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State Opioid Limits and Volume of Opioid Prescriptions Received by Medicaid Patients

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Abstract

Background: Since early 2016, an increasing number of states passed legislations that limit the duration and/or dosage of initial opioid prescriptions or opioids for acute pain.

Objective: To assess changes in the number of opioid prescriptions covered by Medicaid and received by Medicaid patients associated with state implementation of legislative limits on initial opioid prescriptions.

Research Design: We explored the natural experiment resulting from staggered implementation of state legislative limits. Analysis adopted a Difference-in-Differences framework and controlled for other major state policies bearing implications for prescription opioid use. Main analysis

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included 26 states that implemented limits from early 2016 to late 2018. A secondary analysis included all 50 states and the District of Columbia.

Measures: Population-adjusted state-quarter level counts of Schedule II and Schedule III opioid prescriptions received by Medicaid patients, based on data from the Medicaid State Drug Utilization Data and state Medicaid enrollment reports for 2013-18.

Results: Implementation of legislative limits on initial opioid prescriptions was associated with a 7% reduction in the number of opioid prescriptions per 100 Medicaid enrollees. Such reduction was largely attributable to reduction in Schedule II opioid prescriptions. Secondary analysis by including all jurisdictions and sensitivity checks supported robustness of results.

Conclusions: Recent implementation of state legislative limits on initial opioid prescriptions was associated with meaningful reductions in the volume of Schedule II opioid prescriptions received by Medicaid patients.

Keywords

Opioid limits; prescription opioid use; Medicaid

The epidemic of prescription opioid misuse and overdose remains a major public health concern in the U.S. In 2017, prescription opioids still accounted for over 40% of opioid overdose deaths, and 11.4 million Americans reportedly misused prescription opioids.¹ Longer duration and higher dose of initial prescriptions to opioid-naïve patients were found to be associated with greater risks for persistent use, misuse, and diversion of prescription opioids.^{2, 3}

From early 2016 through the end of 2018, 27 states implemented laws limiting the duration or dosage of opioid prescriptions prescribed to a patient for the first time (initial prescriptions) or for acute pain (e.g., prescribed in an emergency department), representing the most recent wave of state policies addressing inappropriate or unsafe opioid prescribing. These limits specifically target first prescriptions and may lead to reduced total volume of prescription opioids as a result of reduced long-term use. Meanwhile, there is concern regarding unintended consequences in that implementation of these limits might lead to repeated prescriptions to make up for reduced quantities of opioids received on the initial prescriptions,⁴ or, be misinterpreted to apply to recurring or chronic opioid therapies or create “chilling effects” that may lead to curtailed prescriptions across the board. Existing research on the impacts of these limits used data from a single state (Rhode Island)⁵⁻⁷ or a single medical center⁸ and found decreased post-operative opioid prescriptions to patients receiving surgeries. Another study using data on distribution of controlled substances for a select set of states⁹ found that implementation of opioid limits in 2016-7 was not associated with changes in opioid distribution.

In this study, we assessed net changes in population-adjusted volume of opioid prescriptions received by Medicaid patients associated with implementation of state legislative limits on initial opioids. We used state-quarter level Medicaid prescription drug utilization data from 2013 to 2018 and exploited the staggered implementation of such limits across the implementing states.

METHODS

Data

We used the Medicaid State Drug Utilization Data during 2013-18 from the Centers for Medicare and Medicaid Services (CMS),¹⁰ which provides total counts of prescriptions (identified by National Drug Codes or NDCs) covered by Medicaid (both fee-for-service and managed care) and received by Medicaid patients in each state and each calendar quarter. We specifically focused on Schedules II and III opioids using NDCs provided by the Centers for Disease Control and Prevention.¹¹

Data on quarterly Medicaid enrollment were from Medicaid monthly enrollment data provided by Centers for Medicare & Medicaid Services (CMS).¹² We derived quarterly Medicaid enrollment by taking the average of the three monthly enrollment reports by CMS within each quarter for 2014-8. Monthly enrollment data were not available in 2013, for which we used mid-year¹³ (for the first two quarters) and end-of-year¹⁴ (last two quarters) enrollment snapshots published by the Kaiser Family Foundation.

