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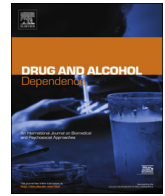
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# Drug and Alcohol Dependence

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Full length article

## Opioid prescribing rates from the emergency department: Down but not out

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### ABSTRACT

**Introduction:** To examine opioid prescribing rates following emergency department (ED) discharge stratified by patient's clinical and demographic characteristics over an 11-year period.

**Material and methods:** We used 3.9 million ED visits from commercially insured enrollees and 15.2 million ED visits from Medicaid enrollees aged 12 to 64 over 2005–2016 from the IBM® MarketScan® Research Databases. We calculated rates of opioid prescribing at discharge from the ED and the average number of pills per opioid prescription filled.

**Results:** Approximately 15–20% of ED visits resulted in opioid prescriptions filled. Rates increased from 2005 into late 2009 and 2010 and then declined steadily through 2016. Prescribing rates were similar for commercially insured and Medicaid enrollees. Being aged 25–54 years was associated with the highest rates of opioid prescriptions being filled. Hydrocodone was the most commonly prescribed opioid, but rates for hydrocodone prescription filling also fell the most. Rates for oxycodone were stable, and rates for tramadol increased. The average number of pills dispensed from prescriptions filled remained steady over the study period at 18–20.

**Discussion:** Opioid prescribing rates from the ED have declined steadily since 2010 in reversal of earlier trends; however, about 15% of ED patients still received opioid prescriptions in 2016 amidst a national opioid crisis.

**Conclusions:** Efforts to reduce opioid prescribing could consider focusing on the pain types, age groups, and regions with high prescription rates identified in this study.

### 1. Introduction

Opioid prescriptions, abuse, addiction, and overdoses have grown dramatically, with a 200% increase in opioid-related overdose deaths from 2000 to 2014 (Centers for Disease Control and Prevention, 2012, 2016; Mazer-Amirshahi et al., 2014a; Rudd et al., 2016). Opioid prescribing increases have been fueled by standards incorporating pain as the “fifth vital sign” (Atkinson et al., 2014), increased patient expectations that pain should be treated aggressively (Taylor, 2011), a lack of recognition of adverse consequences of opioids, and direct-to-consumer advertising (Van Zee, 2009). In response to increased prescribing, several state and federal government agencies and provider organizations have developed guidelines to reduce opioid prescribing,

particularly problematic prescribing (e.g., long prescriptions for high-dose opioids) (Guy et al., 2017; McLellan and Turner, 2010; Michigan Department of Community Health, 2012). In 2011, the Institute of Medicine (now called the National Academy of Medicine) released findings and recommendations for government health care agencies, practitioners, organizations, and researchers to transform prescribing practices (Simon, 2012). In 2016, the Centers for Disease Control and Prevention released national guidelines for prescribing opioids for chronic pain (Dowell et al., 2016).

Although most opioid prescriptions originate outside the emergency department (ED) (Jeffery et al., 2018), EDs are also a common source for opioid prescriptions, as patients with acute and chronic painful conditions often seek care at EDs, where they can be prescribed opioids

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mostly to relieve acute pain or treat acute exacerbations of chronic pain (Cantrill et al., 2012; Grover et al., 2012; Mazer-Amirshahi et al., 2014a; Pletcher et al., 2008) A minority of ED patients seek opioids from EDs because of addiction (Varney et al., 2016; Weiner et al., 2013, 2015). In 2012, the American College of Emergency Physicians (ACEP) released a clinical policy on opioid prescribing; however, the guidelines were not explicitly proscriptive (Dowell et al., 2016). Several jurisdictions, such as Washington state and New York City, have implemented specific guidelines for opioid prescribing in the ED (Neven et al., 2012; NYC Health, 2019.).

Substantial variation in opioid prescribing rates exists across emergency physicians (Barnett et al., 2017; Pomerleau et al., 2017; Tamayo-Sarver et al., 2014) and high prescribing ED providers have been linked to high rates of long-term substance use disorders among their patients (Tamayo-Sarver et al., 2014). Prior studies of ED opioid prescribing have been limited to a single state, the Medicare population (Varney et al., 2016), survey data (Tamayo-Sarver et al., 2004), or a small number of military hospitals (Ganem et al., 2015); have not included data more recent than 2011 (Kea et al., 2016; Mazer-Amirshahi et al., 2014a; Maughan et al., 2015; Pomerleau et al., 2016); have examined initiatives of limited scope (Barnett et al., 2017); or have examined only a cross-section of ED visits (Hoppe et al., 2015). Our study examined ED prescribing rates using a dataset with a large number of patients from commercial and Medicaid claims databases from multiple states over a period of more than a decade by patient demographic and clinical characteristics. Specifically, in this study, we examined how opioid prescribing rates at discharge from the ED have changed over time and by patient demographic and clinical factors.

