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Monograph

Cannabis and opioid perceptions, co-use, and substitution among patients across 4 NCI-Designated Cancer Centers

Rebecca L. Ashare, PhD,[1,2,*] Brooke Worster, MD,[3] Shannon M. Nugent, PhD,[4,5] Danielle M. Smith, PhD,[6] Benjamin J. Morasco, PhD,[5] Amy E. Leader, PhD,[3] Amy A. Case, MD,[7] Salimah H. Meghani, PhD[1,8]

[1]Abramson Cancer Center at the University of Pennsylvania, Philadelphia, PA, USA
[2]Department of Psychology, University at Buffalo, Buffalo, NY, USA
[3]Sidney Kimmel Cancer Center at Thomas Jefferson University, Philadelphia, PA, USA
[4]Knight Cancer Institute, Oregon Health & Science University, Portland, OR, USA
[5]Department of Psychiatry, Oregon Health & Science University, Portland, OR, USA
[6]Department of Health Behavior, Roswell Park Comprehensive Cancer Center, Buffalo, NY, USA
[7]Department of Palliative and Supportive Care, Roswell Park Comprehensive Cancer Center, Buffalo, NY, USA
[8]Department of Biobehavioral Health Sciences, NewCourtland Center for Transitions and Health, Leonard Davis Institute for Health Economics, University of Pennsylvania, Philadelphia, PA, USA

*__Correspondence to__: Rebecca L. Ashare, PhD, Department of Psychology, SUNY Buffalo, 334 Diefendorf Hall, Buffalo, NY 14214, USA (e-mail: rlashare@buffalo.edu).

Abstract

Prescription opioids are used for managing pain in persons with cancer, however, there are socioeconomic and racial disparities in medication access. Cannabis is increasingly used for cancer symptom management and as an opioid alternative. Limited data are available about patterns of opioid and cannabis use among patients with cancer. We used survey data from 4 National Cancer Institute–designated cancer centers in 3 states (n = 1220) to assess perceptions, use of cannabis and opioids for pain, their substitution, and racial and ethnic differences in each outcome. Compared with White patients, Black patients were less likely to use opioids for pain (odds ratio [OR] = 0.66; $P = .035$) and more likely to report that cannabis was more effective than opioids (OR = 2.46; $P = .03$). Race effects were mitigated ($P > .05$) after controlling for socioeconomic factors. Further research is needed to understand cannabis and opioid use patterns and how overlapping social determinants of health create a disadvantage in cancer symptom management for Black patients.

Cannabis use is increasing among persons with cancer (1–4). However, the rapid legislative changes within the United States continue to blur the distinction between when cannabis is illicit, recreational (with abuse potential), or medicinal. Up to 50% of cancer patients who are actively using cannabis either consume it for symptom management or believe in its anticancer properties (5–8). Patients with cancer experience various symptoms throughout their illness, and many use alternative and supportive therapies for symptomatic relief. Several studies have demonstrated that cannabis is most frequently endorsed for cancer-related pain management, relative to other symptoms (6,9,10). More than one-third of patients report moderate to severe pain due to cancer, its treatments, or both (11). For 1 in 3 patients, pain persists months to years after completing cancer treatment (12).

Opioid medications are extensively used in clinical practice for pain management among those with cancer, constituting more than half of all opioid prescriptions written in 2018 (13). Prescription opioids remain a cornerstone of cancer pain treatment and have demonstrated effectiveness for many types of pain associated with metastatic cancer (14). Although opioids will remain an important part of the treatment of cancer-related pain, we are increasingly aware of opioid-related risks. Once diagnosed with cancer, patients and survivors (vs individuals with no history of cancer) are at increased risk of continuing chronic, high-dose opioids for up to 6 years posttreatment, with White patients being more likely to receive long-term opioid therapy than Black or Hispanic patients (15–17). Long-term opioid therapy is associated with increased risk of dependence or abuse, cardiovascular and orthopedic complications, and overdose (18). Because of problems in prescription opioid misuse due to the opioid epidemic, however, there are increasing health system barriers to opioid access stemming from regulatory, legal, and safety concerns over long-term opioid therapy (19–21). As opioid prescribing decreases, including the overall rate, dose, and duration (14,22–24), patients with cancer may unfortunately have increased difficulty in obtaining adequate opioid prescriptions.

There are also notable racialized and socioeconomic disparities in access to pain management (including opioids) in the United States because of provider bias and systemic racism, which permeate all aspects of our medical system, including cancer care (25,26). This issue highlights the importance of whether,

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and how, members of racial and ethnic minority groups may alternatively manage their cancer pain, including with cannabis. Further, some patients with cancer report using cannabis to substitute or reduce their use of opioids, which patients consider "harder medications" because of side effects, stigma, and addiction concerns. In a recent study (27), one patient stated: "I'll [first] go to the marijuana. If that doesn't work, I'll go to the harder medicines.… Rather than take OxyContin and hydrocodone, I'm taking…the [marijuana] strands…I have one for insomnia, one for pain, one for anxiety."

