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A POPULATION STUDY OF PRESCRIBED OPIOID-BASED PAIN RELIEVER USE AMONG INDIVIDUALS WITH MOOD AND ANXIETY DISORDERS IN CANADA

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Abstract

Background—In the context of the ongoing North American overdose crisis, a clear understanding of opioid prescription and usage trends is important. Although individuals with mood and/or anxiety disorders are a sub-population at increased risk of developing substance use disorders, they have been identified as more likely to receive opioid prescriptions. The primary objective of this study was to investigate differences in prescribed opioid-based pain reliever use between Canadians with and without diagnosed mood and/or anxiety disorders.

Methods—We utilized data from the 2015-2016 Canadian Community Health Survey (CCHS), a population-based, cross-sectional survey. We examined self-reported diagnoses of mood and/or anxiety disorders and self-reported prescribed opioid-based pain reliever use. Logistic regression modeling was used to estimate the unadjusted and adjusted odds of prescribed opioid-based pain reliever use associated with mood and/or anxiety disorders.

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Authors' contribution statement

Lisa J.W. Liu: Formal analysis, Interpretation. Paxton Bach: Interpretation. James A.G. Crispo: Interpretation. John L.K. Kramer: Interpretation. Jacquelyn J. Cragg: Interpretation.

Contributors

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Declaration of Competing Interest

No conflict declared.

Results—Our study sample had 2,810 individuals. The prevalence of mood and/or anxiety disorders and prescribed opioid use was 11.7% and 14.6%, respectively. Individuals diagnosed with mood and/or anxiety disorders were more likely to use prescribed opioid-based pain relievers compared with individuals without these diagnoses (OR = 2.36, 95% CI = 1.64, 3.41), even after adjustment for age, sex, total household income, cultural/racial background, and chronic pain (AOR= 1.78, 95% CI= 1.23, 2.58).

Conclusions—Our findings suggest that mood and/or anxiety disorders were positively associated with prescribed opioid-based pain reliever use. Future research should investigate potential unmet healthcare needs among individuals with these conditions, as mood and/or anxiety disorders may be modifiable risk factors.

Keywords

mood disorders; anxiety disorders; opioids; pain

1. INTRODUCTION

North America is amidst a serious opioid crisis. In Canadian provinces like Ontario and British Columbia, the rate of opioid-related deaths has increased by almost 400% since the turn of the century (Fischer et al., 2019). In particular, more than 13,900 apparent opioid-related deaths occurred in Canada between January 2016 and June 2019 (Special Advisory Committee on the Epidemic of Opioid Overdoses, 2019). Currently, opioids account for greater premature mortality than many other leading causes, like motor-vehicle accidents (Fischer et al., 2019). In addition, the financial burden of the opioid crisis has been enormous. In 2014, the total economic costs (including healthcare, lost productivity, criminal justice, and other direct costs) of opioid use in Canada was estimated to be \$3.49 billion (Canadian Substance Use Costs and Harms Scientific Working Group, 2018). Similarly, in the United States, opioid-related overdose deaths increased 4-fold over the past 20 years (National Institute on Drug Access, 2020) and results in an estimated economic burden of \$78.5 billion annually (Florence et al., 2016).

While a growing number of opioid-related overdoses can be attributed to illegally-obtained opioids, prescribed opioids still continue to contribute to the opioid epidemic (Gomes et al., 2018b). In 2018, almost one in eight Canadians were prescribed an opioid (Canadian Institute for Health Information, 2019). Furthermore, a study found that more than half of the opioid-related hospitalizations occurred among Canadians who had received a prescription opioid in the six months preceding overdose (Gomes et al., 2018a). In the United States, drug overdose deaths involving prescription opioids rose from 3,442 in 1999 to 17,029 in 2017 (National Institute on Drug Access, 2020). Besides the over-prescription of opioids to individuals with acute or chronic non-cancer pain, a recent study in the United States also found that 51% of all opioids were prescribed to individuals with anxiety and mood disorders (Davis et al., 2017). Surprisingly, individuals with mood and/or anxiety disorders within this study were more likely to be prescribed opioids despite the evidence showing that those with such conditions are more likely to become dependent on opioids and experience overdose (Bartoli et al., 2014; Feingold et al., 2017).

Canadian clinical guidelines have encouraged reducing opioid therapy for those with chronic, non-cancer pain. However, the guidelines have not focused on those with mental health disorders (Busse et al., 2017). Therefore, it is important to examine prescribed opioid use among individuals with mental health disorders to further inform clinical guidelines for the current public health crisis. To determine the extent of this issue in Canada, the primary objective of this study was to investigate whether individuals with a mood and/or anxiety disorder were more likely to be prescribed opioid-based pain relievers than individuals without a mood and/or anxiety disorder. Our secondary objectives were to investigate the relationship between prescribed opioid-based pain reliever use for individuals with only anxiety disorders, mood disorders, as well as concurrent mood and anxiety disorders (compared with individuals without mood or anxiety disorders) and to examine associations between other respondent characteristics of interest and self-reported prescribed opioid use.

