Prevalence of cannabis use and behavioral health conditions among primary care patients with and without chronic non-cancer pain in Washington state

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A thesis

submitted in partial fulfillment of the

requirements for the degree of

Master of Science

University of Washington

2020

Committee:

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Program Authorized to Offer Degree:

Health Services

University of Washington

Abstract

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Chronic non-cancer pain (CNCP) is common among primary care patients, with few effective treatments. Patients report that cannabis provides relief , however little is known about characteristics and patterns of cannabis use among patients with CNCP, overall and relative to those without CNCP. This study estimated the prevalence of past-year cannabis use, medical cannabis use, and behavioral health diagnoses for patients with and without CNCP in a large sample of primary care patients screened for cannabis use. EHR and claims data from 25 primary care clinics were used. Chi-squared tests tested for differences between patients with and without CNCP. Adjusted fixed effects logistic regression models were used to estimate the prevalence of past-year cannabis use, with 95% confidence intervals, among patients with and without CNCP. We found a higher adjusted prevalence of medical cannabis use and most behavioral health

conditions among those with CNCP compared to those without CNCP. Patients with CNCP may benefit from care management that includes behavioral health care.

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Introduction

Approximately 50 million American adults are affected by chronic pain, translating to about 20% of the U.S. adult population.[1] Prevalence estimates of chronic non-cancer pain (CNCP) vary among primary care samples, ranging from 5% to 40.2%.[2,3] The economic costs associated with chronic pain, including lost productivity and health care expenses, are upwards of $560billion annually.[4,5] Chronic pain is one of the most common reasons adults pursue medical care. Yet, treatment for chronic pain is often inadequate, especially as opioids are not effective or safe long-term options given the high risks of addiction and overdose.[1,4,6,7]

Approximately 43.5 million (15.9%) Americans aged 12 or older reported past-year cannabis use in 2018[8] and is most prevalent among young adults aged 18-25 (11.8 million, 34.8%), followed by adults 26 or older (28.5 million, 13.3%).[8] Evidence suggests cannabis may provide symptom relief for neuropathic pain.[11,12,13,14,15] On the other hand, patients report cannabis provides relief for a variety of chronic pain conditions and view cannabis as a safer alternative to prescription pain medications. Moreover, chronic pain is the most common reason patients report for medical cannabis use.[1] More states legalized medical and recreational cannabis use in recent years, providing opportunities for cannabis use as a treatment for chronic pain.[4] As of June 2019, 33 states have legalized medical cannabis use, and among those 11 states plus the District of Columbia, have legalized adult recreational cannabis use.[9] Medical cannabis use was legalized in Washington State in 1998, and in 2012 it became one of two states to first legalize non-medical cannabis for adults aged 21 and older.[10]

CNCP and cannabis use are each associated with behavioral health conditions including anxiety, depression, and substance use disorders—notably, opioid use disorder.[11,16,17,18,19,20] For example, chronic pain is associated with a higher risk of suicide compared to those without

chronic pain.[21] People with CNCP may be more inclined than people without CNCP to use cannabis for pain relief and may choose cannabis as an alternative to opioids for pain. However, use of cannabis can exacerbate mental health conditions, including anxiety.[11] Yet, little is known about the proportion of patients with CNCP who use cannabis, for medical or recreational purposes, as well as the clinical characteristics of these patients.[11,16,17,18,19] Randomized clinical trials designed to evaluate the effectiveness of cannabis for CNCP cannot sufficiently fill this evidence gap as US legal restrictions limit inclusion of the variety of high THC products available in most legal markets.[6,11,22]

Given the high prevalence of CNCP among patients, primary care providers would benefit from understanding how patients CNCP may differ from patients without CNCP with regards to cannabis use and other behavioral health conditions. This study aims to fill some of these evidence gaps by first estimating the prevalence of CNCP within a large sample of primary care patients screened for cannabis use as part of a routine behavioral health screening, as well as the prevalence of past-year cannabis use, medical cannabis use and behavioral health diagnoses among patients with and without CNCP. Secondarily, among patients who report past-year cannabis use, we estimate the prevalence of these same conditions among patients with and without CNCP. We know that among the patients in this sample, a higher frequency of cannabis use is associated with a higher prevalence of behavioral health conditions. Thus, our comparison aims to better understand differences between patients with and without CNCP to appropriately guide care for patients who have CNCP. We hypothesize patients with CNCP diagnoses will differ in the prevalence of past-year cannabis use, including medical cannabis use, and behavioral health conditions compared to patients without CNCP.

