

Use of cannabis and opioids for chronic pain by older adults: Distinguishing clinical and contextual influences

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Abstract

Introduction and Aims. Chronic pain is one of the most common health-related conditions experienced by Americans over the age of 65. In this study, we examine the intersection between pain, opioids and cannabis use among older adults in Colorado and Illinois and examine how medical needs and other variables associated with a person's background and attitudes influence choices concerning the use of opioids and cannabis to treat pain. **Design and Methods.** Data were collected via a survey about cannabis and opioids use, and questions related to individual need factors (e.g. pain, quality of life) and contextual factors (e.g. sex, finances, personal attitudes, interaction with physicians) were included in this study. We built a logistic regression model to evaluate factors associated with drug use and a multinomial regression model to understand factors that influence drug choices between cannabis and opioids. **Results.** A total of 436 individuals completed the survey; 62 used opioids only, 71 cannabis only and 72 used both. When comparing drug users to non-drug users, pain was significantly associated with using cannabis and/or opioids when controlling for other covariates. However, when we compared cannabis users to opioid users, pain was no longer a determining factor. Instead, other contextual factors such as sex, personal beliefs and physician attitudes influenced an individual's choice between cannabis or opioids. **Discussion and Conclusions.** This study showed that contextual factors appear to have more influence on an individual's decision to use cannabis as an alternative to opioids than individual need or characteristics. [Bobitt J, Kang H, JACrokerIII, Quintero Silva L, Kaskie B. Use of cannabis and opioids for chronic pain by older adults: Distinguishing clinical and contextual influences. *Drug Alcohol Rev* 2020]

Key words: chronic pain, aging, cannabis, opioid.

Introduction

Pain is one of the most common health-related conditions experienced by Americans over the age of 65. Depending on the setting (i.e. community or residential facility), anywhere between 45% and 85% of adults over the age of 65 years report experiencing pain daily [1,2]. Chronic pain tends to be highest among individuals diagnosed with cancer, or a musculoskeletal condition associated with the lower back, hip or knee, and depressive symptoms [2–4]. Additionally, 68% of older adults currently experience two or more chronic conditions, placing them at increased risk for pain [5]. Vulnerability to pain also is associated with being female, having a lower education and lower socioeconomic

status [4]. Pain in older adults reduces mobility and increases the risk for falls, depression, anxiety and lack of sleep [6,7]. Pain in older adults also contributes to increased health-care use, more frequent emergency room visits and higher rates of hospitalisations [3,4].

The most common approach to addressing pain in older adults is to prescribe medications approved by the US Food and Drug Administration. Acetaminophen and nonsteroidal anti-inflammatory drugs are often used to treat mild to moderate levels of pain whereas older adults with more moderate to severe levels of pain are more likely to be prescribed stronger pain relief in the form of opioids [3]. One study reported that between 1999 and 2010, opioid prescriptions for older adult outpatients increased from 4% to

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9% [8]. Another examined hospitalised patients aged 65 years and older and found that 51% received opioids before they were admitted and 8 out of 10 patients increased their use of opioids during their hospital stay [9]. In a nationwide study of over 250 000 individuals, the use of prescription opioids was highest among white, educated females between the ages of 70 and 75 [10]. Women over the age of 65 also have higher rates of long-term use of prescription opioids than all other groups aged over 18 years [11].

However, the use of anti-inflammatories and opioids can be problematic. Anti-inflammatory medications have been associated with cardiovascular, gastrointestinal and renal problems [3,12]. Opioid use by older adults can result in problematic side effects such as nausea, constipation, sedation and confusion [12,13]. Some studies have also shown increased risk of falls and the potential for opioid misuse or overdose [14]. Alternatively, an increasing number of older adults who experience these side effects or have become sensitive to the risks associated with opioids have pursued alternative or complementary approaches to pain management. These include acupuncture, exercise, massage, mindfulness therapy, tai chi, yoga, vitamins, nutritional supplements and cannabis [15,16].