2. METHODS

2.1. Dataset

The Canadian Community Health Survey (CCHS) is a nationally representative, cross-sectional survey that is administered by Statistics Canada every two years (Statistics Canada, 2016). The survey collects information related to the health status, health care utilization, and health determinants for Canadians in all ten provinces and three territories. Participants were selected for in-person or phone interviews using a multi-stage cluster sample allocation strategy. The 2015-2016 survey includes individuals 12 years of age and older that do not live on reserves or other Aboriginal settlements in the provinces and is representative of over 97% of the Canadian population. Canadians that were not represented in the survey include full-time members of the Canadian Forces, youth aged 12 to 17 years living in foster homes, the institutionalized population, and persons living in the remote Quebec health regions of Region du Nunavik and Region des Terres-Cries-de-la-Baie-James. Overall, 185,176 of the selected units in the 2015-2016 CCHS were eligible for the survey, with a response obtained for 110,095 individuals (59.5% response rate). The total number of respondents documented in the final survey was 109,659 (Statistics Canada, 2016).

2.2. Study Sample

The CCHS includes core content asked of all respondents, as well as optional content that provinces and territories can choose to include for additional health information on their residents. Only respondents who were asked the optional content questions about medication use were included in our study sample. This included individuals from Prince Edward Island, Yukon, and the Northwest Territories (Fig. 1). Respondents were surveyed regarding their use of opioid-based pain relievers during the past 12 months using the following three distinct questions:

1. During the past 12 months, have you used any codeine products like Tylenol #3, Tylenol #1, 292s or 222s?
2. During the past 12 months, have you used any oxycodone product such as Percocet or Percodan?

3. During the past 12 months, have you used any other opioid products such as hydromorphone, Dilaudid, Hydromorph Contin, morphine, MS Contin, or Demerol?

Respondents were then categorized as having (1) used opioid-based pain relievers (defined as “Yes” to any question), (2) not used opioid-based pain relievers (“No” to all questions), or (3) unclear use of opioid-based pain relievers (defined as combinations of “Don’t Know”, “Refusal”, and “No” to all questions). Respondents with unclear use of opioid-based pain relievers were then excluded from our study cohort. Next, of respondents that used pain relievers in the past 12 months, those reporting exclusive use of non-prescribed opioid-pain relievers (“No, none were prescribed”) or could not recall if opioid-based pain relievers were prescribed (“Don’t Know”) in response to a subsequent question regarding use of prescribed opioid-based medications (“Thinking about all the pain relievers you have used during the past 12 months, were they prescribed for you?”) were excluded from our cohort. Application of the aforementioned exclusions resulted in all respondents within our analytical cohort having used at least one prescribed opioid-based pain reliever (“Yes, they all were prescribed” and “Some were prescribed and others were not”) or no opioid-based pain reliever in the preceding year.

We then excluded individuals for which we were unable to accurately assess the presence or absence of mood and anxiety disorders, as well as individuals with unclear responses (defined as “Don’t Know”, “Refusal”, or “Not Stated”) to questions about some or all other respondent characteristics of interest.

2.3. Chronic Mood and Anxiety Disorders (Exposure Variables)

Interviewers prefaced all questions regarding “long-term conditions” by stating that the chronic condition had to be diagnosed by a health professional and was expected to last or have already lasted for six or more months.

Respondents with a mood and/or anxiety disorder were categorized as having: (1) a mood and/or anxiety disorder, (2) a mood disorder (only), (3) an anxiety disorder (only), and (4) both a mood and anxiety disorder (concurrent). To ascertain these conditions, respondents were asked the following questions:

1. Do you have a mood disorder such as depression, bipolar disorder, mania, or dysthymia?
2. Do you have an anxiety disorder such as a phobia, obsessive-compulsive disorder or a panic disorder?

2.4. Use of Prescribed Opioid-based Pain Relievers (Outcome Variable)

Survey respondents who reported using at least one prescribed opioid-based pain reliever (herein after referred to as “prescribed opioid”) during the prior year were classified as prescribed opioid users, while respondents who reported no use of any opioid were classified as non-users of prescribed opioids.

2.5. Other Respondent Characteristics

We examined the following respondent characteristics within our study sample: age (grouped as 12 to 19 years and then in ten-year increments), sex (male or female), total household income in Canadian dollars (< \$20,000, \$20,000 to \$39,000, \$40,000 to \$59,999, \$60,000 to \$79,000, or \$80,000+), cultural/racial background (white or non-white), and chronic pain.