Methods

Setting and population

Kaiser Permanente Washington (KPWA) is a large health system in Washington State, where medical and non-medical cannabis use is legal which offers annual behavioral health screening, including a single-item about the frequency past-year cannabis use, for all adult primary care patients. Deidentified KPWA electronic health record (EHR) information and claims data from 25 primary care clinics included demographics, diagnoses, behavioral health screen results, and prescription medications. Eligible participants included: 1) adult patients age 18 and older who attended one of 25 KPWA primary care clinics between January 2016 and October 2018; 2) had a cannabis screen documented in their EHR at the time of the visit; and 3) did not have any cancer diagnosis documented in the year prior to the screen, as the treatment and duration of cancer pain can differ significantly from that of CNCP.[15] A random screen was selected for patients screened more than once during the study period. The project was approved for waivers of HIPAA documentation and documentation of consent by the Kaiser Permanente Washington Health Research Institute Institutional Review Board.

Measures

Chronic non-cancer pain: The independent variable, CNCP, is a binary variable indicating CNCP, derived from 13 pain types developed based on the National Pain Strategy, including: abdominal and bowel pain; back pain; fibromyalgia; fractures, contusions, sprains and strains; limb/extremity, joint pain and nonsystemic, noninflammatory arthritic disorders; musculoskeletal chest pain; neck pain; neuropathy; headache; orofacial, ear, and temporomandibular (TM) disorder pain; other painful conditions; systemic disorders or diseases causing pain; and urogenital, pelvic and menstrual pain.[41] EHR-documented ICD 9 and 10 codes for each pain type

were assessed in the year prior to the cannabis screen date , with chronic pain indicated by documentation of at least two diagnoses of similar pain types in the past year, documented at least 30 days apart.[23,24,25,41] Indicators for the 13 CNCP types were collapsed into a binary indicator for CNCP.

Cannabis measures

Past-year cannabis use screen: Primary care patients are annually offered a 7-item behavioral health screen that includes a question about past-year cannabis use, "*How often in the past year have you used marijuana?"* Response options include *never, less than monthly, monthly, weekly, daily/almost daily."* The question was adapted from a validated single-item drug use screen[26] with response options adapted from one item of the World Health Organization's Alcohol Use Disorder Identification Test (AUDIT).[16,23] A categorical measure of *past-year cannabis use* was defined as: *none, less than monthly, monthly, weekly, daily/almost daily*.

EHR-documented medical cannabis use: A binary measure of EHR-documented medical cannabis use was derived from EHR text, identified with a natural language processing strategy. Using EHR notes within 365 days prior and up to 7 days after each patient cannabis screen date, this two-step strategy included development and application of a high-specificity machine-learned NLP algorithm followed by NLP-assisted manual chart review to identify notes that indicated any EHR-documented medical cannabis use.[27,28] The composite measure of EHR documented cannabis use was created by combining the categorial cannabis screen result, *past-year cannabis use*, with the binary *EHR-documented medical cannabis use* measure. Responses for this combined measure were categorized as *no use* if there was no reported past-year use on the cannabis screen and no EHR-documented medical use; *non-medical cannabis use* if patients reported any past-year use on the cannabis screen and had no EHR-documented medical use; and

medical cannabis use if patients reported any past-year use on the cannabis screen and had EHR-documented medical use. The non-medical use category may include medical use not captured by NLP measure.

