



## A Comparison of Opioid Prescribing Patterns by Dentists in New York and Oregon, 2014-2016

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Center for Health Workforce Studies  
School of Public Health  
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**September 2021**



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# PREFACE

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Dentists are 1 of the top 5 opioid analgesic prescribers among health care professionals in the US. These opioids are often prescribed for tooth extractions and occasionally for root canals, implant placements, and periodontal surgeries; however, most of these prescriptions remain unused after dental surgery, with upwards of 100 million opioid analgesic pills estimated to be left unused following surgical tooth extractions. This study aimed to describe dentists' prescribing patterns in 2 very different states—Oregon and New York—prior to the implementation of prescribing guidelines. This will establish a baseline to understand prescribing trends before and after the implementation of guidelines for Medicaid patients.

The Oral Health Workforce Research Center (OHWRC) at the Center for Health Workforce Studies (CHWS) at the University at Albany's School of Public Health completed a study to examine the alignment of policy and infrastructure with evidence-based workforce strategies to increase access to oral health services for rural populations. Research focuses on best practices as well as the barriers and facilitators to effective implementation of workforce strategies to increase the availability of oral health services.

This report was prepared for OHWRC by Elizabeth Mertz, Matthew Jura, Shen Wang, Miranda Werts, Robert Martiniano, Ulrike Muench, and Enihomo Obadan-Udoh, with layout design by Leanne Keough.

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The mission of OHWRC is to provide accurate and policy-relevant research on the impact of the oral health workforce on oral health outcomes. The research conducted by OHWRC informs strategies designed to increase access to oral health services for vulnerable populations. OHWRC is based at CHWS at the School of Public Health, University at Albany, State University of New York (SUNY), and is the only HRSA-sponsored research center with a unique focus on the oral health workforce.

The views expressed in this report are those of OHWRC and do not necessarily represent positions or policies of the School of Public Health, University at Albany, SUNY.

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# EXECUTIVE SUMMARY

## BACKGROUND

According to the US Centers for Disease Control and Prevention, 218,000 people died from prescription opioid-related overdoses between 1999 and 2017, with the number of deaths per year increasing 5-fold in less than 2 decades.<sup>1</sup> In 2017, the US Department of Health and Human Services declared the opioid crisis an epidemic.<sup>2,3</sup> Dentists are responsible for 12% of immediate-release opioid prescriptions, making them one of the top 5 opioid analgesic prescribers among health care professionals in the US.<sup>4-7</sup> These opioids are often prescribed for tooth extractions and occasionally for root canals, implant placements, and periodontal surgeries<sup>8</sup>; however, most of these prescriptions remain unused after dental surgery, with upwards of 100 million opioid analgesic pills estimated to be left unused following surgical tooth extractions.<sup>9,10</sup>

Improving the training and education of medical professionals in pain management, opioid pharmacology, and principles of abuse and addiction remains essential to addressing the epidemic, while other tools, like prescription drug monitoring programs (PDMPs) and regulatory avenues can provide further guidance.<sup>11</sup> Recent prescribing guidelines for chronic pain and dental pain from the Centers for Disease Control and Prevention (CDC) and the American Dental Association are examples of efforts to reduce the volume and dosage prescribed to patients.<sup>12-15</sup>

This study aimed to describe dentists' prescribing patterns in 2 very different states—Oregon and New York—prior to the implementation of prescribing guidelines.<sup>14,16</sup> This will establish a baseline to understand prescribing trends before and after the implementation of guidelines for Medicaid patients.

## METHODS

### Study Data and Inclusion/Exclusion Criteria

Study data included eligibility files for all Medicaid enrolled adults (18+ years of age) in New York and Oregon and their associated medical, dental, and pharmacy claims between 2014 and 2016.

Inclusion criteria were designed to ensure completeness and comparability of New York and Oregon data sets using information from the eligibility files. Only adults 18+ were included, with age determined as of January 1 of each measurement year. Longitudinal analyses spanning years 2014-2016 were restricted to adults aged 18+ as of January 1 of the first claims year (2014). Based on prior studies' exclusion criteria, researchers chose to omit only those in pain associated with cancer and palliative/end-of-life situations,<sup>14</sup> including people in hospice<sup>17</sup> and people with a diagnosis of cancer<sup>18</sup> or end-stage renal disease.<sup>19,20</sup> By removing these individuals, it is more likely to observe prescribing patterns for the typical acute pain dental patient population and less likely to see differences driven by disease profiles.

### Opioid Prescription Identification and Measures

Opioid prescriptions in the pharmacy claims were identified and converted to standard total oral morphine milligram equivalents (MME) and daily MME using CDC conversion charts.<sup>21</sup> In both states, the prescription claim explicitly identifies the prescriber specialty type, which allows to differentiate a dentist from physician, or other type of qualified prescriber, then categorize the prescription as either dentist-provided or nondentist-provided.\* Opioid prescriptions were assessed in MMEs and days supply (DS) for each year, by claim, by provider type, and per patient. Descriptive statistics were computed for the

\* Nondentist providers are primarily physicians, nurse practitioners, and other medical prescribers.

Oregon data using CRAN R<sup>22</sup> and for the New York data using SPSS,<sup>23</sup> including overall study population demographics.

Opioid prescriptions provided by a dentist were matched to a dental visit that occurred within a  $\pm 7$ -day window. Dental visits were categorized as surgical or nonsurgical based on CDT codes recorded at that visit using established methodology.<sup>24</sup> Opioid prescriptions by a dentist without a matching visit within the  $\pm 7$ -day window were further categorized as to whether they occurred on the same day as a dental-related ED visit<sup>25</sup> or whether no dental visit was ever recorded for that patient in the 3 study years.

Researchers reviewed the current guidelines and literature on prescribing best practices<sup>16,26-28</sup> and calculated the number of claims in each state that exceeded the following suggested limits: daily dose exceeding 90 MME and 120 MME, DS exceeding 3 and 7 days, and not linkable to any face-to-face assessment by a dental provider.<sup>29</sup>

## KEY FINDINGS

### Opioid Prescription Policy History in New York and Oregon

- The comparison states for this study have different historical policies for dentists prescribing opioids, which likely influenced the dental prescribing patterns found in this study, such as early implementation of a PDMP in New York (1973) relative to Oregon (2011) and a mandated use of e-prescribing in New York.
- Strong guidelines for opioid prescriptions for acute pain and/or by dental providers did not appear in both states until late 2016, at the very end of the study period (2014-2016).

### New York and Oregon Medicaid and Dentist Populations

- The New York Medicaid-enrolled adult population is about 10 times larger, slightly younger, and much more racially and ethnically diverse than the Oregon Medicaid-enrolled adult population.
- Although there are no dentist enrollment numbers within the study timeframe, approximately 46% of dentists in NY in 2018 were enrolled as Medicaid providers. Approximately 51% of Oregon dentists in 2018 accepted Medicaid.

### Dentist Opioid Prescribing Patterns

- In both states, dentists were responsible for approximately 1.5% of nonopioid prescriptions. In New York, dentists provided 6.9% of all opioid prescriptions, with a large decrease in prescription share between 2014 and 2016. In Oregon, dentists provided 11.9% of all opioid prescriptions, with a small decline over the 3-year period.
- Quantity of opioids prescribed (standardized to MME and DS) varied with provider type. In New York, dentists prescribed, on average, a total MME of 112.4 vs 1,335.3 by medical providers, while Oregon dentists provided an average total MME of 101.8 vs 747.7 by medical providers. The quantity of each prescription, in total MME and DS, was lower in Oregon than in New York for both dentists and physicians.
- While dentists prescribed a small proportion of the overall share of opioids in each state, a large percentage of the opioids prescribed in both states between 2014 and 2016 exceeded current best practices.<sup>16,26-28</sup> In both states, claims were most likely to exceed the 3 DS threshold. Finally, current guidelines recommend prescribing only after a direct patient assessment. In New York, 10.3% of

prescriptions could not be matched to a dental visit within a  $\pm 7$ -day window, while in Oregon this number exceeded 20%.

### Unique Medicaid Patients With Any Opioid Prescription

- When examining the number of unique patients with any opioid prescription, researchers found that 12.2% of patients *with any dental visit* in New York received an opioid, as did 34.9% of patients *with any dental visit* in Oregon.
- The prescribing rate is about 3 times as great per patient visit in Oregon as in New York.

### Dentist Opioid Prescription Patterns by Patient

- When examining the total opioid prescriptions for individual patients, dentists in Oregon, on average prescribed higher mean MMEs and median MMEs than dentists in New York, as well as higher mean total DS prescribed. In both states, the mean MME and mean total DS declined between 2014 and 2016.
- Overall, most patients received only 1 opioid prescription from a dentist, and both New York and Oregon appeared to be trending down in the mean number of claims per patient (1.5 in NY vs 2.2 for OR) toward the median of 1 claim.

### Matching Opioid Prescriptions by Dentists to Dental Visits

- Among the total opioid prescriptions by a dental provider, 89.7% in New York and 79.7% in Oregon were able to be matched to a dental visit within  $\pm 7$  days, with the majority in both states matched on the same day. The prescriptions provided by a dentist that were not matched to a visit within this win-

dow may be attributed to phone-in prescriptions or refills, or to visits in a medical setting in which a dentist may have been employed.

- The dental visits in the 3-year study matched to opioid prescriptions were assessed to be either surgical or nonsurgical in nature. Although the majority of opioid prescriptions were associated with a surgical visit, approximately one-third of matched visits with an opioid prescription were nonsurgical in nature.

### 90-day Event Sequences After Opioid Prescriptions at a Dental Visit or at the Emergency Department

- Compared with Oregon for events after a nonsurgical dental visit, New York had a greater proportion of surgical follow-up visits from a nonsurgical dental visit with an opioid prescription, and dentists prescribed lower MMEs per episode and provided fewer opioid prescriptions. However, New York had 3 times the rate of patients following up in the ED for a dental-related condition (1.6% vs 0.5%).
- For events after a surgical dental visit, less than 15.0% of surgical visits were followed by another surgical visit in both states; however 27.4% in New York had a nonsurgical follow-up compared to 42.6% in Oregon. The mean MME in both states related to these episodes was lower than for those starting with a nonsurgical visit. In New York, the rate of ED visits after a surgical dental visit (2.7%) was almost twice that after a nonsurgical visit, while in Oregon, the rate of ED visits as the next encounter was the same for a surgical dental visit as for a nonsurgical one (both 0.5%).
- After an ambulatory sensitive dental-related condition in the ED, as not all dental-related visits start in a dental office, both states display similar patterns on whether these individuals were able to obtain

follow-up dental care within a 90-day period. Among the one-third of ED visits that had an opioid prescription on the same day in both states, 43.7% had a dental follow-up visit within 90 days in New York compared to 52.6% in Oregon. About half of those dental follow-up visits received additional opioids from the dentist in both New York and Oregon. Among the other two-thirds of dental ED visits without an associated opioid prescription, only 24.3% had a dental follow-up visit in New York compared to 33.8% in Oregon.

## **DISCUSSION AND CONCLUSION**

This study describes dentists' opioid prescribing patterns prior to the implementation of guidelines for dentists in New York and Oregon and prior to national guidance from the American Dental Association. Consistent with previous research,<sup>4</sup> this study found that dentists in Oregon prescribed 11.9% of all opioid prescriptions during the 3-year study period, while dentists in New York prescribed only 6.9% of all opioid prescriptions. This study also found that, mirroring a national trend, the proportion of prescribing by dentists decreased over the study period. This was paralleled by a decline in MME and DS over time.

New York has nearly 5 times the Medicaid adult population of Oregon (3.5M vs 750K) as well as a higher utilization rate (51% vs 44%); however, total opioid prescribing by dentists in New York was only 1.3 times greater than that in Oregon (327K vs 252K). Among enrollees with a dental visit, only 12.2% received an opioid from a dentist in New York compared with 34.9% in Oregon.