Indeed, a growing number of research studies have highlighted the benefits older persons derive from taking cannabis for pain and other medical purposes. Most notably, the National Academies of Sciences, Engineering and Medicine [17] found substantial evidence supporting cannabis as an effective treatment for chronic pain in adults. Other clinical studies completed since then have also found cannabis to be effective for relieving pain related to chronic conditions. For example, Abuhasira *et al.* [18] surveyed 2736 patients over the age of 65 who were taking cannabis primarily for cancer and chronic pain and found participants reported reduced pain and increased quality of life. Poli *et al.* [19] studied 338 patients with different chronic pain conditions and also found cannabis to be a viable tool in the management of chronic pain. In an individual patient ($n = 178$) meta-analysis, Andreae *et al.* [20] found that cannabis was effective in treating neuropathic pain associated with conditions such as diabetes, fibromyalgia and spinal trauma. In our previous work, we also found older individuals reported using cannabis primarily for chronic pain and pain-related conditions [21,22].

As cannabis is increasingly being seen as a way to treat pain, more states are including it as a qualifying condition for medical cannabis program participation. In fact, 33 states have legalised the use of cannabis for medical purposes such as cancer, multiple sclerosis, rheumatoid arthritis and osteoarthritis and

fibromyalgia [23]. Furthermore, some states (e. g. Illinois, New Jersey, New York, Colorado) have integrated opioid replacement as a qualifying condition for their medical cannabis programs—allowing for participants to choose medical cannabis as a complement to, or substitute for, taking opioids. Researchers have established that older adults are participating in these state programs at higher rates than expected and the primary reason for doing so is to treat pain [21,24,25]. Other researchers have found that states with legal access to cannabis have experienced a co-occurring reduction in opioids prescription rates [26,27].

Although some recent studies have begun to explore co-occurring cannabis and opioid use in older adults, we have yet to see a study that has examined individual *needs* as well as the *contextual factors* that influence the choice to use cannabis, opioids or both. While we suspect that older adults who use either opioids or cannabis (or both) experience higher levels of pain than those who do not report using these drugs, we are less certain about why some older people choose to use only opioids while others may choose to use cannabis or use cannabis in addition to opioids to treat symptoms of pain. We suspect those who take opioids may experience higher levels of pain compared to those who use cannabis. We also think that attitudes and knowledge about opioids and cannabis may shape the choice.

In this study, we illuminate the intersection between pain, opioids and cannabis use among older adults by analysing survey data collected from 436 adults aged 60 and older in Colorado and Illinois by specifically examining how medical need and other variables associated with a persons' background and attitudes influence choices concerning the use of opioids and cannabis to treat pain. We specifically hypothesized that older adults who have higher levels of pain and report lower levels of quality of life (need) are more likely to use opioids and/or cannabis than non-drug users, controlling for other predisposing and enabling factors (age, sex, education, attitudes, providers). Also, when comparing opioids-only users to cannabis users, we suspect that pain may drive their choices but we also suspect that the choice between opioids-only and cannabis users may be influenced by contextual factors as well, reflecting predisposing (age, sex, marital status, education, attitudes) and enabling (knowledgeable providers) characteristics.

Methods

The data were collected from two cross-sectional surveys of persons aged over 60 years. One survey was

fielded in Colorado between June and November 2017 and the other in Illinois from February to August 2018.

In all, a purposive sample of 470 adults aged 60 years and older was recruited from senior centres, a university research volunteer list, health clinics and other locations where older adults typically obtain services and information as identified by local leaders of Colorado and Illinois Area Agencies on Aging. Participants also were recruited from state-registered cannabis clubs, retail shops and dispensaries in Colorado and licensed dispensaries in Illinois. These individuals were encouraged to participate regardless of their history of cannabis use so intentional efforts were made to survey both cannabis users and non-users. For this study, we excluded 34 participants who did not answer whether or not they used cannabis or opioids. In total, 436 survey responses were used for this study.