Common conditions associated with chronic pain include cancer, degenerative spine disease, osteoarthritis, fibromyalgia, human immunodeficiency virus, migraine, diabetic neuropathy, and postherpetic neuralgia (Fine, 2011). We assessed chronic pain by examining responses to the following chronic condition survey questions:

1. Do you have scoliosis?
2. Do you have fibromyalgia?
3. Do you have arthritis, for example osteoarthritis, rheumatoid arthritis, gout or any other type, excluding fibromyalgia?
4. Do you have back problems, excluding scoliosis, fibromyalgia and arthritis?
5. Do you have cancer?
6. Do you have migraine headaches?

These long-term conditions were chosen because they could serve as a proxy for chronic pain. Respondents who answered “Yes” to having at least one of these conditions were classified as having chronic pain, while respondents who answered “No” to all these questions were classified as not having chronic pain.

2.6. Statistical Analyses

Frequency counts and cross tabulations were conducted to describe study sample characteristics. We used bivariable logistic regression analyses to estimate the odds of prescribed opioid use for our main exposure variable (diagnosis of a mood and/or anxiety disorder) and the other respondent characteristics of interest (such as age, sex, and chronic pain). We then used multivariable logistic regression to estimate the odds of prescribed opioid use, while adjusting for age, sex, total household income, race/ethnicity, and chronic pain.

For our secondary analyses, we constructed similar models to those developed for our primary analyses; however, we categorized mental health disorders as follows: (1) mood disorder only, (2) anxiety disorder only, and (3) mood and anxiety disorder (concurrent).

All analyses were performed using SAS University Edition software (SAS Institute Inc., Cary, NC) and 95% confidence intervals (95% CI) were used to report variability around estimates of association. Statistical significance was defined as a p-value < 0.05. The survey sampling design was accounted for in all analyses using sampling weights provided by

Statistics Canada to account for uneven probabilities of selection and to provide more precise estimates of variance around point estimates. The CCHS is conducted under the authority of the Statistics Act that requires that the data be kept private and confidential (Government of Canada, 2017a). Study-specific ethics approval was not required due to the publicly available data clause governing the use of public release data sets outlined in the Tri-Council Policy Statement for Ethical Conduct for Research Involving Humans adopted by the University of British Columbia's Policy #LR9: Research Involving Human Participants (The University of British Columbia Board of Governors, 2019).

2.7. Sensitivity Analyses

Inclusion of individuals with acute joint pain or cancer in our analyses may bias reported estimates of association. Therefore, to investigate the robustness of associations reported in our primary analyses, two sensitivity analyses were conducted using the multivariable model constructed in our primary analysis: (1) an acute joint pain variable was added to the model and (2) individuals with cancer were omitted from the model.

Acute joint pain was assessed using responses to the following question: "During the past 30 days, have you had any symptoms of pain, aching, or stiffness in or around a joint?". Responses to this question were complete ("Yes" or "No") for all individuals in our study cohort. Cancer diagnoses were assessed using responses to the following question: "Do you have cancer?". Individuals with a "Yes" or "Don't Know" response were removed.

3. RESULTS

3.1. Study Sample

Overall, of the 3,802 residents from Prince Edward Island, Yukon, and the Northwest Territories that were surveyed, 2,810 were included in our primary analyses (Fig. 1). Our study sample had a nearly even proportion of males and females (Table 1), and was approximately equally divided across age groups, with a lower number of respondents in the youngest and oldest age categories (8.7% aged 12 to 19 years and 10.8% aged 70+ years). The majority of the sample self-identified as being white (93.7%) and most respondents reported no chronic pain-related conditions (60.4%). Respondents with a total annual household income of \$80,000 or more represented the largest proportion of our sample (46.8%).

The prevalence of a mood and/or anxiety disorder as well as prescribed opioid use in the study sample was 11.7% and 14.6%, respectively (Table 1). For respondents who used prescribed opioids, 87 (21.0%) reported a mood and/or anxiety disorder and 278 (61.4%) reported the presence of a chronic pain-related condition. For respondents without prescribed opioid use, 272 (10.1%) reported a mood and/or anxiety disorder and 922 (35.9%) reported a chronic pain-related condition. The largest proportion of individuals who used prescribed opioids were in the middle age category (42.8% aged 50 to 69 years). In addition, a greater proportion of individuals who used prescribed opioids had income levels of \$20,000 or less (11.4%) than observed among non-users of prescribed opioids (6.2%).