Researchers found that ED visits for nontraumatic dental conditions were associated with an opioid prescription in 36.4% of cases in New York and 34.1% of cases in Oregon. These proportions are lower than found in prior research, which indicated that 55% to 65% of ED visits for nontraumatic dental conditions

led to opioid prescriptions.<sup>30,31</sup> Among these, about one-fifth in New York and one-quarter in Oregon were followed up with a dental visit with another opioid prescription, speaking to the potential use of opioids as a palliative approach to treatment when definitive treatment is unavailable.

Compared to a recent study on national dentist prescribing patterns prior to guidelines for commercially insured patients, which found that 29% of prescriptions exceeded the MME recommendations,<sup>29</sup> this study found far fewer Medicaid adults receiving prescriptions that exceeded the daily 90 MME guidelines, daily 120 MME guidance, or 7 DS guidance. However, more than half of the claims in New York and one-third of the claims in Oregon exceeded the 3 DS guidance. These findings are consistent with prior work estimating that Medicaid populations received fewer opioids than commercially insured populations.<sup>32,33</sup>

Finally, 10.3% of opioid prescriptions in New York and 20.3% in Oregon are being provided without any discernible face-to-face assessment by a dentist. These findings clearly indicate that improvement in prescribing practices is needed, particularly when it comes to DS and clinical assessments. Providers in these states exhibit vastly different prescribing patterns, likely due to much more stringent pre-existing policy in NY. Yet prescribers in both states generally follow the current guidelines (<120 daily MME, <7 DS) for any single prescription.

This report adds to the current literature by examining the longitudinal trend in dental care access after a dental visit with an opioid prescription. Future work should examine changes, particularly in Oregon, after the institution of opioid prescribing guidelines. In summary, dentists contribute to overall exposure for opioids, although the trend is downward. The present study showed both wide variation and opportunities for improvement in clinical practice.

## REFERENCES

1. Prescription Opioid Data. Centers for Disease Control and Prevention website. <https://www.cdc.gov/drugoverdose/data/prescribing.html>. Accessed June 25, 2021.
2. Determination that a Public Health Emergency Exists. US Department of Health and Human Services website. <https://www.phe.gov/emergency/news/healthactions/phe/Pages/opioids.aspx>. Accessed June 12, 2021.
3. Overview of the Drug Overdose Epidemic: Behind the Numbers. Centers for Disease Control and Prevention website. <https://www.cdc.gov/drugoverdose/data/index.html>. Accessed June 13, 2021.
4. Denisco RC, Kenna GA, O'Neil MG, et al. Prevention of prescription opioid abuse: the role of the dentist. *J Am Dent Assoc*. 2011;142(7):800-810.
5. Levy B, Paulozzi L, Mack KA, Jones CM. Trends in Opioid Analgesic–Prescribing Rates by Specialty, US, 2007–2012. *Am J Prev Med*. 2015;49(3):409-413.
6. Rigoni GC. *Drug utilization for immediate and modified release opioids in the US*. Silver Spring, MD: US Food and Drug Administration;2003.
7. Volkow ND, McLellan TA, Cotto JH, Karithanom M, Weiss S. Characteristics of opioid prescriptions in 2009. *JAMA*. 2011;305(13):1299-1301.
8. McCauley JL, Leite RS, Melvin CL, Fillingim RB, Brady KT. Dental opioid prescribing practices and risk mitigation strategy implementation: identification of potential targets for provider-level intervention. *Subst Abus*. 2016;37(1):9-14.
9. Maughan BC, Hersh EV, Shofer FS, et al. Unused opioid analgesics and drug disposal following outpatient dental surgery: a randomized controlled trial. *Drug Alcohol Depend*. 2016;168:328-334.
10. Webster LR, Grabois M. Current Regulations Related to Opioid Prescribing. *PMR*. 2015;7(11 suppl):S236-S247.
11. Volkow ND, McLellan TA. Curtailing diversion and abuse of opioid analgesics without jeopardizing pain treatment. *JAMA*. 2011;305(13):1346-1347.
12. Policies and Recommendations on Substance Use Disorders. American Dental Association website. 2018; <https://www.ada.org/en/about-the-ada/ada-positions-policies-and-statements/substance-use-disorders#>. Accessed June 12, 2018.
13. Quick Reference for Healthcare Providers. Centers for Disease Control and Prevention website. [https://www.cdc.gov/drugoverdose/pdf/Guidelines\\_Factsheet-a.pdf](https://www.cdc.gov/drugoverdose/pdf/Guidelines_Factsheet-a.pdf). Accessed June 12, 2021.
14. Dowell D, Haegerich T, Chou R. CDC Guideline for Prescribing Opioids for Chronic Pain—United States, 2016. *MMWR Recomm Rep*. 2016;65(1):1-49.
15. American Dental Education Association. Opioids Update: Prescription Limits. ADEA Advocate newsletter. 2019;1(20). <https://adea.informz.net/informzdataservice/onlineversion/ind/bWFpbGluZ2luc3RhbmN-laWQ9ODYzOTkwOCZzdWJzY3JpYm-VyaWQ9MTEyODE5OTAxNQ>. Published June 25, 2019. Accessed July 25, 2019.
16. Oregon Health Authority. Oregon Opioid Prescribing Guidelines: Recommendations for the Safe Use of Opioid Medications, 2017–2018. <https://www.icarehealthplan.org/Files/>

- [Resources/PROVIDER-DOCS/CPG-OpioidPrescribingGuidelines](#). Accessed March 8, 2021.
17. *HEDIS Value Set Directory*. Washington DC: National Committee for Quality Assurance (NCQA). 2018. <https://www.dropbox.com/s/bgwp9dpgmo7ksdu/2018-Adult-HEDIS-VSD.xlsx?dl=0>. Accessed March 20, 2021.
  18. PQA Opioid Core Measures. Pharmacy Quality Alliance website. <https://www.pqaalliance.org/opioid-core-measure-set>. Updated March 17, 2021. Accessed March 21, 2021.
  19. ICD-9-CM diagnosis and procedure codes: abbreviated and full code titles. Centers for Medicare & Medicaid Services website. <https://www.cms.gov/Medicare/Coding/ICD9ProviderDiagnosticCodes/codes>. Updated April 14, 2020. Accessed March 20, 2021.
  20. National Center for Health Statistics. *International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM)*. Centers for Disease Control and Prevention website. <https://www.cms.gov/Medicare/Coding/ICD10/index>. Accessed March 20, 2021.
  21. Frieden TR, Houry D. Reducing the Risks of Relief--The CDC Opioid-Prescribing Guideline. *N Engl J Med*. 2016;374(16):1501-1504.
  22. Mutlu I, Abubaker AO, Laskin DM. Narcotic prescribing habits and other methods of pain control by oral and maxillofacial surgeons after impacted third molar removal. *J Oral Maxillofac Surg*. 2013;71(9):1500-1503.
  23. Moore PA, Ziegler KM, Lipman RD, Aminoshariae A, Carrasco-Labra A, Mariotti A. Benefits and harms associated with analgesic medications used in the management of acute dental pain: An overview of systematic reviews. *J Am Dent Assoc*. 2018;149(4):256-265, e253.
  24. Gupta N, Vujcic M, Blatz A. Opioid prescribing practices from 2010 through 2015 among dentists in the United States: What do claims data tell us? *J Am Dent Assoc*. 2018;149(4):237-245, e236.
  25. Manz M. *Recommended Guidelines for Surveillance of Non-Traumatic Dental Care in Emergency Departments*. Reno, NV: Association of State and Territorial Dental Directors; 2017. <https://www.astdd.org/docs/ed-dental-care-protocols-w-appendices-july-6-2017.pdf>. Accessed March 8, 2021.
  26. Moore PA, Ziegler KM, Lipman RD, Aminoshariae A, Carrasco-Labra A, Mariotti A. Benefits and harms associated with analgesic medications used in the management of acute dental pain. *J Am Dent Assoc*. 2018;149(4):256-265, e253.
  27. Hersh EV, Kane WT, O'Neil MG, et al. Prescribing recommendations for the treatment of acute pain in dentistry. *Compend Contin Educ Dent*. 2011;32(3):22, 24-30.
  28. Koppen L, Suda KJ, Rowan S, McGregor J, Evans CT. Dentists' prescribing of antibiotics and opioids to Medicare Part D beneficiaries: Medications of high impact to public health. *J Am Dent Assoc*. 2018;149(8):721-730.
  29. Suda KJ, Zhou J, Rowan SA, et al. Overprescribing of Opioids to Adults by Dentists in the US, 2011-2015. *Am J Prev Med*. 2020;58(4):473-486.
  30. Okunseri C, Dionne RA, Gordon SM, Okunseri E, Szabo A. Prescription of opioid analgesics for nontraumatic dental conditions in emergency departments. *Drug Alcohol Depend*. 2015;156:261-266.
  31. Singhal A, Tien YY, Hsia RY. Racial-Ethnic Disparities in Opioid Prescriptions at Emergency Department Visits for Conditions Commonly Associated with Prescription Drug Abuse. *PLoS One*. 2016;11(8):e0159224.

32. Okunseri C, Okunseri E, Thorpe JM, XiangQ, Szabo A. Medications prescribed in emergency departments for nontraumatic dental condition visits in the United States. *Med Care.* 2012;50(6):508-512.
33. Roberts RM, Bohm MK, Bartoces MG, Fleming-Dutra KE, Hicks LA, Chalmers NI. Antibiotic and opioid prescribing for dental-related conditions in emergency departments: United States, 2012 through 2014. *J Am Dent Assoc.* 2020;151(3):174-181, e171.





# TECHNICAL REPORT

## BACKGROUND

According to the US Centers for Disease Control and Prevention, 218,000 people died from prescription opioid-related overdoses between 1999 and 2017, with the number of deaths per year increasing 5-fold in less than 2 decades.<sup>1</sup> In 2017—a year in which 47,600 opioid-related deaths were recorded, accounting for nearly 68% of all overdose deaths in the country—the US Department of Health and Human Services declared the opioid crisis an epidemic.<sup>2,3</sup> By the department's estimates, more than 100 opioid-related overdose deaths occur daily, and more than 11 million people misuse prescription opioids.<sup>4</sup> A problem of excess opioids in acute, trauma, and perioperative settings persists, contributing to leftover medications, a lack of proper disposal, and the opportunity for diversion of prescription opioids.<sup>5</sup> Dentists are responsible for 12% of immediate-release opioid prescriptions, making them one of the top 5 opioid analgesic prescribers among health care professionals in the US.<sup>6-9</sup> These opioids are often prescribed for tooth extractions and occasionally for root canals, implant placements, and periodontal surgeries<sup>10</sup>; however, most of these prescriptions remain unused after dental surgery, with upwards of 100 million opioid analgesic pills estimated to be left unused following surgical tooth extractions.<sup>5,11</sup>

Primary care providers and internists are the top 2 prescribers of opioids in the US. Additionally, emergency departments (EDs) are one of the top 3 prescribers to adolescents and young adults, and a recent national study found that the rate of opioid prescribing was 14.9% for ED visits among this group.<sup>8,12</sup> In Washington State, EDs had higher rates of dispensing for visits associated with prior substance use disorder, pain-related discharge, and chronic or risky opioid use in the previous 6 months.<sup>13</sup> EDs have also seen steady increases in the rate of opioid prescriptions for nontraumatic dental conditions.<sup>14</sup> However, dentists also play a significant role in the availability

of prescription opioids, falling behind only primary care providers and internists as one of the main prescribers of opioids.<sup>8</sup> Dentists have been the number one prescriber of opioids to patients 25 and under, accounting for the highest frequencies of index prescriptions.<sup>8,10,15,16</sup> Within dentistry, opioids are one of the most prescribed medications by dentists at 19.5% of all dental prescription claims,<sup>17</sup> with one-third of all opioids prescribed during nonsurgical visits, most of which were restorative.<sup>15</sup> This high-volume prescribing trend is also seen with antibiotics, which account for 58.7% of dental prescription claims<sup>17</sup> and were found to be unnecessarily prescribed for infection prophylaxis.<sup>18</sup> Astonishingly, a recent study found that the proportion of prescribed opioids was 37 times greater in the US than in England (22.3% and 0.6%, respectively).<sup>19</sup>