When comparing the data between Colorado and Illinois, we found no significant differences between the entire sample of users and non-users. We found some differences in terms of demographics toward cannabis use for users only (Table S1). We did not perform further analysis by drug user type because of the small sample size.

The studies were approved by the Institutional Review Boards at the University of Colorado, Colorado Springs and at the University of Illinois at Urbana Champaign. All participants provided consent prior to taking the surveys.

The surveys consisted of 80 questions on a variety of topics, including attitudes about cannabis, prevalence of pain, use of opioids and health/quality of life indicators. We also asked respondents to list their chronic conditions and symptoms for which they use cannabis. Pain-related conditions included arthritis, cancer, glaucoma, migraines and spinal conditions including chronic back pain. We did not ask about acute, pain-related conditions. Respondents could also check that they used cannabis for symptoms of pain (Figure 1). Construction of the survey instrument is detailed in another paper [22]. While both states allow legal access to medical cannabis, only Colorado has legalised access for recreational use. Therefore, our study focuses on those individuals who indicated cannabis use for medical purposes.

Data

For outcome measures, we asked participants if they used cannabis and/or opioids in last year. We measured *medical need* as the self-reported level of pain ('Please rate your pain on a scale of 1–10') and quality

of life such as 'In general, would you say your quality of life is: Excellent, Very Good, Good, Fair, Poor'. We measured *predisposing factors* by age, sex, marital status, education and financial situation. These factors have been previously linked to cannabis and opioids use [25,26]. Predisposing factors can also include an individual's beliefs and values [28], therefore we included the following beliefs and values relative to cannabis use such as 'Using medical cannabis leads to the use of harder drugs' or 'I believe the use of cannabis for medical purposes is acceptable' and 'Have you ever had a negative experience with cannabis' followed by a scale of 'Strongly Disagree' to 'Strongly Agree'. Enabling conditions include characteristics of the environment that facilitate action including resources required to attain specific behaviour [28]. Based on our previous research that indicated physicians were likely to be facilitators of cannabis use [22], we measured *enabling conditions* with the following questions: 'Has your doctor ever talked to you about cannabis?' and 'What is your doctor's attitudes toward cannabis?'

Analysis

To test our hypotheses, we performed two analyses. First, we used a logistic regression model to evaluate factors associated with cannabis and opioid use. When a respondent answered 'yes' to the question 'Did you use cannabis in last year' or 'Did you use opioids in last year', it was coded as 1 (cannabis/opioid user), otherwise it was coded as 0 (non-drug user). We conceptualised that need factors are the main determinants of opioid and/or cannabis use, whose effects are modified by predisposing factors. Need factors include self-report of pain and quality of life and predisposing factors include age, sex, education, marital status, financial status and attitudes toward cannabis. The logistic model took the following form:

Drug Use = Need Factor + Predisposing Characteristics.

Second, we built a multinomial regression model to understand the factors that influence drug choices between cannabis and opioids. For the analysis, three groups were defined—opioids-only users, cannabis-only users, and both cannabis and opioids users, and the opioids-only user group was used as a reference group. The model includes need factors, predisposing factors and enabling factors. Our conceptual model was that medical need is the main determinant of choosing opioids over cannabis and predisposing factors and enabling factors modify the effect. Need factors and predisposing factors included in the multinomial regression model were like those used in the logistic regression. In the multinomial regression

