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Evaluating Opioid Dispensing Rates among Pediatrics and Young Adults based on CURES Data Reporting in California from 2015-2019

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Abstract

Background

Receipt of opioid prescriptions in pediatric and young adult patients may be a risk factor for future opioid misuse. Data from prescription drug monitoring programs provide insight on outpatient opioid use. In our study, we analyzed the opioid dispensing rates for pediatrics and young adults in California.

Methods

A secondary analysis was performed from 2015-2019 using Controlled Utilization Review and Evaluation System data. This database provides dispensing data of controlled substances in California. Patients younger than 25 years who were prescribed opiates were analyzed by county. We further divided them into two groups (children: ≤ 14 years; adolescents and young adult: 15-24 years). Descriptive statistics and heat maps were used to illustrate the trends in opioid usage among different age groups.

Results

The overall percentages for the number of opioids being dispensed to patients aged <25 years have decreased over the past four years. In 2015, 6 out of 58 counties in California were considered “high-rate” with $>2.9\%$ of opioids dispensed to patients younger than 25 years old; in 2019, this number reduced to zero. Patients 25 and older received a higher proportion of opioids compared to younger populations; in 2019, 35.91% of opioids were dispensed to patients 45-64, and 8.92% to patients younger than 25.

Conclusion

Pediatric opioid prescriptions have declined over the recent years. However, a high degree of variability of prescription rates between demographic counties was noted. More studies are warranted in order to understand this discrepancy in opioid prescribing among pediatric and young adult patients.

Introduction

The opioid epidemic has been widely viewed as a serious public health problem that has been focused primarily on adults in the US. However, a similar pattern of increased prescribing rates of opioids in adolescents and young adults have also been noted.^(1,2) This pattern of opioid use in this patient population has contributed to increased reports of accidental poisoning, misuse and abuse, overdose-related hospitalizations, and death.⁽³⁻⁵⁾ From 1999-2016, the pediatric mortality rate increased by 268% in children and adolescents due to opioids.⁽⁶⁾ In an effort to enhance consistency in the prescribing of opioids, the CDC published its first guidelines regarding the use of opioids in 2016.⁽⁷⁾ Since the release of

these guidelines, national opioid use in this population has declined significantly.^(8,9)

Opioids are commonly used in the pediatric pain management paradigm. In an earlier cross-sectional observational study, 64% of clinicians were reported to have prescribed an opioid to manage acute pain in pediatric patients.⁽¹⁰⁾ Managing opioid usage in children needs to be personally tailored and monitored closely due to the developmental changes in young children and adolescents. Their unique developmental characteristics result in the distinct pharmacodynamic and pharmacokinetic features which differ from those seen in adults.⁽¹¹⁾ Although guidelines exist for opioid prescription in pediatrics⁽¹²⁻¹⁴⁾, the resources and training provided to healthcare professionals are limited. This makes pain management in the pediatric population more challenging, especially in outpatient settings, and often leaves prescribers to rely on their clinical judgment and experience when prescribing opioids.^(2,15)

There has been a significant pullback from opioid prescribing in both adults and pediatric patients. From 2012 until 2018, the overall opioid prescribing rates fell from 81.3 to 51.5 prescriptions per 100 persons.⁽⁸⁾ With the heightened attention being placed on the use of opioids overall and growing concerns over the use of opioids within pediatric and young adult populations, there is a growing number of research studies being published. However, few studies to-date have focused on state-specific or county-level analysis. Previous research that analyzed variations in regional opioid use across the United States did show higher rates of opioid prescribing for pediatric and young adult patients in the western region of the United States, which includes the state of California, as compared to opioid prescribing rates in other areas of the country.⁽⁹⁾ To better understand the use of opioids among pediatric and young adult patients in California, we conducted an analysis of publicly available data from the state’s controlled substance reporting system. The goal of the study was to examine county-level trends in opioid prescribing in pediatrics and young adults in California from 2015 to 2019. The California Controlled Substance Utilization Review and Evaluation System (CURES) data, which is collected by the California Department of Justice (DOJ), was used for the analysis of the study.

Objective

The primary outcome of the study is to assess the changes in county-level opioid dispensing rates to pediatric and young adult patients in California from 2015-2019. A secondary outcome is identifying whether the presence of a pediatric hospital within the county impacts the likelihood the county is deemed a “high-rate” county, defined as having a high magnitude of opioids dispensed to pediatrics and young adults.