Dentists' play an important role in helping to relieve the opioid epidemic. Improving the training and education of medical professionals in pain management, opioid pharmacology, and principles of abuse and addiction remains essential to addressing the epidemic, while other tools and regulatory avenues can provide further guidance.<sup>20</sup> Dentists who reported a higher frequency of opioid prescribing were associated with less consistent implementation of risk mitigation strategies, such as using prescription drug monitoring programs (PDMP) and providing patients with proper education on the use and disposal of opioids.<sup>21</sup> Despite some roadblocks to integrating the system into practice and differences across states regarding how PDMPs should be used in practice, many studies have found that usage of PDMPs has helped reduce the rate of opioid prescribing.<sup>5,21-26</sup> Moving forward, a more robust and national PDMP system would be most beneficial to address some of those difficulties.<sup>27</sup> Federal regulatory organizations also have the capacity to increase education and awareness, support antidrug activities, improve risk evaluation and mitigation strategies, and approve alternative drugs with abuse-deterrent properties.<sup>5,28-31</sup> The Centers for Disease Control and Prevention (CDC)

and the American Dental Association have both released their own opioid prescribing guidelines for chronic pain and dental pain, respectively, in an effort to reduce the volume and dosage prescribed to patients.<sup>32-35</sup> Other initiatives, outside of the dental office, avoid attempting to control the number of available prescription opioids in favor of increasing access of overdose treatments to laypersons (including family and friends) as well as to law enforcement, and many states have implemented “Good Samaritan” laws in their efforts to decrease deaths caused by overdose.<sup>36-38</sup>

Expanding on previous work that examined opioid prescribing to Washington State’s Medicaid population, the present study aimed to describe dentists’ prescribing patterns in 2 very different states—Oregon and New York—prior to the implementation of prescribing guidelines.<sup>33,39</sup> This will establish a baseline to understand prescribing trends before and after the implementation of guidelines for Medicaid patients.

## METHODS

### Study Data

Study data included eligibility files for all Medicaid enrolled adults (18+ years of age) in the New York and Oregon and their associated medical, dental, and pharmacy claims between 2014 and 2016.

### Population Inclusion Criteria

Inclusion criteria were designed to ensure completeness and comparability of New York and Oregon data sets using information from the eligibility files. Only adults 18+ were included, with age determined as of January 1 of each measurement year. Longitudinal analyses spanning years 2014-2016 were restricted to adults aged 18+ as of January 1 of the first claims year (2014). Researchers assessed Medicaid eligibil-

ity criteria categories between New York and Oregon and included only individuals who were clearly eligible in both programs. For example, foster children up to age 26, pregnant women, Medicaid expansion adults, and immigrants and refugees are eligible in both states’ programs. However, only New York specifically covers undocumented pregnant women, so those individuals were not included. Additionally, both data sets had a small number (<0.01%) of eligibility codes that conflicted with age criteria (for example, a person eligible under an infant code but with age listed as 18+). Individuals that were not able to be reconciled were dropped. Inclusion criteria further required being able to observe individual’s entire spectrum of care in medical/dental/pharmacy set of claims, so researchers did not include dual-eligible individuals who would be missing records paid under Medicare.

### Population Exclusion Criteria

Exclusion criteria were developed with the goal of removing patients who were experiencing pain from an underlying illness that may require opioid prescriptions to treat illness. By removing these individuals, we are more likely to observe prescribing patterns for the typical acute pain dental patient population and are less likely to see differences driven by disease profiles.

Prior studies have identified the following 4 domains for exclusion: (1) acute pain in hospitalization, (2) new-onset acute pain for those with chronic pain, (3) acute pain in substance use disorder, and (4) pain associated with cancer and palliative/end-of-life situations.<sup>33</sup> Researchers chose to omit those only in category 4, including people in hospice<sup>\*40</sup> and people with a diagnosis of cancer<sup>41</sup> or end-stage renal disease.<sup>42,43</sup> The final population included in the study retained 83.8% (n=750,206) of the total Medicaid-eligible adults in Oregon and 64.4% (n=3,503,035) of Medicaid-eligible adults in New York (Table 1).

\* Hospice: HEDIS. Cancer: PQA Opioid Measure Set. ESRD: ICD9 and ICD10 (2018 ICD-10-CM set).

**TABLE 1. Inclusion/Exclusion Population Counts, Oregon and New York Medicaid Claims, 2014-2016**

	New York				Oregon			
	Year	Exclusion	Inclusion	Percent Retained	Year	Exclusion	Inclusion	Percent Retained
Age (18+ years)		< 18 years	18+ years			< 18 years	18+ years	
	2014	-	4,077,887		2014	662,628		
	2015	-	4,293,432		2015	769,663		
	2016	-	4,134,094		2016	791,370		
	2014-2016	-	5,438,733		2014-2016	895,377		
Aid Codes		Unmatched	Matched					
	2014	8,676	4,069,211	99.8%	2014	No aid codes dropped in Oregon		
	2015	19,530	4,273,902	99.5%	2015			
	2016	31,385	4,102,709	99.2%	2016			
	2014-2016	45,417	5,393,316	99.2%	2014-2016			
Medicaid Only		Dual-eligible	Medicaid			Dual-eligible	Medicaid	
	2014	957,571	3,111,640	76.3%	2014	77,523	585,105	88.3%
	2015	960,088	3,313,814	77.2%	2015	83,466	686,197	89.2%
	2016	942,116	3,160,593	76.5%	2016	87,059	704,311	89.0%
	2014-2016	1,154,482	4,238,834	77.9%	2014-2016	96,000	799,377	89.3%
Min. 90 Days' Cont. Coverage		<90	90+			<90	90+	
	2014	394,731	2,716,909	66.6%	2014	44,867	540,238	81.5%
	2015	439,370	2,874,444	66.9%	2015	34,769	651,428	84.6%
	2016	483,864	2,676,729	64.7%	2016	35,767	668,544	84.5%
	2014-2016	636,555	3,602,279	66.2%	2014-2016	28,692	770,685	86.1%
Hospice		+	-			+	-	
	2014	9,578	2,707,331	66.4%	2014	2,131	538,107	81.2%
	2015	10,888	2,863,556	66.7%	2015	1,726	649,702	84.4%
	2016	12,212	2,664,517	64.5%	2016	1,061	667,483	84.3%
	2014-2016	29,709	3,572,570	65.7%	2014-2016	2,532	768,153	85.8%
Cancer		+	-			+	-	
	2014	24,481	2,682,850	65.8%	2014	10,618	527,489	79.6%
	2015	24,648	2,838,908	66.1%	2015	12,452	637,252	82.8%
	2016	19,299	2,645,218	64.0%	2016	9,766	657,717	83.1%
	2014-2016	57,098	3,515,472	64.6%	2014-2016	16,767	751,386	83.9%
End Stage Renal Disease		+	-			+	-	
	2014	7,099	2,675,751	65.6%	2014	949	526,540	79.5%
	2015	7,381	2,831,527	66.0%	2015	925	636,327	82.7%
	2016	7,065	2,638,153	63.8%	2016	784	656,933	83.0%
	2014-2016	12,437	3,503,035	64.4%	2014-2016	1,180	750,206	83.8%

## Opioid Prescription Identification and Measures

Opioid prescriptions in the pharmacy claims were identified and converted to standard total oral morphine milligram equivalents (MME) and daily MME using the following formulas from CDC conversion charts:<sup>44</sup>

$MME_{\text{Total/claim}} = \text{Strength per Unit} \times \# \text{Units} \times \text{CDC MME Conversion Factor}$

$MME_{\text{Daily}} = \text{Strength per Unit} \times \frac{(\# \text{Units})}{(\text{Days Supply})} \times \text{CDC MME Conversion Factor}$

In both states, the prescription claim explicitly identifies the prescriber specialty type—this allows researchers to identify a dentist from physician, or other type of qualified prescriber. Prescriptions were then categorized as either dentist-provided or non-dentist-provided.<sup>†</sup> The small number of pharmacy claims that were missing provider type (0.03%) in both states were dropped from the analysis.

Using published workforce data from 2018, researchers were able to estimate the Medicaid participation rate of dentists in both states.<sup>45</sup> However, due to the variability in the format of data from New York and Oregon, we were able to calculate the percentage of Medicaid-participating dentists who prescribed any opioid in New York, but not for Oregon.

Descriptive statistics were computed for the Oregon data using CRAN R46 and for the New York data using SPSS,<sup>47</sup> including overall study population demographics. Opioid prescriptions were assessed in MMEs and days supply (DS) for each year, by claim, by provider type, and per patient.

Opioid prescriptions provided by a dentist were matched to a dental visit that occurred within a  $\pm 7$ -

day window. In contrast to prior studies using a smaller window when prescriber type was not available,<sup>15,48</sup> we used a wider range in order to maximally but reasonably capture pre- and post-dental-visit opioid prescriptions since our data captured the provider type. Dental visits were categorized as surgical or nonsurgical based on CDT codes recorded at that visit using established methodology.<sup>15</sup> Opioid prescriptions by a dentist without a matching visit within the  $\pm 7$ -day window were further categorized as to whether they occurred on the same day as a dental-related ED visit<sup>49</sup> or whether no dental visit was ever recorded for that patient in the 3 study years.

Researchers reviewed the current guidelines and literature on prescribing best practices<sup>17,39,50,51</sup> and calculated the number of claims in each state that exceeded the following suggested limits: daily dose exceeding 90 MME and 120 MME, DS exceeding 3 and 7 days, and not linkable to any face-to-face assessment by a dental provider.<sup>52</sup> Researchers did not differentiate by type of opioid prescribed.<sup>7</sup>

## FINDINGS

### Opioid Prescription Policy History in New York and Oregon

The comparison states for this study have different historical policies for dentists prescribing opioids, which likely influenced the dental prescribing patterns found in this study. The comparison of these policy environments is provided in Table 2. Key takeaways are early implementation of a prescription monitoring program (PMP) in New York (1973) relative to Oregon (2011) and a mandated use of e-prescribing in New York. Strong guidelines for opioid prescriptions for acute pain and/or by dental providers did not appear in both states until late 2016, at the very end of this study period (2014-2016).

<sup>†</sup> Non-Dentist providers are primarily physicians, nurse practitioners and other medical prescribers.