3.2. Logistic Regression

3.2.1. Primary Analyses—Unadjusted and adjusted estimates of association between our main exposure (diagnosis of a mood and/or anxiety disorder) and select respondent characteristics with use of prescribed opioids are shown in Table 2. In the unadjusted logistic regression model, individuals who had a mood and/or anxiety disorder versus those individuals without these specific conditions had 2.36 (95% CI = 1.64, 3.41) times the odds of prescribed opioid use in the past year. After controlling for age, sex, household income, race/ethnicity, and chronic pain, the odds remained significantly elevated (adjusted odds ratio [AOR] = 1.78, 95% CI = 1.23, 2.58).

Other respondent characteristics significantly associated with the use of prescribed opioids after adjustment for suspected confounders included age, household income, and race/ethnicity (Table 2). Furthermore, the diagnosis of one or more chronic pain-related condition was associated with prescribed opioid use (AOR = 2.52, 95% CI = 1.87, 3.39).

3.2.2. Secondary Analyses—Unadjusted and adjusted estimates from our secondary analyses are reported in Table 3. After adjustment for potential confounders, individuals with concurrent mood and anxiety disorders were significantly more likely to use prescribed opioids compared with individuals without a mood and/or anxiety disorder (AOR = 2.39, 95% CI = 1.39, 4.12). Conversely, there were no observed differences in the use of prescribed opioids among individuals reporting the diagnosis of only a mood (AOR = 1.68, 95% CI = 0.96, 2.95) or an anxiety (AOR = 1.60, 95% CI = 0.82, 3.10) disorder compared with individuals who did not report having these conditions. Findings from modelled associations for age, race, and chronic pain with use of prescribed opioids in our secondary analyses were similar to those observed in our primary analyses.

4. DISCUSSION

The present study utilized data from a nationally representative Canadian survey to investigate the relationship between mood and anxiety disorders and prescribed opioid use. Almost 15% of respondents reported prescribed opioid use and over 10% of respondents reported the presence of a mood or anxiety disorder in our study, which is similar to numbers reported by other published data in Canada. The Canadian Tobacco Alcohol and Drugs Survey (CTADS) reported approximately 12% of Canadian residents aged 15 years and older had used prescription opioids in 2017 (Government of Canada, 2017b) and in 2015, almost 10% of Canadians had used health services for mood and anxiety disorders (Government of Canada, 2019). Mood and/or anxiety-related disorders were independently associated with a nearly two-fold increase in the odds of prescribed opioid use compared with individuals without these conditions. Furthermore, individuals with concurrent mood and anxiety disorders had a further elevated odds of prescribed opioid use compared with individuals without a mood or anxiety disorder. Notably, these elevated odds persisted after adjusting for chronic conditions which are commonly associated with pain. While the results of the single disorders indicated that individuals with only a mood disorder and only an anxiety disorder (Table 3) were not significantly more likely to use prescribed opioids, this is likely a function of the reduced sample size.

As the first study to explore this specific relationship in Canada using population-wide data, the current results align with existing evidence from other jurisdictions, namely the USA, where a comparable opioid crisis is occurring. A population-based study using data from the Medical Expenditure Panel Survey found that adults with mental health disorders had more than twice the odds of being prescribed opioids compared with adults that do not have mental health disorders (Davis et al., 2017), though this study did not distinguish between mood and anxiety disorders and did not examine concurrent mood and anxiety disorders. Other smaller studies have also reached similar conclusions when looking at both the general population and individuals with chronic pain only (Braden et al., 2009; Halbert et al., 2016).

While there are likely many potential explanations for the relationship observed in this study, a study from Ontario (Desveaux et al., 2019) found that physicians often feared unintended consequences if opioids were not prescribed. These fears included a weakened therapeutic relationship, destabilizing otherwise stable individuals by tapering opioid prescriptions, as well as an increase in illicit drugs and stimulants. Since individuals with depression and anxiety often have greater pain symptoms and report more pain complaints, these mental health disorders may act as a moderator for the relationship between chronic physical conditions and pain (Bair et al., 2003; de Heer et al., 2014). Furthermore, one study that examined chronic musculoskeletal pain in primary care patients found that individuals with both depression and anxiety experienced more severe pain levels than individuals with pain only, pain and anxiety, as well as pain and depression (Bair et al., 2008). Therefore, individuals with a mood and/or anxiety disorder may show greater pain levels, further increasing the likelihood of being prescribed opioids. In addition, these individuals may ask their physicians for a higher dose or present themselves to their physicians more often and accumulate prescriptions through the increased frequency of interaction.

Other common themes, including a lack of access to non-pharmacological options and no system resources to support pain management, may also lead to opioid prescription “out of necessity” (Desveaux et al., 2019). Despite guidelines encouraging multi-disciplinary approaches to managing pain, community resources may be either not in place or financially inaccessible, especially for individuals in rural settings.