## 2. Methods

### 2.1. Study design and settings

We conducted a retrospective study using the IBM® MarketScan® Commercial Database from January 2005 through September 2016 and using the IBM MarketScan Multi-State Medicaid Database from January 2005 through June 2016 to identify ED visits not resulting in an inpatient admission. We excluded ED visits resulting in subsequent admission to the hospital because opioid prescriptions following those events may or may not reflect the prescribing decisions of physicians practicing in the ED. We limited the sample to individuals aged 12 to 64 years with prescription drug coverage who were enrolled for at least 7 days before and after the ED visit and excluded those dually enrolled in Medicare and Medicaid because we did not have access to their Medicare claims (see Appendix Table A1 for attrition). The MarketScan Commercial Database contains health insurance claims and enrollment records for employees and dependents covered by large, self-insured employers and regional health plans. The MarketScan Multi-State Medicaid Database contains health insurance claims and enrollment records from Medicaid enrollees in participating states. The MarketScan Databases are consistent with the definition of limited data sets under the Health Insurance Portability and Accountability Act Privacy Rule and contain no unencrypted patient identifiers. Because this was a retrospective study using encrypted de-identified data, it was determined to be exempt from institutional review board.

### 2.2. Outcomes and data processing

The first indicator of interest was the fraction of ED visits which resulted in an opioid prescription being filled. The second indicator we studied was the average number of pills dispensed per ED opioid prescription filled. We used the IBM Micromedex RED BOOK™ to identify National Drug Codes that indicate opioid prescriptions and to identify whether the form of the drug was a capsule, tablet, or neither.

For all analyses except those stratified by region, we restricted the sample to include only enrollees of employers, health plans, and

Medicaid agencies that contributed data during every year of the study period, which yielded a sample drawn from 77 employers and health plans and four Medicaid states. This restriction reduced the possibility of changes in the enrollee composition of MarketScan inducing artificial changes in the indicators over time. Among the commercially insured, we excluded enrollees not residing in any of the states that contributed data to the Medicaid database during every year of the study period; that is, the Medicaid and the Commercial insurance data are from the same states. This restriction facilitated comparison of commercial and Medicaid populations.

We identified ED encounters as claims that had an indication of ED in the place of service, service type, procedure code group, or revenue code fields of the outpatient claim records (Barnett et al., 2017). We considered multiple ED claims with the same service date associated with the same enrollee as a single ED visit.

We used the MarketScan drug files in conjunction with RED BOOK (a database that includes drug product pricing and packaging information developed by IBM [<https://www.ibm.com/us-en/marketplace/micromedex-red-book>]) to identify filled prescriptions for the following types of opioids, which are classified by the U.S. Drug Enforcement Administration (DEA) as controlled substances: butorphanol, codeine, dihydrocodeine, fentanyl, hydrocodone, hydromorphone, levorphanol, meperidine, methadone, morphine, oxycodone, oxymorphone, pentazocine, propoxyphene, tapentadol, and tramadol, the last of which was added as a controlled substance in 2014. Opioid prescriptions for which the days' supply fell outside the range of 1–365 were excluded because they were most likely data entry errors. Filled methadone prescriptions identify methadone for the treatment of pain; they do not identify methadone for treatment of substance use disorders.

According to the algorithm, if a beneficiary had a valid nonrefill opioid prescription filled within the 7 days following the ED visit, we categorized the opioid prescription as being written during that preceding ED visit, unless there was also a non-ED outpatient or inpatient visit during the 7 days preceding the opioid prescription fill; in the latter case, we categorized the source of the opioid prescription to be ambiguous and excluded it from the analysis. Opioid prescription refills were not linked with ED visits because the original opioid prescription may have allowed for refills without the need for a follow-up office visit.

To analyze average number of pills dispensed per opioid ED prescription filled, we further restricted our sample to ED visits in which opioid prescriptions were written for tablets or capsules. Opioid prescriptions for which the number of pills dispensed fell outside the range of 1–90 were excluded because they most likely indicate data entry errors or prescriptions written outside the ED.