Mental health and substance use disorders: Binary measures for mental health and substance use diagnoses were derived from any EHR-documented ICD 9 and 10 codes assessed in the year prior to the cannabis screen. Mental health disorder diagnoses include: Major Depressive Disorder, Anxiety Disorder, Bipolar Disorder, Schizophrenia, and Psychosis. The binary composite measure *any mental health disorder diagnosis* was created from these five diagnoses. Substance use disorder diagnoses include: alcohol use disorder, cannabis use disorder, opioid use disorder, stimulant use disorder, and prior/other drug use disorder. The binary composite measure *any substance use disorder diagnosis* was created from these five diagnoses. These measures were collapsed to allow for a comprehensive measure of mental health and substance use disorders. Additionally, behavioral health conditions asked alongside the cannabis screen were evaluated as binary variables: Depressive symptoms within the past 2 weeks (Patient Health Questionnaire-2 [PHQ-2]; ≥ 2 points on either item[29]), unhealthy alcohol use within the past year (Alcohol Use Disorders Identification Test-Consumption [AUDIT-C]; ≥ 3 points women; ≥ 4 men),[30,31] illicit and/or non-medical use of prescription drugs used within the past year,[16] and any tobacco use in the past year.

Prescription medications: Medications commonly used to treat behavioral health conditions and CNCP were evaluated based on EHR-documentation of past-year prescription medication fills. These included binary measures of antidepressants; antiemetics; opioids & codeine; nerve medication; muscle relaxants; other sedatives, benzodiazepines, and/or sleep aids. The binary

measure *Any prescription medications* was coded as *no past-year prescription medications* or *past-year prescription medications* based upon these medications.

Demographics and other measures: Variables of age (categorical), race (categorical), gender (binary), and primary care clinic (categorical) are obtained from EHR documentation. Age categories include ages 18-29; 30-44; 45-64; ≥65 and are obtained from the EHR-documented date of birth. Race and ethnicity categories include Asian; Black; Hawaiian or Other Pacific Islander; Native American; Other/Unknown; White; Multiracial; and Hispanic ethnicity. Patients are asked to self-identify their race and ethnicity have the option to endorse as many race and ethnicity categories that apply. Patients who endorse more than one race category are considered to be part of the Multiracial category. Gender categories include men and women. Primary care clinics are defined by clinic location.

Analyses

We describe the prevalence of patients with CNCP as well as those reporting EHR-documented medical cannabis use in the sample and describe the sample of patients with and without CNCP, with significant differences assessed with chi-squared tests of independence. We estimated the adjusted prevalence of EHR-documented medical cannabis use across patients with and without CNCP using fixed effects logistic regression models, adjusting for demographics and clinic-level variation, selected based on known associations with CNCP.[16,32] Results are presented as the average adjusted prevalence of past-year medical and non-medical cannabis use, with 95% confidence intervals (C.I.), among patients with and without CNCP.[33] We repeat these analyses for outcomes including mental health and substance use disorders, behavioral health conditions and prescription medications, and again among the patient sample who reported using cannabis in the past-year. Secondarily, we limit our analysis to patients who

report cannabis use to evaluate differences in prevalence of these behavioral health conditions between patients with and without CNCP. Stata 16 was used to complete the analysis.[34]

Results

Among 171,727 primary care patients, the prevalence of past-year CNCP was 27.8% (95% C.I. 26.6%, 27.0%). Conditions that predominantly contributed to the CNCP measure were limb and joint pain (55.9%), back pain (35.9%) and other painful conditions (20.1%). Patients with CNCP were predominantly women (64.5%, p-value<0.000), aged 45-64 (39.9%, p-value<0.000) and white (77.3%, p-value<0.000) and this was similar compared to the sample of patients without CNCP (Table 1).