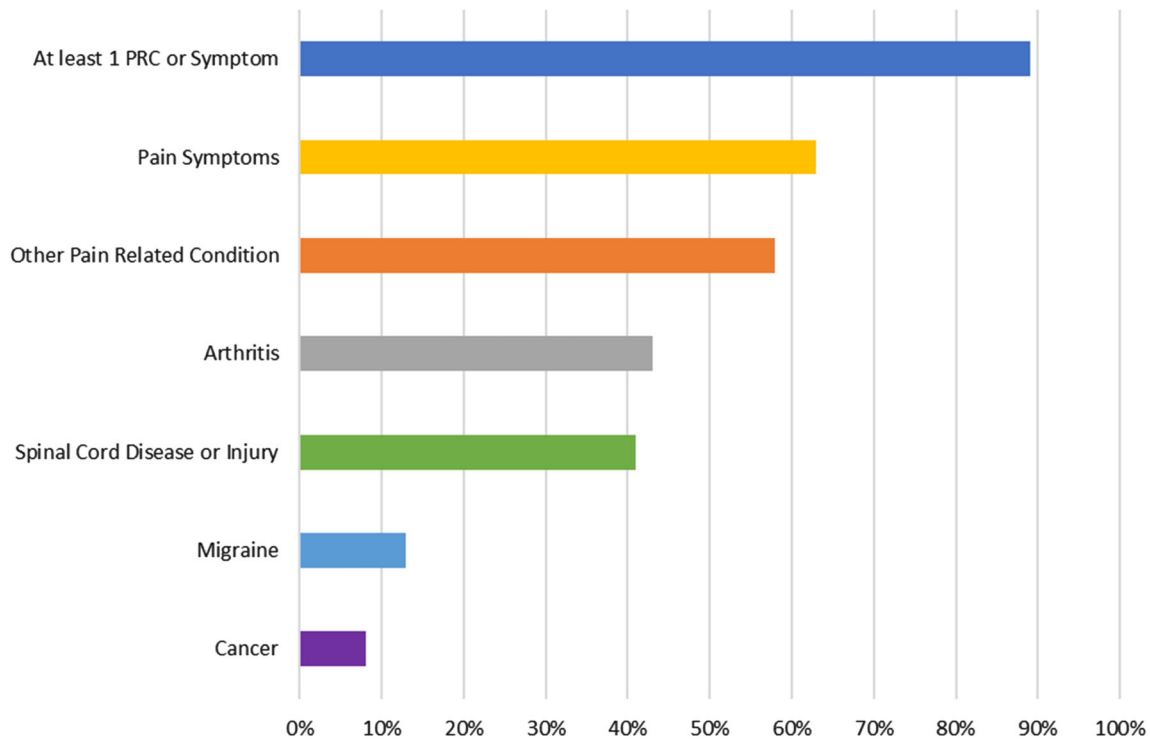


Figure 1. Chronic pain-related conditions (PRC) and symptoms reported by survey respondents

model, attitudes toward cannabis were added as a predisposing factor, and provider attitudes and providers willingness to discuss cannabis was used as enabling factors. Multinomial regression took the following form:

Type of Drug Use (opioids only vs. cannabis only vs. cannabis and opioids) = Need Factor + Predisposing Characteristic + Enabling Factor.

The models were built in Stata 17.

Results

Table 1 shows the univariable analysis of factors related to opioids and/or cannabis use ($n = 436$). Overall, the mean age of participants was 72.42 years (SD: 7.10). The majority of the participants were female (62.0%), partnered, lived in a metropolitan area (60.3%), financially comfortable (76.1%) and nearly half (46.3%) reported a college degree. Of the survey respondents, 62 reported using opioids only in the past year and 71 reported using cannabis only in the past year, 72 reported using both cannabis and opioids (see Table 2). We also ran an analysis to determine if survey respondents were using cannabis for pain related to chronic conditions or symptoms and found that 89.0% of our data set was using specifically for longer term pain. Other long-term conditions indicated by

our respondents were for Alzheimer's disease, anxiety, post-traumatic stress disorder and HIV/AIDS.

Non-drug users versus drug users

Table 3 summarises the results from the logistic regression. It indicated that pain was significantly associated with using cannabis and/or opioids when controlling for other covariates. When the self-reported pain score increases by one unit, the odds of using either cannabis or opioids or both drugs would increase by 43% [odds ratio (OR) 1.43; 95% confidence interval (CI) 1.28–1.60]. This supports our first hypotheses that the use of either cannabis or opioids (or both) would be driven by a medical need when compared to non-users. However, self-reported quality of life was not a significant determinant of use (OR 1.03; 95% CI 0.78–1.36) when adjusting for other factors.

