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Characterizations of Opioid Prescribing in Community Health Centers in 2018

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Abstract

Objective: To identify the patient- and clinic-level correlates of any prescription opioid use, chronic use, and high-dose opioid use in a multi-state network of Community Health Centers (CHCs). **Methods:** We used electronic health record data from 337 primary care clinics serving 610 983 patients across 15 states in 2018. The primary outcomes were prescription of any opioid, chronic opioid, and high-dose opioid. **Results:** Overall, 6.5% of patients were prescribed an opioid; of these, 31% were chronic users and 5% were high-dose users. Males had 5% lower odds (Odds Ratio [OR] = 0.95; 95% Confidence Interval = 0.93-0.97) of being prescribed an opioid but 16% higher odds (OR = 1.16; 95% CI = 1.10-1.21) of being chronic users and 48% (OR = 1.48; 95% CI = 1.36-1.64) higher odds of being high-dose users than females. Rural clinics had higher rates of chronic opioid (rate ratio = 1.86; 95% CI = 1.20, 2.88) and high-dose users (rate ratio = 2.95; 95% CI = 1.81-4.81). **Conclusions:** Our study highlights variations in opioid prescribing with regard to patient-level and clinic-level factors. Targeted efforts and resources may be required to support rural CHCs who seek to reduce high-risk opioid prescribing.

Keywords

community health, medications, opioid, primary care, underserved communities

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Introduction

Nearly 70 000 people died from opioid overdose in the United States (US) in 2020,[1] a dramatic increase from 2019 (50 178 deaths).[1,2] This epidemic of opioid overdoses began with, and continues to be driven at least partly by opioid prescriptions from medical settings.[3] In response, various US federal (eg, Centers for Disease Control and Prevention's prescription guideline) and state policies (Prescription Drug Monitoring Program [PDMP], opioid prescribing limits) have been implemented to reduce unsafe prescribing. Although policy changes and a growing recognition of the harms of prescription opioid overuse have led to gradual declines in prescribing since 2012,[4] opioid prescribing remains relatively high.[5]

Patients with lower income are disproportionally impacted by the opioid epidemic and have a higher risk for hospitalization and overdose death.[6,7] Many of these patients receive care in community health centers (CHCs), which provide healthcare services to 29 million vulnerable patients.[8] CHCs serve predominately low-income populations with 91% of patients near or in poverty, large proportion of racial and ethnic minorities, and patients with Medicaid or no insurance coverage. CHCs reduce barriers to cost (through sliding scale fee structures), accept patients without insurance, and tailor services to specific vulnerable populations (eg, homeless, non-English speakers).[8] Recent

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evidence shows a precipitous decline in opioid prescribing between 2009 and 2018 in CHCs, citing the importance of federal, state, and local efforts in curtailing prescribing patterns and CHCs' heightened quality improvement initiatives to reduce overprescribing.[9]

However, little is known about the characteristics of patients being prescribed opioids among this vulnerable population. Most studies characterizing patients who are prescribed opioid have used national surveys, claims, or managed care databases, missing the most vulnerable patients, and showed conflicting results regarding variation by age, sex, race/ethnicity, and income.[10-14] Understanding which CHC patients are more likely to be prescribed opioids and whether some clinic characteristics are associated with variation in opioid prescriptions can inform targeted efforts especially in the wake of the COVID-19 pandemic.

Therefore, the purpose of this study was to identify the patient- and clinic-level correlates of any prescription opioid use, chronic use, and high-dose opioid use in a large network of CHCs in 2018.

Methods

We abstracted data from the Accelerating Data Value Across a National Community Health Center Network (ADVANCE) Clinical Research Network (CRN), a member of PCORnet. For this study, the data were from the OCHIN network's ambulatory electronic health record (EHR) database from the calendar year of 2018. These data are part of OCHIN, which is part of the ADVANCE CRN, a large network of CHCs (federally qualified health centers, county health department clinics, and not-for-profit clinics) providing care to all regardless of insurance status. Data were extracted from 337 clinics across 15 states with at least one opioid prescription in 2018 sharing a common EPIC© based EHR. We included all adult (ages ≥18 years) patients who had at least one visit with a primary care provider in an ambulatory clinic in 2018 (555 039 patients). Patients with a history of cancer (17 613) were excluded.

Medication prescribing records contain EPIC© generated medication identifications in addition to text fields containing the Medication Name, Generic Name, Form, and Pharmaceutical Class. We included those with pharmaceutical class of "analgesic" and excluded those with class of "expectorant," "antitussive," and "antidiarrheal," and all that were not oral or transdermal in form. We excluded buprenorphine with the exception of 2 forms that have been US Food and Drug Administration approved for pain (1 transdermal and 1 buccal formulation). Prescription order data included the ordering date, patient identifications, prescriber identifications, medicine name, size/strength (eg, 5 mg), number of units (eg, 30 tablets), and number of authorized refills. Refills were counted in the same year or quarter, as the initiating prescription.