Among all patients, the prevalence of past-year non-medical cannabis use was 20.4% (95% C.I. 20.2%, 20.6%) and medical cannabis use was 1.8% (95% C.I. 1.8%, 1.9%). The adjusted prevalence of past-year cannabis use differed between patients with and without CNCP, such that patients with CNCP had a higher documented prevalence of medical cannabis use, 3.7% (95% C.I. (3.5%, 4.0%), compared to 1.2% (95% C.I. 1.2%, 1.3%) among patients without CNCP (Table 2).

Overall, patients with CNCP had a higher prevalence of behavioral health diagnoses and conditions compared to those without CNCP. For example, the prevalence of any past-year mental health disorder diagnosis was 37.9% (95% C.I. 37.4%, 38.3%) for patients with CNCP compared to 23.0% (95% C.I. 22.8%, 23.3%) for those without CNCP. The prevalence of any past-year substance use disorder diagnosis was 6.1% (95% C.I. 5.9%, 6.3%) for patients with CNCP compared to 2.9% (2.8%, 3.0%) for those without CNCP (Table 2). The prevalence of unhealthy alcohol use was the exception to this trend, which was lower among those with CNCP (23.4%, 95% C.I. 22.9%, 23.9%) compared to those without CNCP (29.9%, 95% C.I. 29.6%,

30.2%). Patients with CNCP also experienced a higher prevalence of prescription medication use than those without CNCP. For example, opioid and codeine prescription prevalence was 39.1% (95% C.I. 28.7%, 39.6%) among those with CNCP compared to 10.4% (10.3%, 10.6%) among those without CNCP; and antidepressant prevalence was 25.8% (95% C.I. 25.4%, 26.2%) among those with CNCP compared to 13.6% (95% C.I.13.4%, 13.8%) among those without CNCP.

In analyses limited to patients with past-year cannabis (n=38,177), 22.5% had CNCP (95% C.I. 21.1%, 23.0%). Across samples of patients with and without CNCP, patients with past-year cannabis use tended to have a higher prevalence of conditions and prescribed medications compared to the same samples among all primary care patients, yet differences between patients with and without CNCP persisted. Of note, the adjusted prevalence of medical cannabis use among patients with CNCP was 16.1% (95% C.I. 15.3%, 16.9%) compared to 5.7% (95% C.I. 5.4%, 6.0%) among patients without CNCP (Table 3).

Discussion

This population-based study of primary care patients in a large health system in Washington State sought to describe the prevalence of CNCP among primary care patients and describe the differences in prevalence of past-year cannabis use (medical and non-medical use) and behavioral health conditions between those with and without CNCP. We found that nearly one in three adult primary care patients experienced CNCP in the past year based on EHR documentation. Moreover, more than 1 in 5 primary care reported past-year cannabis use, with more than 1 in 20 patients having documentation of both chronic pain and past-year cannabis use. Patients with CNCP experience a higher prevalence of mental health disorders and other behavioral health conditions Lastly, among patients who report past-year cannabis use, patients with CNCP are nearly three times more likely to report medical cannabis use (16.1% vs. 5.7%).

The prevalence of CNCP among primary care patients found here is within the range of study findings of Gureje et al. (2001)[3] and Upshur et al. (2006).[35] Prevalence estimates in these studies range from 5% to 40.2% and define CNCP over different time periods. For example, Gureje et al. defined CNCP as a persistent pain condition with one or more current pain symptoms present on most days over a 6-month or more time period, and required at least one indicator of clinically significant pain, such as presentation to a health care provider or significant interference with activities. Their sample also included several cities within and outside of the United States.[3] Upshur et al. defined CNCP as a current chronic pain complaint that included back pain, joint pain, headache, generalized pain, neck pain, abdominal pain, fibromyalgia, arm pain, pelvic pain, neuropathic pain, and complex regional pain syndrome.[35] These findings varied due to the type of primary care clinics included in their analyses, such as small group-private practices, large public clinics, federally qualified health centers, and hospital-oriented community centers, which differed from our sample of patients in a large health system in one state.[3,35] Our findings support empirical evidence that CNCP is common among primary care patients and indicate the importance of primary care provider training in treating CNCP alongside other conditions, given many patients with CNCP will seek care from their primary care provider.[4]