Diagnoses were classified into pain types using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classification Software (CCS), which groups International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes into clinically meaningful categories. We cross-classified pain types as either acute or chronic using the AHRQ Chronic Condition Indicator (CCI) tool, with two modifications based on author expertise: we reclassified a subset of amputation codes within the CCS category “open wounds of extremities” as acute rather than chronic, and we re-classified the ICD-9-CM diagnosis “personal history of arthritis” as chronic rather than acute. We scanned all diagnosis fields from the ED visit claims to identify pain types. Pain type is the only stratification for which the levels are not mutually exclusive: if an ED visit contained diagnoses associated with more than one pain type, we associated the visit with each pain type present in the diagnosis fields, unless there was a cancer diagnosis present, in which case the visit was excluded. For example, if an acute back pain diagnosis and an acute abdominal pain diagnosis were both recorded during an ED visit, that visit would be classified both as a visit for back pain and as a visit for abdominal pain. Results stratified by pain type are presented only through September 2015, the

final period during which ICD-9-CM diagnosis coding was used prior to the transition to ICD-10-CM, for the eight most prevalent pain types diagnosed during ED visits: abdominal pain (acute), back pain and disorders (acute), sprains and strains (acute), nonspecific chest pain (acute), headache; including migraine (chronic), non-traumatic joint disorders (acute), headache (acute), and open wounds of extremities (chronic).

We assigned enrollees to the following regions based on their residence: North Central, Northeast, South, and West. To protect the confidentiality of the Medicaid agencies that contribute to the MarketScan Databases, we do not present results stratified by region for Medicaid enrollees. We present results for the commercial population stratified by region without imposing the restrictions that limited the sample to continuous employer and health plan contributors. The race field is well-populated only in the MarketScan Multi-State Medicaid Database so we do not present results stratified by race for commercially insured enrollees. We omit trends for races other than white and black because of small sample sizes.

### 2.3. Data analysis

We conducted descriptive analyses using SAS version 9.4 (SAS Institute, Cary NC) and R version 3.4.1 with the tidyverse version 1.1.1 collection of packages. We calculated opioid prescribing rates from the ED each month. We stratified these outcomes by insurance status of the enrollee (commercial or Medicaid), and within insurance status by pain type, age, sex, region (commercial only), and race (Medicaid only). We also calculated rates of prescribing by type of opioid. There was minimal variation in the average number of pills dispensed across the stratification variables we considered, so we present trends in the average number of pills aggregated only by insurance type; however, pill count trends further stratified by pain type, age, sex, region, and race are available from the authors upon request. All reported statistics are statistically significant per chi-square test statistics, but specific *p*-values are not reported because of the large sample size.

All demographic information was extracted from the ED claim records; thus, we captured the patient's age at the time the visit occurred. We also examined the rate of prescribing for each type of opioid among all ED visits. We limited the scope of this analysis to include only the four most commonly prescribed types of opioids—hydrocodone, oxycodone, codeine, and tramadol—plus two less commonly prescribed opioids that are of interest: hydromorphone for its higher abuse potential (Walsh et al., 2008) and morphine for its lower abuse potential, although high dose is high risk regardless of the type of opioid (Vander Weele et al., 2014).

## 3. Results

### 3.1. Characteristics of study subjects

The study sample consisted of 3.9 million commercial ED visits and 15.2 million Medicaid ED visits over nearly 12 years. Medicaid beneficiaries who had ED visits were generally younger and more likely to be female than patients with commercial insurance who had ED visits (Table 1). Compared with all ED visits, the age distributions of ED visits in which opioids were prescribed were more concentrated in the middle age groups—25 to 54 years—for both commercial and Medicaid: among the commercial population, 65% of ED visits in which opioid prescriptions were written were from patients between the ages of 25 and 54 years compared with 56% of ED visits in which opioid prescriptions were not written, and among the Medicaid population, 62% of ED visits in which opioid prescriptions were written were from patients between the ages of 25 and 54 years compared with 46% of ED visits in which opioid prescriptions were not written. Over half the Medicaid beneficiaries who had an ED visit where an opioid was prescribed were white, although the share of that population that was white dropped

from 62 percent in 2005 to 51 percent in 2015. The most common pain condition diagnosed in ED visits overall and where opioids were prescribed was abdominal pain.

### 3.2. Main results

Opioid prescribing rates from the ED trended similarly for commercial and Medicaid visits, peaking in July 2010 for commercial insurance at 20% of ED visits and in December 2009 for Medicaid at 22% of ED visits, before gradually declining through 2016 (Fig. 1; for both commercial and Medicaid). Rates of ED visits in which an opioid was prescribed stratified by pain type diagnosed during the visit are presented in Fig. 2. ED visits with a diagnosis of acute back pain had the highest rates of opioid prescribing over the study period, peaking at 47% in January 2009 among commercial visits and at 44% in January 2010 for Medicaid. By September 2015, the rates of opioid prescribing for ED visits with an acute back pain diagnosis had fallen to 33% and 29% for those with commercial insurance and Medicaid, respectively.