Our outcomes of interest were 3 different measures of opioid use (any opioid use, chronic opioid use, and high-dose use). We defined these measures of opioid use as inferred from prescriptions the patient received in the following manner:

Any opioid use: patients who received at least one prescription for an opioid in 2018.
Chronic opioid use: patients who, within calendar quarter, were prescribed ≥160 opioid pills (short- or long-acting), ≥90 long-acting pills, or any methadone pills or fentanyl patches.[9]
High-dose use: chronic users who averaged more than 90 morphine milligram equivalents (MMEs) per day through any quarter in 2018.[9]

We considered both patient- and clinic-level covariates. *Patient-level characteristics included*: age at first visit in 2018, sex, race and ethnicity, federal poverty level, homeless status ever recorded in study period, veteran status, most frequent insurance status across visits, usual provider index (percent of visits to the same provider), urban/rural residence (based on Rural/Urban Commuting Area Codes[15]), and US regions based on the clinics' location (Midwest, Northeast, South, West).[16] We also adjusted for physical chronic health condition and number of mental health conditions (excluding opioid use disorder) using International Classification of Diseases (ICD-9/10) diagnosis.

Clinic-level characteristics were derived from ambulatory visits in 2018 and included: percent of female patients, percent of white, black, or Hispanic patients, percent of patients with English language preferred, percent of patients with income <138% the Federal Poverty Level (FPL), urban/rural location, US regions based on the clinics' location (Midwest, Northeast, South, West),[16] percent of Medicaid visits, percent of uninsured visits, number of ambulatory visits, number of providers, % of visits to providers (Doctors of Medicine or Osteopathic [MD/DO], nursing staff, nurse practitioners, other providers). All clinic demographics, except for urbanicity, were categorized into terciles to facilitate interpretation.

Statistical Analysis

We summarized patient-and clinic-level characteristics in 2018 stratified by opioid use types (none, any, chronic, high-dose). We then performed 3 separate multivariable generalized estimating equations (GEE) logistic regression modeling at the patient level to identify correlations of patient characteristics with the odds of any opioid, chronic opioid, or high-dose opioid prescription.

In clinic-level analyses, we estimated unadjusted rates of opioid use, chronic opioid, and high-dose opioid

prescription by clinic-level covariate categories. Next, we performed 2 separate GEE Poisson regression models at the clinic level to model rates of chronic opioid and high-dose opioid prescription as a function of the clinic-level covariates listed above. For the clinic-level analysis, the clinic sample was restricted to clinics with at least one opioid prescription. Our outcome variables at the clinic level were the rates of patients with chronic opioid or high dose opioid prescriptions.

All GEE models assumed an exchangeable working correlation structure to account for clustering of patients within clinics at the patient level and clustering of clinics within states at the clinic level. Analyses were conducted in R version 4.0.2. This study was approved by the Institutional Review Board.

Results

Our study population consisted of 555 039 patients from 335 clinics across 15 states. Table 1 describes characteristics of patients for the year 2018 stratified by opioid use types. Overall, 6.5% of patients were prescribed an opioid at least once during 2018; of these, 31% were considered chronic users and 5% were considered high-dose users. Older patients (aged 55 and older), non-Hispanic white patients, veterans, patients with Medicare or Medicaid insurance, patients residing in rural areas, those with mental health conditions, and patients with somatic multimorbidity have higher rates of any opioid use than their counterparts. Patients with greater provider continuity had lower rates of any opioid prescribing. The profile of those with chronic opioid use was similar to that of patients with any opioid. Non-Hispanic white, Medicare beneficiaries, veterans, and those with an increasing number of mental and physical conditions were more likely to be high-dose users than their counterparts.

Table 2 presents the results of the patient-level multivariable GEE logistic models. Increasing age, those with Medicare insurance, and those with increasing number of mental or physical conditions were at higher odds of any opioid prescription, chronic use, and high-dose use relative to their counterparts. Patients with more visits to the same provider were less likely to have any opioid prescription use than their counterparts, but more likely to be chronic or high-dose users. Patients residing in rural areas were more likely to have any or chronic opioid prescription than patients in urban areas. Patients who received care in western region were more likely to have any, chronic, or high dose opioid than those in Midwest or South regions. Non-Hispanic white patients were more likely to get any opioid prescription and be chronic and high-dose users than any other racial/ethnic groups. Males had 5% lower odds (odds ratio [OR] = 0.95; 95% confidence interval [CI] = 0.93-0.97) of being prescribed an opioid but 16% higher odds (OR = 1.16; 95% CI = 1.10-1.21) of being a chronic user and 48% (OR = 1.48; 95% CI = 1.34-1.64) higher odds of being a high-dose user relative to females. Those who were ever recorded as homeless had 42% lower odds (OR = 0.68; 95% CI = 0.64-0.72) of being prescribed an opioid and 36% (OR = 0.74; 95% CI = 0.64-0.85) lower odds of being chronic users compared to those who were never homeless.