We found the overall prevalence of cannabis use in our sample (22.5%) is higher than the national average of 15.9%, while the prevalence of medical cannabis use is lower than the national prevalence of 10.5% reported among adults aged 18 and older.[36] Differences are likely because non-medical cannabis use estimates are measured among Americans aged 12 and older and medical cannabis estimates derive from BRFSS data, while our sample is comprised of primary care patients aged 18 and older in one health system in Washington State. We found an

adjusted prevalence of medical and non-medical cannabis use among those with CNCP that may reflect what is known in the literature in terms of trends of use, as chronic pain is the most common reason patients cite using cannabis for.[11] This is an important consideration for primary care providers, as many of their patients with CNCP may also be using cannabis, perhaps as a way to self-medicate. Providers may consider screening for and discussing cannabis use in more detail with their CNCP patients, especially as cannabis legalization continues across the United States.

Patients with CNCP had a higher prevalence of mental health disorders, notably, major depressive disorder (28.0%), which was within the range of 5.9% to 46% in a review of patients in primary care settings.[37] The prevalence of substance use disorders among patients with CNCP in our sample (6.1%) was concurrent with the range in literature, as between 3% and 48% of patients with CNCP have been found to also have a substance use disorder and cannabis use is associated with a higher prevalence of substance use disorders.[17,18,38,32] The adjusted prevalence of prescription medications is congruent with previous findings indicating a higher prevalence of prescription use among those with CNCP.[4] These results suggest that patients with CNCP frequently experience comorbid behavioral health concerns and may benefit from chronic care management that includes behavioral health care.

The finding of a higher prevalence of self-reported past-year unhealthy alcohol use among patients without CNCP may suggest that patients in this sample reflect similar findings of Davis et al. (2018), who found patients reporting lower pain severity tend to report higher odds of high-risk alcohol use.[20] Further, there was a higher prevalence of unhealthy alcohol use (50.7%) among patients who endorsed past-year cannabis use and did not have CNCP. Our findings may support what Davis et al. suggested—that these “high-risk drinkers” who use

medical cannabis for pain relief may have less pain initially, or as Alford et al. (2016)[18] suggested—that patients may use alcohol as a way to relieve their pain. Overall, it has been shown that patients with CNCP have a higher prevalence of other health concerns and our findings do support this literature.[4,39,40] It is important to ensure that behavioral health concerns are addressed among primary care patients with CNCP, and using measurement-based care such as routine screenings may provide a way to do this. For example, routinely screening for unhealthy alcohol use and other behavioral health outcomes may provide a more in-depth picture of what a patient is dealing with both physically and emotionally while addressing their CNCP. Measurement-based care can improve the quality of care for patients in primary care settings[40] and our findings provide important insight for primary care providers to utilize this approach.

In the sample of patients who report cannabis use in the past year, there is a higher adjusted prevalence of medical cannabis use among those with CNCP compared to those without CNCP. These findings are important for primary care providers to be aware of, as they suggest patients who report past-year cannabis use may be using cannabis as a way to alleviate their CNCP.

We found the adjusted prevalence of past-year cannabis use among those with CNCP compared to those without CNCP is an important consideration for primary care providers. We do show that the prevalence of documented medical cannabis use is three-fold higher among patients with CNCP compared to those without CNCP. There are similar relationships and different prevalence findings when comparing mental health and substance use disorders across patients with and without CNCP, yet the threefold difference in the prevalence of medical cannabis use has important implications for what primary care providers need to be discussing with their patients. Patients in this sample who endorse cannabis use describe their reasons for

use. This is an opportunity for providers to explore patients' use of cannabis with the potential benefits and the potential risks they are experiencing. There are often first-line proven treatment options that providers can recommend over cannabis use and it is beneficial to explore those options with patients.