Measures

Our outcome was state-level aggregate number of Schedule II and/or III opioid prescriptions per 100 Medicaid enrollees per quarter. The key independent variable of interest was a binary indicator for exposure to a legislative limit on initial opioids in the state in a given quarter. The indicator took the value of 1 (and 0 otherwise) for each full calendar quarter after a state implemented laws to restrict initial opioid prescriptions and/or prescriptions for acute pain to a 7 days' supply or less or to a specified daily dosage measured by morphine milligram equivalents (MMEs). We did not consider duration limits beyond 7 days to be consistent with the CDC Guideline that "3 days or less will often be sufficient; more than 7 days will rarely be needed".¹⁵ Of the 26 states with at least one full quarter post-implementation by the end of 2018 ("implementing states" hereafter), 23 states limited the duration (19 with a 7-day and 4 with a less-than-7-day limit), 7 states limited the daily dose, and 4 limited both. (Table A1, Supplemental Digital Content or SDC1).

Statistical Analyses

Our main analysis included 26 states that implemented an opioid limit by the end of 3rd Quarter of 2018. Oklahoma, which implemented a limit in November 2018, provides no post-policy data to the analysis and was thus excluded from the main analysis. We exploited the staggered implementation of opioid limits among these states and assessed changes in the outcome before and after the laws took effect, using state-quarters that were not yet exposed to the law as controls (SDC2), a design known as Difference-in-Differences (DiD). To the extent that implementing states were similar in terms of the severity of the opioid crisis and policies addressing the crisis, our main analysis comparing implementing states to themselves would achieve greater validity than comparing implementing states to non-implementing states. A secondary analysis included all 50 states and D.C. For both analyses, we included state and quarter fixed effects to control for time-invariant state-level differences and national trends in the outcome, respectively. We also controlled for state-specific linear trends.

We controlled for additional state policies that may have contributed to changes in prescription opioid use, including Medicaid expansion,¹⁶ presence of a Prescription Drug Monitoring Program (PDMP),¹⁷ comprehensive legislative mandates for prescriber use of PDMP at the point of care^{18, 19} and medical marijuana legalization.²⁰ Information on sources of these policy data are available from SDC2.

Counts of Schedule II and Schedule III opioids were combined but also analyzed separately. We derived robust standard errors to account for clustering of quarters within the same state (SDC2).

We conducted two robustness checks. First, we left one state out at a time and re-estimated the model to test whether the results were sensitive to the inclusion of a specific state. Second, we dropped abnormal data points in a state's data series with values that were different from both adjacent data points by at least 3 standard deviations.

RESULTS

Overall, the quarterly number of opioid prescriptions per 100 Medicaid enrollees declined substantially over 2013-18 (Figure 1). At the beginning of 2013, the states that went on to implement opioid limits had a higher rate of opioid prescriptions per-enrollee (14.4) compared to states that did not implement a limit during study years (11.7). The decline was largely parallel between the two groups over 2013-5. Starting in 2016, during which Massachusetts, Rhode Island, Connecticut and New York became the first 4 states to have implemented opioid limits, the decline accelerated among the implementing states. By the end of 2017, the gap between the two groups of states was entirely closed. In the fourth quarter of 2018, opioid prescriptions were reduced to 6.4 per 100 Medicaid enrollees in both groups, representing a 56% reduction in implementing states and a 45% reduction in non-implementing states, compared to their rates in the first quarter of 2013.