Opioids versus cannabis users

Table 4 shows the results from the multinomial regression model. We found that pain was not significantly associated with whether the individual chose to use opioids, cannabis or both. Self-reported quality of life

Table 1. Univariate analysis for demographic, social, health characteristics and attitudes on cannabis use of the sample by users and non-users

	All mean (%), n = 436	Non-users, mean (%), n = 231	Users, mean (%), n = 205	P
Age, mean (SD)	72.42 (7.10)	74.33 (6.60)	70.26 (7.04)	<0.001
Sex				0.05
Male	165 (37.8)	77 (33.3)	88 (42.9)	
Female	271 (62.2)	154 (66.7)	117 (57.1)	
Race				0.175
White	390 (89.4)	208 (90.0)	182 (88.8)	
Non-white	28 (6.4)	11 (4.8)	17 (8.3)	
Education level				0.471
College degree and above	199 (45.6)	104 (45.0)	95 (46.3)	
Below college degree	232 (53.2)	123 (53.2)	109 (53.2)	
Marital status				0.007
Married/have a partner	233 (53.4)	107 (46.3)	126 (61.5)	
Not married/single	200 (45.9)	122 (52.8)	78 (38.0)	
Living area				0.457
Metropolitan	263 (60.3)	137 (59.3)	126 (61.5)	
Non-metropolitan	158 (36.2)	88 (38.1)	70 (34.1)	
Financial status				0.008
Financially comfortable	353 (81.0)	197 (85.3)	156 (76.1)	
Non-financially comfortable	71 (16.3)	26 (11.3)	45 (22.0)	
General quality of life				0.008
Poor	6 (1.4)	1 (0.4)	5 (2.4)	
Fair	30 (6.9)	9 (3.9)	21 (10.2)	
Good	129 (29.6)	63 (27.3)	66 (32.2)	
Very good	164 (37.6)	90 (39.0)	74 (36.1)	
Excellent	95 (21.8)	60 (26.0)	35 (17.1)	
Pain, mean (SD)	4.08 (2.53)	3.15 (2.13)	5.13 (2.53)	<0.001
Cannabis acceptance				<0.001
Strongly disagree	19 (4.4)	17 (7.4)	2 (1.0)	
Disagree	7 (1.6)	7 (3.0)	0 (0.0)	
Neutral	50 (11.5)	42 (18.2)	8 (3.9)	
Agree	65 (14.9)	48 (20.8)	17 (8.3)	
Strongly agree	292 (67.0)	114 (49.4)	178 (86.8)	
Cannabis leads to stronger drugs				<0.001
Strongly disagree	197 (45.2)	53 (22.9)	144 (70.2)	
Disagree	75 (17.2)	50 (21.6)	25 (12.2)	
Neutral	76 (17.4)	62 (26.8)	14 (6.8)	
Agree	25 (5.7)	18 (7.8)	7 (3.4)	
Strongly agree	50 (11.5)	40 (17.3)	10 (4.9)	
Negative experience with cannabis				0.007
Yes	87 (20.0)	39 (16.9)	48 (23.4)	
No/Do not know	296 (67.9)	154 (66.7)	142 (69.3)	
Health provider discussions about cannabis				<0.001
Yes	95 (21.8)	22 (9.5)	73 (35.6)	
No	337 (77.3)	205 (88.7)	132 (64.4)	
Health provider attitude about cannabis				0.001
Positive	28 (6.4)	5 (2.2)	23 (11.2)	
Negative/neutral	399 (91.5)	221 (95.7)	178 (86.8)	

was also not a significant determining factor between the use of opioids-only and cannabis-only. In other words, persons using cannabis or opioids or both appeared to have comparable levels of pain and quality of life, suggesting that the medical need was not a distinguishing factor among the use of cannabis-only, opioids-only or the use of both.