Table 3 shows unadjusted rates of any opioid, chronic opioid, and high-dose prescription per 100 patients. These results show that clinics with a higher proportion of white, English-preferring patients, or Medicare recipient, and clinics located in rural areas and Western region have higher rates of any opioid, chronic, and high-dose users.

Table 4 presents our clinic-level adjusted GEE Poisson regression model results. The rate of chronic opioid and high-dose prescribing in a clinic increases with higher percentages of white, the size of the clinic (number of ambulatory visits), the percent of visits to MD/DO, and the percent of visits to other provider types (eg, behavioral health provider). Rural clinics had higher rates of both chronic opioid and high-dose prescribing. The percent of uninsured visits in a clinic was inversely related to the rate of both chronic opioid and high-dose prescribing.

Discussion

Community health centers play an essential role in curtailing the opioid epidemic because they disproportionately serve vulnerable patients. Opioid prescribing has declined significantly in these settings since 2008.[9] Our study highlights variations in opioid prescribing across patient-level and clinic-level factors. Similar to other studies,[10-12] we found that older patients, female patients, those with Medicaid or Medicare insurance, non-Hispanic white patients, and patients residing in rural areas were more likely to be prescribed at least one opioid. Additionally, we found that although women were prescribed an opioid more frequently, men were more likely to be prescribed chronic or high-dose opioids. Evidence suggests that men are more likely to exhibit substance abuse problems than women[17-21] which may result from chronic or high dose prescribing increasing the risk of opioid use disorder.

As expected, we found that patients with an increasing number of mental and/or physical health conditions were more likely to be prescribed opioids, including chronic and high-dose opioids. This is concerning because certain comorbidities are associated with greater risk of using opioids inappropriately. In general, CHC patient populations are more complex and have more physical and mental health comorbidities than those in other settings.[22-24] In a 2018 survey, CHCs reported experiencing an increase in the number of patients with opioid use disorders in the past 3 years,[25] and this likely accelerated in the wake of the

Table 1. Percent of any Opioid, Chronic Opioid, and High-Dose Opioid Prescription by Patient-Level Characteristics in 337 Community Health Centers, 2018.

	No opioid, n	Any opioid[a], n (%)	Among any opioid	
			Chronic user[b], n (%)	High-dose users[c], n (%)
Number of patients	555 039	38 331 (6.5)	11 999 (31.3)	1948 (5.1)
Age				
18-34	181 502	4732 (2.5)	599 (12.7)	98 (2.1)
35-44	108 047	5823 (5.1)	1338 (23.0)	240 (4.1)
45-55	103 588	8538 (7.6)	2658 (31.1)	461 (5.4)
55-64	96 895	11 162 (10.3)	4270 (38.3)	739 (6.6)
≥65	65 007	8076 (11.1)	3134 (38.8)	410 (5.1)
Sex				
Female	326 886	23 067 (6.6)	6998 (30.3)	1010 (4.4)
Male	227 399	15 221 (6.3)	4991 (32.8)	937 (6.2)
Other/unknown	754	43 (5.4)	10 (23.3)	1 (2.3)
Race/Ethnicity				
Non-Hispanic White	215 543	22 934 (9.6)	8133 (35.5)	1465 (6.4)
Non-Hispanic Black	96 477	5526 (5.4)	1664 (30.1)	250 (4.5)
Hispanic	182 550	7034 (3.7)	1391 (19.8)	132 (1.9)
Other	33 346	1386 (4.0)	382 (27.6)	40 (2.9)
Unknown	27 123	1451 (5.1)	429 (29.6)	61 (4.2)
Federal poverty level				
≤138%	95 167	6506 (6.4)	1954 (30.0)	298 (4.6)
>138%	328 652	20 969 (6.0)	6312 (30.1)	987 (4.7)
Missing	131 220	10 856 (7.6)	3733 (34.4)	663 (6.1)
Homeless status[d]				
Yes	26 708	1105 (4.0)	315 (28.5)	33 (3.0)
No	528 331	37 226 (6.6)	11 684 (31.4)	1915 (5.1)
Veteran status				
Yes	9376	1125 (10.7)	413 (36.7)	72 (6.4)
No	484 859	33 532 (6.5)	10 454 (31.2)	1732 (5.2)
Unknown	60 804	3674 (5.7)	1132 (30.8)	144 (3.9)
Urbanicity[e]				
Rural	52 607	6198 (10.5)	2298 (37.1)	349 (5.6)
Urban	451 465	28 289 (5.9)	8413 (29.7)	1384 (4.9)
Unknown	50 967	3844 (7.0)	1288 (33.5)	215 (5.6)
Region[f]				
West	344 419	28 973 (7.8)	9314 (32.1)	1572 (5.4)
Midwest	73 323	3240 (4.2)	836 (25.8)	86 (2.7)
Northeast	104 019	4262 (3.9)	1263 (29.6)	238 (5.6)
South	33 278	1856 (5.3)	586 (31.6)	52 (2.8)
Most frequent insurance				
Medicaid	262 416	18 048 (6.4)	4812 (26.7)	723 (4.0)
Medicare	75 558	12 315 (14.0)	5286 (42.9)	938 (7.6)
Other Public	26 164	338 (1.3)	50 (14.8)	6 (1.8)
Private	104 042	5184 (4.7)	1495 (28.8)	234 (4.5)
Uninsured	86 859	2446 (2.7)	356 (14.6)	47 (1.9)
Usual Provider Continuity Index[g]				
0.01-0.49	54 309	5512 (9.2)	1380 (25.0)	228 (4.1)
0.50-0.99	201 809	19 588 (8.8)	6338 (32.4)	1029 (5.3)
1.00	298 921	13 231 (4.2)	4281 (32.4)	691 (5.2)