In the main analysis including 26 states, the DiD analysis (SDC2) indicated that implementation of opioid limits was associated with 0.80 (95% confidence interval: -1.46, -0.14) fewer opioid prescription per 100 Medicaid enrollees per quarter, equivalent to a 6.9% reduction compared to the predicted rate assuming no limit (Figure 2). This reduction was largely attributable to the reduction in Schedule II opioid prescriptions (-0.78, 95% CI: -1.41, -0.16, a 7.2% reduction). Implementation of opioid limits was not associated with statistically or practically significant changes in the rate of Schedule III opioids. (Table A2, SDC1)

Medicaid expansion was associated with a 13.5% increase in the number of opioid prescriptions per 100 Medicaid enrollees per quarter (95% CI: 3.1%, 23.9%). PDMP with a comprehensive use mandate was associated with a 10.2% reduction (95% CI: 1.3%, 19.4%), relative to the absence of a PDMP. Medical marijuana legalization was not associated with a statistically significant change (Figure 3).

In the secondary analysis including all 50 states and D.C., we found a similar reduction associated with opioid limits (Table A3, SDC1). Sensitivity analyses suggested that the

results were not driven by a particular state (Table A4, SDC1) or data outliers (Table A5, SDC1).

DISCUSSION

We found that recent state legislations limiting the duration or dosage of initial opioid prescriptions or opioids for acute pain were associated with a 7% reduction in Schedule II opioid prescriptions per 100 Medicaid enrollees. The magnitude of this reduction was comparable with previously estimated changes associated with state's implementation of comprehensive PDMP use mandates.¹⁹

Part of the estimated reduction may reflect intended outcomes of implementation of the laws. With shorter duration or lower dosage of the first opioid prescriptions, new users of opioids are less likely to develop into long-term, chronic users^{2, 3}. Initial opioid prescriptions and/or prescriptions for acute pain may have been denied at pharmacies if they did not meet the duration or dose limits that newly took effect in the implementing states, also leading to reduced total volume of opioid prescriptions. Future studies with data at the individual patient level should assess, to what extent, such denials have restricted access to opioid therapies for acute pain.

Of greater concern is potential reduction in opioid prescriptions that were recurrent or chronic as a result of the opioid limits, reflecting unintended consequences of the laws. Despite an explicit focus on initial prescriptions, such limits may have had “chilling effects” on prescribers, leading to curtailing or termination of opioid prescriptions across the board. Reduction in chronic opioid use may also have occurred if pharmacies and insurance plans applied limits to all opioid prescriptions, or, to patients exempted from the laws, for example, patients undergoing active cancer treatment. Abrupt discontinuation of chronic opioid therapies may lead to opioid withdrawal, uncontrolled pain, and potential initiation of illegal opioid use.²¹ Such unintended harms need to be assessed in future studies.

A previous study found that limits on initial opioids may have led to repeated short prescriptions to new opioid users to compensate for reduced quantity in the first prescription.⁴ Although the aggregate nature of our data does not allow us to examine this unintended effect, our findings indicate that such increases, if any, were substantially outweighed by reductions in opioid prescriptions at the population level.

Our study has several limitations. First, implementation of opioid limits coincided with the implementation of other state policies intended to address high-risk opioid prescriptions. Of the 26 implementing states in our study, 8 states implemented comprehensive PDMP use mandates within 2 quarters of the effective dates of their opioid limits, making it statistically challenging to isolate the contribution of either policy. Second, aggregate counts of opioid prescriptions do not allow an assessment of the appropriateness of the changes or the intended and unintended effects of the limits. Our findings of overall reduction in opioid prescriptions in response to the opioid limits, however, help shed light on directions for future research to further elucidate implications of such policies for patient populations with

different pain management needs. Third, our findings may not apply to populations with other insurance status.