Methods

CURES Database

The Controlled Substance Utilization Review and Evaluation System (CURES) is a prescription drug monitoring program that longitudinally tracks all Schedule II-IV controlled substance prescriptions dispensed in the state through California's Department of Justice (DOJ). The DOJ provides aggregated reports to the general public based on the data collected through the CURES and makes them available online.⁽¹⁶⁾ All data analysis conducted as part of this study were conducted using the aggregated datasets available from the publicly available online reports published from 2015-2019.⁽¹⁶⁾

California state law requires dispensing pharmacies, clinics, or other dispensers of Schedule II-IV controlled substances to provide specified dispensing information to the DOJ on a weekly basis. The patient's identifiable information, such as name, date of birth, gender, and address, are also recorded, in addition to the prescriber and pharmacy identities with DEA registration numbers. The publicly available data provided by the DOJ used to conduct this research study are a series of limited datasets which have been deidentified and reported as aggregates based on various patient and provider factors. For example, metrics such as morphine milligram equivalents (MME) and pill counts were automatically calculated by CURES and prepared as composite data from the CA DOJ. This study is exempt from Institutional Review Board (IRB) approval, given the nature of the data analyzed. The public CURES database includes the number of patients receiving opioid prescriptions in a patients' locale based upon the county, gender, age group (≤ 14 years, 15-24 years, 25-44 years, 45-64 years, and ≥ 65 years), and year, from 2015 to 2019. To analyze how opioid dispensing rates are affected by the presence of children's hospitals, these hospitals were identified using a directory available from the Children's Hospital Association.⁽¹⁷⁾

Study Population

The CURES data used to complete the analysis of the study includes all information reported for opioid prescriptions dispensed in California. This data included reports of the number of patients dispensed opioids, broken up by the year, county, and preset age groupings. Stratification of age was maintained from the reported age groups in the DOJ's publicly reported CURES statistics. All 58 counties in California were included in the study.

Study Outcome

The primary outcome of the study was the changes in county-level opioid dispensing rates to pediatric and young adult patients in California from 2015-2019. Our secondary outcome was identifying whether the presence of a local pediatric hospital is associated with a county's likelihood of being a "high-rate" county, defined as having a high magnitude of opioid prescriptions to pediatrics and young adults.

Statistical Analysis

Descriptive statistics and heat maps were used to illustrate trends in opioid prescribing among different age groups and demographic regions and counties over the years studied. The total number of opioid prescriptions was collected from the datasets and analyzed in comparison to other demographic regions and counties in California. Opioid prescription trends were evaluated through three methods.

Overall rate of opioids dispensed to pediatric and young adult patients: First, the percentage of pediatric and young adults (< 25 years old) dispensed opioids in each county was examined. "High-rate" counties were defined as counties that had a calculated percentage of opioid dispensing greater than 2.9% of the population, which is one standard deviation above the average rate reported in 2015, and is also the rate that marked the 80th percentile of counties in 2015. The trends were determined by comparing the heatmaps generated by different years.

Proportion of opioids dispensed to pediatrics and young adults: The next analysis examined the proportion of opioids prescribed to the pediatric and young adult population, comparing it to the total number of opioids prescribed in each county. Specifically, patients aged 15-24 years old in their respective counties were examined, broken down by year. Using the same method, the distribution of opioid prescriptions across each specific age group (≤ 14 , 15-24, 25-44, 45-64, ≥ 65) in their respective county was visualized. Proportions of opioid prescriptions for each specific age group were calculated and demonstrated in the heatmap format using a color scale, where the red color represents the highest proportions seen.

Prevalence of a pediatric hospital on opioid dispensing rate: The last point examined opioids dispensed to patients ≤ 14 years old within the total population of the county. As in the first analysis, "high-rate" counties were defined by rates which were one standard deviation above the average rate reported in 2015, which was calculated to be 2.18%. These counties were highlighted in red and children's hospital locations were identified and marked on the map.

Results

Based on census data, there were 37 million residents in California within our study time period, 2015-2019. During the individual years reported, the year of 2015 had the highest number of individual patients with an opioid prescription dispensed, with 7.12 million total patients receiving an opioid. In 2016, the number of patients with opioid prescriptions significantly decreased, with 4.81 million patients receiving an opioid (Table 1). Following the substantial reduction in overall number of patients being dispensed opioids from 2015 to 2016, the number of patients remained relatively stable from 2016 to 2019. In the final year of reporting, 5.01 million patients received an opioid in 2019. A similar trend also persisted when examining other metrics such as total morphine equivalent dose (MME) prescribed, CII-IV pill count, and total CII-IV prescription count per year. Notably, a higher quantity of CII pills and prescriptions were dispensed to the pediatric and young adult population each year compared to the amount of CIII-IV substances given to the same population (Table 1).