(continued)

Table 1. (continued)

	No opioid, n	Any opioid[a], n (%)	Among any opioid	
			Chronic user[b], n (%)	High-dose users[c], n (%)
Mental health condition[h]				
0	373 193	17 695 (4.5)	4821 (27.2)	666 (3.8)
1	97 039	10 334 (9.6)	3658 (35.4)	622 (6.0)
2	67 473	7818 (10.4)	2707 (34.6)	499 (6.4)
≥3	17 334	2484 (12.5)	813 (32.7)	161 (6.5)
Physical chronic conditions				
0	205 766	4573 (2.2)	557 (12.2)	91 (2.0)
1	136 041	6182 (4.3)	1366 (22.1)	235 (3.8)
2	89 784	6866 (7.1)	1984 (28.9)	314 (4.6)
≥3	123 448	20 710 (14.4)	8092 (39.1)	1308 (6.3)

Abbreviation: NH, non-Hispanic.
[a]Opioid user are those who received at least one prescription for an opioid in 2018. Percentage denominator is all patients in the study sample.
[b]Chronic opioid user are those patients who, within calendar quarter, were prescribed ≥160 opioid pills (short- or long-acting), ≥ 90 long-acting pills, or any methadone pills or fentanyl patches. Percentage denominator is all patients with opioid prescription.
[c]High-dose user are chronic users who averaged more than 90 morphine milligram equivalents per day through any quarter in 2018. Percentage denominator is all patients with opioid prescription.
[d]Ever recorded as homeless on medical record.
[e]Identified using patient recorded zipcode data linked to Rural-Urban Commuting Area Codes.[15]
[f]Represents the US region in which the clinic is located.
[g]Represents the % of visits to the same provider.
[h]Excludes opioid use disorder.

Table 2. Odds of any Opioid, Chronic Opioid, anD High-Dose Opioid Prescription bY Patient-Level Characteristics in 337 Community Health Centers, 2018.

	Any opioid odds ratio (95% CI)	Chronic user[a] odds ratio (95% CI)	High-dose users[b] odds ratio (95% CI)
Age			
18-34	Reference	Reference	Reference
35-44	**1.67 (1.60, 1.74)**	**1.67 (1.49, 1.86)**	**1.62 (1.26, 2.09)**
45-55	**1.92 (1.84, 1.99)**	**2.02 (1.82, 2.25)**	**1.70 (1.33, 2.18)**
55-64	**1.98 (1.90, 2.06)**	**2.34 (2.11, 2.59)**	**1.78 (1.39, 2.28)**
≥65	**1.42 (1.35, 1.49)**	**1.74 (1.55, 1.97)**	0.94 (0.71, 1.24)
Sex			
Female	Reference	Reference	Reference
Male	**0.95 (0.93, 0.97)**	**1.16 (1.10, 1.21)**	**1.48 (1.34, 1.64)**
Other/unknown	0.74 (0.53, 1.01)	-	-
Race/Ethnicity			
Non-Hispanic White	Reference	Reference	Reference
Non-Hispanic Black	**0.85 (0.82, 0.88)**	**0.86 (0.79, 0.92)**	**0.78 (0.66, 0.93)**
Hispanic	**0.55 (0.53, 0.57)**	**0.55 (0.52, 0.60)**	**0.33 (0.27, 0.41)**
Other	**0.50 (0.47, 0.53)**	**0.73 (0.64, 0.83)**	**0.45 (0.31, 0.65)**
Unknown	**0.75 (0.71, 0.80)**	**0.82 (0.72, 0.94)**	**0.73 (0.55, 0.98)**
Federal poverty level			
≤138%	Reference	Reference	Reference
>138%	0.98 (0.95, 1.01)	**0.9 (0.84, 0.97)**	0.9 (0.78, 1.04)
Missing	**1.27 (1.24, 1.30)**	**1.12 (1.06, 1.19)**	**1.26 (1.13, 1.41)**
Homeless status[c]			
Yes	**0.68 (0.64, 0.72)**	**0.74 (0.64, 0.85)**	1.00 (0.76, 1.31)
No	Reference	Reference	Reference