Conclusion

State legislative limits on initial opioid prescriptions implemented between 2016 and 2018 were associated with meaningful reductions in the volume of Schedule II opioid prescriptions covered by Medicaid and received by Medicaid patients. Studies employing patient level data are needed to quantify intended and unintended effects of such limits.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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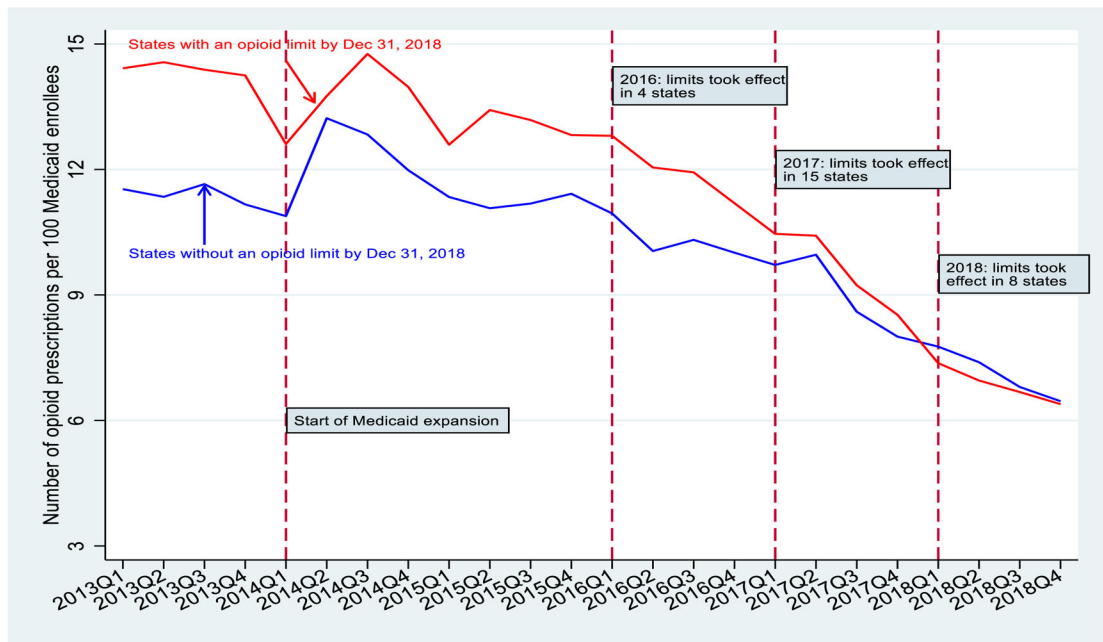


Figure 1.
Opioid Prescriptions per 100 Medicaid Enrollees by State Implementation of Opioid Limits, 2013-2018

NOTES:

“Implementing states” included 26 states that implemented opioid limits by the end of Q3 of 2018. “Non-implementing states” included 24 states and Washington D.C. that did not implement a limit by 3rd Quarter of 2018. Opioid limits included either a limit on duration to no more than 7 days of supply or a limit on the daily dosage.