Not only are more pain treatment options necessary, but mental health needs must also be addressed due to their effect on pain symptoms. In 2018, over 40% of Canadians who needed help with their mental health reported that their needs were not fully met (Statistics Canada, 2019). For individuals who specifically use opioids, one USA study found that less than a third of these individuals who also met the criteria for a mental health disorder were on any medication for their mental health disorder (Sullivan et al., 2005). Furthermore, individuals with comorbid chronic pain may benefit additionally from improved mental health. For instance, one study showed improvements in arthritis pain intensity with improvements in depression (Lin et al., 2003).

Since individuals with chronic, pain-related conditions are at a much higher risk of experiencing symptoms of depression and anxiety (Canadian Mental Health Association Ontario, 2008), it is possible that these individuals may be developing mental health

disorders after being prescribed opioids for their pain-related condition. However, individuals with mental health disorders were still more likely to use prescribed opioids even after adjustment for pain conditions, suggesting this is only a small factor that explains the increased prescription rates for this sub-population.

4.1. Limitations

Several limitations exist within our study. There may be unmeasured and residual confounding, including but not limited to differences in the health-seeking behaviours of individuals with and without mental health disorders that contributed to observed differences in prescribed opioid use. The 2015-2016 cycle of the CCHS includes a question that explicitly asks about an individual's pain level; however, it is an optional module asked only to three territories and does not overlap with individuals who were included in the medication module. Therefore, a derived variable was created based on the limited number of chronic pain-related conditions included in the survey. Since chronic pain was presumed to be a strong confounder in our study, the inclusion of other pain-related conditions or a rating from a validated pain scale may have further attenuated the results. However, the results of our sensitivity analysis indicated that even when we included an additional pain-related condition (acute joint pain) into our derived variable, our results remained identical.

A number of respondents were excluded because they provided unclear responses (i.e. "Don't Know") for questions regarding pain reliever use that creates an opportunity for participation bias. In addition, as this study relies on exclusively self-report data, respondents may not have been truthful about whether their pain relievers were prescribed. Since research has shown that individuals with mental health disorders are more likely to have lifetime non-prescribed use of pain relievers (Wu et al., 2008), there may be a differential misclassification that biased the results away from the null. Similarly, respondents self-reported whether or not they had a mood and/or anxiety disorder, as well as the other chronic-pain related conditions. While interviewers indicated these conditions had to be diagnosed by a health professional, it is possible that responses were misclassified. In the case of our study, misclassification of examined health conditions is presumed to be non-differential and to minimally affect the magnitude and direction of modelled associations.

Due to the cross-sectional design of the study, causality cannot be determined. In fact, evidence suggests that long-term opioid use may increase the risk of new-onset depression (Scherrer et al., 2016). Therefore, reverse-causality cannot be excluded given that the time frame for opioid use was the previous 12 months whereas mental health disorder was the previous six months.

Finally, given that medication questions were only asked to individuals in two territories and one province, which are also three of the four smallest province and territories in Canada with no large urban population centres, there may be limited external validity from our findings because of the underlying known and presumed variations in regional and healthcare characteristics across Canada. In addition, only a small proportion of individuals in this study had a total annual household income of \$20,000 or less (6.9%). Therefore, the generalization of our findings to a particular population, such as those with low SES, may be limited. However, while these factors limit the generalizability of our findings to all

Canadians, our study is of value to health professionals and regulators, as it is the first to examine relationships between select mental health conditions and use of prescribed opioids within a Canadian context. Our findings may serve to inspire future observational and interventional studies on this topic, as well as essential population health interventions within our studied populations. Ultimately, findings from our study and future investigations may serve to inform necessary health policies pertaining to the prescribing of opioids.

5. CONCLUSION

This study adds to the literature by demonstrating that individuals with mood and/or anxiety disorders are more likely to be prescribed opioid-based pain relievers than individuals without these disorders. In addition, individuals with concurrent mood and anxiety disorders have an even greater odds of prescribed opioid use compared with individuals without a mood or anxiety disorder. To further shed light on this relationship, there is a need for investigation of potential unmet healthcare needs among the individuals with mood or anxiety disorders who do go on to receive prescription opioids as mood and anxiety disorders may be a modifiable risk factor for limiting opioid prescribing. Given the strong evidence of an existing relationship between mental health disorders and prescribed opioid use, further research into this area has the potential to directly inform clinical practice and help reduce the burden of opioid prescribing for this susceptible population.

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HIGHLIGHTS

- Prescribed opioid-based pain reliever use was examined.
- Compared groups include individuals with and without mood and/or anxiety disorders.
- Mood and/or anxiety disorder was associated with prescribed opioid use.
- Mood and/or anxiety disorders may be modifiable risk factors for opioid use.