(continued)

Table 2. (continued)

	Any opioid odds ratio (95% CI)	Chronic user[a] odds ratio (95% CI)	High-dose users[b] odds ratio (95% CI)
Veteran Status			
Yes	1.00 (0.93, 1.07)	0.93 (0.82, 1.07)	0.89 (0.68, 1.17)
No	Reference	Reference	Reference
Unknown	**0.94 (0.91, 0.98)**	1.03 (0.94, 1.11)	**0.78 (0.64, 0.94)**
Urbanicity[d]			
Rural	**1.19 (1.15, 1.23)**	**1.14 (1.07, 1.22)**	0.96 (0.84, 1.10)
Urban	Reference	Reference	Reference
Unknown	1.04 (1.00, 1.08)	1.02 (0.95, 1.11)	1.03 (0.87, 1.22)
Region[e]			
West	Reference	Reference	Reference
Midwest	**0.52 (0.49, 0.54)**	**0.69 (0.63, 0.76)**	**0.44 (0.35, 0.57)**
Northeast	**0.50 (0.48, 0.52)**	**0.87 (0.81, 0.95)**	1.04 (0.88, 1.22)
South	**0.68 (0.65, 0.72)**	**0.87 (0.77, 0.98)**	**0.56 (0.41, 0.77)**
Most frequent Insurance			
Medicaid	**1.25 (1.20, 1.29)**	0.94 (0.87, 1.01)	0.87 (0.73, 1.03)
Medicare	**1.77 (1.70, 1.85)**	**1.49 (1.37, 1.62)**	**1.81 (1.51, 2.17)**
Other Public	**0.30 (0.27, 0.34)**	**0.60 (0.45,0.80)**	0.59 (0.25, 1.39)
Private	Reference	Reference	Reference
Uninsured	**0.74 (0.70, 0.78)**	**0.59 (0.52, 0.68)**	**0.66 (0.47, 0.93)**
Usual Provider Continuity Index[f]	**0.50 (0.47, 0.52)**	**2.05 (1.85, 2.27)**	**2.07 (1.66, 2.58)**
Mental Health Condition[g]			
0	Reference	Reference	Reference
1	**1.58 (1.54, 1.62)**	**1.30 (1.23, 1.37)**	**1.46 (1.29, 1.66)**
2	**1.62 (1.57, 1.67)**	**1.28 (1.20, 1.36)**	**1.54 (1.34, 1.76)**
≥3	**1.84 (1.75, 1.93)**	**1.24 (1.12, 1.36)**	**1.60 (1.31, 1.96)**
Physical Chronic Conditions			
0	Reference	Reference	Reference
1	**1.60 (1.54, 1.67)**	**1.64 (1.46, 1.84)**	**1.56 (1.17, 2.07)**
2	**2.28 (2.18, 2.37)**	**2.04 (1.81, 2.29)**	**1.66 (1.27, 2.17)**
≥3	**4.08 (3.93, 4.25)**	**2.68 (2.4, 3.00)**	**2.04 (1.56, 2.66)**

Abbreviation: NH, non-Hispanic.

Odds Ratio (OR) and Confidence Interval (CI) were computed using multivariable generalized estimating equations (GEE) logistic regression models. This model assumed an exchangeable working correlation structure to account for clustering of patients within clinics at the patient level and clustering of clinics within states at the clinic level. Bolded results at significant at $P < .05$.

[a]Chronic opioid user are those patients who, within calendar quarter, were prescribed ≥160 opioid pills (short- or long-acting), ≥90 long-acting pills, or any methadone pills or fentanyl patches.

[b]High-dose user are chronic users who averaged more than 90 morphine milligram equivalents per day through any quarter in 2018.

[c]Ever recorded as homeless on medical chart.

[d]Identified using patient recorded zipcode data linked to Rural-Urban Commuting Area Codes.[15]

[e]Represents the US region in which the clinic is located.

[f]Represents the % of visits to the same provider.

[g]Excludes opioid use disorder.

COVID-19 pandemic. CHCs experienced enormous financial losses as a result of the pandemic,[26] some closing completely, creating uncertainty for patients receiving prescriptions and especially those at risk for opioid use disorders.[27] Our results can inform CHCs in their decision-making with regard to prioritizing patient outreach (eg, reaching out to their more medically complex patients) and providing access during this and future pandemics to mitigate high-risk opioid use.