**TABLE 2. New York and Oregon State Opioid Policy Through 2016**

Year	New York Opioid Policy	Year	Oregon Opioid Policy
1973	NY Establishes one of the first PDMP as part of its Controlled Substances Act (Rockefeller Laws). Upheld by Supreme Court in 1977 (Roe vs Whalen).	1995, 2003, 2007	Oregon Intractable Pain Act passed (amended in 2003 and 2007). "Allows physicians to prescribe controlled substances for treatment of chronic pain without sanction from the OR Medical Board." <sup>58</sup>
2012	Prescription Drug Reform Act overhauled the way prescription drugs are dispensed and tracked in New York to improve safeguards for drugs that are prone to abuse. The Act updated the Prescription Monitoring Program (PMP) Registry (also known as I-STOP) to require pharmacies to report information about dispensed controlled substances on a "real time" basis, as well as require health care practitioners to consult the PMP before prescribing or dispensing certain controlled substances most prone to abuse and diversion. <sup>29</sup>	2009	Creation of the Alcohol and Drug Policy Commission <sup>58</sup>
2013	<p>Changes to Schedules: On February 23rd all products containing hydrocodone were placed on Schedule II, Tramadol was placed on Schedule IV.</p> <p>E-Prescribing: Regulations allow for electronic prescribing of controlled substances in NY effective March 27th</p> <p>I-STOP goes into effect August 27th Most prescribers are required to consult the Prescription Monitoring Program (PMP) Registry when writing prescriptions for Schedule II, III, and IV controlled substances.<sup>57</sup> The PMP is available 24 hours a day/7 days a week via an application on the Health Commerce System (HCS).</p>	2011	Oregon's prescription drug monitoring program (PDMP) became operational. Use is voluntary.
2014	Legislation amends Penal Law Section 220.78 to grant Good Samaritan protections to individuals who administer an opioid antagonist like naloxone, expanded access to naloxone by allowing nonpatient-specific prescriptions (Public Health Law Section 3309), enacted insurance reforms to improve treatment options for individuals suffering from addiction, directed OASAS to create a wraparound services demonstration program to provide services to adolescents and adults for up to 9 months after successful completion of a treatment program, and enhanced penalties to crack down on illegal drug distribution. <sup>57</sup>	2012	SAMHSA reports that Oregon leads the nation in non-medical use of opioid analgesics.
2015	Electronic prescribing of controlled and non-controlled substances becomes mandatory for all practitioners in NY as of March 27, 2015, but the deadline has extended for one year on March 18, 2015.	2013	Legislation (SB 470) to amend PDMP. Authorizing the PDMP to collect additional prescription data and increased system access to PDMP information. The Alcohol and Drug Policy Commission hands of some responsibility to Lines for Life, a community-based prevention program (becomes responsible for public and practitioner education, advocacy for take-backs, and promoting access to medication for treatment of opioid dependence). <sup>58</sup>
2016	<p>Mandatory E-Prescribing Effective March 27, 2016.</p> <p>June 9th, Governor Cuomo's Heroin and Opioid Task Force issued its report and made 9 recommendations.</p> <p>On June 22, Comprehensive Legislative Package (the report) was passed to limit opioid prescriptions from 30 to 7 Days, Requires Mandatory Prescriber Education on Pain Management to Stem the Tide of Addiction, Eliminates Burdensome Insurance Barriers to Treatment.</p> <p>October 22, NYS pharmacies must distribute a hand-out, developed by New York State, which includes the dangers of misuse and risk for addiction, warning signs for addiction, alcohol and drug addiction treatment resources, and safe disposal guidelines with all dispensed controlled substances.</p>	2014	Annual report shows DDS/DMD use of PDMP rose from 3706 to 7750 inquires between 2012 and 2014. This is less than 1% of the total 810,996 inquires in 2014).
		2015	<p>Oregon Health Authority launches the Opioid Initiative with the goal to increase "access to nonopioid pain treatment, supporting medication-assisted treatment and naloxone access for people taking opioids, decreasing opioid prescribing, and using data to inform policies and interventions."<sup>59</sup></p> <p>The addition of MED information to opioid prescription records in 2015 to help identify patients at increased risk of overdose. <a href="http://www.orpdmp.com/orpdmpfiles/PDF_Files/Reports/2014_PDMP-AC_Annual_Report_02_05_15.pdf">http://www.orpdmp.com/orpdmpfiles/PDF_Files/Reports/2014_PDMP-AC_Annual_Report_02_05_15.pdf</a></p> <p>Oregon Prescription Drug Overdose, Misuse, and Dependency Prevention Plan published.</p>
		2016	In June, Oregon Opioid Prescribing Guidelines Task Force approves CDC Guideline for Prescribing Opioids.
			In November, Task Force approves adoption of Oregon-specific prescribing guidelines (based on CDC Guidelines for chronic pain).

Abbreviations: CDC, Centers for Disease Control and Prevention; MED, morphine equivalent dosage; OASAS, Office of Addiction Services and Supports; PMP, prescription monitoring program; SAMHSA, Substance Abuse and Mental Health Services Administration.

## NY and OR Medicaid Population

The population demographics for the comparative Medicaid populations are shown in Table 3. Of note, the New York Medicaid-enrolled adult population is about 10 times larger, slightly younger, and much more racially and ethnically diverse than the Oregon Medicaid-enrolled adult population. Among aid code categories, proportionally more of Oregon’s adult population is eligible as “adults and couples” and fewer “families” relative to New York. Both states are Medicaid expansion states under the Affordable Care Act.

**TABLE 3. Study Population Demographics, New York and Oregon Adult Medicaid Enrollees, 2014-2016**

Demographics	New York		Oregon	
	n	%	n	%
<b>Age</b>				
18-20	335,863	9.6	45,868	6.1
21-24	468,531	13.4	90,249	12.0
25-34	1,001,162	28.6	229,623	30.6
35-44	698,132	19.9	150,056	20.0
45-54	633,594	18.1	127,382	17.0
55-64	299,405	8.5	100,883	13.5
65-74	43,284	1.2	5,434	0.7
75-84	19,177	0.5	548	0.1
85+	3,887	0.1	163	0.0
<b>Sex</b>				
Female	1,928,213	55.0	404,669	53.9
Male	1,574,822	45.0	345,537	46.1
<b>Race</b>				
White	1,077,436	30.8	391,777	52.2
Black	617,421	17.6	18,780	2.5
Hispanic	825,649	23.6	62,087	8.3
Asian	423,643	12.1	17,513	2.3
Pacific Islander/Native Hawaiian	2,971	0.1	2,630	0.4
American Indian	9,320	0.3	13,385	1.8
Multi-Race	202,815	5.8	13,306	1.8
Unknown	343,780	9.8	230,728	30.8
<b>Aid Code Category</b>				
Children (18+)	41,818	1.2	9,293	1.2
Foster Children	1,174	0.0	1,333	0.2
Pregnant Women	56,508	1.6	34,217	4.6
Families	1,821,755	52.0	149,014	19.9
Adults & Couples	1,394,072	39.8	540,585	72.1
Blind/Disabled	149,222	4.3	8,865	1.2
Immigrants/Refugees	2,085	0.1	48	0.0
Elderly	36,401	1.0	6,851	0.9

## NY and OR Dentist Populations

Although we do not have dentist enrollment numbers within our study timeframe, there were approximately 18,103 dentists in New York in 2018, among whom 8,296 (46%) were enrolled as Medicaid providers. Similarly, there were approximately 3,800 dentists in Oregon in 2018, among whom 1,927 (51%) accepted Medicaid. Our claims data do not contain demographic or practice information about the prescribing dentists.

## Dentist Opioid Prescribing Patterns

Over the 3-year study period (2014-2016), researchers calculated that 44% of Medicaid-enrolled dentists in New York prescribed any opioid. The Oregon data do not allow for a similar calculation.

In both states, dentists were responsible for approximately 1.5% of nonopioid prescriptions. In New York, dentists provided 6.9% of all opioid prescriptions, with a large decrease in prescription share from 8.2% to 5.3% between 2014 and 2016 (Table 4). In comparison, in Oregon, dentists provided 11.9% of all opioid prescriptions, with a small decline (12.1% to 11.8%) over the 3-year period. Another notable difference between the states was the prescription volume in relation to enrolled population size. New York has nearly 5 times the Medicaid adult population as Oregon (3.5 million vs 750,000), and yet only 1.3 times the total number of prescriptions (327,000 vs 252,000).

Nondentist prescribers—primarily physicians, nurse practitioners, and other medical prescribers (hereafter collectively referred to as medical providers)—provided the vast majority of opioid prescriptions in both states, with Oregon medical providers having a greater share of opioid vs nonopioid prescriptions.

The quantity of opioids prescribed (standardized to MME and DS) varied with provider type. In New York, dentists prescribed, on average, a total MME of 112.4 versus 1,335.3 by medical providers, while Oregon dentists provided an average total MME of 101.8 versus 747.7 by medical providers. In an inverse pattern from the share of overall prescriptions by dentists and physicians shown in Table 4, the quantity of each prescription, in total MME and DS, was lower in Oregon than in New York for both dentists and physicians (Table 5).

These data from 2014 to 2016 predate most national dental guidelines for opioid prescribing and general guidelines for acute or chronic pain. In order to determine potential areas for improvement, researchers compared the data to the common measures found in current guidelines and best practices.<sup>17,39,50,51</sup> These recommend rarely exceeding a daily maximum of 90 MME (ideal) and 120 MME (maximum) and limits of 3 (ideal) and 7 (maximum) DS, as well as the recommendation that an in-person visit be performed before a prescription is provided (Table 6).

**TABLE 4. Share of Opioid and Nonopioid Prescriptions by Provider Type**

	Dentist Rx				Nondentist Rx			
	New York		Oregon		New York		Oregon	
All Rx Claims	n	%	n	%	n	%	n	%
Opioid Rx	327,546	15.2	251,524	45.63	4,425,109	3.5	1,823,813	7.8
Non-Opioid Rx	1,831,890	84.8	299,674	54.37	123,187,952	96.5	21,480,610	92.2
Total	2,159,436	100.0	551,198	100.00	127,613,061	100.0	23,304,423	100.0
Opioid Rx Claims	n	%	n	%	n	%	n	%
2014	144,783	8.2	89,717	12.1	1,623,801	91.6	634,908	85.6
2015	109,447	6.8	86,651	11.7	1,485,166	92.9	636,553	86.2
2016	73,316	5.3	75,156	11.8	1,316,142	94.5	552,352	86.4
<b>3-year total<sup>a</sup></b>	<b>327,546</b>	<b>6.9</b>	<b>251,524</b>	<b>11.9</b>	<b>4,425,109</b>	<b>92.9</b>	<b>1,823,813</b>	<b>86.1</b>

<sup>a</sup> Totals do not add to 100% due to Opioid Rx by unknown prescriber types (0.2% in NY, and 2.1% in OR) – data not shown. Abbreviation: Rx, prescription(s).

**TABLE 5. Opioid Prescription Quantity by Provider Type**

	Dentist Rx				Nondentist Rx			
	New York		Oregon		New York		Oregon	
<b>Total MME per prescription claim</b>	Mean	SD	Mean	SD	Mean	SD	Mean	SD
2014	110.8	57.8	99.7	72.5	1,324.6	1,697.8	783.2	1343.9
2015	112.4	64.6	103.9	65.3	1,319.5	1,720.8	752.8	1206.1
2016	114.6	66.4	101.8	72.8	1,362.5	1,646.9	701.0	1072.5
<b>3-year total</b>	<b>112.4</b>	<b>62.0</b>	<b>101.8</b>	<b>70.2</b>	<b>1,335.3</b>	<b>1,698.1</b>	<b>747.7</b>	<b>1219.0</b>
<b>Daily MME per prescription claim</b>	Mean	SD	Mean	SD	Mean	SD	Mean	SD
2014	27.2	10.4	33.3	15.3	70.0	64.6	49.22	55.78
2015	27.7	10.1	33.9	15.6	69.0	61.8	48.03	53.44
2016	28.4	11.1	33.9	16.4	68.4	57.5	45.80	47.50
<b>3-year total</b>	<b>27.7</b>	<b>10.4</b>	<b>33.7</b>	<b>15.7</b>	<b>69.1</b>	<b>60.9</b>	<b>47.77</b>	<b>52.58</b>
<b>DS per prescription claim</b>	Mean	SD	Mean	SD	Mean	SD	Mean	SD
2014	4.1	2.3	3.2	1.7	18.9	7.2	15.7	11.6
2015	4.1	1.9	3.3	1.7	19.1	7.1	15.9	11.7
2016	4.0	1.7	3.2	1.7	19.9	6.2	15.9	11.6
<b>3-year total</b>	<b>4.1</b>	<b>2.2</b>	<b>3.3</b>	<b>1.7</b>	<b>19.3</b>	<b>7.1</b>	<b>15.8</b>	<b>11.7</b>

Abbreviations: DS, days' supply; MME, morphine milligram equivalents; Rx, prescription(s); SD, standard deviation.