The goal of this multistate, multicenter study is to investigate perceptions of cannabis and prescription opioid use for symptom management in persons with cancer who used cannabis during or after cancer treatment. We further investigated whether perceptions of cannabis and opioid use, their co-use, and substitution to manage pain differed according to race and ethnicity.

Methods

Overview

In 2020, the National Cancer Institute (NCI) issued a Funding Opportunity Announcement to support supplements to 12 funded NCI-designated cancer centers to conduct surveys to better understand the patterns and perceptions of cannabis use across the United States.

Design, sample, and setting

Cross-sectional survey data were combined from 4 NCI-designated cancer centers: University of Pennsylvania Abramson Cancer Center, Thomas Jefferson University Sidney Kimmel Cancer Center, Oregon Health & Science University Knight Cancer Center, and Roswell Park Comprehensive Cancer Center. At the time of the survey, cannabis was legal for nonmedical use in Oregon (since 2015) and New York (since March 2021; though retail dispensaries were not yet open) and for medical use in Pennsylvania (since 2016). Each study was reviewed by their respective institutional review boards. All institutions included adults who had been diagnosed with any type of cancer and had completed treatment within 1-5 years. Additional methods can be found in Supplementary Material (available online), and Supplementary Table 1 (available online) provides a detailed overview of inclusion criteria and recruitment procedures. The final analytic sample included 1220 patients across all cancer centers (University of Pennsylvania Abramson Cancer Center, n = 328; Thomas Jefferson University Sidney Kimmel Cancer Center, n = 430; Oregon Health & Science University, n = 192; Roswell Park Comprehensive Cancer Center, n = 270).

Survey development and measures

The survey was developed through discussion and consensus among the 12 consortium sites in collaboration with ICF Next (https://www.icf.com). The core data elements can be found at https://epi.grants.cancer.gov/clinical/#initiatives (28). Each site also included site-specific survey questions. For the current analysis, the 4 sites collaborated on developing items related to cannabis and prescription opioid use.

Current and past use of cannabis

We inquired about lifetime history, use since diagnosis, use during cancer treatment, and current use. Patients who reported consuming cannabis since their diagnosis responded to additional questions about cannabis use.

Frequency of cannabis use

We assessed frequency of cannabis use on average since their diagnosis (ie, during or after treatment) (eg, 1 = only tried it once or twice; 2 = once a month or less; 3 = a few times a month; 4 = a few times a week; 5 = once a day or almost every day; 6 = more than once a day).

Opioid use

Each center included items asking about history of prescription opioid use (never, discontinued use more than 3 months ago, discontinued use in the past 3 months, and currently) and whether they had used cannabis instead of opioids to manage pain (yes, no). Among those who reported using cannabis instead of opioids for pain, we asked about reasons for using cannabis instead of opioids; specific prompts included (yes, no) the following: cannabis is safer, cannabis has fewer side effects, cannabis is less addictive, and I was able to lower my dose of opioids. For the subset who had ever used opioids and reported using cannabis instead of opioids for pain, we inquired about perceived efficacy of opioids compared with cannabis to manage pain (opioids were better, cannabis and opioids were the same, cannabis was better).

Sociodemographic and cancer variables

Information about age, self-identified sex at birth, race and ethnicity, income, and education were obtained via self-report. Of the 4 cancer centers, 3 collected data about cancer type, stage, and cancer treatments received.

Data analyses

The final sample for analysis included individuals who reported using cannabis at any time since their cancer diagnosis and responded to the cannabis use frequency question (n = 1220). For each racial and ethnic group, χ^2 analyses indicated statistically significant differences for sex, age, income, education, and cancer center; these variables were included as covariates in the stepwise regressions. Frequency of cannabis use during or after treatment was also included. Outcomes included the following: opioid use (never [reference group] vs current and former opioid use), use of cannabis instead of opioids, reasons for using cannabis instead of opioids, and perceived efficacy of cannabis compared with opioids (opioids were better and cannabis and opioids were the same [reference group] vs cannabis was better than opioids). "No" was the reference category for binary outcomes.

Our primary analyses tested the association of race and ethnicity with each outcome and whether these associations remained statistically significant after controlling for age, sex, education, income, cancer center, and frequency of use. We conducted stepwise logistic regressions with 3 steps for each outcome. Step 1 tested the association of race. Step 2 added sex, age, income, education, and cancer center. Step 3 added frequency of cannabis use. To examine the impact on model fit after adding variables in each step, we used the Akaike information criteria. For all models, step 3 had the lowest Akaike information criteria indicating the best model fit and was chosen for main study findings. See Supplementary Tables 2-8 (available online) for the full set of stepwise regression model findings.