Our findings also showed that patients with chronic or high-dose use of opioids were more likely to visit the same provider. Previous studies[28-31] have shown the benefit of provider continuity for medication adherence, reduction in hospitalization, and improved health care utilization. For the CHCs population, the high rate of multimorbidity may

Table 3. Unadjusted Rates of Chronic Opioid and High-Dose Opioid Prescription per 100 Patients by Clinic-Level Characteristics in 337 Community Health Centers, 2018.

	Rate of any opioid users[a], mean (SD)	Rate of chronic users[b], mean (SD)	Rate of high-dose users[c], mean (SD)
% Female patients			
0-56	6.86 (6.49)	2.35 (3.75)	0.39 (0.92)
57-62	8.89 (6.25)	2.92 (3.53)	0.45 (0.78)
62-100	5.90 (4.45)	1.27 (1.55)	0.12 (0.31)
% White patients			
0-21	4.26 (3.86)	0.95 (1.62)	0.12 (0.41)
22-67	6.86 (5.52)	1.96 (2.98)	0.52 (0.94)
68-100	10.52 (6.35)	3.62 (3.89)	0.31 (0.68)
% Black patients			
0-2	10.20 (6.59)	3.42 (3.92)	0.47 (0.93)
3-13	5.63 (3.85)	1.33 (1.61)	0.19 (0.37)
13-100	5.81 (5.81)	1.78 (3.14)	0.30 (0.76)
% Hispanic patients			
0-8	8.60 (7.14)	3.05 (3.82)	0.40 (0.86)
9-37	8.18 (5.78)	2.52 (3.34)	0.43 (0.80)
38-100	4.88 (3.58)	0.97 (1.48)	0.13 (0.42)
% with English language preferred			
0-70	4.79 (3.54)	1.22 (1.72)	0.18 (0.45)
71-93	7.60 (5.70)	2.13 (3.24)	0.35 (0.77)
94-100	9.26 (7.10)	3.18 (3.86)	0.42 (0.89)
% Patient FPL<138%			
0-41	9.56 (6.84)	3.08 (3.80)	0.42 (0.84)
42-78	7.60 (5.68)	2.43 (3.32)	0.39 (0.81)
78-100	4.49 (3.65)	1.03 (1.63)	0.15 (0.44)
Urbanicity[d]			
Rural	14.03 (7.49)	5.26 (4.91)	0.82 (1.39)
Urban	6.47 (5.22)	1.84 (2.72)	0.27 (0.60)
Region[e]			
West	4.33 (5.56)	1.29 (2.59)	0.12 (0.28)
Midwest	8.77 (6.35)	2.73 (3.65)	0.40 (0.85)
Northeast	4.49 (3.95)	1.20 (1.54)	0.10 (0.20)
South	4.83 (3.23)	1.29 (1.76)	0.28 (0.60)
% Medicaid visits			
0-41	7.24 (6.49)	2.45 (3.50)	0.34 (0.77)
42-58	7.08 (5.36)	2.15 (2.81)	0.30 (0.64)
58-100	7.33 (5.90)	1.93 (3.17)	0.31 (0.77)
% Medicare visits			
0-12	3.96 (3.80)	0.71 (1.37)	0.07 (0.18)
13-20	6.82 (5.27)	1.79 (2.98)	0.28 (0.74)
21-100	10.87 (6.25)	4.04 (3.70)	0.61 (0.93)
% Uninsured visits			
0-4	8.34 (6.75)	2.87 (3.88)	0.45 (0.95)
5-14	8.31 (6.15)	2.47 (3.28)	0.36 (0.76)
15-100	5.02 (3.88)	1.20 (1.71)	0.15 (0.31)
Number of ambulatory visits			
0-2475	7.44 (6.51)	2.37 (3.47)	0.30 (0.71)
2476-7694	6.72 (5.51)	1.68 (2.81)	0.24 (0.72)
7695-32962	7.48 (5.71)	2.49 (3.16)	0.42 (0.76)

(continued)

Table 3. (continued)