**TABLE 6. Dentist Opioid Prescription Claims Exceeding Current Best Practices**

	New York		Oregon	
	Total	%	Total	%
<b>Claims exceeding daily 90 MME</b>				
2014	1,868	1.3	640	0.7
2015	1,467	1.3	642	0.7
2016	1,012	1.4	606	0.8
<b>3-year total</b>	<b>4,347</b>	<b>1.3</b>	<b>1,888</b>	<b>0.8</b>
<b>Claims exceeding daily 120 MME</b>				
2014	805	0.6	127	0.1
2015	744	0.7	156	0.2
2016	609	0.8	199	0.3
<b>3-year total</b>	<b>2,158</b>	<b>0.7</b>	<b>482</b>	<b>0.2</b>
<b>Claims exceeding 3-day supply</b>				
2014	82,391	56.9	29,967	33.4
2015	61,859	56.5	30,698	35.4
2016	40,104	54.7	24,607	32.7
<b>3-year total</b>	<b>184,354</b>	<b>56.3</b>	<b>85,272</b>	<b>33.9</b>
<b>Claims exceeding 7-day supply</b>				
2014	4,852	3.4	1,133	1.3
2015	3,937	3.6	1,144	1.3
2016	2,275	3.1	726	1.0
<b>3-year total</b>	<b>11,064</b>	<b>3.4</b>	<b>3,003</b>	<b>1.2</b>
<b>Claims not linked to an in-person dental visit (+/- 7 days of Rx)</b>				
2014	14,998 <sup>a</sup>	10.4	18,413	20.5
2015	12,123 <sup>a</sup>	11.1	19,584	22.6
2016	7,747 <sup>a</sup>	10.6	12,966	17.3
<b>3-year total</b>	<b>33,893</b>	<b>10.3</b>	<b>50,963</b>	<b>20.3</b>

<sup>a</sup> 3-year total counts (33,893) are smaller than the sum counts of each of the 3 years (14,998 + 12,123 + 7,747 = 34,868). The difference (975 Rx) was primarily due to the fact that some Rx provided near the beginning/end of the year failed to be linked to a visit happening in the neighboring year within ±7 days because of the year mark.

Abbreviations: DS, days' supply; MME, morphine milligram equivalents; Rx, prescription(s).

In both states, we found a range of claims that exceeded these current recommendations, but claims were most likely to exceed the 3 DS threshold. In New York, 1.3% of claims over the 3-year period exceeded 90 MME daily, with 0.7% exceeding 120 MME daily, while in Oregon, the comparable rates were 0.8% and 0.2%—all relatively low. However, in New York, 56.3% of claims exceeded the 3 DS limit, although only 3.4% exceeded the 7 DS maximum. In Oregon, the comparable rates were 33.9% and 1.2%, respectively. Finally, current guidelines recommend prescribing only after a direct patient assessment. In New York, 10.3% of prescriptions could not be matched to a dental visit within a  $\pm 7$ -day window, while in Oregon this number exceeded 20%.

In summary, while dentists prescribed a small proportion of the overall share of opioids in each state, a large percentage of the opioids prescribed in both states between 2014 and 2016 exceeded current best practices.

### Unique Medicaid Patients With Any Opioid Prescriptions

Up to this point, the analyses have focused on the individual prescriptions provided by dentists, regardless of patient counts. When we examine the number of unique patients with any opioid prescription (Table 7), we find that 12.2% of patients with any dental visit in New York received an opioid ( $n=219,056$ ), as did 34.9% of patients with any dental visit in Oregon ( $n=114,193$ ). This pattern is similar among patients with any medical visit, where 16.3% in New York received an opioid prescription compared with 41.8% in Oregon.

Among the Medicaid-enrolled New York population in our study ( $n=3,503,035$ ), 51% had a dental visit in the 3-year period, while among the Oregon population enrolled in our study ( $n=750,206$ ), the dental utilization rate over the 3-year period was 44%. The prescribing rate is about 3 times as great per patient visit in Oregon as in New York, which partially explains the considerable difference in prescriptions per Medicaid enrollee previously noted.

### Dentist Opioid Prescription Patterns by Patient

When examining the total opioid prescriptions for individual patients (Figure 1), we see that, on average, dentists in Oregon prescribed higher mean MMEs (224.1 vs 167.9) and median MMEs (140 vs 87) than dentists in New York. In both states, the mean MME declined slightly between 2014 and 2016—a positive trend—while in Oregon, the median MME also decreased over time.

Similarly, the mean total DS prescribed by dentists per patient over the entire study period (Figure 2) was higher in Oregon than in New York (7.2 vs 6.1), but again with a decreasing trend in evidence, particularly for Oregon. The median DS appeared to hold steady over time in both states.

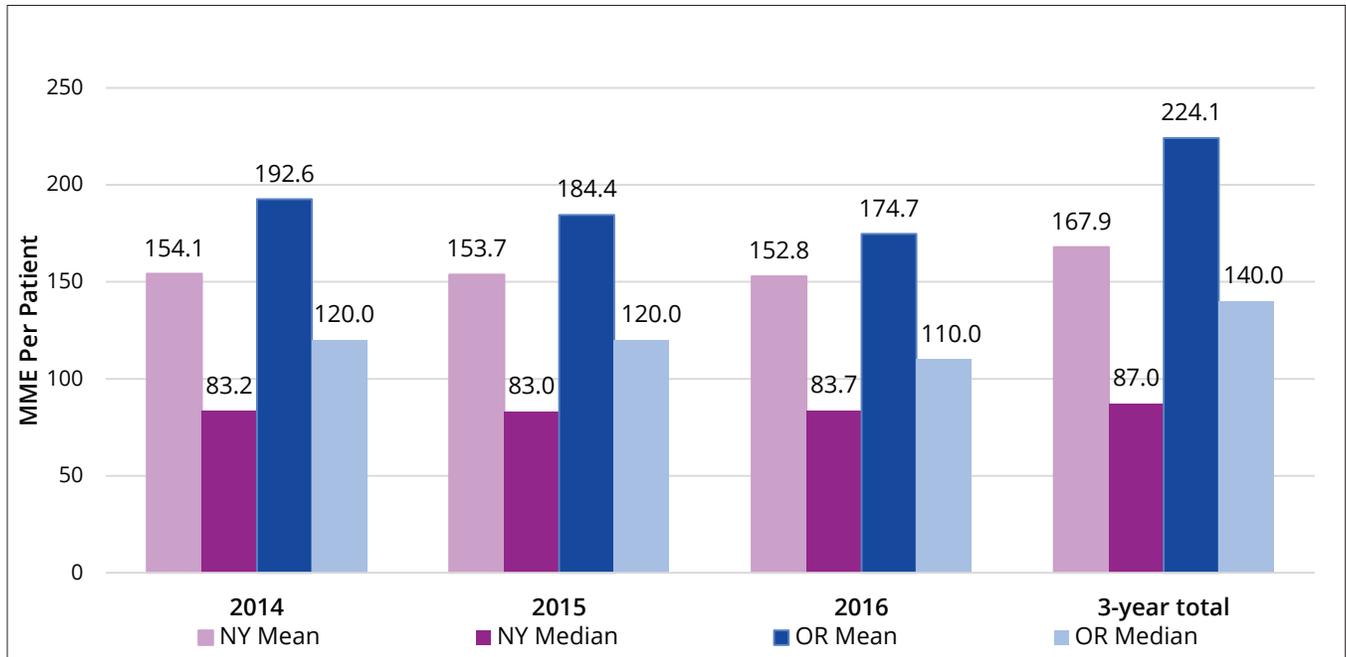
Overall, most patients received only 1 opioid prescription from a dentist (Figure 3), and both New York and Oregon appeared to be trending down in the mean number of claims per patient (1.5 in New York vs 2.2 for Oregon) toward the median of 1 claim.

**TABLE 7. Unique Patients With Opioid Prescription by Provider Type, 2014-2016**

	Dentist/Dental Visit				Nondentist (Medical) Visit			
	New York		Oregon		New York		Oregon	
Unique patients with any visit by provider type listed	(n=1,789,166)		(n=327,102)		(n=4,362,341)		(n=628,957)	
Unique patients with any opioid Rx claim	n	%	n	%	n	%	n	%
	219,056	12.2%	114,193	34.9%	711,577	16.3%	262,685	41.8%

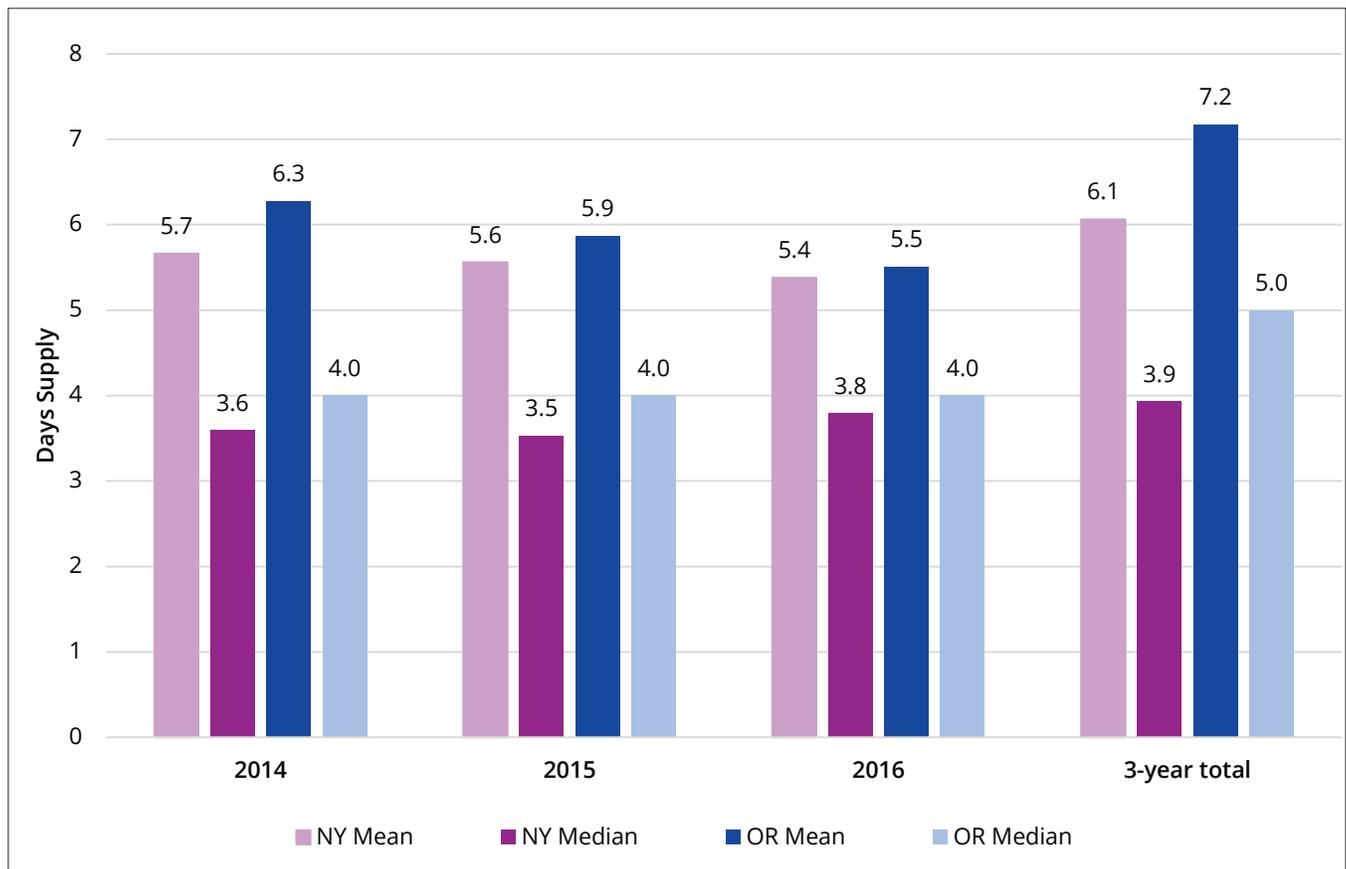
Abbreviation: Rx, prescription(s).