In contrast, we identified several contextual variables were significantly associated with choosing cannabis or opioids after adjusting for other variables. Females in our study were less likely to choose cannabis (OR 0.17; 95% CI 0.05–0.57) or cannabis and opioids (OR 0.18; 95% CI 0.05–0.60) versus opioids only. Age, marital status, education level and financial

Table 2. Univariate analysis for demographic, social, health characteristics and attitudes on cannabis use of the sample by opioids users, cannabis users, and opioid and cannabis users

	Opioid users mean (%), n = 62	Cannabis users mean (%), n = 71	Opioid and cannabis users mean (%), n = 72	P
Age, mean (SD)	73.76 (7.78)	69.58 (6.20)	67.92 (5.98)	<0.001
Sex				<0.001
Male	13 (21.0)	36 (50.7)	39 (54.2)	
Female	49 (79.0)	35 (49.3)	33 (45.8)	
Race				0.089
White	57 (91.9)	66 (93.0)	59 (81.9)	
Non-white	4 (6.5)	5 (7.0)	8 (11.1)	
Education level				0.036
College degree and above	20 (32.3)	40 (56.3)	35 (48.6)	
Below college degree	42 (67.7)	30 (42.3)	37 (51.4)	
Marital status				0.036
Married/have a partner	29 (46.8)	46 (64.8)	51 (70.8)	
Not married/single	32 (51.6)	25 (35.2)	21 (29.2)	
Financial status				0.152
Financially comfortable	43 (69.4)	61 (85.9)	52 (72.2)	
Non-financially comfortable	17 (27.4)	10 (14.1)	18 (25.0)	
General quality of life				0.354
Poor	0 (0.0)	1 (1.4)	4 (5.6)	
Fair	8 (12.9)	7 (9.9)	6 (8.3)	
Good	24 (38.7)	22 (31.0)	20 (27.8)	
Very good	21 (33.9)	28 (39.4)	25 (34.7)	
Excellent	7 (11.3)	13 (18.3)	15 (20.8)	
Pain, mean (SD)	5.16 (2.53)	4.83 (2.56)	5.41 (2.49)	0.398
Cannabis acceptance				<0.001
Strongly disagree	2 (3.2)	0 (0.0)	0 (0.0)	
Disagree	0 (0)	0 (0)	0 (0)	
Neutral	6 (9.7)	2 (2.8)	0 (0.0)	
Agree	11 (17.7)	4 (5.6)	2 (2.8)	
Strongly agree	43 (69.4)	65 (91.5)	70 (97.2)	
Cannabis leads to stronger drugs				<0.001
Strongly disagree	24 (38.7)	59 (83.1)	61 (84.7)	
Disagree	13 (21.0)	8 (11.3)	4 (5.6)	
Neutral	8 (12.9)	4 (5.6)	2 (2.8)	
Agree	6 (9.7)	0 (0.0)	1 (1.4)	
Strongly agree	8 (12.9)	0 (0.0)	2 (2.8)	
Negative experience with cannabis				0.217
Yes	17 (27.4)	13 (18.3)	18 (25.0)	
No/do not know	39 (62.9)	56 (78.9)	47 (65.3)	
Health provider discussions about cannabis				<0.001
Yes	4 (6.5)	40 (56.3)	29 (40.3)	
No	58 (93.5)	31 (43.7)	43 (59.7)	
Health provider attitude about cannabis				0.004
Positive	0 (0.0)	13 (18.3)	10 (13.9)	
Negative/neutral	61 (98.4)	58 (81.7)	59 (81.9)	

status were not predictors of type of drug use. Individuals who thought cannabis use would lead to harder drugs were 0.46–0.53 times less likely to use cannabis only (OR 0.46, 95% CI 0.25–0.85) or both (OR 0.53; 95% CI 0.32–0.89) compared to using opioids only. The belief that cannabis was appropriate for medical purposes was a determining factor. When a respondent's physician is willing to talk about cannabis with their patient, the odds of choosing cannabis-only or both cannabis and opioids rather than

opioids-only increased by 24–43 times compared when their health provider did not talk about cannabis use.