Limitations

Limitations of this study include that it is a cross-sectional design within a single health care system. The sample is predominantly white and lives in Washington State where cannabis is legal, which may not generalize to other states. Measures of pain in the study rely on EHR-documented diagnosis codes of pain, which differs most prior studies that rely on patient self-report assessments of pain. As such, this study does not have a measure of pain severity. The study relied on a novel measure of EHR-documented cannabis use. While the screen item about cannabis use was adapted from validated alcohol and substance use measures, it has not been validated against a gold-standard measure for cannabis use. Finally, medical documentation of cannabis use is based on provider report, EHR documentation and a NLP algorithm to gather cannabis use data; therefore, we are uncertain how patients talk about their cannabis use, how providers document it and whether the NLP algorithm gathered all data without categorizing cannabis use inaccurately.

Conclusion

This population-based study of primary care patients in Washington State is one of the first studies to measure the population prevalence of CNCP, cannabis use and behavioral health conditions among primary care patients. Over 20% of primary care patients endorse past year cannabis use and 28% have CNCP. More importantly, patients with CNCP who report past year cannabis use have a high prevalence of documented medical cannabis use compared to patients

without CNCP. The prevalence of mental health disorder and substance use disorder diagnoses were higher among patients with CNCP. There is limited existing empirical evidence of the overlap between cannabis use and CNCP in primary care settings and these results provide more context for primary care providers. These results suggest that patients with CNCP frequently experience comorbid behavioral health concerns and may benefit from chronic care management that includes behavioral health care.

Funding Resources:
Study conducted with support from the Kaiser Permanente Washington Health Research Institute and the National Drug Abuse Treatment Clinical Trials Network (NIDA CTN).
Kelsey Hamilton is supported as an AHRQ/NRSA T32 Trainee.

Table 1: Sample demographics and characteristics

	Patients with CNCP (n=46,054)		Patients without CNCP (n=125,673)		
Gender	**n**	**(%)**	**n**	**(%)**	**p-value**
Women	29,701	(64.5)	71,418	(56.8)	<0.000
Men	16,352	(35.5)	54,254	(43.2)	
Age					
18-29	3,050	(6.6)	23,469	(18.7)	<0.000
30-44	7,381	(16.0)	30,770	(24.5)	
45-64	18,366	(39.9)	46,671	(37.1)	
≥65	17,257	(37.5)	24,763	(19.7)	
Race					
Asian	3,099	(6.7)	13,964	(11.1)	<0.000
Black	2,298	(5.0)	6,005	(4.8)	
Hawaiian or Other Pacific Islander	371	(0.8)	1,254	(1.0)	
Native American	418	(0.9)	894	(0.7)	
Other/Unknown	3,014	(6.5)	11,379	(9.1)	
White	35,595	(77.3)	88,439	(70.4)	
Multiracial	1,259	(2.7)	3,738	(3.0)	
Hispanic Ethnicity	2,514	(5.7)	7,664	(6.5)	<0.000
Past-Year Cannabis Use[§]					
None	37,998	(82.5)	96,362	(76.7)	<0.000
Less than monthly	3,639	(7.9)	13,359	(10.6)	
Monthly	1,120	(2.4)	4,475	(3.6)	
Weekly	1,485	(3.2)	5,267	(4.2)	
Daily/almost daily	1,812	(3.9)	6,210	(4.9)	
Chronic Non-Cancer Pain[†]					
Abdominal & bowel pain	5,977	(13.0)	n/a		
Back pain	16,517	(35.9)	n/a		
Fibromyalgia	2,291	(5.0)	n/a		
Fractures, sprains	5,906	(12.8)	n/a		
Headache	3,867	(8.4)	n/a		
Limb/extremity, joint pain	25,751	(55.9)	n/a		
Musculoskeletal chest pain	3,030	(6.6)	n/a		
Neck pain	8,693	(18.9)	n/a		
Neuropathy	2,139	(4.6)	n/a		
Orofacial, ear, TM pain	447	(1.0)	n/a		
Other painful conditions	9,267	(20.1)	n/a		