Opioid prescribing rates stratified by age are shown in Fig. 3. Enrollees between the ages of 12 and 17 years were least likely to receive opioids from the ED (peaking at 11% in 2010 and falling below 10% by 2016), whereas enrollees aged 25 to 44 years were most likely to receive opioids from the ED (around 20% or more throughout the study period); in particular, opioid prescribing rates among 35 to 44 year-olds reached 24% for commercial visits in July 2010 and 28% for Medicaid visits in November 2010. Trends in opioid prescribing rates were similar for all age groups except 55 to 64 year-olds, which was the only age group not to experience a substantive decline in opioid prescribing rates (around 15% throughout the study period). These patterns held among both commercial and Medicaid visits. The rates of prescribing were slightly higher for males in the commercial population, whereas females received opioid prescriptions at a greater rate from the ED among the Medicaid population (Appendix Fig. A1).

Fig. 4 depicts prescribing rates stratified by race for the Medicaid population. White enrollees were prescribed opioids more frequently than black enrollees throughout the study period, but prescribing rates for white enrollees exhibited a greater decline since December 2009. Rates of opioid prescribing from ED visits were higher in the south, west, and north central regions, peaking at 19%, 18%, and 17% respectively, and were significantly lower in the Northeast, where the opioid prescribing rate reached only 12% (Fig. 5). Trends for all regions are similar, peaking between 2009 and 2011 and then declining. Although trends by region are not limited to continuously contributing organizations, they follow patterns similar to other stratification trends that do impose this restriction for commercial populations.

Trends for selected opioids are shown in Fig. 6. Hydrocodone was consistently prescribed at the highest rates throughout the study period (peaking around 11% in 2011), exhibiting the largest increase in prescribing from 2005 through 2011 followed by the largest decrease in prescribing through the middle of 2016 among both commercial and Medicaid patients with ED visits (rates falling to 7.5% for commercial insurance and around 6% for Medicaid). Oxycodone was the next most-frequently prescribed opioid during the initial periods (peaking around 4% in 2010), although it was prescribed far less often than hydrocodone. However, unlike hydrocodone, oxycodone prescribing rates were stable over the study period. Prescribing rates for tramadol increased steadily, equaling or surpassing oxycodone prescribing rates by the end of the study period. Codeine prescribing rates fell gradually through the middle of 2014 and then experienced a sharp increase. Prescribing rates for morphine and hydromorphone were negligible. Opioid type prescribing rates from the ED for commercial and Medicaid enrollees exhibited similar patterns. The average quantity of pills per opioid prescription from the ED remained stable throughout the study period, hovering between 18 and 20 (Appendix Fig. A2).

**Table 1**  
Characteristics of patients with emergency department visits.

Characteristics	All ED Visits						ED Visits in Which Opioids Were Prescribed					
	Commercial			Medicaid			Commercial			Medicaid		
	2005	2010	2015	2005	2010	2015	2005	2010	2015	2005	2010	2015
Overall (n)	272,102	301,248	471,261	1,200,277	1,351,682	1,655,551	39,847	57,246	77,428	223,223	282,610	259,223
Age (years, %)												
12–17	10	11	8	25	22	21	7	6	4	14	12	10
18–24	11	13	16	24	24	20	11	11	14	21	21	16
25–34	18	17	17	23	24	25	19	20	19	29	31	31
35–44	20	20	19	15	14	15	23	24	23	20	18	21
45–54	21	21	20	9	11	10	24	23	23	11	13	13
55–64	19	18	19	5	6	8	18	16	18	5	6	9
Sex (%)												
Female	59	60	62	73	72	73	57	59	59	74	74	74
Male	41	40	38	27	28	27	43	41	41	26	26	26
Region <sup>a</sup> (%)												
North Central	31	25	22	—	—	—	29	25	21	—	—	—
Northeast	14	22	15	—	—	—	8	17	10	—	—	—
South	42	39	49	—	—	—	48	44	56	—	—	—
West	13	14	13	—	—	—	14	14	13	—	—	—
Race (%)												
Black	—	—	—	41	40	41	—	—	—	33	34	37
Hispanic	—	—	—	1	1	1	—	—	—	1	1	1
Other	—	—	—	1	1	1	—	—	—	1	1	1
White	—	—	—	54	53	47	—	—	—	62	60	51
Unknown	—	—	—	3	5	10	—	—	—	3	4	10
Pain (%)												
Abdominal pain (acute)	7	11	10	10	13	11	9	16	15	11	15	13
Back pain and disorders (acute)	6	5	6	6	8	6	9	12	12	12	15	12
Headache (acute)	3	5	5	5	6	5	4	5	4	5	6	4
Headache; including migraine (chronic)	5	7	6	6	8	6	5	7	5	7	8	5
Non-traumatic joint disorders (acute)	2	4	4	5	6	5	4	7	9	8	10	9
Nonspecific chest pain (acute)	7	10	9	6	7	6	3	5	5	5	6	5
Open wounds of extremities (acute)	4	3	2	2	2	1	5	4	3	2	2	2
Sprains and strains (acute)	8	7	5	7	7	5	15	14	10	12	12	8

ED – emergency department.