When evaluating patients younger than 25 years of age, similar patterns of dispensing were present. Similar to the overall statewide population, patients 24 years old or younger reported the largest number of patients dispensed an opioid in 2015 (780,630 patients), followed by a significant drop in patients dispensed an opioid in 2016 (473,764 patients), followed by a significant increase in 2017 (643,709 patients), and eventually noting a consistent decrease from 2018 (537,197 patients) to 2019 (454,002 patients) (Table 1).

The number of "high-rate" counties for those aged < 25 years old significantly decreased from six in 2015 to zero thereafter.

Table 1. Characteristics of the CURES database collected by the California Department of Justice from 2015-2019.

Year		2015	2016	2017	2018	2019
Total Population		37,249,464*				
Total Patients on Opioids		7,126,766	4,812,163	6,339,863	5,654,496	5,013,324
	≤14	112,004	68,287	93,699	74,012	61,564
	15-24	668,626	405,477	550,010	463,185	392,438
	25-44	2,052,961	1,300,451	1,748,964	1,509,500	1,293,749
	45-64	2,594,842	1,789,532	2,272,118	2,017,861	1,765,536
	≥65	1,698,333	1,248,416	1,675,072	1,589,938	1,500,037
Number of Opioid Prescribers		123,930	116,514	123,765	126,346	122,946
Number of Schedule II Prescribers		120,258	115,414	124,065	122,769	119,940
Number of Opioid Prescriptions Filled Including Refills		—	12,492,715	18,759,427	16,626,400	14,824,350
Number of Registered Dispensers		—	36,364	37,712	37,501	36,899
Total Opioid Prescriptions		—	12,492,715	18,759,427	16,626,400	14,824,350
Total MME		1,093,698,465	605,986,592	772,949,844	918,235,514	777,690,541
Pill Count		137,726,061	81,779,125	123,648,425	110,416,083	97,374,688
CII	≤14	35,958,297	21,833,864	35,489,647	33,950,350	30,029,432
	15-24	54,005,353	31,367,448	46,331,271	40,781,843	36,103,067
CIII	≤14	699,141	353,698	440,764	291,134	213,281
	15-24	4,355,942	2,495,425	3,520,474	2,877,581	2,474,713
CIV	≤14	15,776,425	10,407,417	16,121,193	14,589,548	13,454,561
	15-24	26,930,901	15,321,270	21,745,073	17,925,625	15,099,631
Rx Count		3,283,322	1,997,999	3,057,174	2,785,409	2,482,719
CII	≤14	890,529	546,320	899,437	871,745	778,608
	15-24	1,368,435	817,743	1,227,520	1,109,581	1,003,873
CIII	≤14	30,282	15,753	19,613	12,747	9,503
	15-24	182,383	108,993	156,934	132,616	117,286
CIV	≤14	204,150	139,634	214,296	195,127	176,318
	15-24	607,543	369,556	539,374	463,593	397,131

"—" means data not available based on the publicly-available databases posted online.

* the total population is based on US Census Data that was aggregated by the California Department of Justice and is representative of the population from 2015-2019⁽¹⁶⁾

Comparing opioid dispensing rates on a county-level from 2015-2019, counties overall reported reduced numbers of opioid prescriptions dispensed to patients younger than 25 years. However, the rate of dispensing in central California counties persistently remained higher than that of other regions. In addition, at an overall state-level of reporting, as well as, within individual counties, there was an increase in the number of patients aged less than 25 years old being dispensed an opioid prescription from 2016 to 2017, followed by a steady decline afterwards. As shown in Table 1, the overall number of patients being dispensed an opioid has declined approximately 10% and 11% per year on average among pediatric (≤ 14 years) and young adult (15-24 years old) patients, respectively.

