for pain in an emergency setting, and discharge prescriptions for opioids should not exceed seven days of supply.

TECHNICAL APPENDIX C:

SENSITIVITY ANALYSIS

In this appendix, we discuss several issues that might affect the results of the interstate comparisons. We focus on four main issues: (1) the large interstate variation in workers receiving prescriptions paid under workers' compensation, (2) the difference in injury severity and case mix across states and how it may be potentially affected by the selection of nonsurgical cases with seven days of lost time that received opioids, (3) the difference in the proportion of outlier cases and heavy users of opioids across states and its impact on overall utilization of opioids, and (4) the impact of different claim maturities on the interstate comparisons of the utilization of opioids. Based on our analysis, we conclude that these potential issues are unlikely to be significant enough to change how the states were characterized in terms of higher, lower, or typical in the utilization of opioids.

CAPTURING PRESCRIPTIONS FILLED BY INJURED WORKERS

There was substantial variation across states in the percentage of nonsurgical claims with more than seven days of lost time that had at least one prescription paid by a workers' compensation payor, as shown in Table 2.2. It is not surprising that prescribing practices vary from state to state. We see large variations in other types of medical practice patterns (e.g., surgery rates, use of diagnostics, and frequency of pain management) as identified in WCRI's CompScope™ Medical Benchmarks. However, we expected that most cases in which the worker lost more than seven days from work would be sufficiently serious to warrant a prescription, and yet a number of them did not have prescriptions in our data. Here we discuss two questions: (1) what explains the variance from expectations? and (2) how does the variation in this measure affect the interstate comparisons on opioid utilization presented in this study?

Conceivably, when most people take a prescription to their "regular" pharmacy, they might not often be asked if the prescription should be billed under workers' compensation. As a result, it would not be surprising that some claims that have prescriptions do not have any prescriptions paid for by the workers' compensation payor. This is consistent with findings from a couple of studies. For example, Stapleton (2001) examined the pharmacy data shortly after New York State implemented their ONCECARD Rx workers' compensation pharmacy benefit program. The program allows state government employees to fill prescriptions for work-related injuries through the same system used for their health insurance coverage.[1] By combining the records of the state fund and the group health insurers' interviews with workers, the study found that 21 percent of all drug expenditures for those injured workers were paid by the state fund, 69 percent by health insurers, and 9 percent by the worker without reimbursement. In another study, Durand et al., (2019) examined opioid utilization among Tennessee injured workers using data from the state prescription drug monitoring program, which would include all opioid prescriptions filled by the injured worker. They found that a majority of workers (65 percent) used group health insurance to pay for opioid prescriptions that were dispensed in the six months after injury, 20 percent used workers' compensation insurance, and another 20 percent of workers made cash

[1] The New York State Insurance Fund provides health insurance for all New York State government employees and also covers the workers' compensation claims of state employees through self-insurance.

payments. If payments by non-workers' compensation payors explains some of the variation, we expect this phenomenon to be more common in states with a higher percentage of the population covered by health insurance. In fact, we found that states with higher health insurance coverage were often (but not always) states that had a lower percentage of cases with prescriptions in the workers' compensation data (see Table TA.C1).

Two other factors might contribute to the large variation in the percentage of claims with prescriptions in our data, but are unlikely to have a significant impact. First, some workers may have paid out of pocket and received reimbursements for the drug expenses. We do have reimbursed drug transactions in our data from a number of data sources, but not all. Second, the prevalence of medical providers without prescribing authority may vary across states—but both are unlikely to be major factors in explaining the substantial interstate variations in receipt of prescriptions, as discussed in more detail in Wang and Liu (2011).

Table TA.C1 Health Insurance Coverage among Employed Workers by State

	Health Insurance Coverage[a]					% of Claims That Had a Prescription				
	2012	2013	2014	2015	2016	2012/2014	2013/2015	2014/2016	2015/2017	2016/2018
Arkansas	80%	81%	85%	89%	90%	60%	53%	56%	50%	47%
California	79%	80%	85%	89%	91%	73%	70%	67%	63%	60%
Connecticut	89%	89%	92%	93%	94%	47%	48%	47%	44%	41%
Delaware	89%	88%	91%	94%	93%	48%	52%	46%	45%	45%
Florida	76%	75%	80%	84%	85%	71%	70%	70%	67%	65%
Georgia	80%	79%	82%	85%	85%	66%	65%	62%	60%	61%
Iowa	90%	90%	93%	95%	95%	49%	48%	46%	44%	42%
Illinois	85%	86%	89%	92%	92%	51%	49%	47%	45%	43%
Indiana	83%	84%	87%	89%	91%	61%	60%	58%	55%	51%
Kansas	86%	86%	88%	90%	91%	54%	53%	52%	50%	48%
Kentucky	85%	84%	89%	93%	94%	55%	52%	47%	46%	43%
Louisiana	79%	79%	82%	86%	88%	56%	54%	53%	50%	48%
Massachusetts	96%	96%	96%	97%	97%	28%	28%	26%	23%	21%
Maryland	88%	88%	91%	93%	93%	54%	53%	50%	47%	45%
Michigan	86%	86%	90%	93%	93%	53%	52%	53%	51%	48%
Minnesota	91%	91%	93%	95%	95%	40%	38%	35%	33%	34%
Missouri	84%	86%	88%	89%	90%	52%	52%	50%	48%	46%
North Carolina	81%	82%	85%	87%	88%	55%	53%	50%	49%	45%
New Jersey	85%	85%	87%	89%	90%	45%	44%	43%	42%	41%
Nevada	78%	79%	83%	86%	87%	66%	66%	63%	60%	61%
New York	87%	87%	89%	91%	93%	36%	36%	34%	32%	28%
Pennsylvania	89%	89%	90%	93%	94%	58%	57%	56%	51%	49%
South Carolina	81%	82%	84%	88%	88%	52%	49%	49%	47%	45%
Tennessee	84%	83%	86%	88%	89%	63%	60%	61%	57%	51%
Texas	74%	75%	78%	81%	81%	67%	65%	63%	60%	59%
Virginia	86%	86%	88%	90%	90%	49%	48%	51%	46%	46%
Wisconsin	90%	90%	92%	93%	94%	40%	38%	38%	36%	36%
Correlation with health insurance coverage						-0.82	-0.79	-0.78	-0.75	-0.76

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for other years.

[a] Showing the percentage of respondents with specified health insurance coverage. The sample is limited to civilian employed respondents who were at work. Source: Author's own estimates from the American Community Survey.

Overall, it is very likely that some of prescriptions filled by injured workers were paid by non-workers' compensation payors and the proportion of such prescriptions varies by state. Since we do not have data on those prescriptions paid by non-workers' compensation payors, we do not know if the frequency of opioid prescriptions is similar to what we observe based on the prescriptions paid under workers' compensation. As a result, we measured the frequency of opioid dispensing as the percentage of claims receiving opioid prescriptions under workers' compensation. This is important to note for the reader who is interested in extrapolating the data we report. One can compute the percentage of claims receiving opioids by multiplying the percentage of claims with prescriptions that had opioids and the percentage of claims with prescriptions. However, the computation bears an important assumption that no opioid prescriptions were paid by non-workers' compensation payors, which is unlikely to be true, especially for states with a lower percentage of claims with prescriptions. Another scenario could be that the likelihood that the prescription is for an opioid is similar for prescriptions paid by workers' compensation and non-workers' compensation payors. If true, the percentage of claims with prescriptions that received opioids would provide an unbiased estimate of the frequency of claims receiving opioids. Nonetheless, we tested the magnitude of this bias and concluded that the measure we reported was unlikely to distort how states are characterized in this analysis as low, medium, or high. Previous WCRI studies on prescription utilization found that the states with the lowest percentage of claims with prescriptions have the longest time from injury to the first prescription paid by workers' compensation (Wang and Liu, 2011). Therefore, to test the bias, we assumed that the rate of filling opioid prescriptions among claims without prescriptions was similar to the rate among claims with one prescription because we are more likely to not capture initial prescriptions. Similar findings were observed when we set the rate of opioid fills to the rate among claims with one or two prescriptions.

Examining trends based on nonsurgical cases with more than seven days of lost time that received prescriptions is also unlikely to be misleading; in fact, we may be understating the decreasing trend in opioid dispensing. Over the study period, we observed decreases in the percentage of claims receiving prescriptions paid under workers' compensation in many states, and they are more likely to be initial prescriptions. This may imply that workers who receive prescriptions paid under workers' compensation might have relatively more serious injuries in later study years compared with those injured at the beginning of the study period. If true, we might be underestimating the decreases in the frequency of opioid dispensing. Even if we had all the initial prescriptions, there are less likely to be opioids in later study years because of the shift in prescribing behavior, which might also result in larger reductions than observed. Nonetheless, the reader should keep this in mind when interpreting the results. At a minimum, the benchmark metrics in this study should be thought of as measuring trend and interstate differences in the utilization of opioids paid under workers' compensation.

Injury Severity, Case Mix, and Selection of Nonsurgical Cases with Opioids

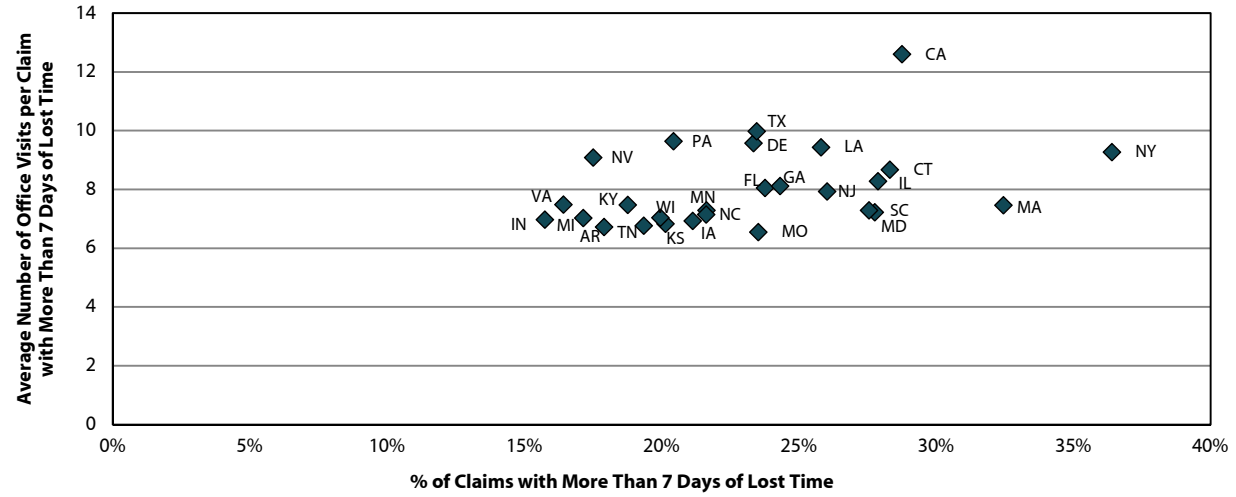
In this study, we examined the utilization of opioids based on nonsurgical cases with more than seven days of lost time that received prescriptions and opioids paid under workers' compensation. This subset of cases was selected based on three variables that are reflective of the differences across the states in terms of claim types and how medical services were provided. Here, we discuss potential endogenous issues related to these three variables and the results of our sensitivity analysis.