Systemic disorders	1,753	(3.8)	n/a	
Urogenital, pelvic pain	1,260	(2.7)	n/a	

§Based on the single screen past-year cannabis use item
†EHR-documented ICD-9/10 codes; assessed in the year prior to visit to primary care clinic & cannabis screen
‡Behavioral health screens asked alongside the cannabis scree

Table 2: Multivariate and bivariate logistic regression: Adjusted prevalence of cannabis use, behavioral health conditions, and prescription medications across patients with and without chronic non-cancer pain among patients who report past-year cannabis use

	Patients with CNCP (n=46,054)		Patients without CNCP (n=125,673)	
	%	(95% C.I.)	%	(95% C.I.)
EHR-documented cannabis use*				
No cannabis use	77.5	(77.1, 77.9)	78.3	(78.0, 78.5)
Non-medical cannabis use	18.9	(18.5, 19.2)	20.5	(20.3, 20.7)
Medical cannabis use	3.7	(3.5, 4.0)	1.2	(1.2, 1.3)
Any mental health disorder diagnosis†‰	37.9	(37.4, 38.3)	23.0	(22.8, 23.3)
Major Depressive Disorder	28.0	(27.6, 28.4)	16.2	(16.0, 16.4)
Anxiety Disorder	21.9	(21.5, 22.3)	12.2	(12.1, 12.4)
Bipolar Disorder	1.9	(1.8, 2.1)	1.1	(1.0, 1.1)
Schizophrenia	0.2	(0.2, 0.3)	0.1	(0.09, 0.1)
Other Psychosis	0.2	(0.1, 0.2)	0.09	(0.08, 0.1)
Any substance use disorder diagnosis†§	6.1	(5.9, 6.3)	2.9	(2.8, 3.0)
Alcohol Use Disorder	3.2	(3.1, 3.4)	2.1	(2.0, 2.2)
Cannabis Use Disorder	1.0	(0.9, 1.2)	0.4	(0.4, 0.5)
Opioid Use Disorder	2.1	(1.9, 2.2)	0.4	(0.3, 0.4)
Stimulant Use Disorder	0.5	(0.4, 0.5)	0.2	(0.1, 0.2)
Prior/Other Drug Use Disorder	0.7	(0.6, 0.8)	0.2	(0.2, 0.3)
Behavioral health conditions‡				
Depressive symptoms (past 2 weeks)	16.8	(16.4, 17.1)	12.4	(12.3, 12.6)
Illicit and/or non-medical use of prescription drugs (past year)	1.8	(1.6, 1.9)	1.8	(1.7, 1.9)
Unhealthy alcohol use (past year)	23.4	(22.9, 23.9)	29.9	(29.6, 30.2)
Tobacco use (past year)	11.9	(11.5, 12.2)	11.2	(11.0, 11.4)
Any prescription medications†	62.1	(61.7, 62.6)	28.8	(28.5, 29.0)
Antidepressants	25.8	(25.4, 26.2)	13.6	(13.4, 13.8)
Antiemetics	12.8	(12.4, 13.1)	3.2	(3.1, 3.3)
Opioids & Codeine	39.1	(38.7, 39.6)	10.4	(10.3, 10.6)
Nerve Medication	10.2	(9.9, 10.4)	2.0	(1.9, 2.0)
Muscle Relaxants	16.0	(15.7, 16.4)	3.3	(3.2, 3.4)
Other Sedatives, Benzodiazepines, Sleep Aids	13.5	(13.2, 13.8)	5.6	(5.4, 5.7)

Adjusted for age, race & ethnicity, and gender

*Based on the NLP-derived indicator of EHR-documented medical cannabis use
†EHR-documented ICD-9/10 codes; assessed in the year prior to visit to primary care clinic & cannabis screen
‰ Includes EHR-documented ICE 9/10 codes for Major Depressive Disorder, Anxiety Disorder, Bipolar Disorder, Schizophrenia, and Other Psychosis
§ Includes EHR-documented ICD 9/10 codes for Alcohol Use Disorder, Cannabis Use Disorder, Opioid Use Disorder, Stimulant Use Disorder, and other Drug Use Disorder
‡ Behavioral health screens asked alongside the cannabis screen