When specifically evaluating the proportion of patients aged 15-24 years old accounting for opioid prescriptions dispensed, this proportion has decreased each year since 2015, with 15-24 years old accounting 9.38% of patients dispensed an opioid in 2015 dropping to 7.82% in 2019 (Figure 2). For this age group, higher proportions of dispensed opioids were observed in central and southern California than in other regions, with relatively fewer changes in the later years. Alpine County reported that 15.23% of individuals aged 15-24 were dispensed an opioid in 2015, the highest percentage of the state that year. The county with the lowest percentage was Trinity County, with a rate of 3.56% in 2019. The largest year over year proportion drop of any county was observed in Alpine County from 2015 – 2016, with a proportion of 15.23% in 2015 and 5.79% in 2016 (an absolute proportion drop of 9.44%). However, Alpine also noted a significant surge in this proportion from 2016-2017, increasing by an absolute proportion of 8.3%. Of note, given the high number of individuals aged 15-24 years having an opioid dispensed among residents, Alpine County also accounted for the highest proportion of opioids within this age group in every year of the analysis, with the exception of 2016.

Among all the opioid prescriptions, the amount of opioids dispensed to individuals aged 25 years and older was consistently higher than those under the age of 25 years old.; similar patterns were observed in every year examined (Figure 3). The average percentage of opioids being dispensed to individuals ≤ 14 years old in 2015 was 1.63%, which is similar to the 1.25% recorded in 2019. The average percentage of total opioids dispensed to adolescents and young adults (15-24 years old) in 2015 was 9.11%, with the actual percentage dropping to 7.29% in 2019 (Figure 2). Compared to other age groups, individuals ≤ 14 years old received the lowest percentage of opioid medications over the years (Figure 3). On average, approximately 27.2%, 37.5% and 24.6% of opioids prescriptions were dispensed to patients aged at 25-44, 45-64, and 65+ years old respectively in 2015, and in 2019, those averages shifted to 23.46%, 35.91%, and 32.08% respectively.

For individuals aged 14 years old and younger, counties were deemed “high-rate” if the rate of opioids prescriptions given to these patients exceeded 2.18%, or one standard deviation above the average rate of opioids dispensed to patients in this age range (Figure 4). Rates were calculated as opioids dispensed per total population, and “high-rate” counties were marked in red. In 2015, there were seven identified “high-rate” counties for patients ≤ 14 years old. The following year, the total number of high-rate counties dropped to 3, and then increased back to 4 in 2017. By 2019 the number of “high-rate” counties had dropped to zero. Overall, most of the “high-rate” counties that had a prescription rates above 2.18% in individuals aged

14 years old or younger were located in Central California.

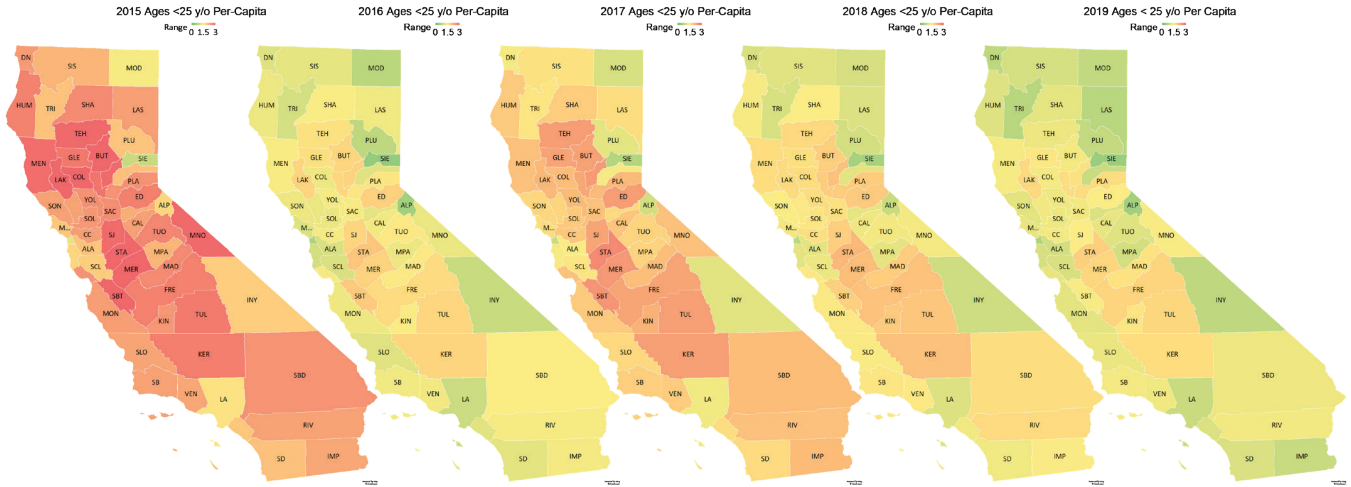
When evaluating counties being deemed to be “high-rate” counties in relationship to opioid dispensing to individuals aged 14 years old or younger, none of the “high-rate” counties had a registered children’s hospital located within the county. Due to the absence of registered children’s hospitals in any of the “high-rate” counties, there was no possibility of running a statistical test to examine differences in opioid-use associated with the presence of a hospital from which to draw a conclusion. When evaluating the location of children’s hospitals and the relationship to opioid dispensing, there did not appear to be an association with higher rates of opioid dispensing among those aged 14 years old and less, as none of the “high-rate” counties contains a registered children’s hospital.