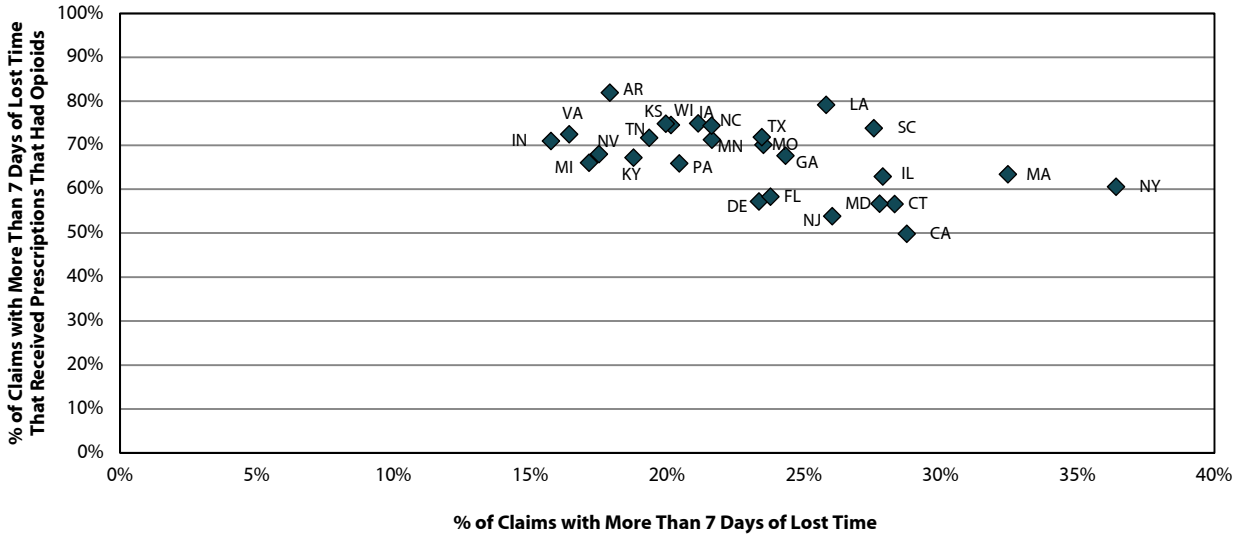
First, we chose to focus on the selection of claims with more than seven days of lost time for this study. Since the percentage of claims that had more than seven days of lost time varied across the states, one may be concerned that the injury severity and case mix of the subset of data with more than seven days of lost time could be very different across the states. Conceivably, a state with a lower percentage of claims with more than

seven days of lost time may have proportionally more severe claims than another state where the percentage was higher. If this was the case, the selection would make interstate comparisons less meaningful. However, previous WCRI studies concluded that differences across states in injury severity and case mix among claims with more than seven days of lost time were not large enough to affect the comparative results materially.[2] We also looked at the use of opioids to see how it was correlated with the percentage of claims with more than seven days of lost time and did not find strong evidence suggesting that it should be a concern (Figure TA.C1).

[2] For example, a WCRI study based on survey data of worker outcomes reported that the injury severity for injured workers with more than seven days of lost time was similar among the 11 states surveyed (Savych and Thumula, 2016). The WCRI CompScope™ multistate benchmarks adjusted for differences in the mix of cases and other factors across the states and assessed the impact of the case-mix adjustment (Dolinschi and Rothkin, 2016). That study found that the difference in the mix of cases across states had only a small impact on the results—not large enough to change how the states were characterized as higher, lower, or typical.

Figure TA.C1 Assessing Potential Bias of Selecting Claims with More Than 7 Days of Lost Time

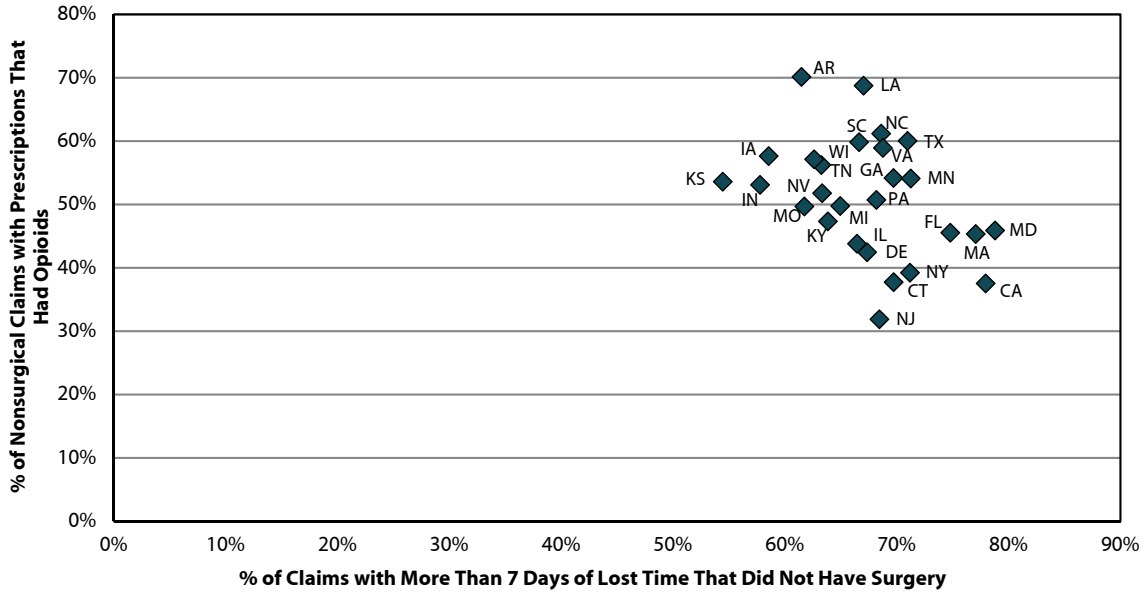




Note: The underlying data include claims with more than seven days of lost time that had injuries occurring from October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

Second, because postoperative opioid use is very different from the opioid use among nonsurgical cases, we chose to use nonsurgical cases as the base to make the interstate comparisons more meaningful. However, a potential concern may be that since surgery rates varied widely across the states (Yee, Pizer, and Fomenko, 2015), the nonsurgical criterion might result in a higher proportion of more severe cases for the states with lower surgery rates, and vice versa. We looked at the percentage of cases that did not have surgery and how it was correlated with the percentage of cases with prescriptions that received opioids. Figure TA.C2 shows a somewhat negative relationship between the percentage of claims with more than seven days of lost time that did not have surgery and the percentage of these claims with prescriptions that had opioids. This negative relationship, if existent, is likely to reinforce the results of the interstate comparisons. For example, the surgery rates were much lower in Maryland and higher in Kansas, which may suggest that the nonsurgical claims in Maryland included in the analysis were somewhat more severe compared with those in Kansas. In the presence of a strong selection effect, the percentage of claims with opioids in Maryland would be higher than that in Kansas, which is the opposite of what we see. Had we included more comparable nonsurgical claims for these two states, we would have seen fewer claims in Maryland receiving opioids than we observed.

Figure TA.C2 Assessing Potential Bias of Selecting Nonsurgical Claims with More Than 7 Days of Lost Time

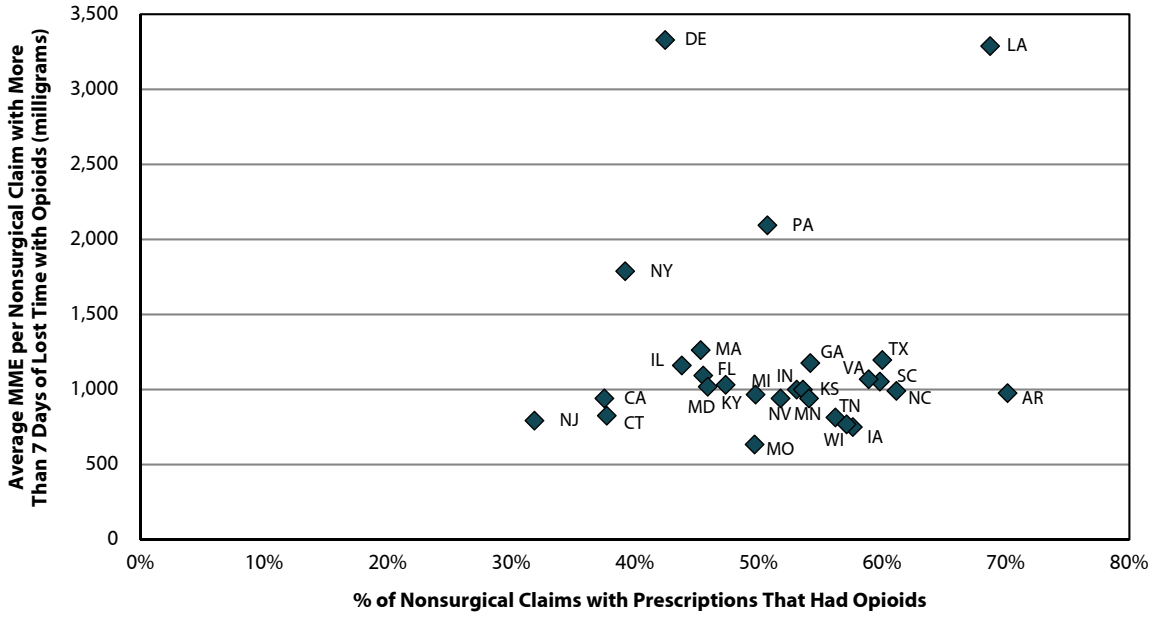


Note: The underlying data include nonsurgical claims with more than seven days of lost time that had injuries occurring from October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

Third, we examined the interstate variations in the average amount of opioids per claim among nonsurgical claims that received opioids. Since injured workers with pain can be treated in various ways, depending on the treating physician's diagnosis and choice of treatments, including using prescription non-opioid pain medications, a potential concern could be that different physicians may have different thresholds of prescribing opioids. For example, for the same injured worker with a pain score of 7 on a scale of 1 to 10, a physician in State A may not think that the pain would be severe enough to warrant the use of opioids, while a physician in State B may well prescribe opioids for pain relief. If this reflects the practice norms in the two states, on average, cases with opioids in State A would be more severe than cases in State B, due to physicians' selection.

Considerable variation across the states in the percentage of cases with prescriptions that received opioids may raise a concern about the comparability of the states' results. However, we did not see a strong correlation between the per-claim utilization and the percentage of nonsurgical cases with prescriptions that received opioids (Figure TA.C3).

Figure TA.C3 Assessing Potential Bias of Selecting Nonsurgical Claims with Opioids



Note: The underlying data include nonsurgical claims with more than seven days of lost time that had injuries occurring from October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

Key: MME: morphine milligram equivalent amount.

The findings from these sensitivity tests suggest that the interstate variations based on nonsurgical cases with more than seven days of lost time that received opioids were unlikely to distort the characterization of a state as higher, in the middle, or lower in terms of the average amount of opioids dispensed to injured workers.