Figure 1.

Study sample from the 2015-2016 CCHS for the analysis of the relationship between the presence of a mood and/or anxiety disorder and prescribed opioid-based pain reliever use.

Table 1.

Sociodemographic characteristics of the study participants; overall and stratified by prescribed opioid use (n = 2,810).

Variable	Overall study sample ^a	Study sample by prescribed opioid use ^a	
	n (% ^b)	Yes, n (% ^b)	No, n (% ^b)
Study Sample	2,810 (100)	436 (14.6)	2374 (85.4)
Prescribed Opioid Use			
Yes	436 (14.6)		
No	2,374 (85.4)		
Mood and/or Anxiety Disorder			
Yes	359 (11.7)	87 (21.0)	272 (10.1)
No	2,451 (88.3)	349 (79.0)	2102 (89.9)
Sex			
Male	1,232 (48.2)	192 (45.9)	1040 (48.7)
Female	1,578 (51.8)	244 (54.1)	1334 (51.3)
Age			
12-19 Years	323 (8.7)	21 (4.0)	302 (9.4)
20-29 Years	288 (13.3)	40 (10.2)	248 (13.9)
30-39 Years	392 (16.3)	59 (18.0)	333 (16.0)
40-49 Years	364 (16.4)	50 (14.4)	314 (16.7)
50-59 Years	495 (17.4)	98 (22.0)	397 (16.7)
60-69 Years	545 (17.1)	108 (20.8)	437 (16.5)
70-79 Years	281 (8.0)	48 (8.5)	233 (7.9)
80+ Years	122 (2.8)	12 (2.1)	110 (2.9)
Income (Household)			
\$80,000 +	1,274 (46.8)	180 (40.6)	1094 (47.9)
\$60,000 To \$79,999	378 (14.6)	69 (14.0)	309 (14.7)
\$40,000 To \$59,999	444 (16.4)	66 (18.2)	378 (16.1)
\$20,000 To \$39,999	461 (15.3)	68 (15.8)	393 (15.2)
< \$20,000	253 (6.9)	53 (11.4)	200 (6.2)
Race/Ethnicity			
Non-White	187 (6.3)	14 (1.4)	173 (7.2)
White	2,623 (93.7)	422 (98.6)	2201 (92.8)
Chronic Pain Condition			
Yes	1,200 (39.6)	278 (61.4)	922 (35.9)
No	1,610 (60.4)	158 (38.6)	1452 (64.1)

^aUnweighted count.

^bWeighted percentage taking into account CCHS survey weights.

Table 2.

Logistic regression for the relationship between mood and/or anxiety disorders and prescribed opioid use.

Variable	Prescribed Opioid Use	
	OR (95 % CI)	AOR (95 % CI) ^c
Mood and/or Anxiety Disorders		
No	Reference	Reference
Yes	2.36 (1.64, 3.41) **	1.78 (1.23, 2.58) **
Sex		
Male	Reference	Reference
Female	1.12 (0.84, 1.49)	1.01 (0.75, 1.36)
Age		
12-19 Years	Reference	Reference
20-29 Years	1.72 (0.85, 3.51)	1.46 (0.73, 2.89)
30-39 Years	2.65 (1.33, 5.29) **	2.23 (1.15, 4.34) *
40-49 Years	2.02 (0.99, 4.13)	1.76 (0.87, 3.59)
50-59 Years	3.10 (1.62, 5.93) **	2.17 (1.15, 4.08) *
60-69 Years	2.96 (1.55, 5.63) **	1.91 (1.03, 3.55) *
70-79 Years	2.54 (1.25, 5.16) **	1.49 (0.74, 2.98)
80+ Years	1.65 (0.65, 4.16)	0.92 (0.36, 2.36)
Income (Household)		
\$80,000 +	Reference	Reference
\$60,000 To \$79,999	1.12 (0.75, 1.68)	1.01 (0.66, 1.53)
\$40,000 To \$59,999	1.34 (0.88, 2.04)	1.20 (0.78, 1.85)
\$20,000 To \$39,999	1.23 (0.82, 1.86)	1.15 (0.72, 1.82)
< \$20,000	2.17 (1.29, 3.65) **	1.86 (1.02, 3.40) *
Race/Ethnicity		
Non-White	Reference	Reference
White	5.44 (2.98, 9.95) **	4.70 (2.51, 8.78) **
Chronic Pain Condition		
No	Reference	Reference
Yes	2.84 (2.11, 3.82) **	2.52 (1.87, 3.39) **

Abbreviations: OR, Odds Ratio; AOR, Adjusted Odds Ratio.

* p-value 0.05.