Discussion

In our study, we consistently observed a decline in opioid prescriptions from 2015 to 2016 among all patient populations recorded in California. The timing of this downtrend is consistent with trends reported nationally and coincides with the release of the updated CDC guidelines for opioid prescribing that encourage a general reduction in opioid use across most clinical situations.^(7,9,18) To our knowledge, this is the first study examining county-level opioid dispensing in California within the time period of this study. Although studies examining national trends generally agree that the use of opioids in pediatric patients has overall decreased in recent years, there is uncertainty with how specific regions contribute to the trend – one study reported the western states with having the lowest prescribing rates⁽¹⁹⁾, while another found the West to have the highest.⁽⁹⁾ A notable point of observation is that the CDC guidelines exclude patients younger than 18 years old; yet, our results suggest that patients younger than 18 have also experienced a decline in opioid prescribing after the publication of the updated CDC guidelines. It is uncertain to what degree that the guideline updates have affected opioid use in the pediatric, adolescent, and young adult population. However, it is likely that practitioners have interpreted these guidelines to suggest that opioids should be restricted for use in these populations in situations where no other pain management strategy is likely to achieve necessary pain reduction. Although it is not possible for us to validate any causes for the decline of opioid prescriptions based on the current CURES data, our study suggests that there may be a potential impact from the CDC guideline upon the decrease in opioid prescribing among pediatric patients given the congruence of the timeline. In addition, the results of our study suggest that following an initial sharp decline in the number of patients being prescribed an opioid from 2015 – 2016, there was a significant rebound effect seen in 2017. This may be the result of practitioners reducing opioid prescribing too rapidly. The steady decline observed from 2017 through 2019 suggests that practitioners once again made efforts to reduce opioid prescribing after the 2017 rebound.

This decline of opioid prescriptions among pediatric and young adults also aligned with the mandate for all California licensed prescribers to register for access to CURES by 2016, and for mandatory CURES consultations to start in 2018.⁽²⁰⁾ From January 2016 to January 2017, there was a 176% increase in registered CURES prescribers in California; within pharmacy, there was a 64% increase of pharmacists.⁽²¹⁾ This and other efforts being made within the state of California to reduce overall

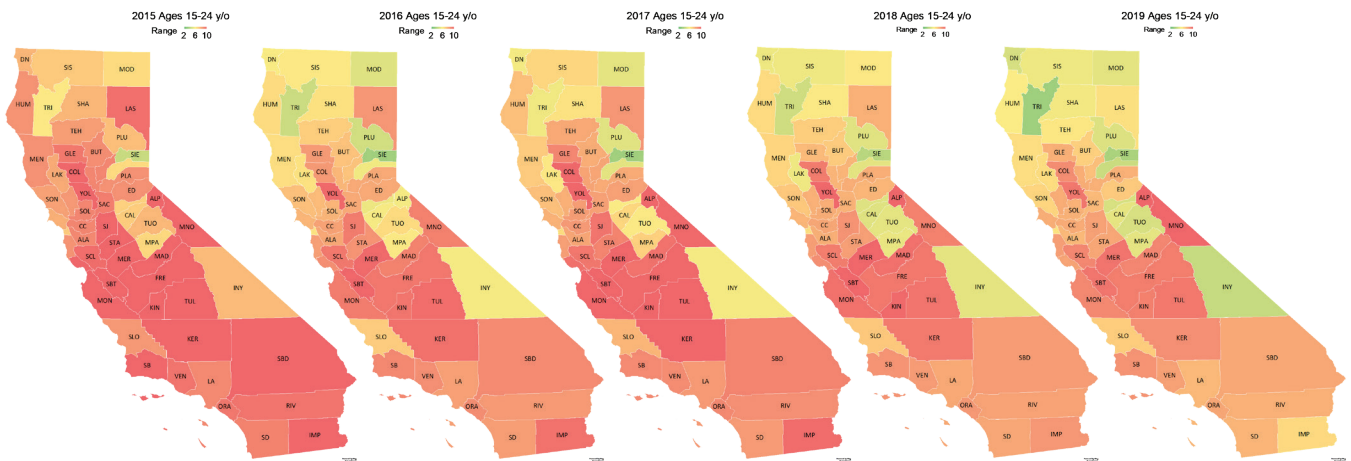
Figure 1. Opioid dispensing rates to patients younger than 25 years old (2015-2019).^{(16)*}