To further ensure that the unadjusted metrics underlying the interstate comparisons in the main body of the report are meaningful and are not driven by differences in case mix, we estimated the utilization metrics while controlling for the differences in the worker's age, gender, and marital status; the type of injury the worker sustained; and the type of industry in which the injured worker was employed. We used logistic regression analyses to compare the categorical utilization measures (e.g., likelihood of an injured worker receiving opioids), and ordinary least squares (OLS) linear regression analyses were used to compare continuous utilization measures (e.g., average MME per claim). Tables TA.C2 and TA.C3 present estimated odds ratios from the logistic regressions for the likelihood of injured workers receiving at least one opioid and two or more opioids. Table TA.C4 presents coefficient estimates from OLS linear regressions for the average MME per claim measure. Table TA.C5 shows the case-mix adjusted and unadjusted values for a select set of measures highlighted in this report to illustrate that the two sets of measures are largely consistent. Adjusting for case mix had little impact on the frequency of opioid use measures except the percentage of claims with prescriptions that had two or more opioid prescriptions in Louisiana. The unadjusted percentage was 48 percent. Case-mix

adjustment reduced the percentage to 41 percent. However, Louisiana remained the highest state. Adjusting for case mix slightly reduced the range of the average amount of opioids per claim across states, but large interstate variations persisted. In general, the characterization of a state as higher, in the middle, or lower remains unchanged, with few exceptions. The average amount of opioids per claim in Massachusetts and Illinois was higher than that in the median state before case-mix adjustment. They became closer to the middle after adjusting for case mix.

Table TA.C2 Odds Ratios from Logistic Regressions Estimating the Likelihood of an Injured Worker with Prescriptions Receiving Opioids

	% of Claims with Prescriptions That Had Opioids	
	Odds Ratio	**Standard Error**
Observations	107,744	
State fixed effect		
Arkansas	2.136***	-0.269
California	0.543***	-0.034
Connecticut	0.541***	-0.042
Delaware	0.653***	-0.083
Florida	0.757***	-0.050
Georgia	1.100	-0.077
Illinois	0.711***	-0.049
Indiana	1.013	-0.080
Iowa	1.193**	-0.105
Kansas	1.017	-0.093
Kentucky	0.782***	-0.066
Louisiana	1.867***	-0.163
Maryland	0.825**	-0.062
Massachusetts	0.698***	-0.055
Michigan	0.897	-0.068
Minnesota	1.052	-0.084
Missouri	0.906	-0.070
Nevada (base)		
New Jersey	0.407***	-0.029
New York	0.522***	-0.036
North Carolina	1.439***	-0.105
Pennsylvania	0.911	-0.062
South Carolina	1.360***	-0.107
Tennessee	1.152*	-0.087
Texas	1.369***	-0.089
Virginia	1.314***	-0.104
Wisconsin	1.147*	-0.091
Age group		
Age under 24	0.810***	-0.021
Age 25 to 39 (base)		
Age 40 to 54	1.105***	-0.017
Age 55 to 60	1.106***	-0.025
Age over 60	1.069***	-0.025
Age is missing	0.954	-0.205
Gender		
Female (base)		
Male	1.015	-0.014
Gender is missing	0.872	-0.082
Marital status		
Married	1.021	-0.015
Single, separated, divorced (base)		
Marital status is missing	1.011	-0.020
Industry type		
Construction	1.200***	-0.034
Manufacturing (base)		
Clerical and professional	0.870***	-0.027
Trade	0.938***	-0.021
High-risk services	0.819***	-0.017
Low-risk services	0.845***	-0.021
Other industries	0.762***	-0.021
Industry is missing	0.753***	-0.075
Injury type		
Neurologic spine pain	0.708***	-0.023
Back and neck sprains, strains, and non-specific pain	0.334***	-0.010
Fractures (base)		
Lacerations and contusions	0.352***	-0.012
Inflammations	0.445***	-0.017
Other sprains and strains	0.330***	-0.010
Upper extremity neurologic (carpal tunnel)	0.705***	-0.058
Other injuries	0.429***	-0.014

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring from October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

* Statistically significant at the 0.1 level; ** statistically significant at the 0.5 level; *** statistically significant at the 0.01 level.

Table TA.C3 Odds Ratios from Logistic Regressions Estimating the Likelihood of an Injured Worker with Prescriptions Receiving Two or More Opioids

	% of Claims with Prescriptions That Had 2 or More Opioid Prescriptions	
	Odds Ratio	**Standard Error**
Observations	107,744	
State fixed effect		
Arkansas	1.768***	-0.212
California	0.645***	-0.038
Connecticut	0.513***	-0.043
Delaware	0.866	-0.120
Florida	0.902*	-0.056
Georgia	1.209***	-0.081
Illinois	0.860**	-0.057
Indiana	1.148*	-0.090
Iowa	1.131	-0.101
Kansas	1.207**	-0.114
Kentucky	0.943	-0.082
Louisiana	2.421***	-0.195
Maryland	0.791***	-0.061
Massachusetts	0.753***	-0.061
Michigan	1.010	-0.076
Minnesota (base)		
Missouri	0.913	-0.071
Nevada	1.015	-0.093
New Jersey	0.414***	-0.030
New York	0.540***	-0.036
North Carolina	1.467***	-0.102
Pennsylvania	1.096	-0.071
South Carolina	1.259***	-0.097
Tennessee	1.213***	-0.089
Texas	1.429***	-0.086
Virginia	1.171**	-0.091
Wisconsin	1.081	-0.085
Age group		
Age under 24	0.644***	-0.022
Age 25 to 39 (base)		
Age 40 to 54	1.160***	-0.021
Age 55 to 60	1.129***	-0.029
Age over 60	1.082***	-0.030
Age is missing	1.434	-0.337
Gender		
Female (base)		
Male	0.994	-0.016
Gender is missing	0.719***	-0.088
Marital status		
Married	0.978	-0.017
Single, separated, divorced (base)		
Marital status is missing	0.970	-0.023
Industry type		
Construction	1.291***	-0.041
Manufacturing (base)		
Clerical and professional	0.901***	-0.032
Trade	0.956*	-0.025
High-risk services	0.875***	-0.022
Low-risk services	0.869***	-0.025
Other industries	0.733***	-0.024
Industry is missing	0.806*	-0.099
Injury type		
Neurologic spine pain	1.669***	-0.054
Back and neck sprains, strains, and non-specific pain	0.659***	-0.021
Fractures (base)		
Lacerations and contusions	0.469***	-0.018
Inflammations	0.662***	-0.027
Other sprains and strains	0.549***	-0.018
Upper extremity neurologic (carpal tunnel)	0.844*	-0.080
Other injuries	0.687***	-0.023

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring from October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

* Statistically significant at the 0.1 level; ** statistically significant at the 0.5 level; *** statistically significant at the 0.01 level.

Table TA.C4 Estimates from OLS Regressions for MME per Claim

	MME per Claim with Opioids in Milligrams	
	Estimate	**Standard Error**
Observations	48,844	
State fixed effect		
Arkansas	-148.852	-188.147
California	-252.405**	-111.265
Connecticut	-440.291***	-136.396
Delaware	1,980.306***	-542.640
Florida	-63.822	-116.449
Georgia	-5.189	-125.471
Illinois	-59.434	-122.202
Indiana	-58.075	-154.303
Iowa	-344.917***	-124.471
Kansas (base)		
Kentucky	-101.650	-133.350
Louisiana	1,945.587***	-228.973
Maryland	-131.146	-140.154
Massachusetts	-16.013	-175.219
Michigan	-124.312	-127.698
Minnesota	-181.975	-158.927
Missouri	-449.707***	-119.080
Nevada	-218.085	-147.900
New Jersey	-453.507***	-133.525
New York	362.965**	-156.835
North Carolina	-94.328	-137.408
Pennsylvania	868.592***	-156.691
South Carolina	-95.660	-150.421
Tennessee	-251.006**	-121.402
Texas	78.637	-113.934
Virginia	-74.890	-145.235
Wisconsin	-343.168***	-127.504
Age group		
Age under 24	-320.442***	-47.575
Age 25 to 39 (base)		
Age 40 to 54	207.499***	-36.087
Age 55 to 60	153.919***	-50.966
Age over 60	53.086	-48.692
Age is missing	-458.888***	-125.225
Gender		
Female (base)		
Male	152.818***	-30.501
Gender is missing	136.095	-269.667
Marital status		
Married	-85.104***	-31.830
Single, separated, divorced (base)		
Marital status is missing	-42.068	-53.153
Industry type		
Construction	395.092***	-77.940
Manufacturing (base)		
Clerical and professional	0.983	-70.495
Trade	-57.599	-48.923
High-risk services	-67.993	-46.514
Low-risk services	-1.850	-57.688
Other industries	-108.722*	-59.060
Industry is missing	506.270	-409.746
Injury type		
Neurologic spine pain	1,551.509***	-59.819
Back and neck sprains, strains, and non-specific pain	599.525***	-44.104
Fractures (base)		
Lacerations and contusions	-27.624	-46.888
Inflammations	232.264***	-56.132
Other sprains and strains	106.688***	-34.144
Upper extremity neurologic (carpal tunnel)	187.303**	-76.911
Other injuries	288.124***	-41.582
Constant	551.034***	-119.742

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had opioid prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring from October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

* Statistically significant at the 0.1 level; ** statistically significant at the 0.5 level; *** statistically significant at the 0.01 level.

Key: MME: morphine milligram equivalent amount; OLS: ordinary least squares.

Table TA.C5 Unadjusted and Case-Mix Adjusted Frequency and Amount of Opioid Utilization, Interstate Comparisons for 2016/2018

	NJ	CA	CT	NY	DE	IL	MA	FL	MD	KY	MO	MI	PA	NV	IN	KS	MN	GA	TN	WI	IA	VA	SC	TX	NC	LA	AR
% of claims with Rx that had opioids																											
Unadjusted	32%	38%	38%	39%	42%	44%	45%	46%	46%	47%	50%	50%	51%	52%	53%	54%	54%	54%	56%	57%	58%	59%	60%	60%	61%	69%	70%
Case-mix adjusted	31%	38%	38%	37%	42%	44%	44%	46%	48%	46%	50%	50%	50%	52%	52%	52%	53%	54%	55%	55%	56%	58%	59%	59%	60%	67%	70%

	NJ	CT	CA	NY	MD	MA	IL	MO	FL	DE	KY	MI	NV	MN	IN	WI	IA	PA	KS	TN	VA	GA	SC	TX	NC	AR	LA
% of claims with Rx that had 2 or more opioid prescriptions																											
Unadjusted	13%	16%	18%	19%	20%	23%	23%	23%	23%	24%	25%	25%	25%	26%	27%	28%	28%	28%	29%	29%	29%	29%	30%	32%	33%	37%	48%
Case-mix adjusted	11%	15%	19%	16%	22%	21%	24%	25%	24%	24%	25%	26%	26%	26%	28%	27%	28%	28%	29%	29%	29%	29%	30%	32%	33%	36%	41%

Among claims that had opioids

	MO	IA	WI	NJ	TN	CT	MN	CA	NV	MI	AR	NC	IN	KS	MD	KY	SC	VA	FL	IL	GA	TX	MA	NY	PA	LA	DE
Average MME per claim with opioids in milligrams																											
Unadjusted	633	749	767	792	814	825	940	940	940	966	976	991	999	999	1,018	1,031	1,052	1,068	1,093	1,159	1,176	1,196	1,262	1,788	2,094	3,287	3,328
Case-mix adjusted	549	654	656	545	748	559	817	747	781	875	850	905	941	999	868	897	903	924	935	940	994	1,078	983	1,362	1,868	2,945	2,979

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring from October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

Key: MME: morphine milligram equivalent amount; Rx: prescriptions.