<sup>a</sup> Not limited to continuous data contributors in same states as Medicaid.

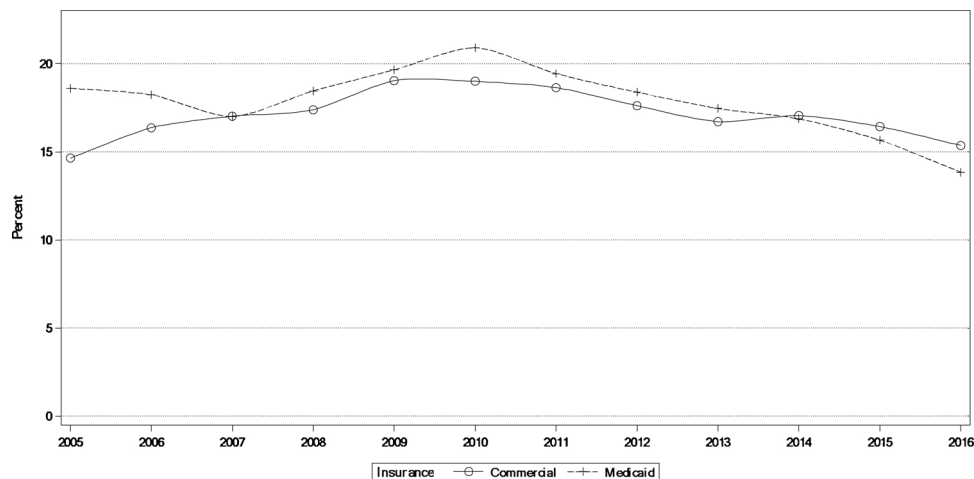


Fig. 1. Emergency department visits resulting in filled opioid prescriptions, by insurance type.

**4. Limitations**

The enrollee composition of the MarketScan Commercial data are not representative of the commercially insured population nationally—in particular, large employers are overrepresented in MarketScan—and the enrollee composition of the MarketScan Multi-State Medicaid Database is limited to a subset of states (and further limited in this analysis to states participating over the study period). Therefore, it is not representative of the Medicaid population

nationally. Although our analyses are limited to organizations that contributed data during every year in the study period, it is still possible that the composition of enrollees in MarketScan may shift over time in ways that deviate from shifts in the composition of enrollees at the national level. We also examined trends without imposing the restrictions that organizations contribute to the database every year and the results were broadly similar.

Because MarketScan pharmacy claims data do not directly identify the prescriber or setting in which the prescription was provided, we

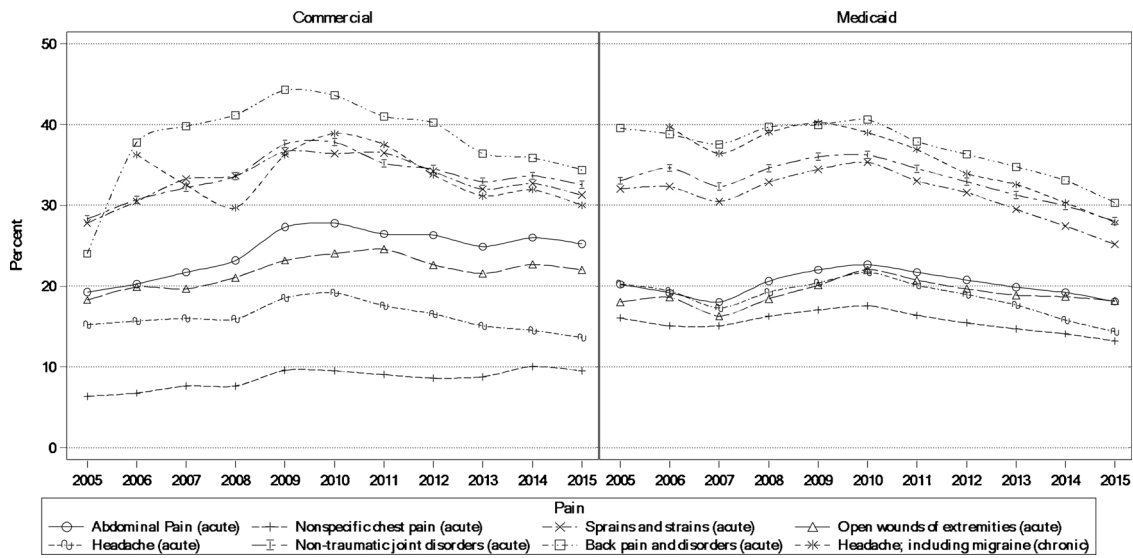


Fig. 2. Emergency department visits resulting in filled opioid prescriptions, by insurance type and pain type.