County	Abrv	County	Abrv	County	Abrv	County	Abrv	County	Abrv	County	Abrv
Alameda	ALA	Glenn	GLE	Marin	MRN	Placer	PLA	San Mateo	SM	Sutter	SUT
Alpine	ALP	Humboldt	HUM	Mariposa	MPA	Plumas	PLU	Santa Barbara	SB	Tehama	TEH
Amador	AMA	Imperial	IMP	Mendocino	MEN	Riverside	RIV	Santa Clara	SCL	Trinity	TRI
Butte	BUT	Inyo	INY	Merced	MER	Sacramento	SAC	Santa Cruz	SCR	Tulare	TUL
Calaveras	CAL	Kern	KER	Modoc	MOD	San Benito	SBT	Shasta	SHA	Tuolumne	TUO
Colusa	COL	Kings	KIN	Mono	MNO	San Bernardino	SBD	Sierra	SIE	Ventura	VEN
Contra Costa	CC	Lake	LAK	Monterey	MON	San Diego	SD	Siskiyou	SIS	Yolo	YOL
Del Norte	DN	Lassen	LAS	Napa	NAP	San Francisco	SF	Solano	SOL	Yuba	YUB
El Dorado	ED	Los Angeles	LA	Nevada	NEV	San Joaquin	SJ	Sonoma	SON		
Fresno	FRE	Madera	MAD	Orange	ORA	San Luis Obispo	SLO	Stanislaus	STA		

*Rates were calculated as total opioids dispensed per total population of the respective county.

Figure 2. Proportion of opioids dispensed to 15-24 year old patients.^{(16)*}



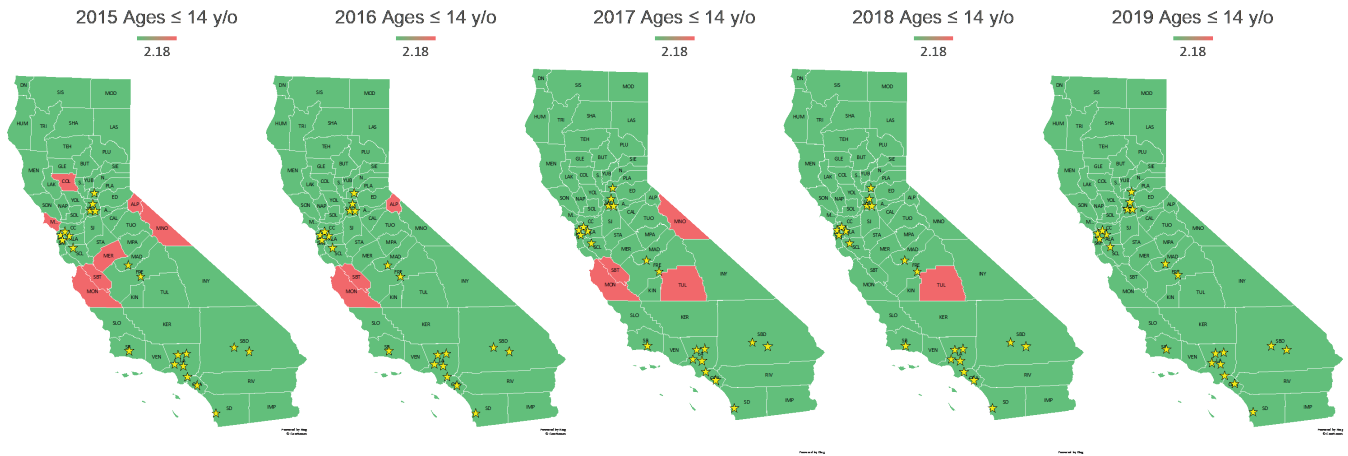
*Proportions calculated as opioids dispensed to 15-24 year olds among total opioids dispensed per respective counties in California from 2015 to 2019.