Discussion

While it is not surprising that higher self-reported levels of pain separate those who do not use cannabis

Table 3. Logistic regression analysis of factors associated with cannabis and opioid use

Variable	OR (95% CI)	P value
Pain	1.43 (1.28–1.60)	0.000
General quality of life	0.99 (0.74–1.31)	0.962
Age	0.93 (0.90–0.96)	0.000
Sex (male), female	0.81 (0.50–1.32)	0.404
Race (white), non-white	1.37 (0.53–3.54)	0.506
Education level (below college degree), above college degree	1.23 (0.76–1.99)	0.384
Marital status (not married/single), married	1.87 (1.12–3.14)	0.016
Financial status (non-financially comfortable), financially comfortable	0.61 (0.31–1.19)	0.151

CI, confidence interval; OR, odds ratio.

or opioids from those that do, we were struck how the level of pain did not influence the choice to use either cannabis or opioids to treat pain, as we anticipated that opioids use would be more likely among those with higher levels of pain. However, other contemporary studies have found that pain was not a primary determinant of long-term opioids use [28]. There may have been other medical needs driving the choice between opioids and cannabis use that were not observed in our work. For example, the type of pain an individual is experiencing could be a determining factor of use, as pain conditions associated with the central nervous system may respond differently to pain relievers than conditions associated with musculoskeletal conditions [3,29]. In addition, cannabis users could be looking to treat pain as well as other co-occurring conditions such as nausea related to cancer, muscle spasticity due to multiple sclerosis, mood disorders and other conditions that cannabis has shown to offer a substantial benefit [17] and, in comparison, are not typically treated with opioids [30]. Future research should expand the exploration of how medical need differentiates users of opioids from those who use cannabis.

Alternatively, predisposing and enabling factors certainly appear to be contributing to the decision to use opioids or cannabis.

Our finding about the increased use of opioids among females is consistent with previous work that showed females were higher users of opioids [10,31]. In contrast, other determinants such as education or race, which previously have been associated with opioids and drug use, were not found to be significant. This could be due to our comparative lack of statistical power.

Attitudes

Previous work has shown an individual's attitudes, beliefs and past behaviour influence their decision to use drugs [32]. The 2016–2017 National Survey on Drug Use and Health [33] data show that perceived risk of cannabis use rises with age and Belcher [34] found lack of knowledge and fear to be contributing factors in medication decision-making among older adults. Still, we know of no research that has examined how older adult's individual beliefs influence their *choice* of pain relief. In our study, we found that individuals who believed that cannabis could lead to harder drug use were more likely to opt for opioids only versus cannabis-only or a combination of cannabis and opioids. This would be consistent with some studies [35,36]. If researchers demonstrate the relative risks and consumers become more educated about using cannabis, it is possible that more older adults will try cannabis. In our previous work, we found that many older adults would consider using cannabis if they had a medical need and their physician recommended it. At the same time, providers and patients may become more cautious about using opioids.

The role of providers

Provider's attitudes towards the use of cannabis or opioids certainly are critical in shaping patient choices. In this research, we found that when health provider's discussed cannabis as an option, participants were more likely to be in the cannabis only or cannabis and opioids groups. This is consistent with other studies that have shown the health provider's attitudes to be important to older adults [37]. For example, in a qualitative analysis of older adults Bobitt *et al.* [21] found that older adults preferred guidance on their use of cannabis by a provider. Researchers in this study also determined that lack of provider knowledge of and unwillingness to discuss cannabis prohibited patients from accessing cannabis as a method of pain control. Similar studies about alternative or complementary medicine use have found that physician's play a key role in whether an individual will consider alternative methods for pain control [38,39]. In Colorado and Illinois, the provider controls access to both opioids and medical cannabis via prescription and certification of the condition and their personal beliefs and recommendation preferences impact the choices their patients make. Furthermore, providers may also be influenced by policies that are in place within their healthcare systems that

Table 4. Multinomial regression analysis of factors comparing opioids-only users to cannabis-only users to both cannabis and opioids users