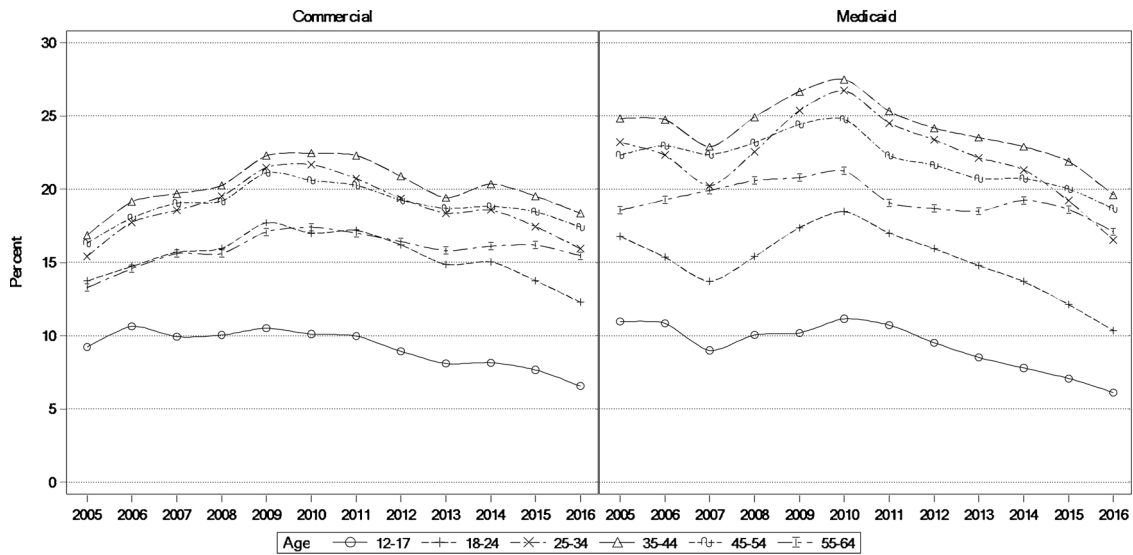


Fig. 3. Emergency department visits resulting in filled opioid prescriptions, by insurance type and age.

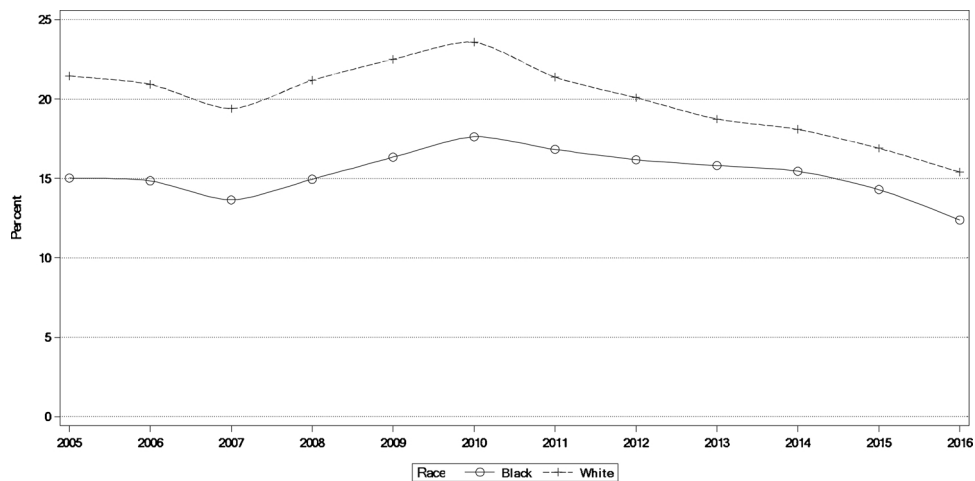


Fig. 4. Emergency department visits resulting in filled opioid prescriptions, for Medicaid by race.