Figure 3. Comparison of opioids prescriptions among different age groups in 2015 and 2019 from data collected by DOJ.^{(16)*}
 A) ≤14 years old; B) ≥ 65 years old.



*Proportions calculated as opioids dispensed to the age group of interest per total opioids dispensed within the county.

Figure 4. Children hospitals near the “high-rate” counties in CA from year 2015-2019.*



*Children hospital or specialty clinics were based on the information from the Children’s Hospital Association.⁽¹⁷⁾ “High-rate” counties were defined as counties that were one standard deviation above the average opioid dispensing rate in 2015.

opioid prescribing may have contributed to the drop in opioid dispensing rates following the 2017 rebound. Similar reductions in opioid use were also observed in other studies which examined state opioid prescribing rates after the implementation of a prescription drug monitoring program (PDMPs).^(22,23) Studies have also demonstrated a reduction in the prescribing of schedule II opioids after mandating registration to PDMPs.⁽²⁴⁾ While the initial intent of a PDMP is to reduce the number of prescriptions given to high-risk drug abusers by identifying patients who regularly fill controlled substances, there may have been a secondary effect where prescribers and dispensers adjusted their overall prescribing and dispensing practices due to the heightened awareness of PDMPs.

In California, the total number of dispensed schedule II substances to pediatric and young adults also declined over the 4-year period, with the biggest drop occurring in 2016. The specific drug breakdown is not available with the given dataset, which restricts the ability to distinguish which of those schedule II substances dispensed were opioids. However, it was noted that a higher amount of schedule II substances was dispensed to the pediatric and young adult population, compared to the schedule III or IV substances. This may warrant further examination, as pediatric exposure to schedule II opioids has been shown to result in a higher likelihood of future alcohol use disorder, cannabis use disorder, or any other drug use disorder, compared to opioids belonging to “lower” scheduled controlled substance classes.⁽²⁵⁾

Our study also revealed that there was a disproportionate decrease in opioids among the different age ranges. Patients older than 65 had the smallest degree of reduction in opioids dispensed, whereas pediatric and young adult patients had some of the largest reduction rates. Thus, the fraction of total opioids dispensed to patients older than 65 increased, while the percentage dispensed to younger patients decreased. This trend suggests that there has been exceptional efforts in diminishing opioid use in age groups deemed at risk of misuse, namely, younger populations such as pediatrics and young adults. Meanwhile, older populations such as those above 65 years old, may have persistently higher rates due to population characteristics such as more cases of palliative care and chronic pain. Opioid prescriptions for younger populations

tend to treat acute issues such as surgical procedures and sport injuries – inherently, these medical issues tend to capture opioid naïve patients who are less likely to require a prolonged use of opioid compared to chronic pain patients. Therefore, the discrepancy observed in opioid prescribing among different age groups may be driven by the differences in their medical conditions that are typically experienced in each age group.

Although the fraction of patients who received opioids at ages 15-24 years old was relatively small compared to older age groups, providers should continue to be diligent with opioid use in this population due to concerns for misuse and abuse. The probability of prescription opioid abuse declines with increasing age at the first opioid exposure, with the peak risk being observed in patients using opioids for the first time as adolescents or young adults aged 18-24 years old.⁽²⁶⁾ This age group itself has been shown to be a risk factor for drug abuse^(27,28), which only further compounds the problem.^(29,30) Additionally, a previous study examining the CURES database found that younger patients and female patients were associated with using multiple prescribers and pharmacies for opioid prescriptions.⁽³¹⁾ However, the data from this study is limited as it examines opioid prescriptions in 2006, which is significantly earlier than the data used in our study. Another study examining CURES opioid prescriptions from 1999 until 2007 revealed that the highest increase of opioid use was among 18-44 year old females, whereas males aged 65 and older had the lowest rate of increase.⁽³²⁾ Juxtaposed with our study, which takes place during an overall effort to curb the opioid crisis, we observed an overall decline with the most change appearing to occur among patients younger than 25.