SENSITIVITY OF AMOUNT OF OPIOIDS PER CLAIM MEASURE

Some of the initial results on interstate variations were surprising. For example, the average MME of opioids per claim was surprisingly high in several states. Since we compared the mean values of the measure, one concern may be that the amounts of opioids received per claim may be influenced by claims with unusually high amounts of opioids. If there were more such cases in some states than in others, the results of interstate comparisons would be skewed and misleading. Similarly, if the proportion of such cases was different across years, the trend results would fluctuate unnecessarily. To address this concern, we did three things.

CLAIMS WITH UNUSUALLY HIGHER AMOUNTS OF OPIOIDS

First, we identified the claims in which the MME of opioids was unusually high and excluded these claims from the data used for the interstate comparison and trend analyses for the use of opioids. Note that we revised the approach to determining the maximum amount of opioids used to identify claims with unusually high amounts of opioids that was used in the first edition of the study (Wang, Mueller, and Hashimoto, 2011). Instead of using a fixed duration, we estimated the maximum amount of opioids based on the duration of opioids received by individual claims from the date of the first to the date of the last opioid prescription, plus a 30-day supply for the last prescription. The MME of opioids was considered unusually high for a claim if the estimated daily dosage (i.e., the total amount of MME opioids received by the claim divided by the duration of receiving opioid prescriptions) for the claim exceeded 120 milligrams of morphine equivalents per day for the duration of opioid use.[3] As a result, we excluded less than 1 percent of the claims with opioids in all states. We report the mean values of the amount of opioids per claim and other utilization measures that would be skewed by extreme values after this exclusion. When we report claim frequency such as the percentage of claims with prescriptions that had opioids and prescription frequency such as the percentage of pain medications that had hydrocodone-acetaminophen, claims with extreme values are included because these claims are usually legitimate. Extreme values are not due to data entry errors or other data anomalies, in general. They are usually due to injured workers receiving a higher-than-typical number of Schedule II opioid prescriptions, such as oxycodone (OxyContin®) and fentanyl patches (Duragesic®), at high doses. Even though injured workers with extreme values accounted for less than 1 percent of all claims with opioids, they accounted for 0.3–2.1 percent of all opioid prescriptions and 5–15 percent of total MME doses dispensed in Florida, Massachusetts, New York, and Pennsylvania. Extreme-value claims accounted for 0.1–0.6 percent of opioid prescriptions and about 1–4 percent of MME doses dispensed in California, Georgia, North Carolina, and Texas. No injured workers had extreme values of opioids in all other states. Half of the claims with extreme values of MME were neurologic spine pain cases, and a majority of the other half were for sprains and strains.

With the extreme value claims included, the amount of opioids per claim would be considerably higher than reported, especially in the states with higher MME amounts per claim, such as New York. We chose to report data with the exclusion to make the trend results more meaningful. Since the comparative results are consistent in the data with and without those extreme-value claims, we report the results of interstate comparisons using the same set of measures for simplicity. The results on the amount of opioids per claim before and after the exclusion are presented in Table TA.C6. This should not be interpreted as the number of claims with more than a 120-milligram morphine equivalent dose per day because we did not compute the duration by adding the days of supply. Instead, we computed duration of opioid use as (last opioid fill date –

[3] The 120-milligram threshold is the maximum daily dosage typically recommended by guidelines (e.g., Oregon guidelines for prescribing opioids [Oregon Health and Science University, 2006]).

first opioid fill date) + 30, which underestimates the average morphine equivalent dose per day.

Table TA.C6 MME per Claim before and after Excluding Claims with Extreme Values, 2016/2018

State	Average MME per Claim with Opioids (milligrams)		% of Claims with Opioids That Received Unusually High Amounts of Opioids
	Before Excluding Claims with Extreme Values	After Excluding Claims with Extreme Values	
Arkansas	976	976	0.0%
California	956	940	0.0%
Connecticut	825	825	0.0%
Delaware	3,328	3,328	0.0%
Florida	1,147	1,093	0.0%
Georgia	1,216	1,176	0.0%
Illinois	1,159	1,159	0.0%
Indiana	999	999	0.0%
Iowa	749	749	0.0%
Kansas	999	999	0.0%
Kentucky	1,031	1,031	0.0%
Louisiana	3,287	3,287	0.0%
Maryland	1,018	1,018	0.0%
Massachusetts	1,388	1,262	0.3%
Michigan	966	966	0.0%
Minnesota	940	940	0.0%
Missouri	633	633	0.0%
Nevada	940	940	0.0%
New Jersey	792	792	0.0%
New York	2,096	1,788	0.6%
North Carolina	1,027	991	0.1%
Pennsylvania	2,262	2,094	0.2%
South Carolina	1,052	1,052	0.0%
Tennessee	814	814	0.0%
Texas	1,212	1,196	0.0%
Virginia	1,068	1,068	0.0%
Wisconsin	767	767	0.0%

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

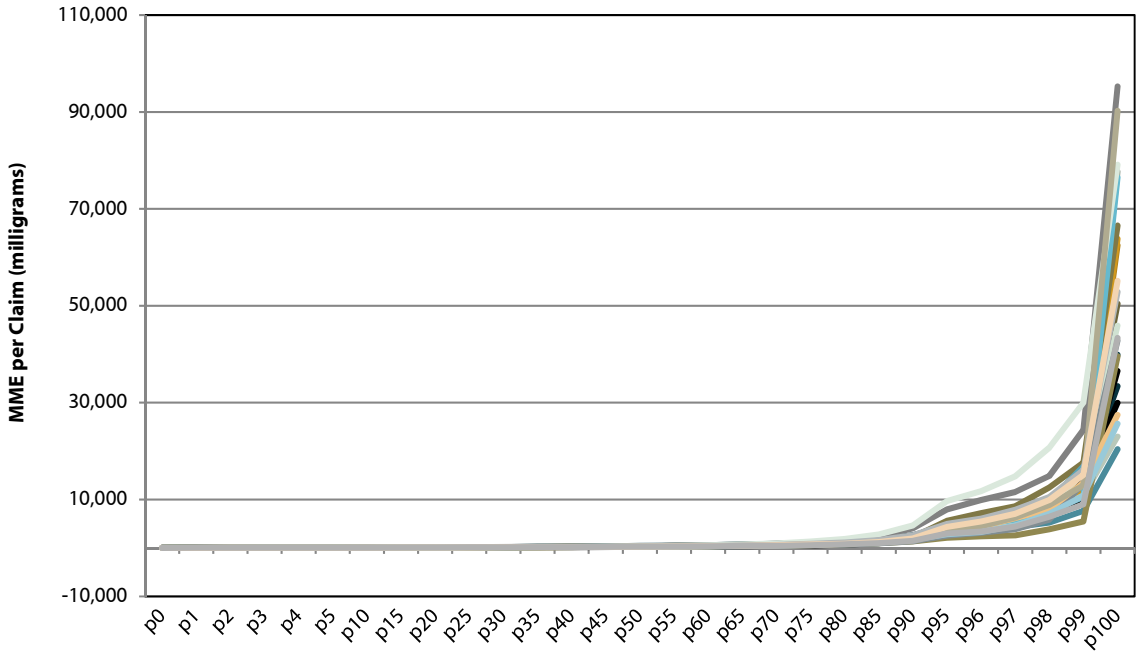
Key: MME: morphine milligram equivalent amount.

CLAIMS WITH MORPHINE MILLIGRAM EQUIVALENT AMOUNT GREATER THAN 2,500 MILLIGRAMS

Second, we report an additional measure—the percentage of claims with MME amounts per claim greater than 2,500 milligrams (for example, one 5-milligram pill of Vicodin® every six hours for four months continuously). Claims with MME amounts greater than 2,500 milligrams represent the top 5 percent of claims with opioids in most study states (Figure TA.C4). In Missouri, fewer than 5 percent of claims had opioids beyond 2,500 milligrams. Several states had proportionally more claims in this category, including Delaware, Louisiana, New

York, and Pennsylvania. The claims with amounts of opioids greater than 2,500 milligrams of morphine equivalents accounted for 15–70 percent of opioid prescriptions and 34–90 percent of total morphine equivalent amounts across the 27 study states.

Figure TA.C4 Percentile Distribution of MME per Claim across 27 Study States, 2016/2018



Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

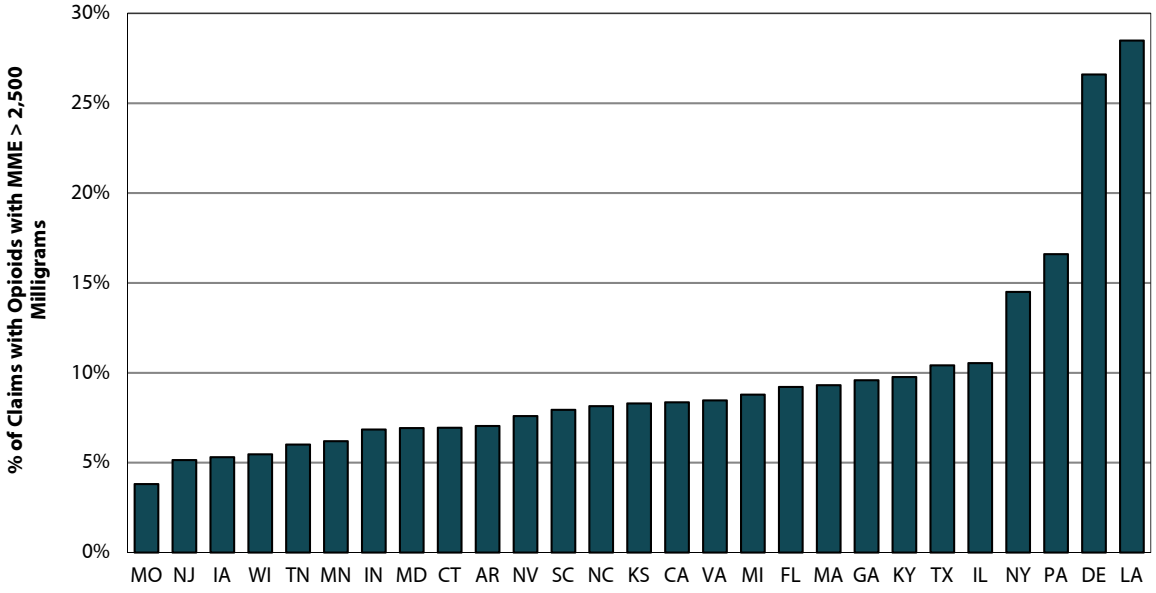
Each line corresponds to a state.

Key: MME: morphine milligram equivalent amount; p: percentile.