**FIGURE 1. Dentist-Prescribed Opioids, Mean and Median MME per Patient by Year and Aggregated, 2014-2016**



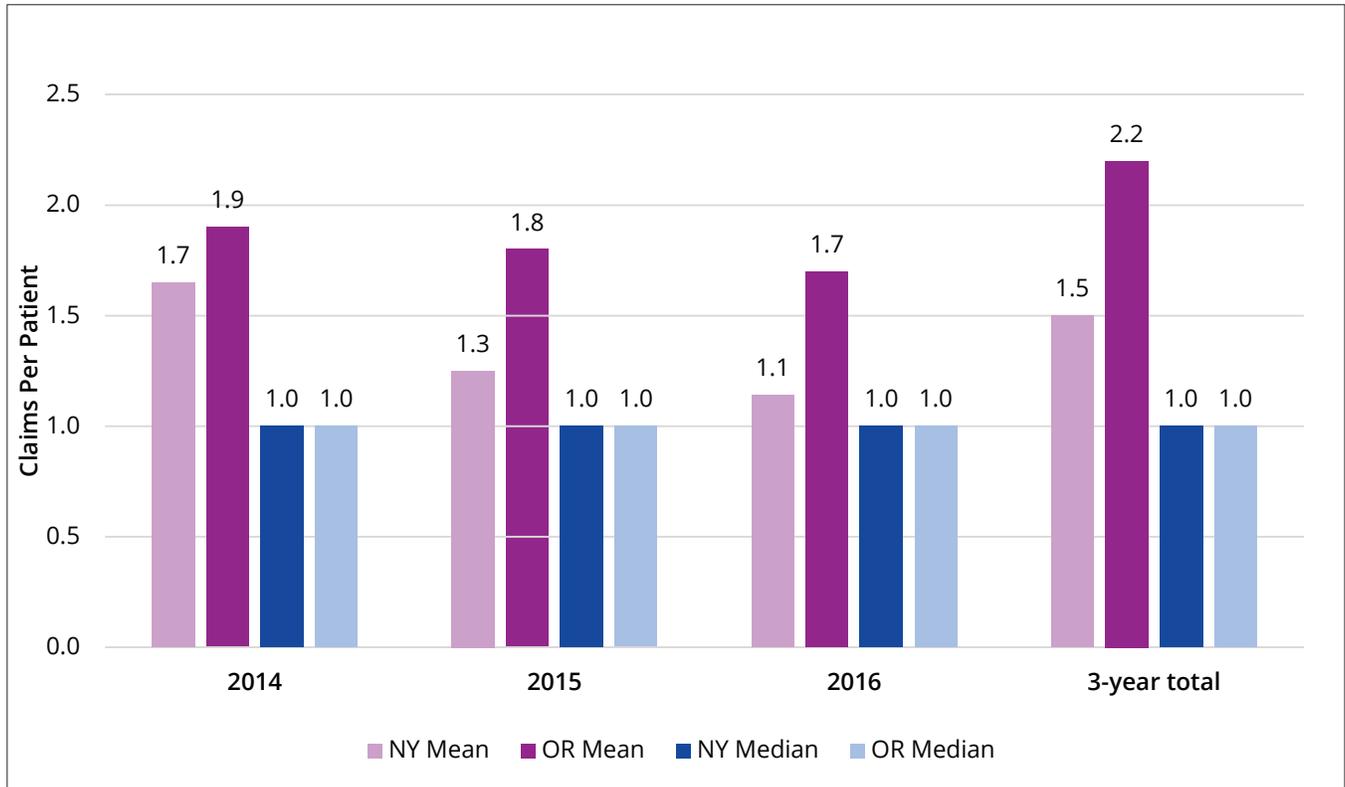
Abbreviation: MME, morphine milligram equivalents; NY, New York; OR, Oregon.

**FIGURE 2. Dentist-Prescribed Opioids, Mean and Median DS per Patient by Year and Aggregated, 2014-2016**



Abbreviations: DS, days' supply; NY, New York; OR, Oregon.

**FIGURE 3. Dentist-Prescribed Opioids, Mean and Median Claims per Patient by Year and Aggregated, 2014-2016**



### Matching Opioid Prescriptions by Dentists to Dental Visits

Among the total opioid prescriptions by a dental provider, 89.7% in New York and 79.7% in Oregon were able to be matched to a dental visit within  $\pm 7$  days, with the majority in both states matched on the same day (Table 8). The matched prescriptions and visits represent 155,384 unique patients in New York and 98,372 unique patients in Oregon. The prescriptions provided by a dentist that were not matched to a visit within this window may be attributed to phone-in initial prescriptions or refills, or to visits in a medical setting in which a dentist may have been employed (such as an ED). Among the unmatched prescriptions, only 186 in New York and 140 in Oregon were matched to a patient who had a dental ED visit on the same day, explaining a mere 0.1% of the unmatched cases. Researchers also found that a total of 9,476 enrollees in New York and 6,194 enrollees in Oregon had at least 1 opioid prescription from a dentist (14,774 and 9,804

prescriptions, respectively) with no recorded dental visit within the 3-year window (2014-2016).

The dental visits in the 3-year study that were matched to opioid prescriptions were assessed to be either surgical or nonsurgical in nature, based on CDT codes reported at the dental visit. Although the majority of opioid prescriptions were associated with a surgical visit, approximately one-third of matched visits with an opioid prescription were nonsurgical in nature (Table 9). This pattern has been noted in prior research,<sup>48</sup> but the reasons for providing an opioid prescription at a nonsurgical visit remain unclear.

**TABLE 8. Count of Opioid Claims by a Dental Provider Matched to a Dental Visit Within a 14-Day Window**

Days Around Dental Opioid Rx	New York Claims		Oregon Claims	
	Count	%	Count	%
-7	13	0.0%	1,121	0.4%
-6	15	0.0%	1,009	0.4%
-5	52	0.0%	866	0.3%
-4	461	0.1%	991	0.4%
-3	1,639	0.5%	1,319	0.5%
-2	6,244	1.9%	1,514	0.6%
-1	11,792	3.6%	2,183	0.9%
Rx date	239,245	73.0%	160,929	64.0%
1	20,353	6.2%	10,655	4.2%
2	7,548	2.3%	4,740	1.9%
3	4,531	1.4%	3,677	1.5%
4	1,311	0.4%	3,076	1.2%
5	392	0.1%	2,776	1.1%
6	40	0.0%	2,593	1.0%
7	17	0.0%	3,112	1.2%
<b>Rx count matched (dental visit)</b>	<b>293,653</b>	<b>89.7%</b>	<b>200,561</b>	<b>79.7%</b>
<b>RX count no match (dental visit)</b>	<b>33,893</b>	<b>10.3%</b>	<b>50,963</b>	<b>20.3%</b>
<i>Unmatched Rx with no patient dental visit in data during 2014-2016</i>	14,774	4.5%	9,804	3.9%
<i>Unmatched Rx with patient same-day ED visit for dental condition</i>	186	0.1%	140	0.1%
<b>Rx count total</b>	<b>327,546</b>	<b>100%</b>	<b>251,524</b>	<b>100%</b>

Abbreviations: ED, emergency department; Rx, prescription(s).

**TABLE 9. Type of Dental Visits by Prescription Status**

	New York		Oregon	
	Visits (n)	%	Visits (n)	%
Dental visit with opioid Rx	195,880	3.5	183,435	13.7
Surgical	138,931	70.9	120,803	65.9
Non-surgical	56,949	29.1	62,632	34.1
Dental visit without opioid Rx	5,345,122	96.5	1,157,882	86.3
Surgical	547,823	9.9	94,871	8.2
Non-surgical	4,797,300	86.6	1,063,011	91.8
<b>Total dental visits</b>	<b>5,541,002</b>	<b>100.0</b>	<b>1,341,317</b>	<b>100.0</b>

Abbreviation: Rx, prescription(s).

## Event Sequences and Opioid Prescriptions

Researchers sought to further examine the trajectory of patient visit patterns after receiving an opioid prescription at a dental visit by examining whether patients had a follow-up visit within a 90-day time period (episodes). Researchers included initial visits up to 90 days prior to our study end date (ie, September 30, 2016) so that all visits could be scanned for a 90-day follow-up visit. These care “episodes” were categorized by the combination of the initial and follow-up visit types and are described in Tables 10 and 11.

### *Events After a Nonsurgical Dental Visit*

Among the 53,241 index dental visits matched to an opioid prescription in New York, 44.7% were followed up by a surgical dental visit, with a mean MME of 157.3 prescribed by a dentist within that episode of care (calculated as -7 days to index visit until +7 days to follow-up visit). For the 36.4% of follow-up visits that were again nonsurgical dental, the mean MME prescribed by a dentist was slightly lower at 125.0. Furthermore, there were 853 visits to the ED for a dental condition within 30 days of a nonsurgical dental visit with an opioid prescription. Finally, for 1,980 visits in this category, there was no follow-up visit in 90 days but a subsequent opioid prescription by a dentist, albeit at a lower mean MME (118.8).

Among the 58,572 index dental visits matched to an opioid prescription in Oregon, 36.1% were followed up by a surgical dental visit, with a mean MME of 199.4 prescribed by a dentist within that episode of care. For the 37.3% of follow-up visits that were nonsurgical dental, the mean MME prescribed by a dentist was slightly lower at 130.4. There were 298 visits to the ED for a dental condition within 30 days of a nonsurgical dental visit with an opioid prescription. For 6,363 visits in this category, there was no follow-up visit in 90 days but a subsequent opioid prescription by a dentist, though at a lower mean MME (114.4). Compared

with Oregon, New York had a greater proportion of surgical follow-up visits from a nonsurgical index visit with an opioid prescription, and dentists prescribed lower MMEs per episode and provided fewer opioid prescriptions. However, New York had 3 times the rate of patients following up in the ED for a dental-related condition (1.6% vs 0.5%).

### *Events After a Surgical Dental Visit*

While opioid prescriptions are more common at a surgical visit than at a nonsurgical visit (likely related to the management of pain associated with the surgical procedure), researchers examined the trajectory after these visits as well (Table 10). In New York, only 14.0% of these visits were followed by another surgical visit, with another 27.4% having a nonsurgical follow-up. The mean MME related to these episodes was lower than for those starting with a nonsurgical visit. The rate of ED visits as the next encounter after a surgical dental visit (2.7%) was almost twice that after a nonsurgical visit (1.6%), with more than 4 times the number of individual cases of this episode pattern (3534 vs 853). Additionally, the 30-day refill rate by a dentist after these types of visits was substantially higher (26.2%).