** p-value 0.01.

^c Adjusted odds ratio for the relationship between mood and/or anxiety disorders and prescribed opioid use (n=2,810).

Table 3.

Logistic regression for the relationship between mental health disorders and prescribed opioid use.

Variable	Prescribed Opioid Use					
	Mood Disorders Only OR (95 % CI)	Mood Disorders Only AOR (95 % CI) ^a	Anxiety Disorders Only OR (95 % CI)	Anxiety Disorders Only AOR (95 % CI) ^b	Concurrent Mood and Anxiety Disorders OR (95 % CI)	Concurrent Mood and Anxiety Disorders AOR (95 % CI) ^c
Mental Health Disorder						
No	Reference	Reference	Reference	Reference	Reference	Reference
Yes	2.30 (1.28, 4.11) **	1.68 (0.96, 2.95)	1.90 (1.00, 3.63)	1.60 (0.82, 3.10)	3.32 (1.93, 5.70) **	2.39 (1.39, 4.12) **
Sex						
Male	Reference	Reference	Reference	Reference	Reference	Reference
Female	1.04 (0.77, 1.41)	0.98 (0.72, 1.34)	1.12 (0.82, 1.52)	1.07 (0.78, 1.47)	1.16 (0.86, 1.57)	1.05 (0.77, 1.44)
Age						
12-19 Years	Reference	Reference	Reference	Reference	Reference	Reference
20-29 Years	1.69 (0.83, 3.44)	1.48 (0.72, 3.06)	2.29 (1.10, 4.77) *	2.00 (0.96, 4.17)	1.71 (0.81, 3.62)	1.59 (0.79, 3.21)
30-39 Years	3.02 (1.51, 6.05) **	2.62 (1.30, 5.30) **	3.20 (1.56, 6.56) **	2.71 (1.29, 5.69) **	2.34 (1.11, 4.95) *	2.24 (1.09, 4.58) *
40-49 Years	2.15 (1.03, 4.46) *	1.97 (0.92, 4.21)	2.86 (1.38, 5.95) **	2.47 (1.16, 5.28) *	2.15 (1.01, 4.61) *	2.08 (0.99, 4.37)
50-59 Years	3.66 (1.92, 6.96) **	2.62 (1.35, 5.05) **	4.26 (2.19, 8.28) **	3.04 (1.54, 6.03) **	3.51 (1.76, 7.02) **	2.66 (1.38, 5.12) **
60-69 Years	3.30 (1.75, 6.21) **	2.15 (1.12, 4.11) *	4.04 (2.09, 7.81) **	2.69 (1.37, 5.29) **	3.06 (1.54, 6.06) **	2.12 (1.11, 4.05) *
70-79 Years	3.24 (1.62, 6.49) **	1.89 (0.92, 3.87)	3.63 (1.76, 7.48) **	2.19 (1.04, 4.61) *	2.81 (1.33, 5.96) **	1.79 (0.87, 3.67)
80+ Years	2.09 (0.84, 5.24)	1.19 (0.46, 3.11)	2.53 (1.00, 6.41)	1.47 (0.56, 3.87)	2.03 (0.78, 5.26)	1.27 (0.49, 3.29)
Income (Household)						
\$80,000 +	Reference	Reference	Reference	Reference	Reference	Reference
\$60,000 To \$79,999	1.17 (0.77, 1.78)	1.05 (0.68, 1.63)	1.06 (0.69, 1.62)	0.93 (0.59, 1.46)	1.09 (0.71, 1.67)	0.96 (0.61, 1.50)
\$40,000 To \$59,999	1.21 (0.76, 1.92)	1.09 (0.68, 1.75)	1.12 (0.71, 1.76)	1.00 (0.62, 1.60)	1.17 (0.75, 1.83)	1.05 (0.66, 1.69)
\$20,000 To \$39,999	1.16 (0.74, 1.81)	1.12 (0.68, 1.85)	1.08 (0.68, 1.72)	1.01 (0.60, 1.71)	1.22 (0.79, 1.88)	1.15 (0.70, 1.90)
< \$20,000	2.10 (1.18, 3.74) *	1.83 (0.93, 3.60)	1.82 (1.00, 3.32)	1.63 (0.81, 3.28)	1.98 (1.09, 3.59) *	1.74 (0.87, 3.46)
Race/Ethnicity						
Non-White	Reference	Reference	Reference	Reference	Reference	Reference
White	5.01 (2.69, 9.34) **	4.45 (2.33, 8.51) **	4.85 (2.64, 8.90) **	4.39 (2.33, 8.26) **	5.14 (2.76, 9.58) **	4.77 (2.49, 9.13) **
Chronic Pain Condition						
No	Reference	Reference	Reference	Reference	Reference	Reference
Yes	2.60 (1.90, 3.55) **	2.32 (1.69, 3.16) **	2.58 (1.88, 3.53) **	2.34 (1.71, 3.19) **	2.74 (2.00, 3.75) **	2.41 (1.77, 3.29) **

Abbreviations: OR, Odds Ratio; AOR, Adjusted Odds Ratio.