	Rate of any opioid users[a], mean (SD)	Rate of chronic users[b], mean (SD)	Rate of high-dose users[c], mean (SD)
Number of providers			
0-11	7.83 (6.06)	2.28 (3.31)	0.26 (0.60)
12-24	7.21 (6.71)	2.39 (3.70)	0.41 (0.97)
24-148	6.58 (4.76)	1.85 (2.31)	0.29 (0.53)
% Visits to provider MD/DO			
0-18	6.33 (5.63)	1.68 (2.59)	0.16 (0.40)
19-45	7.94 (6.50)	2.56 (3.59)	0.42 (0.91)
46-100	7.39 (5.52)	2.30 (3.21)	0.38 (0.76)
% Visits to nursing staff			
0-<1	7.52 (6.52)	2.26 (3.43)	0.26 (0.68)
1-5	6.57 (5.52)	1.97 (2.62)	0.41 (0.90)
6-100	7.55 (5.66)	2.31 (3.41)	0.29 (0.56)
% Visits to nurse practitioners			
0-36	7.63 (5.56)	2.23 (2.77)	0.38 (0.72)
37-64	7.22 (5.74)	2.42 (3.59)	0.37 (0.84)
65-100	6.80 (6.44)	1.89 (3.11)	0.21 (0.60)
% Visits to other providers[f]			
0-1	6.43 (5.18)	1.73 (2.90)	0.25 (0.71)
2-7	7.69 (6.46)	2.54 (3.56)	0.35 (0.71)
8-100	7.53 (6.01)	2.27 (2.99)	0.36 (0.77)

Abbreviation: FPL, federal poverty level.
[a]Rate of any opioid use is the number of patients with a prescription for opioid use per 100 patients.
[b]Rate of chronic opioid users is the number of patients who, within calendar quarter, were prescribed ≥160 opioid pills (short- or long-acting), ≥90 long-acting pills, or any methadone pills or fentanyl patches per 100 patients with an opioid prescription.
[c]Rate of high dose users is the number of chronic users who averaged more than 90 morphine milligram equivalents per day through any quarter in 2018 per 100 patients with an opioid prescription.
[d]Identified using clinic zipcode data linked to Rural-Urban Commuting Area Codes.[15]
[e]Represents the US region in which the clinic is located.
[f]Other providers include behavioral health providers, clinical social workers, physician assistant, naturopath, etc.

explain this result. As noted above, we found that patients with more physical and mental illnesses were more likely to be chronic and high-dose opioid users. These patients are likely to need frequent visits to the same provider for chronic health management. More research is needed, however, to assess whether provider continuity among this population contributes to safer opioid prescribing.

We know of no other large studies that assess opioid prescribing among homeless populations. Our finding that homeless patients who receive care in CHCs had opioid prescriptions and chronic opioid prescriptions less frequently than patients without homeless status was unexpected and needs further investigation. It may reflect patient factors, for example, that the homeless condition may distract from seeking pain treatment. It could also reflect prescriber factors such as biases that impede ordering opioids for those living in less settled situations and who might not be able to secure their prescriptions. Given the magnitude of homelessness in the United States, further studies are warranted to better understand opioid prescribing patterns in this population.

Overall, clinic characteristics associated with higher prescription rates are similar to patient-level correlates. Clinics with a greater proportion of white patients, Medicare beneficiaries, larger number of visits, and those in rural areas were more likely to serve chronic and high-dose opioids using patients. Many studies have demonstrated the barriers faced by rural providers to safely prescribe opioids.[32-36] These barriers include difficulty using the PDMP during patient visits,[32] competing demands on clinicians and staff, a culture of clinician autonomy, inadequate data systems, and a lack of patient resources.[32,35,36] The COVID-19 pandemic disrupted all facets of primary care[37] and created the need for an unprecedented, rapid uptake of telemedicine.[38] Uptake of telemedicine for medication treatment for managing patients with chronic pain may be one strategy for providers in rural areas to assist patients with getting the care they need[39]; however, the effectiveness of telemedicine has not been proven, and barriers to its use in rural areas (eg, lack of broadband), may hamper this strategy.

Our study is limited in several ways. First, our EHR data contain orders for prescriptions, and it was not possible to confirm that these orders were picked up by patients, possibly overestimating actual use of the opioids. The OCHIN population is disproportionately represented by West Coast states and may not be representative of all national CHCs or overall national population estimates.

Table 4. Rate Ratios of Chronic Opioid and High-Dose Opioid Prescription by Clinic-Level Characteristics in 337 Community Health Centers, 2018.