We also tried to determine whether the injured workers in the upper tail of the distribution were short-term opioid users or injured workers with ongoing opioid use. We observed that claimants with MME amounts per claim greater than 2,500 milligrams were less likely to be acute (opioid use ending within six weeks of injury) or subacute (opioid use ending between six weeks and three months of injury) pain cases. A closer analysis of opioid utilization among claims with opioid use greater than 2,500 milligrams revealed that less than 1 percent to 7 percent of cases were acute pain cases and 1 to 17 percent of cases were subacute pain cases across the states.

Figure TA.C5 presents the interstate comparison of states using the percentage of claims with MME amounts greater than 2,500 milligrams, and Table TA.C7 compares the state trends using changes in the average MME per claim (reported throughout this report) and changes in the new measure. We found that the interstate comparison of states and results for the state trends using this measure were almost always consistent with the major findings reported using the average MME per claim measure.

Figure TA.C5 Percentage of Claims with Opioids with MME Greater Than 2,500 Milligrams,[a] 2016/2018



Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

[a] Reported are the mean values of MME per claim with opioids after excluding a small percentage of claims that had unusually high amounts of opioids. See Chapter 2 for a description of how we identify claims with unusually high amounts of opioids.

Key: MME: morphine milligram equivalent amount.

Table TA.C7 Association between MME per Claim and Percentage of Claims with MME Greater Than 2,500 Milligrams, 2012/2014–2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI
Among claims that had opioids																											
Average MME for opioids per claim in milligrams (mean)																											
2012/2014	1,483	1,941	1,641	2,972	1,413	1,856	1,293	1,468	1,266	1,174	2,081	3,652	1,891	1,808	1,381	1,502	1,008	1,755	1,143	1,370	3,443	2,733	1,892	1,476	1,696	1,662	1,358
2013/2015	1,311	1,691	1,375	3,749	1,269	1,554	1,119	1,492	1,255	1,203	1,756	3,652	2,019	1,513	1,194	1,266	797	1,727	1,077	1,354	2,534	2,687	1,833	1,216	1,573	1,489	1,272
2014/2016	1,257	1,368	1,459	3,824	1,250	1,330	976	1,453	1,113	1,327	1,613	3,235	1,873	1,366	1,199	1,307	764	1,541	939	1,239	2,398	2,583	1,601	904	1,437	1,408	1,076
2015/2017	1,106	1,160	1,380	3,025	1,291	1,388	927	1,446	1,021	1,074	1,568	3,303	1,491	1,242	1,348	1,191	784	1,491	905	1,155	2,080	2,148	1,400	974	1,439	1,333	1,041
2016/2018	976	940	825	3,328	1,093	1,176	749	1,159	999	999	1,031	3,287	1,262	1,018	966	940	633	991	792	940	1,788	2,094	1,052	814	1,196	1,068	767
% change from 2012/2014 to 2016/2018	-34%	-52%	-50%	12%	-23%	-37%	-42%	-21%	-21%	-15%	-50%	-10%	-33%	-44%	-30%	-37%	-37%	-44%	-31%	-31%	-48%	-23%	-44%	-45%	-30%	-36%	-44%
% of claims with MME > 2,500 milligrams																											
2012/2014	12%	17%	12%	18%	11%	14%	10%	13%	12%	9%	18%	30%	15%	13%	12%	11%	8%	14%	9%	12%	23%	19%	15%	12%	14%	14%	11%
2013/2015	9%	16%	12%	26%	11%	14%	8%	12%	11%	10%	16%	29%	15%	11%	10%	9%	7%	13%	7%	14%	18%	19%	15%	9%	13%	11%	10%
2014/2016	12%	13%	11%	24%	10%	13%	7%	13%	9%	11%	14%	26%	13%	11%	10%	10%	5%	12%	7%	11%	18%	18%	12%	7%	12%	11%	9%
2015/2017	8%	10%	11%	22%	11%	12%	7%	13%	9%	9%	14%	31%	10%	10%	10%	9%	6%	12%	7%	9%	16%	17%	12%	7%	12%	9%	8%
2016/2018	7%	8%	7%	27%	9%	10%	5%	11%	7%	8%	10%	28%	9%	7%	9%	6%	4%	8%	5%	8%	14%	17%	8%	6%	10%	8%	5%
% point change from 2012/2014 to 2016/2018	-5	-9	-5	8	-2	-4	-4	-2	-5	-1	-9	-2	-6	-6	-3	-4	-4	-6	-4	-4	-9	-2	-7	-6	-4	-5	-5

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018. Similar notation is used for other years. Percentage point changes shown may not agree with reported percentages due to rounding.

Key: MME: morphine milligram equivalent amount.

MORPHINE EQUIVALENT AMOUNT PER CLAIM AT SELECTED PERCENTILES

Third, we examined the comparative results for the amount of opioids per claim at the median and other selected percentiles higher than the median for the amount of opioids per claim. We found that the results for most states were consistent in terms of how a state is characterized as a higher, lower, or typical utilization state. Table TA.C8 provides the comparative results of the amount of opioids per claim at the median and several selected percentiles. Delaware, Louisiana, New York, and Pennsylvania are higher at the median, and the gap becomes larger at most of the percentiles higher than the median. Similarly, Missouri had the lowest average amount of opioid use among the study states, and was lower at the median as well as other percentiles. Massachusetts was the only state that was characterized as having a higher-than-typical average amount of opioids per claim but had typical utilization based on the values at the median and the 75th percentile.

HOW DO STATES COMPARE ON THE USE OF OPIOIDS WHEN CLAIMS BECOME MORE MATURE?

Another concern often raised about interstate comparisons of per-claim utilization of opioids is that such interstate rankings may change depending upon the maturity of the claims being analyzed—claims may develop differently across states due to differences in workers' compensation laws, benefit structures, and administration. To address this concern, we analyzed the patterns in the MME of opioids per claim at different claim maturities and found that the amount of opioids per claim in the four states with the highest amounts of opioids per claim (Delaware, Louisiana, New York, and Pennsylvania) were already much higher at the end of the first year postinjury (Table TA.C9).

HOW DO STATES COMPARE ON THE USE OF OPIOIDS BY DURATION OF TEMPORARY DISABILITY?

We also looked at how the use of opioids per claim correlates with different intervals of temporary disability duration across the states and found a strong positive correlation between the amount of opioids per claim and the proportion of claims with longer disability duration (Table TA.C10). This suggests that the higher use of opioids in some states may be explained partially by the average longer duration of temporary disability. It is also possible that a certain pattern of opioid use may lead to longer disability duration. Without a more rigorous analysis, we cannot tell to what extent the longer disability duration would affect the use of opioids in a state. However, we tried to assess the sensitivity of our characterization of states as higher, lower, or typical by setting the disability duration distribution in each state to the distribution in the median state; we found that Delaware, Louisiana, New York, and Pennsylvania continued to be among the states with the highest amount of opioid use per average injured worker even after the adjustment, although the adjusted average amount of opioids per claim was lower than the actual amount.

Table TA.C8 MME per Claim at Median and Selected Percentiles after Excluding Claims with Unusually High Amounts of Opioids,[a] 2016/2018

	MO	IA	WI	NJ	TN	CT	MN	CA	NV	MI	AR	NC	IN	KS	MD	KY	SC	VA	FL	IL	GA	TX	MA	NY	PA	LA	DE
MME per claim, mean value (milligrams)	633	749	767	792	814	825	940	940	940	966	976	991	999	999	1,018	1,031	1,052	1,068	1,093	1,159	1,176	1,196	1,262	1,788	2,094	3,287	3,328
% above/below 27-state median	-37%	-25%	-23%	-21%	-19%	-17%	-6%	-6%	-6%	-3%	-2%	-1%	0%	0%	2%	3%	5%	7%	9%	16%	18%	20%	26%	79%	110%	229%	233%
50th percentile	280	300	290	250	300	225	250	300	250	300	300	300	338	350	300	400	300	300	400	450	325	300	300	400	375	765	473
% above/below 27-state median	-7%	0%	-3%	-17%	0%	-25%	-17%	0%	-17%	0%	0%	0%	13%	17%	0%	33%	0%	0%	33%	50%	8%	0%	0%	33%	25%	155%	58%
75th percentile	600	675	600	600	645	543	600	825	629	900	630	795	705	805	750	975	750	750	900	1,050	900	870	788	1,125	1,350	3,070	2,700
% above/below 27-state median	-24%	-14%	-24%	-24%	-18%	-31%	-24%	5%	-20%	14%	-20%	1%	-10%	2%	-5%	24%	-5%	-5%	14%	33%	14%	10%	0%	43%	71%	290%	243%
85th percentile	985	1,150	1,025	956	1,200	975	950	1,350	1,260	1,450	1,125	1,440	1,285	1,515	1,350	1,710	1,350	1,250	1,650	1,800	1,620	1,650	1,500	2,370	2,805	6,896	7,500
% above/below 27-state median	-27%	-15%	-24%	-29%	-11%	-28%	-30%	0%	-7%	7%	-17%	7%	-5%	12%	0%	27%	0%	-7%	22%	33%	20%	22%	11%	76%	108%	411%	456%
90th percentile	1,350	1,650	1,500	1,380	1,725	1,675	1,640	2,063	2,000	2,125	1,545	2,175	1,800	2,250	1,800	2,475	2,065	1,988	2,275	2,700	2,400	2,640	2,250	4,050	4,660	10,000	12,600
% above/below 27-state median	-35%	-20%	-27%	-33%	-16%	-19%	-21%	0%	-3%	3%	-25%	5%	-13%	9%	-13%	20%	0%	-4%	10%	31%	16%	28%	9%	96%	126%	384%	510%
95th percentile	2,110	2,550	3,000	2,535	2,850	3,090	2,975	3,630	3,813	4,030	3,113	3,900	3,425	4,050	3,600	3,760	3,660	4,360	3,975	4,500	5,093	5,015	5,600	7,958	9,700	16,170	16,875
% above/below 27-state median	-45%	-33%	-21%	-34%	-25%	-19%	-22%	-5%	0%	6%	-18%	2%	-10%	6%	-6%	-1%	-4%	14%	4%	18%	34%	32%	47%	109%	154%	324%	343%
99th percentile	5,480	7,650	9,000	13,298	10,800	11,700	15,525	10,050	13,505	10,350	13,890	10,500	12,078	13,895	16,190	10,875	12,900	15,100	11,700	12,015	13,050	16,210	17,590	24,360	29,970	30,220	28,672
% above/below 27-state median	-58%	-41%	-31%	2%	-17%	-10%	19%	-23%	3%	-21%	6%	-20%	-7%	6%	24%	-17%	-1%	16%	-10%	-8%	0%	24%	35%	87%	130%	132%	120%

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

[a] Reported are the mean values of the average MME per claim with opioids after excluding a small percentage of claims that had unusually high amounts of opioids (i.e., high-value claims). See Chapter 2 for a description of how we identify claims with unusually high amounts of opioids. Table TA.C6 provides the mean values without the exclusions.

Key: MME: morphine milligram equivalent amount.