To our knowledge, few studies exist that examine county level factors in California that affect opioid prescribing. Since a large percentage of pediatric opioid prescribing comes from hospitals at discharge^(33,34), we attempted to determine if the presence of a pediatric hospital would affect opioid prescribing rates. Our results found that none of the “high-rate” counties had a pediatric hospital, which may indicate that the presence of a pediatric hospital equipped with pediatric-specialty trained providers may improve opioid prescribing practices. Additional studies are needed, as others have suggested that opioid prescribing practices between general and pediatric

hospitals are similar to one another.⁽³⁵⁾ Other sources of opioid prescriptions may be driving county-level factors, as there is a positive correlation between the number of available physicians within a patient's residential county and number of prescribers and pharmacies that a patient uses per year.⁽³⁶⁾ In respect to national trends, one study examining congressional districts in 2016 observed that Northern California, Eastern Arizona, and Nevada had relatively high opioid prescribing rates, second only to areas along the Appalachian and throughout the South.⁽³⁷⁾ The same study also found that 3 of the 10 lowest rates were from regions in California. In addition, county-based factors such as median household income, average educational attainment, race/ethnicity, and physician availability may also significantly impact patient's choice of multiple prescribers and pharmacies.⁽³¹⁾ How this information translates to opioid use in pediatrics is unclear, and warrants further investigation.

Another important consideration is the proportion of opioid prescriptions given per patient, as some opioid prescription rates may be driven by individuals receiving a substantial number of opioid prescriptions and those demonstrating drug-seeking behaviors, such as doctor-shopping. Our results show that less than 1% of patients are non-unique patients, but it is unclear how this number is distributed among those aged less than 25 years old. Additionally, non-unique patients who receive an opioid are not necessarily misusing opioids and may simply be managing more long-term pain disorders. Other studies examining CURES data has suggested that past rates of doctor shopping ranged from 1.25% to 5.31%, with the highest number being female patients older than 65; pediatric and young adult populations were not considered a high risk group.⁽³²⁾ Factors that affect multiple prescriber and pharmacy utilization among opioid users is understudied, but it is suspected that these factors may be similar to those that predict illicit drug use, such as psychological factors, socioeconomic status, and neighborhood disadvantage.⁽³⁸⁻⁴⁰⁾ Seeking multiple prescribers may also be driven by clinically legitimate reasons, such as having multiple comorbidities that are treated by separate physicians, or suffering from undertreated pain due to the restricted opioid prescribing after the publication of the CDC guidelines.^(41,42) Although our data does not reveal age-specific information related to individuals being dispensed multiple opioid prescriptions, it suggests that there remains a very low number of patients that are non-unique opioid recipients in California from 2015 to 2019.

Ultimately, the tightening of opioid prescribing and dispensing is intended to improve public health outcomes and reduce overdose morbidity and mortality. According to the CDC, there was an overall reduction in deaths due to opioid prescriptions in California from 2014-2018.⁽⁴³⁾ Yet, deaths due to illicit and synthetic opioids have increased in the state, which have been driving up the overall opioid mortality rates. This is also mirrored on a national scale^(3,4), which enforces the complexity of the opioid climate. Simply reducing opioid prescriptions does not improve the opioid mortality rate and further investigation is needed to identify effective research-driven policies surrounding opioid use.^(44,45)

Limitations

Given the retrospective, cross-sectional nature of the study, we are limited to reporting opioid prescribing rates and are restricted from conducting further predictive or causal analyses. While CURES data captures all controlled prescriptions that are dispensed through a pharmacy, it

does not include federally regulated pharmacies, such as those under the jurisdiction of the Department of Defense and Indian Health Services. The application of our findings is also limited, as it lacks comparison to other states' pediatric prescribing rates during the same studied time period. Further, not every pediatric-specific hospital may have been captured in this study, as it is not mandatory to join the Children's Hospital Association. Another limitation of this study is its lack of analyzable variables that have been shown to affect opioid prescribing rates, such as sex/gender. This analysis was limited to the available information that was published on the CA DOJ website, which provided aggregate data sets with restricted manipulation. Therefore, we were unable to perform additional subgroup analyses and account for other demographic factors such as different age groupings, sex, race/ethnicity, and medication information (e.g. opioid name, quantity, and prescriber information).

Conclusion

There has been an overall downtrend of pediatric and young adult patients on opioid prescriptions in California. Safer practices in this population should not be limited to reducing opioid prescriptions, as evidenced by the continued prevalence of opioid deaths despite the downtrend of prescribed opioids. Older adolescents and young adults are at risk of opioid misuse and abuse – identifying the environmental and intrinsic mechanisms that lead to this risk is essential, and targeting communities and regions with the higher risk may mitigate the issue substantially. Efforts aimed at public health policies should be specific and target at-risk populations, rather than be generalized, as this may prove ineffective.

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