Results

Patient characteristics

Table 1 shows participant characteristics by racial and ethnic group. Overall, 81.8% identified as White, 9.8% identified as

Table 1. Participant characteristics

Characteristics	Race and ethnicity			
	White No. (%) (n = 998)	Black No. (%) (n = 119)	Hispanic or other race No. (%) (n = 103)	Total No. (%) (n = 1220)
Sex at birth*				
Male	428 (42.9)	40 (33.6)	35 (34.0)	503 (41.2)
Female	570 (57.1)	79 (66.4)	68 (66.0)	717 (58.8)
Age older or younger than 65 years*				
65 years and older	365 (36.6)	44 (37.0)	22 (21.4)	431 (35.3)
Education*				
High school or less	118 (11.8)	34 (28.6)	24 (23.3)	176 (14.4)
Some college or technical school	285 (28.6)	50 (42.0)	33 (32.0)	368 (30.2)
College graduate	316 (31.7)	20 (16.8)	24 (23.3)	360 (29.5)
Postgraduate	279 (28.0)	15 (12.6)	22 (21.4)	316 (25.9)
Household income*				
<$20 000	97 (9.7)	37 (31.1)	29 (28.2)	163 (13.4)
$20 000-$49 999	174 (17.4)	39 (32.8)	27 (26.2)	240 (19.7)
$50 000-$99 999	330 (33.1)	31 (26.1)	25 (24.3)	386 (31.6)
≥$100 000	397 (39.8)	12 (10.1)	22 (21.4)	431 (35.3)
Cancer center*				
UPenn	266 (26.7)	39 (32.8)	23 (22.3)	328 (26.9)
RPCCC	242 (24.2)	10 (8.4)	18 (17.5)	270 (22.1)
SKCC	324 (32.5)	70 (58.8)	36 (35.0)	430 (35.2)
OHSU	166 (16.6)	0 (0.0)	26 (25.2)	192 (15.7)
Cancer type[a]				
Gastrointestinal	127 (15.3)	21 (17.6)	16 (20.8)	164 (16.0)
Genitourinary	96 (11.5)	15 (12.6)	3 (3.9)	114 (11.1)
Hematological	154 (18.5)	18 (15.1)	10 (13.0)	182 (17.7)
Breast	159 (19.1)	24 (20.2)	21 (27.3)	204 (19.8)
Other	335 (40.3)	45 (37.8)	31 (40.3)	411 (40.0)

[a] One site did not collect data on cancer type, so the sample size for this analysis is n = 1028.OHSU = Knight Cancer Institute at Oregon Health and Science University; RPCCC = Roswell Park Comprehensive Cancer Center; SKCC = Sidney Kimmel Cancer Center at Thomas Jefferson University; UPenn = Abramson Cancer Center at the University of Pennsylvania.

* Difference across race $P < .01$.

Black, and 8.4% identified as Hispanic or other race (ie, individuals who identified as Asian or two or more races); 58.8% of participants identified as female, 35.3% were aged 65 years or older, 85.0% had at least some college or technical school, and 67.0% had a household income of $50 000 or more. There were statistically significant differences across racial and ethnic groups for sex, age, education, income, and cancer center. Given the differences across cancer centers, we conducted a sensitivity analysis in which we ran each regression model with 1 site removed. The pattern of results remained consistent regardless of which data collection site was removed.

History of opioid use

Overall, 728 (59.7%) of 1220 participants reported ever using opioids for pain: White individuals (60.5%), Black individuals (50.4%), Hispanic individuals or other race (62.7%). There was a statistically significant effect of race and ethnicity, suggesting that Black patients were less likely to have ever used opioids compared with White patients (odds ratio [OR] = 0.66, 95% confidence interval [CI] = 0.45 to 0.97; $P = .035$; Supplemental Table 2, available online). However, after controlling for sex, age, income, education, cancer center, and average frequency of cannabis use since cancer treatment, the difference in history of opioid use by race was marginal. In step 3, age and frequency of cannabis use were statistically significant, suggesting that older patients and patients who used cannabis less frequently during their cancer treatment were less likely to have ever used opioids (Table 2).

Use of cannabis instead of opioids

Overall, 506 (43.4%) participants reported using cannabis instead of opioids to manage pain: 41.6% White, 46.2% Black, 57.9% Hispanic or other race. There was an initial effect of race and ethnicity, suggesting that patients who identified as Hispanic or other race were more likely to use cannabis instead of opioids for pain (OR = 1.93, 95% CI = 1.26 to 2.96; $P = .002$; Supplementary Table 3, available online). However, in the step 3 model, only income and frequency of cannabis use remained statistically significant, such that lower income and more frequent cannabis use during cancer treatment were associated with greater likelihood of using cannabis instead of opioids for pain (Table 2).