Table TA.C9 Average MME of Opioids per Claim at Different Maturities, 2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI	Median State
Average MME per claim with opioids, 2016/2018	976	940	825	3,328	1,093	1,176	749	1,159	999	999	1,031	3,287	1,262	1,018	966	940	633	991	792	940	1,788	2,094	1,052	814	1,196	1,068	767	999
Average MME per claim with opioids as of the end of given quarter (milligrams)																												
First quarter	480	345	365	737	496	478	445	583	556	517	506	692	459	415	514	453	436	482	413	402	557	545	446	441	413	446	470	470
Second quarter	630	476	459	1,278	678	701	530	798	686	633	651	1,157	640	569	682	581	522	634	555	567	822	871	583	571	573	592	608	630
Third quarter	687	583	535	1,777	813	843	589	921	760	746	758	1,589	793	688	788	716	560	754	604	666	1,037	1,213	696	654	712	723	675	723
Fourth quarter	732	675	593	2,392	905	959	651	1,009	856	821	842	1,989	903	771	845	821	592	851	640	762	1,199	1,488	803	701	834	828	724	828
Fifth quarter	788	758	656	2,780	972	1,044	683	1,070	894	900	912	2,360	993	863	888	869	609	935	679	832	1,343	1,680	874	741	942	913	742	894
Sixth quarter	836	828	710	3,145	1,020	1,101	712	1,109	918	960	950	2,696	1,093	929	921	912	621	978	739	890	1,507	1,840	923	764	1,037	981	754	929
Seventh quarter	881	880	755	3,295	1,055	1,139	738	1,133	946	999	979	2,985	1,186	973	942	941	635	997	763	925	1,641	1,970	966	786	1,112	1,033	760	973
Eighth quarter	912	911	786	3,345	1,077	1,158	743	1,149	984	1,012	1,011	3,188	1,239	998	962	960	636	1,012	785	938	1,706	2,031	1,008	798	1,159	1,058	762	1,008
Ninth quarter	921	927	816	3,345	1,086	1,163	747	1,159	996	1,014	1,022	3,256	1,263	1,003	971	968	636	1,018	804	940	1,749	2,073	1,034	805	1,181	1,068	766	1,014
Tenth quarter	923	932	826	3,345	1,090	1,164	749	1,162	998	1,014	1,028	3,281	1,269	1,005	974	977	635	1,019	811	940	1,784	2,087	1,045	809	1,189	1,077	768	1,014

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

Key: MME: morphine milligram equivalent amount.

Table TA.C10 Average MME per Claim with Opioids, by Disability Duration, 2016/2018

	AR	CA	CT	DE	FL	GA	IA	IL	IN	KS	KY	LA	MA	MD	MI	MN	MO	NC	NJ	NV	NY	PA	SC	TN	TX	VA	WI	27-State Median
Average MME per claim with opioids (milligrams)	976	940	825	3,328	1,093	1,176	749	1,159	999	999	1,031	3,287	1,262	1,018	966	940	633	991	792	940	1,788	2,094	1,052	814	1,196	1,068	767	999
% of claims by disability duration in weeks																												
PPD claims with no TD payments	13%	9%	5%	8%	21%	18%	14%	10%	15%	19%	8%	6%	1%	9%	3%	6%	26%	23%	6%	12%	5%	12%	25%	13%	9%	6%	6%	9%
1–4 weeks	35%	22%	28%	22%	24%	20%	34%	18%	32%	32%	21%	15%	16%	26%	26%	35%	31%	20%	24%	35%	16%	22%	19%	32%	28%	31%	38%	26%
5–13 weeks	27%	21%	27%	30%	26%	22%	29%	30%	31%	28%	26%	19%	27%	30%	34%	27%	24%	22%	34%	24%	24%	27%	23%	33%	27%	31%	32%	27%
14–26 weeks	13%	14%	17%	15%	15%	13%	13%	22%	12%	12%	21%	14%	19%	17%	20%	13%	11%	13%	19%	13%	20%	10%	13%	13%	16%	15%	15%	14%
27–54 weeks	11%	17%	11%	15%	10%	15%	7%	12%	8%	6%	16%	14%	14%	10%	12%	11%	6%	11%	11%	9%	16%	13%	10%	7%	12%	8%	8%	11%
Longer than 54 weeks	2%	16%	12%	10%	5%	12%	2%	8%	3%	3%	8%	31%	23%	8%	6%	7%	2%	12%	5%	6%	19%	16%	11%	2%	7%	8%	1%	8%
Average MME per claim with opioids (milligrams), TD duration																												
PPD claims with no TD payments	700	771	421	2,768	926	782	683	629	632	557	1,159	1,372	859	554	346	1,753	489	607	609	552	931	2,653	1,003	671	995	783	386	700
1–4 weeks	298	366	446	2,195	537	434	494	473	353	536	430	433	286	391	488	405	465	472	468	455	494	616	375	355	413	306	353	434
5–13 weeks	662	525	670	3,206	931	564	543	809	901	1,109	628	816	461	736	751	526	502	676	495	727	1,070	868	571	637	625	708	733	676
14–26 weeks	940	736	660	1,719	1,293	948	937	1,188	1,238	1,758	755	1,596	938	1,067	1,053	722	888	922	803	1,434	1,367	1,459	731	1,184	1,194	963	1,124	1,053
27–54 weeks	3,269	1,399	1,076	3,531	1,811	1,944	1,787	1,698	1,913	1,604	2,038	2,926	1,638	1,673	1,928	1,797	1,379	1,776	1,473	1,553	2,282	2,831	1,979	2,360	2,361	2,983	1,841	1,841
Longer than 54 weeks	3,693	2,006	2,184	9,144	3,280	3,299	3,244	3,913	7,573	3,893	2,526	7,588	2,970	3,655	2,540	3,963	3,758	2,795	3,417	3,359	4,003	5,516	2,812	3,929	4,536	3,981	4,089	3,693

Notes: The underlying data include nonsurgical claims with more than seven days of lost time that had prescriptions filled by injured workers over the defined period and paid for by a workers' compensation payor. 2016/2018 refers to claims with injuries occurring in October 1, 2015, through September 30, 2016, and prescriptions filled through March 31, 2018.

Key: MME: morphine milligram equivalent amount; PPD: permanent partial disability; Rx: prescriptions; TD: temporary disability.

REFERENCES

Ahmedani, B., E. Peterson, K. Wells, D. Lanfear, and L. Williams. 2014. Policies and events affecting prescription opioid use for non-cancer pain among an insured patient population. *Pain Physician* 17 (3): 205–216.

Alford, D., L. Zisblatt, P. Ng, S. Hayes, S. Peloquin, I. Hardesty, and J. White. 2015. SCOPE of pain: An evaluation of an opioid risk evaluation and mitigation strategy continuing education program. *Pain Medicine*. DOI:10.1111/pme.12878.

American College of Occupational and Environmental Medicine (ACOEM). 2011. *ACOEM's guidelines for the chronic use of opioids.* Elk Grove Village, IL: ACOEM.

American Medical Association. 2006. *Current procedural terminology CPT 2006.* Chicago, IL: American Medical Association.

Azad, T., D. Vail, J. Bentley, S. Han, P. Suarez, K. Varshneya, V. Mittal, A. Veeravagu, M. Desai, J. Bhattacharya, and J. Ratliff. 2018. Initial provider specialty is associated with long-term opiate use in patients with newly diagnosed low back and lower extremity pain. *Spine* 44 (3): 211–218.

Bao, Y., Y. Pan, A. Taylor, S. Radakrishnan, F. Luo, H. Pincus, and B. Schackman. 2016. Prescription drug monitoring programs are associated with sustained reductions in opioid prescribing by physicians. *Health Affairs* 35 (6): 1,045–1,051.

Bateman, B., and N. Choudhry. 2016. Limiting the duration of opioid prescriptions balancing excessive prescribing and the effective treatment of pain. *JAMA Internal Medicine* 176 (5): 583–584.

Bohnert, A., G. Guy, and J. Losby. 2018. Opioid prescribing in the United States before and after the Centers for Disease Control and Prevention's 2016 Opioid Guideline. *Annals of Internal Medicine* 169 (6): 367–375.

Brady, J., H. Wunsch, C. DiMaggio, B. Lang, J. Giglio, and G. Li. 2014. Prescription drug monitoring and dispensing of prescription opioids. *Public Health Reports* 129 (2): 139–147.

Buchmueller, T., and C. Carey. 2018. The effect of prescription drug monitoring programs on opioid utilization in Medicare. *American Economic Journal: Applied Economics* 10: 77–112.

Centers for Disease Control and Prevention (CDC), United States Department of Health and Human Services. 2010. *Unintentional drug poisoning in the United States.* Issue Brief.

———. 2012. CDC grand rounds: Prescription drug overdoses—a U.S. epidemic. *Morbidity and Mortality Weekly Report* 61 (01): 10–13.

_____. 2016. CDC guidelines for prescribing opioids for chronic pain—United States, 2016. *Morbidity and Mortality Weekly Report* 65: 1–49.

Cepeda, M., F. Camargo, C. Zea, and L. Valencia. 2007. Tramadol for osteoarthritis: A systematic review and metaanalysis. *The Journal of Rheumatology* 34: 543–555.

Chua, K., C. Brummett, and J. Waljee. Opioid Prescribing Limits for Acute Pain: Potential Problems with Design and Implementation. *JAMA* 321 (7): 643–644.

Clark, T., J. Eadie, P. Kreiner, and G. Strickler. 2012. *Prescription drug monitoring programs: An assessment of the evidence for best practices.* The Prescription Drug Monitoring Program Center for Excellence at Brandeis University. Prepared for The Pew Charitable Trusts.

Curtis, L., J. Stoddard, J. Radeva, S. Hutchison, P. Dans, A. Wright, R. Woosley, and K. Schulman. 2006a.

Geographic variations in the prescription of Schedule II opioid analgesics among outpatients in the United States. *Health Services Research* 41: 837–855.

———. 2006b. Correction to "Geographic variations in the prescription of Schedule II opioid analgesics among outpatients in the United States." *Health Services Research* 41: 856–858.

Dart, R., H. Surratt, T. Cicero, M. Parrino, S. Severtson, B. Bucher-Bartelson, and J. Green. 2015. Trends in opioid analgesic abuse and mortality in the United States. *New England Journal of Medicine* 372: 241–248.

David, R., S. Jones, B. Ramirez, and A. Swedlow. 2015. *Medical Review and dispute resolution in the California workers' compensation system.* Oakland, CA: California Workers' Compensation Institute.

Davis, C., and D. Carr. 2016. Physician continuing education to reduce opioid misuse, abuse, and overdose: Many opportunities, few requirements. *Drug and Alcohol Dependence* (2016), ahead of print http://dx.doi.org/10.1016/j.drugalcdep.2016.04.002.

Davis, C., A. Lieberman, H. Hernandez-Delgado, and C. Suba. 2019. Laws limiting the prescribing or dispensing of opioids for acute pain in the United States: A national systematic legal review. *Drug and Alcohol Dependence* 194: 166–172.

Dolinschi, R., and K. Rothkin. 2016. *CompScope™ benchmarks: Technical appendix, 16th edition.* Cambridge, MA: Workers Compensation Research Institute.

———. 2018. *CompScope™ medical benchmarks: Technical appendix, 19th edition.* Cambridge, MA: Workers Compensation Research Institute.

Donovan, A., G. Wood, D. Rubio, H. Day, and C. Spagnoletti. 2016. Faculty communication knowledge, attitudes, and skills around chronic non-malignant pain improve with online training. *Pain Medicine.* Advance online publication. DOI: 10.1093/pm/pnw029.