*
p-value 0.05.

**
p-value 0.01.

^a Adjusted odds ratio for the relationship between mood disorders and prescribed opioid use (n = 2,581).

^b Adjusted odds ratio for the relationship between anxiety disorders and prescribed opioid use (n = 2,582).

^c Adjusted odds ratio for the relationship between concurrent mood and anxiety disorders and prescribed opioid use (n = 2,548).

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Table 4.

Logistic regression for the relationship between mood and/or anxiety disorders and prescribed opioid use - Sensitivity analyses.

Variable	Prescribed Opioid Use			
	Including acute joint pain variable		Excluding individuals with cancer	
	OR (95 % CI) ^a	AOR (95 % CI) ^a	OR (95 % CI)	AOR (95 % CI) ^b
Mood and/or Anxiety Disorders				
No	Reference	Reference	Reference	Reference
Yes	2.36 (1.64, 3.41) **	1.72 (1.19, 2.48) **	2.45 (1.70, 3.55) **	1.86 (1.28, 2.70) **
Sex				
Male	Reference	Reference	Reference	Reference
Female	1.12 (0.84, 1.49)	1.01 (0.75, 1.37)	1.10 (0.82, 1.47)	1.00 (0.74, 1.35)
Age				
12-19 Years	Reference	Reference	Reference	Reference
20-29 Years	1.72 (0.85, 3.51)	1.46 (0.73, 2.93)	1.72 (0.85, 3.51)	1.46 (0.74, 2.91)
30-39 Years	2.65 (1.33, 5.29) **	2.20 (1.14, 4.25) *	2.56 (1.28, 5.12) **	2.16 (1.11, 4.22) *
40-49 Years	2.02 (0.99, 4.13)	1.63 (0.81, 3.30)	2.02 (0.99, 4.13)	1.78 (0.88, 3.63)
50-59 Years	3.10 (1.62, 5.93) **	1.98 (1.04, 3.75) *	2.97 (1.55, 5.69) **	2.10 (1.11, 3.96) *
60-69 Years	2.96 (1.55, 5.63) **	1.77 (0.94, 3.32)	2.91 (1.53, 5.56) **	1.93 (1.03, 3.59) *
70-79 Years	2.54 (1.25, 5.16) **	1.41 (0.70, 2.84)	2.45 (1.19, 5.04) *	1.49 (0.73, 3.02)
80+ Years	1.65 (0.65, 4.16)	0.88 (0.34, 2.26)	1.44 (0.53, 3.90)	0.83 (0.30, 2.28)
Income (Household)				
\$80,000 Or More	Reference	Reference	Reference	Reference
\$60,000 To \$79,999	1.12 (0.75, 1.68)	1.00 (0.65, 1.54)	1.07 (0.72, 1.59)	0.97 (0.63, 1.47)
\$40,000 To \$59,999	1.34 (0.88, 2.04)	1.21 (0.78, 1.86)	1.33 (0.87, 2.05)	1.19 (0.77, 1.84)
\$20,000 To \$39,999	1.23 (0.82, 1.86)	1.13 (0.72, 1.79)	1.18 (0.78, 1.80)	1.10 (0.69, 1.77)
< \$20,000	2.17 (1.29, 3.65) **	1.83 (1.03, 3.27)	2.13 (1.25, 3.65) **	1.83 (0.98, 3.39)
Race/Ethnicity				
Non-White	Reference	Reference	Reference	Reference
White	5.44 (2.98, 9.95) **	4.27 (2.28, 8.00) **	6.40 (3.35, 12.24) **	5.53 (2.83, 10.81) **
Chronic Pain Condition				
No	Reference	Reference	Reference	Reference
Yes	2.84 (2.11, 3.82) **	2.14 (1.57, 2.92) **	2.76 (2.04, 3.72) **	2.44 (1.81, 3.30) **
Acute Joint Pain				
No	Reference	Reference		
Yes	2.45 (1.81, 3.31) **	1.67 (1.20, 2.33) **		

Abbreviations: OR, Odds Ratio; AOR, Adjusted Odds Ratio.

* p-value 0.05.

** p-value 0.01.

^a AOR adjusted for sex, age, income, race/ethnicity, chronic pain condition, and acute joint pain (n = 2,810).

^b AOR adjusted for sex, age, income, race/ethnicity, and chronic pain condition, with the removal of cancer patients (n = 2,767).

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