Oregon saw a similar pattern after an index surgical visit with an opioid prescription (Table 10). In Oregon, only 13.4% of these visits were followed by another surgical visit, with another 42.6% having a nonsurgical follow-up dental visit within 90 days. The mean MME related to surgical-surgical episodes was lower than for those starting with a nonsurgical visit but higher than for those with a nonsurgical follow-up. The rate of ED visits as the next encounter was the same for a surgical dental visit as for a nonsurgical one (both 0.5%), with just under twice the number of individual cases of this episode pattern (550 vs 298). The 30-day refill rate by a dentist after these types of visits was considerably higher, at 21.2%.

**TABLE 10. Event Sequence After Dentist-Prescribed Opioid**

90-day events after non-surgical dental visit with opioid Rx	New York					Oregon				
	Visits (n=52,341)		Mean Episode MME			Visits (n=28,572)		Mean Episode MME		
	n	%	Dentist Rx	Medical Rx	Total Rx	n	%	Dentist Rx	Medical Rx	Total Rx
Surgical follow-up dental visit	23,371	44.7	157.3	713.2	255.5	21,162	36.1	199.4	695.4	277.8
Non-surgical follow-up dental visit	19,030	36.4	125.0	724.9	229.9	21,380	37.3	130.4	823.3	240.0
ED visit in 90 days with dental ICD	853	1.6	110.8	445.7	195.7	298	0.5	126.8	311.9	196.6
No visits within 90 days, but subsequent dentist-provided opioid Rx within 30 days	1,980	3.8	118.8		n/a	6363	10.9	114.4		n/a
90-day events after surgical dental visit with opioid Rx	Visits (n=128,930)		Mean Episode MME			Visits (n=112,183)		Mean Episode MME		
	n	%	Medical			n	%	Medical		
			Dentist Rx	Rx	Total Rx			Dentist Rx	Medical Rx	Total Rx
Surgical follow-up dental visit	18,090	14.0	127.4	747.4	249.5	15,054	13.4	141.9	860.8	231.6
Non-surgical follow-up dental visit	35,381	27.4	111.2	685.6	240.8	47,785	42.6	136.9	915.1	242.5
ED visit in 90 days with dental ICD	3,534	2.7	103.1	603.8	189.8	550	0.5	155.5	207.6	174.5
No visits within 90 days, but subsequent dentist-provided opioid Rx within 30 days	33,784	26.2	118.8		n/a	23,796	21.2	114.4		n/a

Abbreviations: ED, emergency department; ICD, International Classification of Diseases; MME, morphine milligram equivalents; NA, not available; Rx, prescription(s).

Because not all dental-related visits start in a dental office, researchers also examined whether individuals who presented for an ambulatory sensitive dental-related condition in the ED were able to obtain follow-up dental care within a 90-day period (Table 11).

In New York, there were 79,650 ED visits for dental conditions among the adult Medicaid population during the 3-year study period. Among the 36.4% of ED visits that had an associated opioid prescription on the same day, only 43.7% had a dental follow-up visit within 90 days, and just under half of those received additional opioids from the dentist. Among the 63.6% of dental ED visits that did not have an associated opioid prescription, only 24.3% had a dentist follow-up visit, and one-third of those visits included an opioid.

In Oregon, there is much of the same pattern. There were 55,605 ED visits for dental conditions among the adult Medicaid population. Among the 34.1% of ED visits that had an associated opioid prescription on the same day, only 52.6% had a dental follow-up visit within 90 days, and half of those received additional opioids from the dentist. Among the 65.9% of dental ED visits that did not have an associated opioid prescription, only 33.9% had a dentist follow-up visit, and one-third of those visits included an opioid.

**TABLE 11. Emergency Room Visits for Ambulatory Sensitive Dental Care Conditions and Dentist Follow-Up**

	New York				Oregon			
	ED Visits (n=79,650)		Mean/SD Episode MME		ED Visits (n=55,605)		Mean/SD Episode MME	
	n	%	At ED Visit	At Dentist Follow-up	n	%	At ED Visit	At Dentist Follow-up
<b>ED visit for ambulatory sensitive dental condition with opioid Rx</b>	<b>28,985</b>	<b>36.4</b>	<b>137.6 (104.4)</b>		<b>18,989</b>	<b>34.1</b>	<b>105.4 (202.3)</b>	
<b>90-day post-ED visit events</b>								
Dental visit with opioid Rx	5,988	20.7	135.4 (102.6)	105.0 (96.3)	5066	26.7	96.4 (88.7)	114.3 (79.6)
Dental visit without opioid Rx	6,669	23	130.9 (98.1)	n/a	4915	25.9	116.0 (296.4)	n/a
No follow-up dental visit within 90 days after ED for dental condition	15,220	52.5	141.4 (105.5)	n/a	9008	47.40%	104.6 (183.9)	n/a
<b>ED visit for ambulatory sensitive dental condition without opioid Rx</b>	<b>50,665</b>	<b>63.6</b>			<b>36,616</b>	<b>65.9</b>		
<b>90-day post-ED visit events</b>								
Dental visit with opioid Rx	4,944	9.8	n/a	103.3 (90.8)	4592	12.5	n/a	105.1 (70)
Dental visit without opioid Rx	7,368	14.5	n/a	n/a	7844	21.4	n/a	n/a
No follow-up dental visit within 90 days after ED for dental condition	38,353	75.7	n/a	n/a	24180	66	n/a	n/a

Abbreviations: ED, emergency department; MME, morphine milligram equivalents; NA, not available; Rx, prescription(s); SD, standard deviation.

## LIMITATIONS

This study had several limitations. 1) The New York and Oregon data had to be analyzed separately under our data use agreement, so researchers could not test if differences between states were significant. 2) Medicaid claims data, like all administrative claims, may have potential coding inaccuracies in diagnoses and procedures. 3) The method for identifying a prescription was based on whether the claim was associated with a dental provider, but researchers were unable to identify specific dentist providers for any workforce specific analyses, nor whether the prescription was a new prescription or a refill. 4) This analysis was restricted to whether the medication was prescribed/billed and does not reflect whether the beneficiary took the medication. Similarly, researchers are unable to account for any opioids that a beneficiary may have obtained outside of Medicaid.

## DISCUSSION

This study describes dentists' prescribing patterns prior to the implementation of prescribing guidelines

for dentists in New York and Oregon and prior to national guidance from the American Dental Association. Consistent with previous research estimating that dentists prescribed 12% of immediate-release opioids,<sup>6</sup> researchers found that dentists in Oregon prescribed 11.9% of all opioid prescriptions during the 3-year study period, while dentists in New York prescribed only 6.9% of all opioid prescriptions. Researchers also found that, mirroring a national trend, the proportion of prescribing by dentists decreased over the study period. In Oregon, this was a small decline (from 12.1% to 11.8% over the 3 years), while in New York, a large decrease in share of prescriptions was observed (from 8.2% to 5.3% between 2014 and 2016). This was paralleled by a decline in MME and DS over time.

New York has nearly 5 times the Medicaid adult population of Oregon (3.5M vs 750K) as well as a higher utilization rate (51% vs 44%); however, total opioid prescribing by dentists in New York was only 1.3 times greater than that in Oregon (327K vs 252K). Among enrollees with a dental visit, only 12.2% received an opioid from a dentist in New York compared with 34.9% in Oregon. The fact that New York was an early adopter of PDMPs and has much stricter electronic

prescribing requirements for controlled substances may well be driving these large differences between states with otherwise similar access to dental care and Medicaid benefits in the 2 states.

In this study, researchers found that ED visits for non-traumatic dental conditions were associated with an opioid prescription in 36.4% of cases in New York and 34.1% of cases in Oregon. These proportions are lower than found in prior research, which indicated that 55% to 65% of ED visits for nontraumatic dental conditions led to opioid prescriptions.<sup>14,56</sup> Among these, about one-fifth in New York and one-quarter in Oregon were followed up with a dental visit with another opioid prescription, speaking to the potential use of opioids as palliative approach to treatment when definitive treatment is unavailable. This report adds to the current literature by examining the longitudinal trend in dental care access after a dental visit with an opioid prescription.

### Policy Limits

This study establishes a baseline to understand the prescribing trends prior to the implementation of guidelines for Medicaid patients in New York and Oregon. Researchers examined the rates at which guideline limits were exceeded in the study population across 3 measures: total MME, daily MME, and DS. In addition, researchers assessed the number of prescriptions that could not be matched to an in-person dental visit. A recent study examined national dentist prescribing patterns prior to guideline implementation among commercially insured patients and found that 29% of national prescriptions by dentists exceeded the MME recommendations for acute pain.<sup>52</sup> This study showed far fewer Medicaid adults receiving prescriptions that exceeded the daily 90 MME guidelines (1.3% and 0.8% in New York and Oregon, respectively), and even fewer exceeding the daily 120 MME guidance. Similarly, very few claims exceeded the 7 DS guidance in New York (3.4%) and Oregon (1.2%). However, researchers found that more than half of

the claims in New York (n=184,354) and one-third of the claims in Oregon (n=85,272) exceeded the 3 DS guidance. These findings are consistent with prior work estimating that Medicaid populations received fewer opioids than commercially insured populations.<sup>57,58</sup> Finally, 10.3% of opioid prescriptions in New York and 20.3% in Oregon are being provided without any discernible face-to-face assessment by a dentist. These findings clearly indicate that improvement in prescribing practices is needed, particularly when it comes to DS and clinical assessments.

## CONCLUSIONS

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This report examines dentists' opioid prescribing patterns for Medicaid-enrolled adults in 2 very different states—New York and Oregon. Providers in these states exhibit vastly different prescribing patterns, likely due to much more stringent pre-existing policy in New York. Yet prescribers in both states generally follow the current guidelines (<120 daily MME, <7 DS) for any single prescription. These data predate current best practice guidelines from the American Dental Association and Oregon Health Authority, and future work should examine changes, particularly in Oregon, after the institution of these guidelines.

In summary, dentists contribute to overall exposure for opioids, although the trend is downward. The present study showed both wide variation and opportunities for improvement in clinical practice.