Variable	RRR ^a (95% CI)	P value
Cannabis users only [vs. opioid-only users]		
Pain	0.971 (0.76–1.24)	0.815
General qol ^b	1.590 (0.87–2.91)	0.130
Age	0.955 (0.89–1.03)	0.225
Gender (male)		
Female	0.169 (0.05–0.57)	0.004
Race (white)		
Non-white	2.459 (0.25–24.48)	0.443
Education level (below college degree)		
Above college degree	1.323 (0.44–3.96)	0.616
Marital status (not married/single)		
Married	0.523 (0.16–1.75)	0.292
Financial status (Non-financially comfortable)		
Financially comfortable	2.338 (0.56–9.77)	0.244
Cannabis leads to harder drugs	0.461 (0.25–0.85)	0.012
Experience with cannabis (Negative experience)		
No negative experience	0.496 (0.15–1.67)	0.258
Cannabis acceptance	5.431 (1.15–25.60)	0.032
Health provider discussions about cannabis (Yes)		
No discussions with health provider	43.484 (6.06–312.20)	0.000
Cannabis and opioids users [vs. opioid-only users]		
Pain	1.117 (0.88–1.43)	0.375
General quality of life	1.911 (1.04–3.50)	0.036
Age	0.959 (0.89–1.03)	0.250
Gender (male)		
Female	0.181 (0.05–0.60)	0.005
Race (white)		
Non-white	5.307 (0.61–46.34)	0.131
Education level (below college degree)		
Above college degree	1.163 (0.39–3.50)	0.788
Marital status (not married/single)		
Married	1.093 (0.32–3.72)	0.887
Financial status (Non-financially comfortable)		
Financially comfortable	1.007 (0.25–4.06)	0.992
Cannabis leads to harder drugs	0.535 (0.32–0.89)	0.016
Experience with cannabis (Negative experience)		
No negative experience	1.463 (0.48–4.50)	0.506
Cannabis acceptance	12.109 (1.72–85.23)	0.012
Health provider discussions about cannabis (Yes)		
No discussions with health provider	24.345 (3.28–180.47)	0.002

^aRelative risk ratio ^bQuality of life.

may caution the over prescription of opioids or prohibit the certification of qualifying conditions for cannabis use. Limitations Because we only surveyed older adults in Colorado and Illinois our results may not be representative of the general population. Colorado and Illinois differed in legal access to cannabis at the time of the study therefore the context of the two states must be considered when interpreting the results of the study. Also, our responses could have been influenced by some degree of social desirability

bias because our respondents may have been hesitant to disclose their cannabis or opioids use on our survey. This could contribute to the lower numbers of users versus non-users in our study. Social desirability bias is common in studies that involve questions related to drug use, however indirect methods of questioning such as our use of an anonymous survey, help to lesson this bias [40]. Additionally, our study did not delve into the frequency of use of opioids, nor the use of cannabis in relation to opioids. Some

studies suggest that cannabis use leads to the use of other drugs including opioids [41]. In contrast, other studies have shown that individuals take cannabis as a way to reduce or replace opioids [42]. Because our study was originally designed to look at cannabis use in older adults, we recognize the need to dive deeper into why individuals choose one form of pain control over another. This is something we intend to address in future research. **Conclusion** These findings shed light on some of the clinical and contextual conditions that drive older individuals to choose cannabis or opioids to treat pain. Few studies have looked at the contextual factors that influence the use of cannabis or opioids specifically in older adults. Additional studies that look further into enabling contextual conditions such as the opioid prescription rate per county, availability of cannabis dispensaries, and number of physicians per county who are willing to discuss and/or certify medical cannabis are important factors to consider. The results of this study also are consistent with a growing body of research suggesting that medical cannabis may play an important role in the use of opioids [26,27,42]. Further research on the intersection between cannabis and opioids use is warranted.

Limitations

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Conclusion

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Conflict of Interest

The authors declare no conflicts of interest.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Table S1. Univariate analysis for demographic, social, health characteristics and attitudes on cannabis use of the sample by Colorado and Illinois users.