	Chronic user[a] Rate ratio (95% CI)	High dose users[b] Rate ratio (95% CI)
% Female patient		
≤56	Reference	Reference
57-62	0.95 (0.75, 1.22)	0.95 (0.63, 1.43)
≥63	0.89 (0.66, 1.22)	0.76 (0.46, 1.25)
% White patient		
≤21	Reference	Reference
22-67	**2.59 (1.92, 3.48)**	**3.70 (1.52, 9.02)**
≥68	**2.46 (1.52, 4.00)**	**3.87 (1.49, 10.09)**
% black patient		
≤2	Reference	Reference
3-13	**0.74 (0.59, 0.92)**	0.77 (0.56, 1.06)
≥14	1.17 (0.92, 1.49)	**1.76 (1.12, 2.76)**
% Hispanic patient		
≤8	Reference	Reference
9-37	**1.43 (1.17, 1.76)**	**2.31 (1.70, 3.13**)
≥38	0.78 (0.58, 1.06)	1.15 (0.60, 2.20)
% With English language preferred		
≤70	Reference	Reference
71-93	1.02 (0.88, 1.18)	1.15 (0.83, 1.57)
≥94	1.18 (0.94, 1.47)	**1.80 (1.02, 3.18)**
% Patient FPL <138%		
≤41	Reference	Reference
42-78	1.25 (0.84, 1.86)	1.53 (0.89, 2.62)
≥79	0.86 (0.45, 1.64)	1.02 (0.42, 2.46)
Urbanicity[c]		
Rural	**1.86 (1.20, 2.88)**	**2.95 (1.81, 4.81)**
Urban	Reference	Reference
Region[d]		
West	Reference	Reference
Midwest	0.74 (0.48, 1.13)	0.51 (0.20, 1.26)
Northeast	**0.69 (0.48, 0.99)**	1.09 (0.66, 1.79)
South	1.04 (0.63, 1.72)	0.66 (0.31, 1.45)
% Medicaid Visits		
≤41	Reference	Reference
42-58	1.16 (0.88, 1.55)	1.01 (0.61, 1.65)
≥59	1.45 (0.83, 2.53)	1.52 (0.60, 3.89)
% Medicare Visits		
≤12	Reference	Reference
13-20	**1.48 (0.89, 2.47)**	1.30 (0.66, 2.59)
≥21	**2.38 (1.18, 4.80)**	2.25 (0.70, 7.31)
% Uninsured Visits		
≤4	Reference	Reference
5-14	**0.50 (0.37, 0.69)**	**0.37 (0.27, 0.53)**
≥15	**0.36 (0.19, 0.67)**	**0.27 (0.12, 0.62)**
Number of Ambulatory Visits		
10-2475	Reference	Reference
2476-7694	1.13 (0.87, 1.46)	1.12 (0.64, 1.98)
7695-32962	**1.58 (1.28, 1.96)**	**1.83 (1.15, 2.90)**
Number of Providers		
1-11	Reference	Reference
12-24	**0.84 (0.72, 0.99)**	0.95 (0.68, 1.33)
25-148	**0.57 (0.42, 0.78)**	0.51 (0.31, 0.82)
% Visits to provider MD/DO		
0-18	Reference	Reference
19-45	**2.08 (1.47, 2.95)**	**4.30 (2.45, 7.55)**
≥46	**1.80 (1.22, 2.66)**	**3.54 (1.96, 6.41)**
% Visits to nursing staff		
<1	Reference	Reference
1-5	**0.82 (0.69, 0.97)**	0.74 (0.52, 1.04)
≥6	**0.73 (0.54, 0.99)**	0.78 (0.56, 1.09)
% Visits to nurse practitioners		
≤36	Reference	Reference
37-64	0.87 (0.72, 1.05)	0.89 (0.68, 1.16)
≥65	0.98 (0.70, 1.38)	1.14 (0.77, 1.70)
% Visits to other providers[e]		
≤1	Reference	Reference
2-7	**1.18 (1.01, 1.37**)	**1.32 (1.02, 1.71)**
≥8	1.20 (0.86, 1.67)	**1.87 (1.05, 3.35)**

Abbreviation: FPL, federal poverty level.

Rate ratios and confidence intervals (CI) were computed using multivariable generalized estimating equations (GEE) Poisson regression model, which assumed an exchangeable working correlation structure to account for clustering of patients within clinics at the patient level and clustering of clinics within states at the clinic level. Bolded results at significant at $P < .05$.

[a]Chronic opioid users are those patients who, within calendar quarter, were prescribed ≥160 opioid pills (short- or long-acting), ≥90 long-acting pills, or any methadone pills or fentanyl patches among patient with any prescription of opioid.

[b]High dose users are chronic users who averaged more than 90 morphine milligram equivalents per day through any quarter in 2018 among patient with any prescription of opioid.

[c]Identified using clinic zipcode data linked to Rural-Urban Commuting Area Codes.[15]

[d]Represents the US region in which the clinic is located.

[e]Other providers include behavioral health providers, clinical social workers, physician assistant, naturopath, etc.

Conclusion

The implications of these findings are important for decision makers within health systems and at the federal level, especially in the wake of the pandemic. Additional targeted efforts and resources are needed to support rural community health centers who have a higher number of patients with chronic opioid prescriptions so that they might have other tools available to assist patients with chronic pain. Moreover, despite an overall reduction in opioid prescribing at CHCs, developing targeted interventions to decrease opioid prescribing and reduce odds of prescription drug misuse for specific populations is critical.

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Author Contributions

NH provided conceptualization, supervision, and writing—original draft. TH provided data curation, formal analysis, and writing—review and editing. JM provided funding acquisition, conceptualization, supervision, and writing—review and editing. All authors contributed writing, review, and editing, and approved the final manuscript.

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