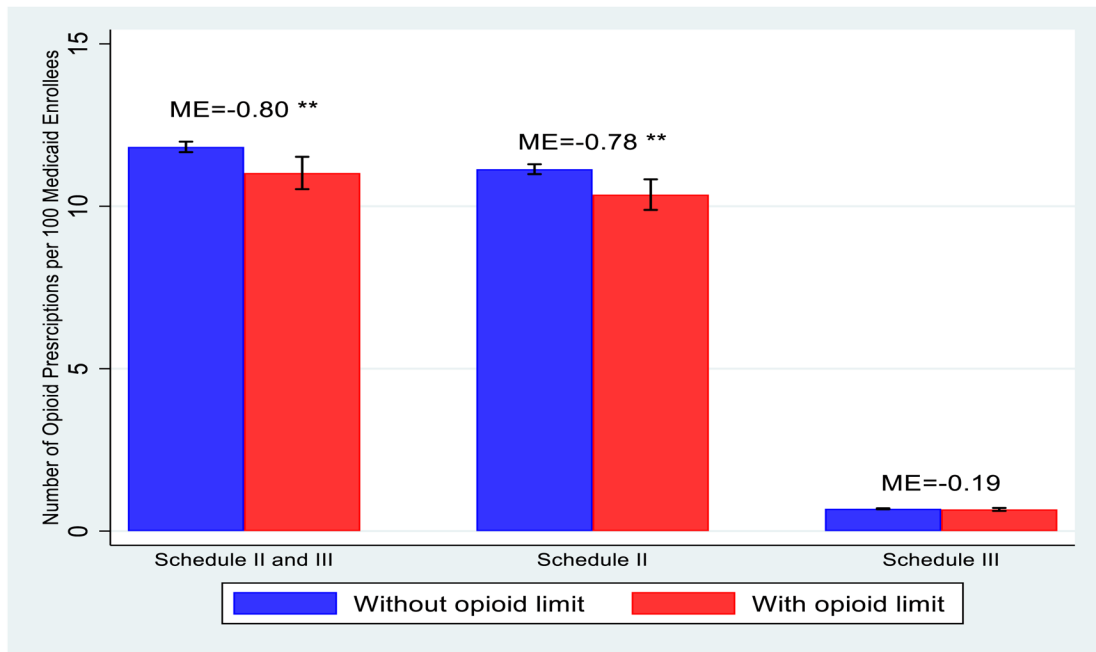


Figure 2.
Predicted Number of Opioid Prescriptions per 100 Medicaid Enrollees Associated With Implementation of Opioid Limits

NOTES:

The data shown are predicted number of prescriptions per 100 Medicaid enrollees for Schedule II and/or III opioids with and without opioid limits, based on results of an analysis including 26 states that implemented opioid limits by the end of Q3 of 2018. The whiskers represent 95% confidence intervals. ME is the marginal effect associated with an opioid limit. * $p < 0.05$.

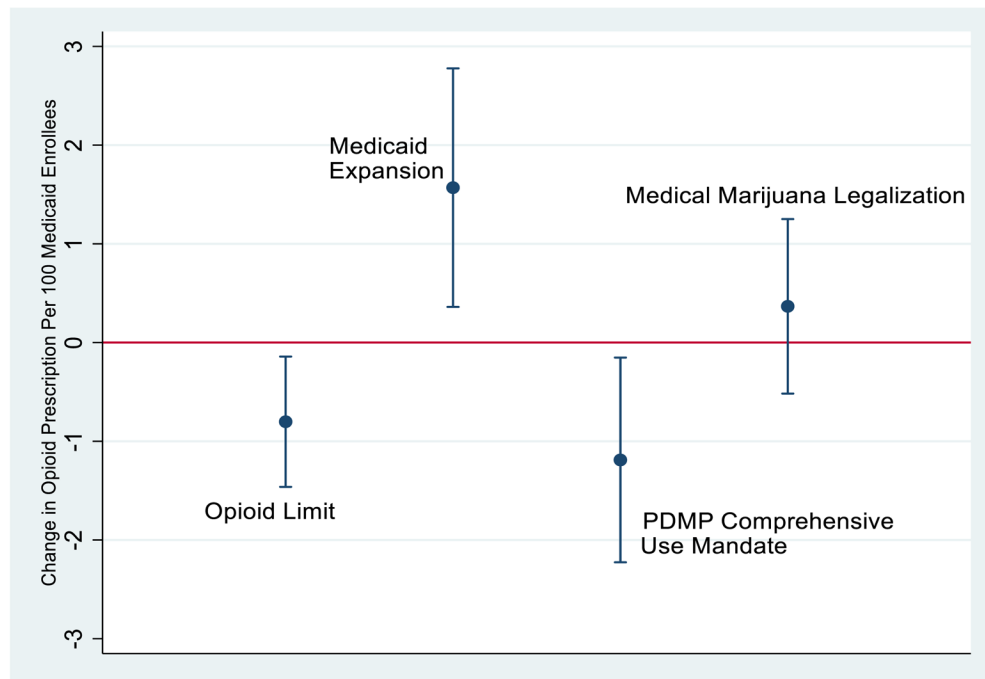


Figure 3. Change in the Number of Opioid Prescriptions per 100 Medicaid Enrollees Associated With State Policies

NOTES:

The data shown are estimated changes in the number of total opioid prescriptions per 100 Medicaid enrollees associated with state policies, based on results of an analysis including 26 states that implemented opioid limits by the end of Q3 of 2018. The whiskers represent 95% confidence intervals. PDMP: Prescription Drug Monitoring Program.