Table 3: Logistic regression: Adjusted prevalence of cannabis use, behavioral health conditions, and prescription medications across patients with and without chronic non-cancer pain among patients who report past-year cannabis use

	Patients with CNCP (n= 8,586)		Patients without CNCP (n=29,591)	
	%	(95% C.I.)	%	(95% C.I.)
EHR-documented cannabis use*				
Non-medical cannabis use	83.9	(83.1, 84.7)	94.3	(94.0, 94.6)
Medical cannabis use	16.1	(15.3, 16.9)	5.7	(5.4, 6.0)
Any mental health disorder diagnosis†‰	49.6	(48.5, 50.7)	32.0	(31.5, 32.6)
Major Depressive Disorder	37.1	(36.1, 38.2)	22.3	(21.8, 22.8)
Anxiety Disorder	31.5	(30.5, 32.6)	18.9	(18.4, 19.3)
Bipolar Disorder	3.6	(3.1, 4.0)	1.8	(1.6, 1.9)
Schizophrenia	0.4	(0.3, 0.6)	0.1	(0.1, 0.2)
Other Psychosis	0.4	(0.3, 0.6)	0.1	(0.08, 0.2)
Any substance use disorder diagnosis†§	11.8	(11.1, 12.5)	6.0	(5.7, 6.2)
Alcohol Use Disorder	5.4	(4.9, 5.9)	3.6	(3.4, 3.9)
Cannabis Use Disorder	4.3	(3.8, 4.8)	1.8	(1.7, 2.0)
Opioid Use Disorder	3.4	(3.0, 3.8)	0.8	(0.7, 0.9)
Stimulant Use Disorder	1.3	(1.0, 1.6)	0.4	(0.3, 0.5)
Prior/Other Drug Use Disorder	1.7	(1.3, 2.0)	0.5	(0.4, 0.6)
Behavioral health conditions‡				
Depressive symptoms (past 2 weeks)	22.0	(21.0, 22.9)	17.7	(17.3, 18.2)
Illicit and/or non-medical use of prescription drugs (past year)	6.4	(5.8, 7.1)	6.8	(6.5, 7.1)
Unhealthy alcohol use (past year)	39.8	(38.4, 41.2)	50.7	(49.9, 51.5)
Tobacco use (past year)†	22.1	(21.2, 23.1)	20.7	(20.2, 21.2)
Any prescription medications†	68.6	(67.6, 69.7)	33.2	(32.6, 33.8)
Antidepressants	31.2	(30.2, 32.2)	16.8	(16.4, 17.3)
Antiemetics	15.0	(14.2, 15.9)	3.6	(3.4, 3.9)
Opioids & Codeine	42.0	(40.9, 43.1)	11.0	(10.6, 11.4)
Nerve Medication	11.8	(11.1, 12.5)	2.1	(2.0, 2.3)
Muscle Relaxants	19.4	(18.5, 20.2)	4.0	(3.8, 4.3)
Other Sedatives, Benzodiazepines, Sleep Aids	16.4	(15.6, 17.1)	6.8	(6.5, 7.1)

Adjusted for age, race & ethnicity, and gender

*Based on the NLP-derived indicator of EHR-documented medical cannabis use

†EHR-documented ICD-9/10 codes; assessed in the year prior to visit to primary care clinic & cannabis screen
‰ Includes EHR-documented ICE 9/10 codes for Major Depressive Disorder, Anxiety Disorder, Bipolar Disorder, Schizophrenia, and Other Psychosis
§ Includes EHR-documented ICD 9/10 codes for Alcohol Use Disorder, Cannabis Use Disorder, Opioid Use Disorder, Stimulant Use Disorder, and other Drug Use Disorder
‡ Behavioral health screens asked alongside the cannabis screen

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