# REFERENCES

## REFERENCES

1. Prescription Opioid Data. Centers for Disease Control and Prevention website. <https://www.cdc.gov/drugoverdose/data/prescribing.html>. Accessed June 25, 2021.
2. Determination that a Public Health Emergency Exists. US Department of Health and Human Services website. <https://www.phe.gov/emergency/news/healthactions/phe/Pages/opioids.aspx>. Accessed June 12, 2021.
3. Overview of the Drug Overdose Epidemic: Behind the Numbers. Centers for Disease Control and Prevention website. <https://www.cdc.gov/drugoverdose/data/index.html>. Accessed June 13, 2021.
4. The opioid epidemic by the numbers. US Department of Health and Human Services website. <https://www.hhs.gov/opioids/sites/default/files/2018-01/opioids-infographic.pdf>. Accessed June 15, 2021.
5. Webster LR, Grabis M. Current Regulations Related to Opioid Prescribing. *PMR*. 2015;7(11 suppl):S236-S247.
6. Denisco RC, Kenna GA, O'Neil MG, et al. Prevention of prescription opioid abuse: the role of the dentist. *J Am Dent Assoc*. 2011;142(7):800-810.
7. Rigoni GC. Drug utilization for immediate and modified release opioids in the US Silver Spring, MD: US Food and Drug Administration;2003.
8. Volkow ND, McLellan TA, Cotto JH, Karithanom M, Weiss S. Characteristics of opioid prescriptions in 2009. *JAMA*. 2011;305(13):1299-1301.
9. Levy B, Paulozzi L, Mack KA, Jones CM. Trends in Opioid Analgesic–Prescribing Rates by Specialty, U.S., 2007–2012. *Am J Prev Med*. 2015;49(3):409-413.
10. McCauley JL, Leite RS, Melvin CL, Fillingim RB, Brady KT. Dental opioid prescribing practices and risk mitigation strategy implementation: identification of potential targets for provider-level intervention. *Subst Abuse*. 2016;37(1):9-14.
11. Maughan BC, Hersh EV, Shofer FS, et al. Unused opioid analgesics and drug disposal following outpatient dental surgery: a randomized controlled trial. *Drug Alcohol Depend*. 2016;168:328-334.
12. Hudgins JD, Porter JJ, Monuteaux MC, Bourgeois FT. Trends in Opioid Prescribing for Adolescents and Young Adults in Ambulatory Care Settings. *Pediatrics*. 2019;143(6):e20181578.
13. Sun BC, Lupulescu-Mann N, Charlesworth CJ, et al. Impact of Hospital “Best Practice” Mandates on Prescription Opioid Dispensing After an Emergency Department Visit. *Acad Emerg Med*. 2017;24(8):905-913.
14. Okunseri C, Dionne RA, Gordon SM, Okunseri E, Szabo A. Prescription of opioid analgesics for nontraumatic dental conditions in emergency departments. *Drug Alcohol Depend*. 2015;156:261-266.
15. Gupta N, Vujicic M, Blatz A. Opioid prescribing practices from 2010 through 2015 among dentists in the United States: What do claims data tell us? *J Am Dent Assoc*. 2018;149(4):237-245 e236.
16. Gupta N, Vujicic M, Blatz A. Multiple opioid prescriptions among privately insured dental patients in the United States: evidence from claims data. *J Am Dent Assoc*. 2018;149(7):619-627.e611.
17. Koppen L, Suda KJ, Rowan S, McGregor J, Evans CT. Dentists’ prescribing of antibiotics and opioids to Medicare Part D beneficiaries: Medications of high impact to public health. *J Am Dent Assoc*. 2018;149(8):721-730.
18. Suda KJ, Calip GS, Zhou J, et al. Assessment of the Appropriateness of Antibiotic Prescriptions for Infection Prophylaxis Before Dental Procedures, 2011 to 2015. *JAMA Netw Open*. 2019;2(5):e193909.
19. Suda KJ, Durkin MJ, Calip GS, et al. Comparison of Opioid Prescribing by Dentists in the United States and England. *JAMA Netw Open*. 2019;2(5):e194303.

20. Volkow ND, McLellan TA. Curtailing diversion and abuse of opioid analgesics without jeopardizing pain treatment. *JAMA*. 2011;305(13):1346-1347.
21. McCauley JL, Leite RS, Gordan VV, et al. Opioid prescribing and risk mitigation implementation in the management of acute pain: results from the National Dental PBRN. *J Am Dent Assoc*. 2018;149(5):353-362.
22. Haffajee RL, Jena AB, Weiner SG. Mandatory use of prescription drug monitoring programs. *JAMA*. 2015;313(9):891-892.
23. Rasubala L, Pernapati L, Velasquez X, Burk J, Ren Y-F. Impact of a mandatory prescription drug monitoring program on prescription of opioid analgesics by dentists. *PLoS ONE*. 2015;10(8):e0135957.
24. Moyo P, Simoni-Wastila L, Griffin BA, et al. Impact of prescription drug monitoring programs (PDMPs) on opioid utilization among Medicare beneficiaries in 10 US States. *Addiction*. 2017;112(10):1784-1796.
25. Norwood CW, Wright ER. Integration of prescription drug monitoring programs (PDMP) in pharmacy practice: Improving clinical decision-making and supporting a pharmacist's professional judgment. *Res Social Adm Pharm*. 2016;12(2):257-266.
26. Vestel C. States Require Opioid Prescribers to Check for 'Doctor Shopping'. <https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2016/05/09/states-require-opioid-prescribers-to-check-for-doctor-shopping>. Published May 9, 2016. Accessed June 12, 2018.
27. Pardo B. Do more robust prescription drug monitoring programs reduce prescription opioid overdose? *Addiction*. 2017;112(10):1773-1783.
28. Pezalla EJ, Rosen D, Erensen JG, Haddox JD, Mayne TJ. Secular trends in opioid prescribing in the USA. *J Pain Res*. 2017;10:383-387.
29. The Trump Whitehouse Archives website. President Donald J. Trump's Initiative to Stop Opioid Abuse and Reduce Drug Supply and Demand. <https://trumpwhitehouse.archives.gov/briefings-statements/president-donald-j-trumps-initiative-stop-opioid-abuse-reduce-drug-supply-demand->. Published Oct 24, 2018. Accessed June 12, 2021.
30. Soelberg CD, Brown RE, Jr., Du Vivier D, Meyer JE, Ramachandran BK. The US Opioid Crisis: Current Federal and State Legal Issues. *Anesth Analg*. 2017;125(5):1675-1681.
31. FDA Opioids Action Plan. US Food and Drug Administration website. <https://www.fda.gov/drugs/information-drug-class/fda-opioids-action-plan>. Accessed July 23, 2021.
32. Quick Reference for Healthcare Providers. Centers for Disease Control and Prevention website. [https://www.cdc.gov/drugoverdose/pdf/Guidelines\\_Factsheet-a.pdf](https://www.cdc.gov/drugoverdose/pdf/Guidelines_Factsheet-a.pdf). Accessed June 12, 2021.
33. Dowell D, Haegerich T, Chou R. CDC Guideline for Prescribing Opioids for Chronic Pain—United States, 2016. *MMWR Recomm Rep*. 2016;65(1):1-49.
34. Policies and Recommendations on Substance Use Disorders. American Dental Association Website. 2018. <https://www.ada.org/en/about-the-ada/ada-positions-policies-and-statements/substance-use-disorders#>. Accessed June 12, 2018.
35. American Dental Education Association. Opioids Update: Prescription Limits. ADEA Advocate newsletter. 2019;1(20). <https://adea.informz.net/informzdataservice/onlineversion/ind/bW-FpbGluZ2luc3RhbmNlaWQ9ODYzOTkwOCZzd-WJzY3JpYmVyaWQ9MTEyODE5OTAxNQ==>. Published June 25, 2019. Accessed July 25, 2019.
36. Davis C, Chang S, Carr D. Legal interventions to reduce overdose mortality: naloxone access and overdose good samaritan laws. <https://nosorh.org/wp-content/uploads/2017/05/state-laws-naloxone.pdf>. Accessed June 12, 2021.
37. Drug overdose immunity and good samaritan laws. National Conference of State Legislatures website. <http://www.ncsl.org/research/civil-and-criminal-justice/drug-overdose-immunity-good-samaritan-laws.aspx#Calling%20911>. Published June 5, 2017. Accessed June 12, 2021.

38. US Surgeon General's Advisory on Naloxone and Opioid Overdose, Department of Health and Human Services website. <https://www.surgeon-general.gov/priorities/opioid-overdose-prevention/naloxone-advisory.html>. Accessed June 12, 2021.
39. Oregon Health Authority. Oregon Opioid Prescribing Guidelines: Recommendations for the Safe Use of Opioid Medications, 2017-2018. <https://www.icarehealthplan.org/Files/Resources/PROVIDER-DOCS/CPG-OpioidPrescribing-Guidelines>. Accessed March 8, 2021.
40. HEDIS Value Set Directory. Washington DC: National Committee for Quality Assurance (NCQA). 2018; <https://www.dropbox.com/s/bgwp9dpgmo7ksdu/2018-Adult-HEDIS-VSD.xlsx?dl=0>. Accessed March 20, 2021.
41. PQA Opioid Core Measure Set PQA. <https://www.pqaalliance.org/opioid-core-measure-set>. Accessed March 21, 2021.
42. ICD-9-CM diagnosis and procedure codes: abbreviated and full code titles. Centers for Medicare & Medicaid Services website. <https://www.cms.gov/Medicare/Coding/ICD9ProviderDiagnosticCodes/codes>. Updated April 14, 2020. Accessed March 20, 2021.
43. National Center for Health Statistics. International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM). Centers for Disease Control and Prevention website. <https://www.cms.gov/Medicare/Coding/ICD10/index>. Accessed March 20, 2021.
44. Data Resource: Analyzing opioid prescription data and morphine milligram equivalents (MME), Centers for Disease Control and Prevention website. <https://www.cdc.gov/drugoverdose/resources/data.html>. Accessed March 20, 2021.
45. Dentist Participation in Medicaid or CHIP, American Dental Association website. [https://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIGraphic\\_0318\\_1.pdf?la=en](https://www.ada.org/~/media/ADA/Science%20and%20Research/HPI/Files/HPIGraphic_0318_1.pdf?la=en). Accessed March 8, 2021.
46. The R Project for Statistical Computing, The R Foundation website. <http://www.R-project.org/>. Accessed March 8, 2021.
47. IBM SPSS Statistics for Windows, V25.0 documentation, IBM website. [https://www.ibm.com/support/knowledgecenter/SSLVMB\\_25.0.0/statistics\\_kc\\_ddita/spss/product\\_landing.html](https://www.ibm.com/support/knowledgecenter/SSLVMB_25.0.0/statistics_kc_ddita/spss/product_landing.html). Accessed March 28, 2021.
48. Obadan-Udoh E, Lupulescu-Mann N, Charlesworth CJ, et al. Opioid prescribing patterns after dental visits among beneficiaries of Medicaid in Washington state in 2014 and 2015. *J Am Dent Assoc*. 2019;150(4):259-268 e251.
49. Manz M. Recommended Guidelines for Surveillance of Non-Traumatic Dental Care in Emergency Departments. Reno, NV: Association of State and Territorial Dental Directors; 2017. <https://www.astdd.org/docs/ed-dental-care-protocols-w-appendices-july-6-2017.pdf>. Accessed March 8, 2021.
50. Current Policies: Substance Use Disorders, American Dental Association website,. <https://www.ada.org/en/advocacy/current-policies/substance-use-disorders>. Accessed March 20, 2021.
51. Hersh EV, Kane WT, O'Neil MG, et al. Prescribing recommendations for the treatment of acute pain in dentistry. *Compend Contin Educ Dent*. 2011;32(3):22, 24-30; .
52. Suda KJ, Zhou J, Rowan SA, et al. Overprescribing of Opioids to Adults by Dentists in the US, 2011-2015. *Am J Prev Med*. 2020;58(4):473-486.
53. Barrett J. Recent Changes to New York's Controlled Substance Act. Albany, New York: New York State Department of Health; 2014. [https://www.deadiversion.usdoj.gov/mtgs/drug\\_chemical/2014/barrett.pdf](https://www.deadiversion.usdoj.gov/mtgs/drug_chemical/2014/barrett.pdf) Accessed March 8, 2021.
54. McCarty D, Bovett R, Burns T, et al. Oregon's strategy to confront prescription opioid misuse: a case study. *J Subst Abuse Treat*. 2015;48(1):91-95.
55. Hedberg K, Bui LT, Livingston C, Shields LM, Van Otterloo J. Integrating Public Health and Health Care Strategies to Address the Opioid Epidemic: The Oregon Health Authority's Opioid Initiative. *J Public Health Manag Pract*. 2019;25(3):214-220.

56. Singhal A, Tien YY, Hsia RY. Racial-Ethnic Disparities in Opioid Prescriptions at Emergency Department Visits for Conditions Commonly Associated with Prescription Drug Abuse. *PLoS One*. 2016;11(8):e0159224.
57. Roberts RM, Bohm MK, Bartoces MG, Fleming-Dutra KE, Hicks LA, Chalmers NI. Antibiotic and opioid prescribing for dental-related conditions in emergency departments: United States, 2012 through 2014. *J Am Dent Assoc*. 2020;151(3):174-181;e171.
58. Okunseri C, Okunseri E, Thorpe JM, Xiang Q, Szabo A. Medications prescribed in emergency departments for nontraumatic dental condition visits in the United States. *Med Care*. 2012;50(6):508-512.









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