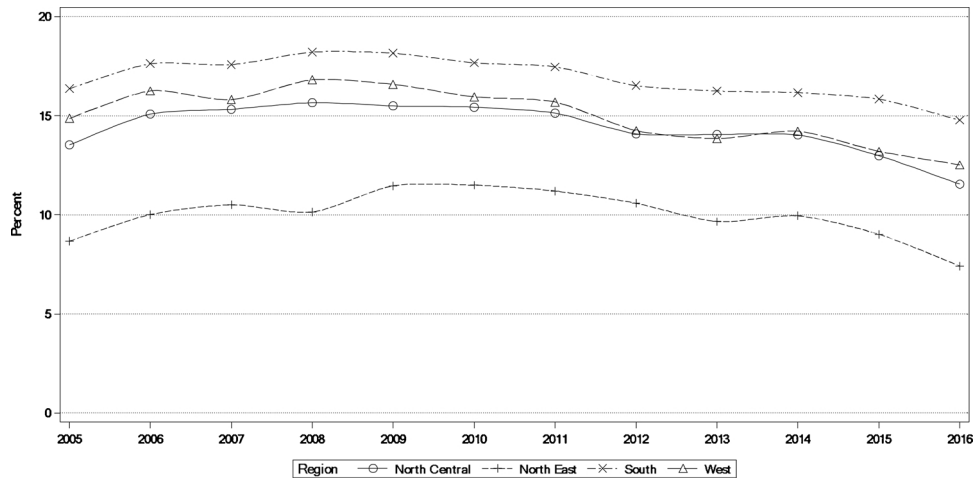


Fig. 5. Emergency department visits resulting in filled opioid prescriptions, for commercial insurance by region.

applied an algorithm to determine whether the opioid prescription was written during the ED visit. We used restrictions to minimize this source of error, but there is still a possibility that we did not capture some prescriptions or erroneously classified others. Also, we cannot measure prescriptions that were never filled or whether this was a first opioid prescription for the patient, nor can we verify that prescribed pills were taken by the intended recipient. Opioids administered in the ED were not captured, and we could not capture opioid prescriptions paid in case without insurance. These limitations are not unique to MarketScan but are inherent to claims data. It is important to note that opioid prescribing varies widely by state. Although we report trends by geographic region, we were unable to analyze state-level differences in opioid prescribing in the ED because of the MarketScan data use agreement, which does not allow the identification of states.

5. Discussion

After an early rise in prescribing from 2005 to 2009, we found a steady decline in ED opioid prescribing beginning in 2010. These declines predated most—but not all—state and professional guidelines on recommended opioid prescribing practices, including the 2012 ACEP-issued opioid prescribing guidelines (Dowell et al., 2016). However, despite this decline and the fact that zero opioid prescribing is not a realistic or desirable goal, opioid prescribing remains at high levels.

Although there has been national attention on reducing opioid prescribing from policymakers, media, and industry groups (e.g., the American Medical Association, 2019), most situations in which opioids are prescribed in the ED are not directly addressed in many of the opioid prescribing guidelines released by the state and federal entities, and choosing specific treatment regimens requires context-dependent knowledge. In addition, there is no objective test for pain, and physicians must rely on their clinical experience as well as the stated pain experienced by the patient. For example, it can be difficult to assess the severity of abdominal pain and hence the sufficiency of an opioid prescription to mitigate such pain. This may explain why opioid prescribing for ED visits among patients with abdominal pain did not fall at all among commercial enrollees and fell only minimally among Medicaid enrollees. The ACEP guidelines recommend reserving opioids for patients with severe pain, which may explain steeper declines in opioid prescribing for back pain than for other conditions (Dowell et al., 2016).

Physicians must also be cognizant of patients with contraindications to non-opioid prescriptions, or drug–drug or drug–disease interactions that might prompt a provider to write an opioid prescription. Patient expectations can also play a role in the decision to prescribe opioids, because physicians face incentives tied to patient satisfaction scores on the Centers for Medicare and Medicaid Services Hospital Consumer Assessment of Healthcare Providers and Systems survey and some