Dowell, D., T. Haegerich, and R. Chou. 2019. No shortcuts to safer opioid prescribing. *The New England Journal of Medicine* 380 (24): 2,285–2,287.

Dowell, D., K. Zhang, R. Noonan, and J. Hockenberry. 2016. Mandatory provider review and pain clinic laws reduce the amounts of opioids prescribed and overdose death rates. *Health Affairs* 35 (10): 1,876–1,883.

Drug Enforcement Administration (DEA), United States Department of Justice. 2014. *Schedules of controlled substances: Placement of tramadol into Schedule IV*. Retrieved from https://www.deadiversion.usdoj.gov/fed_regs/rules/2014/fr0702.htm (accessed May 28, 2019).

———. 2017. *Drugs of abuse.* Retrieved from http://www.justice.gov/dea/pr/multimedia-library/publications/drug_of_abuse.pdf (accessed May 28, 2019).

Durand, Z., S. Nechuta, S. Krishnaswami, E. Hurwitz, and M. McPheeters. 2019. Prescription opioid use by injured workers in Tennessee: A descriptive study using linked statewide databases. *Annals of Epidemiology* February 2019, ahead of print. https://doi.org/10.1016/j.annepidem.2019.02.001.

Federation of State Medical Boards (FSMB). 2013. *Model policy on the use of opioid analgesics in the treatment of chronic pain.*

———. 2014. *Responsible opioid prescribing: A clinician's guide.*

———. 2017. *Guidelines for chronic use of opioid analgesics.* Retrieved from https://www.fsmb.org/siteassets/advocacy/policies/opioid_guidelines_as_adopted_april-2017_final.pdf (accessed May 31, 2019).

Fink, D., J. Scleimer, A. Sarvet, K. Grover, C. Delcher, A. Castillo-Cariglia, J. Kim, A. Rivera-Aguirre, S. Henry, S. Martins, and M. Cerda. 2018. Association between prescription drug monitoring programs

and nonfatal and fatal drug overdoses: A systematic review. *Annals of Internal Medicine* 168: 783–790.

Finklea, K., L. Sacco, and E. Bagalman. 2014. *Prescription drug monitoring programs.* Congressional Research Service. Retrieved from https://www.fas.org/sgp/crs/misc/R42593.pdf (accessed January 21, 2016).

Food and Drug Administration (FDA). U.S. Department of Health and Human Services. 2017. *Transmucosal immediate release fentanyl (TIRF), risk evaluation and mitigation strategy (REMS).* Retrieved from https://www.accessdata.fda.gov/drugsatfda_docs/rems/TIRF_2017-09-07_REMS_Document.pdf (accessed June 3, 2019).

———. 2018. *Introduction for the FDA blueprint for prescriber education for extended-release and long-acting opioid analgesics.* Retrieved from https://www.accessdata.fda.gov/drugsatfda_docs/rems/Opioid_analgesic_2018_09_18_FDA_Blueprint.pdf (accessed June 3, 2019).

Franklin, G., J. Mai, J. Turner, M. Sullivan, T. Wickizer, and D. Fulton-Kehoe. 2012. Bending the prescription opioid dosing and mortality curves: Impact of the Washington State opioid dosing guideline. *American Journal of Industrial Medicine* 55 (4): 325–331.

Franklin, G., J. Mai, T. Wickizer, J. Turner, D. Fulton-Kehoe, and L. Grant. 2005. Opioid dosing trends and mortality in Washington State workers' compensation, 1996–2002. *American Journal of Industrial Medicine* 48: 91–99.

Franklin, G., B. Stover, J. Turner, D. Fulton-Kehoe, and T. Wickizer. 2008. Early opioid prescription and subsequent disability among workers with back injuries. *Spine* 33 (2): 199–204.

Frogner, B., K. Harwood, C. Andrilla, M. Schwartz, and J. Pines. 2018. Physical therapy as the first point of care to treat low back pain: An instrumental variables approach to estimate impact on opioid prescription, health care utilization, and costs. *Health Services Research* 53 (6): 4,629–4,646.

Garg, R., D. Fulton-Kehoe, J. Turner, A. Bauer, T. Wickizer, M. Sullivan, and G. Franklin. 2013. Changes in opioid prescribing for Washington workers' compensation claimants after implementation of an opioid dosing guideline for chronic noncancer pain: 2004 to 2010. *Journal of Pain* 14 (12): 1,620–1,628.

Gomes, T., S. Greaves, W. can den Brink, T. Antoniou, M. Mamdani, J. Paterson, D. Martins, and D. Juurlink. 2018. Pregabalin and the risk for opioid-related death: A nested case-control study. *Annals of Internal Medicine* 169: 732–734.

Gomes, T., D. Juurlink, T. Antoniou, M. Mamdani, J. Paterson, and W. van den Brink. 2017. Gabapentin, opioids, and the risk of opioid-related death: A population-based nested case-control study. *PLOS Medicine* 14 (10): e1002396.

Green, T., S. Bowman, C. Davis, C. Los, K. McHugh, and P. Friedman. 2015. Discrepancies in addressing overdose prevention through prescription monitoring programs. *Drug and Alcohol Dependence* 153: 355–358.

Guy, G., K. Zhang, M. Bohm, J. Losby, B. Lewis, R. Young, L. Murphy, and D. Dowell. 2017. Vital signs: Changes in opioid prescribing in the United States, 2006–2015. *Morbidity and Mortality Weekly Report* 66 (26): 697–704.

Guy, G., K. Zhang, L. Schieber, R. Young, and D. Dowell. 2019. County-level opioid prescribing in the United States, 2015 and 2017. *JAMA Internal Medicine* 179 (4): 574–576.

Haegerich, T., L. Paulozzi, B. Manns, and C. Jones. 2014. What we know, and don't know, about the impact of state policy and systems-level interventions on prescription drug overdose. *Drug and Alcohol*

Dependence 145: 34–47.

Haffajee, R., A. Jena, and S. Weiner. 2015. Mandatory use of prescription drug monitoring programs. *Journal of the American Medical Association* 313 (9): 891–892.

Haffajee, R., M. Mello, F. Zhang, A. Zaslavsky, M. Larochelle, and J. Wharam. 2018. Four states with robust prescription drug monitoring programs reduced opioid dosages. *Health Affairs* 37(6): 964–974.

Han, H., P. Kass, B. Wilsey, and C. Li. 2012. Individual and county level factors associated with use of multiple prescribers and multiple pharmacies to obtain prescriptions in California. *PLoS ONE* 7(9): e46246.

Hayes, S., and A. Swedlow. 2019. *California Workers' Comp Pharmaceutical Utilization & Reimbursement Part 2: Emerging Outcomes under the MTUS Formulary.* Oakland, CA: California Workers' Compensation Institute.

Hegmann, K., M. Weiss, K. Bowden, F. Branco, K. DuBrueler, C. Els, S. Mandel, D. McKinney, R. Miguel, K. Mueller, R. Nadig, M. Schaffer, L. Studt, J. Talmage, R. Travis, T. Winters, M. Thiese, and J. Harris. 2014. ACOEM practice guidelines: Opioids for treatment of acute, subacute, chronic, and postoperative pain. *Journal of Occupational and Environmental Medicine* 56 (12): e143–59.

Ireland, J., B. Young, and A. Swedlow. 2014. *Part 1: Schedule II & Schedule III opioids: Prescription and payment trends in California workers' compensation.* CWCI Research Update. Oakland, CA: California Workers' Compensation Institute.

Johnson, H., L. Paulozzi, C. Porucznik, K. Mack, and B. Herter. 2014. Decline in drug overdose deaths after state policy changes—Florida, 2010–2012. *Morbidity and Mortality Weekly Report* 63 (26): 569–574.

Joint Commission on Accreditation of Healthcare Organizations. 2002. *Examples of compliance: Pain assessment and management.* Oakbrook Terrace, IL: Joint Commission Resources.

Jones, S. 2016. *Impact of the RBRVS fee schedule on California workers' comp physician & non-physician practitioner service payments.* Oakland, CA: California Workers' Compensation Institute.

Jones, J., P. Lurie, and D. Throckmorton. 2016. Effect of US Drug Enforcement Administration's rescheduling of hydrocodone combination analgesic products on opioid analgesic prescribing. *JAMA Internal Medicine* 176 (3): 399–402.

Jones, C., and J. McAninch. 2015. Emergency department visits and overdose deaths from combined use of opioids and benzodiazepines. *American Journal of Preventive Medicine* 49 (4): 493–501.

Jones, J., S. Mogali, and S. Comer. 2012. Polydrug abuse: A review of opioid and benzodiazepine combination use. *Drug and Alcohol Dependence* 125 (1-2): 8–18.

Kidner, C., T. Mayer, and R. Gatchel. 2009. Higher opioid doses predict poorer functional outcome in patients with chronic disabling occupational musculoskeletal disorders. *The Journal of Bone and Joint Surgery* 91: 919–927.

Kraman, P. 2004. *Drug abuse in America—Prescription drug diversion.* The Council of State Governments: Trends Alert. Retrieved from http://www.csg.org/knowledgecenter/docs/TA0404DrugDiversion.pdf (accessed January 21, 2016).

Laudau C., W. Carr, A. Razzetti, N. Sessier, C. Munera, and S. Ripa. 2007. Buprenorphine transdermal delivery system in adults with persistent noncancer-related pain syndromes who require opioid therapy: A multicenter, 5-week run-in and randomized, double-blind maintenance-of-analgesia study. *Clinical Therapeutics* 29 (10): 2,179–2,193.

Levy, B., L. Paulozzi, K. Mack., and C. Jones. 2015. Trends in opioid analgesic-prescribing rates by specialty, U.S., 2007–2012. *American Journal of Preventative Medicine* 49 (3): 409–413.

Lipton, B., C. Laws, and L. Li. 2009. *Narcotics in workers compensation.* NCCI Research Brief. Boca Raton, FL: National Council on Compensation Insurance, Inc.

Lisi, A., K. Corcoran, E. DeRycke, L. Bastian, W. Becker, S. Edmond, C. Goertz, J. Goulet, S. Haskell, D. Higgins, T. Kawecki, R. Kerns, K. Mattocks, C. Ramsey, C. Ruser, and C. Brandt. 2018. Opioid use among veterans of recent wars receiving veterans affairs chiropractic care. *Pain Medicine* 19: 54–60.

Lyapustina, T., L. Rutkow, H. Chang, M. Daubresse, A. Ramji, M. Faul, E. Stuart, and G. Alexander. 2015. Effect of a "pill mill" law on opioid prescribing and utilization: The case of Texas. *Drug and Alcohol Dependence* 159: 190–197.

McDonald, D., K. Carlson, and D. Izrael. 2012. Geographic variation in opioid prescribing in the U.S. *The Journal of Pain* 13 (10): 988–996.

Medi-Span®. 2005. *Master drug data base (MDDB®) v2.5: Documentation manual.* Indianapolis, IN: Wolters Kluwer Health, Inc.

National Governors Association. 2012. *Six strategies for reducing prescription drug abuse.* Washington, DC.

———. 2014. *Reducing prescription drug abuse: Lessons learned from an NGA policy academy.* Washington, DC.

———. 2016. *Finding solutions to the prescription opioid and heroin crisis: A road map for states.* Washington, DC.

National Safety Council. 2018. *Prescription nation 2018: Facing America's opioid epidemic.*

New York State Office of the Attorney General. 2012. *Internet system for tracking over-prescribing (I-STOP), a proposal addressing New York's prescription drug abuse and drug diversion epidemic.* Retrieved from http://www.ag.ny.gov/sites/default/files/press-releases/2012/ISTOP%20REPORT%20FINAL%201.10.12.pdf (accessed January 21, 2016).

New York State Workers' Compensation Board. 2014. *New York non-acute pain medical treatment guidelines. first edition.* Retrieved from http://www.wcb.ny.gov/content/main/hcpp/MedicalTreatmentGuidelines/Non-AcutePainMTG2014.pdf (accessed January 21, 2016).

Noble, M., J. Treadwell, S. Tregear, V. Coates, P. Wiffen, C. Akafomo, and K. Schoelles. 2010. Long-term opioid management for chronic noncancer pain. *Cochrane Database of Systematic Reviews.* Issue 1. Art. No.: CD006605. DOI: 10.1002/14651858.CD006605.pub2.

Ohio Bureau of Workers' Compensation. 2015. *Fiscal year 2014 report.* Columbus, OH.

Okie, S. 2010. A flood of opioids, a rising tide of deaths. *New England Journal of Medicine* 363 (21): 1,981–1,985.

Oregon Health and Science University. 2006. *Opioids and chronic non-malignant pain: A clinicians' handbook. Part II, Section 3: Converting opioids after a successful trial: Equianalgesic dosing.* Portland, OR.

Pardo, B. 2017. Do more robust prescription drug monitoring programs reduce prescription opioid overdose? *Addiction* 112: 1,773–1,783.

Patrick, S., C. Fry, T. Jones, and M. Buntin. 2016. Implementation of prescription drug monitoring programs associated with reductions in opioid-related death rates. *Health Affairs.* Published online before print June 2016, DOI:10.1377/hlthaff.2015.1496.Paulozzi, L., and G. Ryan. 2006. Opioid analgesics and rates of fatal drug poisoning in the United States. *American Journal of Preventive Medicine* 31: 506–511.

Peckham, A., M. Ananickal, and D. Sclar. 2018. Gabapentin use, abuse, and the US opioid epidemic: the case for reclassification as a controlled substance and the need for pharmacovigilance. *Risk Management*

and Healthcare Policy 11: 109–116.

The Pew Charitable Trusts. 2016. *Prescription drug monitoring programs: Evidence-based practices to optimize prescriber use.* Philadelphia, PA.

Prescription Drug Monitoring Program Center of Excellence at Brandeis University (PDMP COE). 2014a. *Briefing on PDMP effectiveness.* Waltham, MA.

———. 2014b. *Mandating PDMP participation by medical providers: Current status and experience in selected states.* Waltham, MA.

———. 2015. *Electronic alerts for prescribers: Massachusetts prescription monitoring program experience.* Waltham, MA.

———. 2016. *PDMP prescriber use mandates: Characteristics, current status, and outcomes in selected states.* Waltham, MA. Retrieved from http://www.pdmpassist.org/pdf/COE_documents/Add_to_TTAC/COE%20briefing%20on%20mandates%203rd%20revision.pdf (accessed March 27, 2017).

Prescription Drug Monitoring Program Training and Technical Assistance Center (PDMP TTAC). n.d. *State profiles.* Retrieved from http://www.pdmpassist.org/content/state-profiles (accessed May 2019).

———. 2018. *Status of prescription drug monitoring programs (PDMPs).* Retrieved from http://www.pdmpassist.org/pdf/PDMP_Program_Status_20180801.pdf (accessed June 3, 2019).

———. 2019. *Mandatory PDMP use.* Retrieved from https://www.pdmpassist.org/pdf/Mandatory_Query_Conditions_20190115.pdf (accessed June 3, 2019).

Reid, D., K. Shah, J. Ruddell, B. Shapiro, E. Akelman, A. Robertson, M. Palumbo, and A. Daniels. 2018. Effect of narcotic prescription limiting legislation on opioid utilization following lumbar spine surgery. *The Spine Journal: Official Journal of the North American Spine Society* 19 (4): 717–725.

Reid, D., K. Shah, B. Shapiro, J. Ruddell, E. Akelman, and A. Daniels. 2019. Mandatory Prescription Limits and Opioid Utilization Following Orthopaedic Surgery. *Journal of Bone and Joint Surgery* 101(10): e43.

Reifler, L., D. Droz, J. Bailey, S. Schnoll, R. Fant, R. Dart, and B. Bartelson. 2012. Do prescription monitoring programs impact state trends in opioid abuse/misuse? *Pain Medicine* 3: 434–442.

Robinson, A., A. Christensen, and S. Bacon. 2019. From the CDC: The prevention for states program: Preventing opioid overdose through evidence-based intervention and innovation. *Journal of Safety Research* 68: 231–237.

Rollman, J., J. Heyward, L. Olson, P. Lurie, J. Sharfstein, and G. Alexander. 2019. Assessment of the FDA Risk Evaluation and Mitigation Strategy for Transmucosal Immediate-Release Fentanyl Products. *JAMA* 321 (7): 676–685.

Rothkin, K. 2018. *Workers' compensation prescription drug regulations: A national inventory, 2018.* Cambridge, MA: Workers Compensation Research Institute.

———. 2019. *Workers' compensation laws as of January 1, 2019.* Cambridge, MA: Workers Compensation Research Institute.

Rudd, R., N. Aleshire, J. Zibbell, and R. Gladden. 2016a. Increase in drug and opioid overdose deaths—United States, 2000–2014. *Morbidity and Mortality Weekly Report* 64 (50 & 51): 1,378–1,382.

Rudd, R., P. Seth, F. David, and L. Scholl. 2016b. Increase in drug and opioid-involved overdose deaths—United States, 2010–2015. *Morbidity and Mortality Weekly Report* 65 (50 & 51): 1,445–1,452.

Savych, B., D. Neumark, and R. Lea. 2018. *The impact of opioid prescriptions on duration of temporary*

disability. Cambridge, MA: Workers Compensation Research Institute.

Savych, B., and V. Thumula. 2016. *Comparing outcomes for injured workers in Michigan*. Cambridge, MA: Workers Compensation Research Institute.

Scholl, L, P. Seth, M. Kariisa, N. Wilson, and G. Baldwin. 2019. Drug and opioid-involved overdose deaths—United States, 2013–2017. *Morbidity and Mortality Weekly Report* 67: 1,419–1,427.

Shah, A., C. Hayes, and B. Martin. 2017. Characteristics of initial prescription episodes and likelihood of long-term opioid use — United States, 2006–2015. *Morbidity and Mortality Weekly Report* 66 (10): 265–269.

Smith, V., K. Gifford, E. Ellis, B. Edwards, R. Rudowitz, E. Hinton, L. Antonisse, and A. Valentine. 2016. *Implementing coverage and payment initiatives results from a 50-state Medicaid budget survey for state fiscal years 2016 and 2017*. The Henry J. Kaiser Family Foundation and National Association of Medicaid Directors.

Stapleton, D., G. Livermore, J. Cores, M. Nowak, and E. Eiseman. 2001. *Evaluation of the New York State ONECARD Rx workers' compensation benefit: Final report*. Prepared for State of New York, Department of Civil Service. Project Officer: Stephanie Washington. Prepared by the Lewin Group, Inc. and Cornell University.

Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. 2014. *The DAWN Report: Benzodiazepines in combination with opioid pain relievers or alcohol: Greater risk of more serious ED visit outcomes*. Rockville, MD.

Telles, C. 2016. *CompScope™ medical benchmarks for Louisiana, 17th edition*. Cambridge, MA: Workers Compensation Research Institute.

Texas Department of Insurance (TDI), Texas Workers' Compensation Research and Evaluation Group. 2013. *Impact of the Texas pharmacy closed formulary: A preliminary report based on 12-month injuries with 9-month services*. Retrieved from http://www.tdi.texas.gov/reports/wcreg/documents/Pharma_070913.pdf (accessed January 21, 2016).

Thumula, V. 2014. *The impact of physician dispensing on opioid use*. Cambridge, MA: Workers Compensation Research Institute.

———. 2017. *Impact of Kentucky opioid reforms*. Cambridge, MA: Workers Compensation Research Institute.

Thumula, V., and T. Liu. 2018. *Monitoring physician dispensing reforms in Pennsylvania*. Cambridge, MA: Workers Compensation Research Institute.

Thumula, V., D. Wang, and T. Liu. 2014. *Interstate variations in use of narcotics, 2nd edition*. Cambridge, MA: Workers Compensation Research Institute.

———. 2016. *Interstate variations in use of opioids, 3rd edition*. Cambridge, MA: Workers Compensation Research Institute.

———. 2017. *Interstate variations in use of opioids, 4th edition*. Cambridge, MA: Workers Compensation Research Institute.

Trust for America's Health. 2013. *Prescription drug abuse: Strategies to stop the epidemic*. Washington, DC.

United States General Accounting Office (GAO). 2002. *Prescription drugs: State monitoring programs provide useful tool to reduce diversion*. GAO-02-634. Retrieved from http://www.gao.gov/new.items/d02634.pdf (accessed January 21, 2016).

Volinn, E., J. Fargo, and P. Fine. 2009. Opioid therapy for nonspecific low back pain and the outcome of chronic work loss. *Pain* 142: 194–201.

Wang, D. 2017. *Longer-term dispensing of opioids, 4th edition.* Cambridge, MA: Workers Compensation Research Institute.

Wang, D., and T. Liu. 2011. *Prescription benchmarks, 2nd edition: Trends and interstate comparisons.* Cambridge, MA: Workers Compensation Research Institute.

Wang, D., K. Mueller, and D. Hashimoto. 2011. *Interstate variations in use of narcotics.* Cambridge, MA: Workers Compensation Research Institute.

Wang, D., V. Thumula, and T. Liu. 2017. *A multistate perspective on physician dispensing, 2011–2014.* Cambridge, MA: Workers Compensation Research Institute.

Webster, B., S. Verma, and R. Gatchel. 2007. Relationship between early opioid prescribing for acute occupational low back pain and disability duration, medical costs, subsequent surgery and late opioid use. *Spine* 32: 2,127–2,132.

Weeks, W., and C. Goertz. 2016. Cross-sectional analysis of per capita supply of doctors of chiropractic and opioid use in younger Medicare beneficiaries. *Journal of Manipulative and Physiological Therapies* 39 (4): 263–266.

Whedon, J., A. Toler, J. Goehl, and L. Kazal. 2018. Association between utilization of chiropractic services for treatment of low-back pain and use of prescription opioids. *The Journal of Alternative and Complementary Medicine* February 2018, ahead of print. https://doi.org/10.1089/acm.2017.0131.

Worley, J. 2012. Prescription drug monitoring programs, a response to doctor shopping: Purpose, effectiveness, and directions for future research. *Issues in Mental Health Nursing* 33: 319–328.

Yee, C., S. Pizer, and O. Fomenko. 2015. *Why surgery rates vary.* Cambridge, MA: Workers Compensation Research Institute.

OTHER WCRI PUBLICATIONS

For a list of WCRI's other publications, please click here.