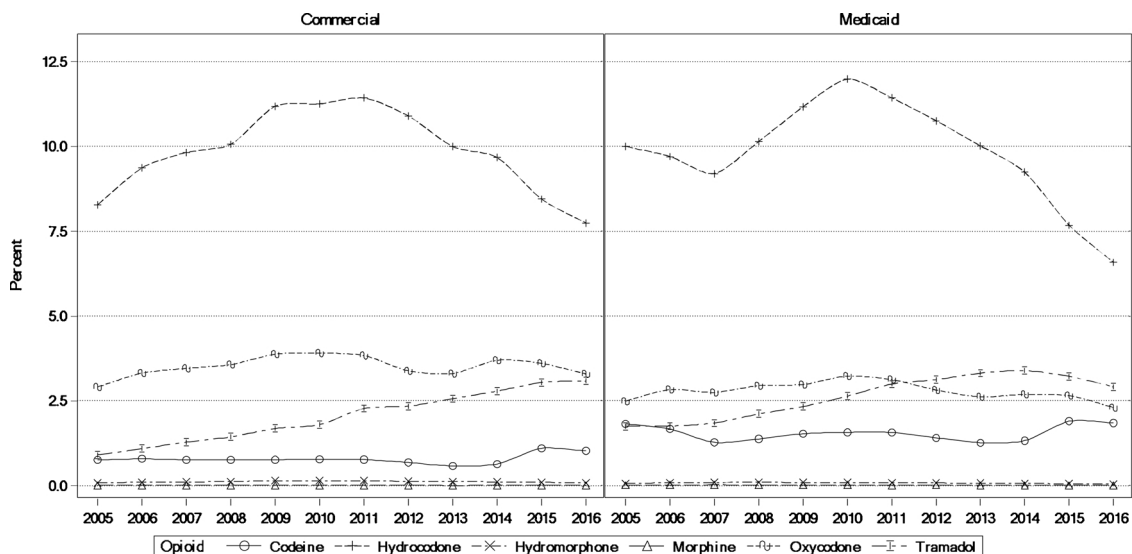


Fig. 6. Emergency department visits resulting in filled prescriptions for each type of opioid, by insurance type.

physicians believe that prescribing opioids will improve patient satisfaction scores (Frantsve and Kerns, 2007; Zgierska et al., 2012).

Opioid prescribing rates were highest for adults between the ages of 25 and 54 years. This may be due to enrollees in this age range being more likely than their younger and older counterparts to present at the ED with acute pain conditions, or it may indicate a reluctance of physicians to prescribe opioids to adolescents and older patients. Adults between the ages of 25 and 54 years might also be more inclined to engage in drug-seeking behavior because of addiction (Ali et al., 2019). Opioid prescribing rates among 55–64-year-olds may have been lower because opioid treatment courses are often discouraged for older patients (Spitz et al., 2011).

The opioid crisis has been documented to have affected non-Hispanic whites disproportionately (Case and Deaton, 2015). In line with other studies, we observe that opioid prescribing rates in the ED are highest for whites. Singhal et al. (2016) argue that emergency physicians might rely on internal racial biases—if only implicitly—when deciding whether to prescribe opioids to a patient presenting at the ED with a pain-related complaint. However, Mazer-Amirshahi et al. (2014b) found that opioid prescribing rates were higher for whites than for blacks even among pediatric populations. Looking at this racial difference further to determine the mechanism of this disparity could be an important direction for future studies to consider.

Previous research has shown that opioid prescribing rates are higher in the South, West, and North Central regions than in the Northeast (McDonald et al., 2012, 2014) including in the ED (Jeffery et al., 2017; Mazer-Amirshahi et al., 2014a). Our findings confirm that this regional pattern holds for the ED setting, which suggests that targeted interventions in particular areas of the country or in particular EDs may help lower the opioid prescribing rate. There may be lessons to be learned from EDs located in the Northeast, which have the lowest opioid prescribing rates from the ED.

Hydrocodone, the most frequently prescribed opioid in the ED, has a high potential for addiction and abuse (Kuehn, 2013); it is encouraging that prescribing rates for hydrocodone fell by the largest amount. During the study period the DEA rescheduled hydrocodone from Schedule III to Schedule II, which might explain this drop in prescribing given its implications for who can prescribe this medication and for how long. Rates of prescribing for tramadol, a lower-strength opioid, generally increased throughout the study period; it is possible that there are situations in which ED doctors, while not refraining from prescribing opioids, are substituting less addictive tramadol (Adams et al., 2006) for more addictive hydrocodone. Yet, prescribing rates for oxycodone, another highly addictive opioid, have remained stable. On the other end of the spectrum, low prescribing rates for hydromorphone are encouraging, as this opioid can be highly addictive (Singhal et al., 2016).

In conclusion, from 2005 to 2016, 1 in every 5 to 6 ED visits resulted in an opioid prescription written upon discharge that was subsequently filled. Rates declined steadily since late 2009; however, in 2016 about 15% of ED patients received opioid prescriptions amidst a national opioid crisis, which has now evolved to include nonprescription drugs, such as illicitly produced fentanyl and heroin. Further targeted efforts aimed at reducing opioid prescribing in the ED may help with efforts in tackling the opioid epidemic.

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#### Contributors

MMA, RM, JMP and MM-A conceived the study, and interpreted the data. EC, RMH and NC performed the statistical analysis. MMA, RM, EC and RHM drafted the manuscript. MMA and RM designed the study and critically revised the manuscript. All authors contributed to and approved of the final manuscript.

#### Declaration of Competing Interest

The authors report no financial relationships with commercial interests and have no conflicts of interest relevant to this article to disclose.

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#### Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.drugalcdep.2019.107636>.

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