Reasons for using cannabis instead of opioids

Among the 506 participants who reported using cannabis instead of opioids, 398 (78.7%) said the reason was because "cannabis is safer" (79.6% White, 70.4% Black, 80% Hispanic or other race), 366 (72.3%) said the reason was because "cannabis is less addictive" (74.3% White, 53.7% Black, 76.4% Hispanic or other race), and 360 (71.1%) said the reason was because "cannabis has fewer side effects" (71.8% White, 63% Black, 74.5% Hispanic or other race). In the step 3 model, Black patients (vs White patients) were less likely to endorse "cannabis is less addictive" as a reason for using cannabis instead of opioids (Table 3). Similarly, patients with a high school education or less were less likely to say that "cannabis is less addictive" (vs those with some college or technical school). Those who used cannabis less

Table 2. Logistic regressions controlling for sociodemographics, site, and frequency of cannabis use

	Opioid use: never vs current and former Referent group = never		Use of cannabis instead of opioids for pain, yes or no Referent group = no		Perceived efficacy of cannabis vs opioids for pain[a] Referent group = opioids better than or same as cannabis	
Variable	**OR (95% CI)**	***P***	**OR (95% CI)**	***P***	**OR (95% CI)**	***P***
Race and ethnicity (White = referent group)						
Black	0.70 (0.46 to 1.06)	.09	1.06 (0.68 to 1.66)	.79	1.85 (0.79 to 4.36)	.16
Hispanic or other race	0.95 (0.61 to 1.47)	.82	1.56 (0.97 to 2.51)	.07	1.13 (0.57 to 2.24)	.73
Cancer center (UPenn = referent group)						
RPCCC	0.76 (0.54 to 1.07)	.11	1.39 (0.96 to 2.00)	.08	1.15 (0.62 to 2.11)	.66
SKCC	0.86 (0.63 to 1.16)	.32	0.78 (0.56 to 1.08)	.14	0.78 (0.43 to 1.40)	.40
OHSU	1.76 (1.16 to 2.65)	.01**	1.37 (0.88 to 2.13)	.17	1.28 (0.67 to 2.44)	.46
Age (younger than 65 years = referent group)						
65 years and older	0.62 (0.48 to 0.80)	<.01**	0.61 (0.46 to 0.81)	<.01**	1.17 (0.70 to 1.94)	.55
Sex at birth (male = referent group)						
Female	1.02 (0.80 to 1.31)	.86	1.18 (0.90 to 1.54)	.22	1.97 (1.24 to 3.11)	<.01**
Education (high school or less = referent group)						
Some college or technical school	1.11 (0.75 to 1.62)	.61	1.01 (0.67 to 1.52)	.98	0.53 (0.26 to 1.08)	.08
College graduate	1.16 (0.76 to 1.75)	.44	0.92 (0.59 to 1.42)	.69	0.30 (0.14 to 0.65)	<.01**
Postgraduate	1.20 (0.78 to 1.84)	.42	1.01 (0.64 to 1.61)	.96	0.28 (0.13 to 0.63)	<.01**
Household income (<$20 000 = referent group)						
$20 000-$49 999	1.16 (0.76 to 1.77)	.49	0.72 (0.46 to 1.13)	.16	1.24 (0.60 to 2.54)	.56
$50 000-$99 999	1.13 (0.75 to 1.72)	.56	0.79 (0.51 to 1.24)	.30	0.96 (0.49 to 1.91)	.91
≥$100 000	1.00 (0.65 to 1.55)	.99	0.55 (0.35 to 0.89)	.01*	0.99 (0.48 to 2.04)	.98
Frequency of cannabis use during or after treatment	1.13 (1.04 to 1.22)	<.01**	1.58 (1.44 to 1.72)	<.01**	1.12 (0.94 to 1.33)	.21
Intercept	1.00 (0.54 to 1.87)	.99	0.19 (0.10 to 0.38)	<.01**	0.74 (0.22 to 2.53)	.64
Sample size	1219		1167		384	

[a] Only individuals who reported using opioids were included in this model. CI = confidence interval; OHSU = Knight Cancer Institute at Oregon Health and Science University; OR = odds ratio; RPCCC = Roswell Park Comprehensive Cancer Center; SKCC = Sidney Kimmel Cancer Center at Thomas Jefferson University; UPenn = Abramson Cancer Center at the University of Pennsylvania.

* $P < .05$, ** $P < .01$.

frequently following cancer treatment were less likely to endorse the statement "cannabis has fewer side effects."

Among the 387 patients who had ever used opioids and used cannabis instead of opioids, 134 (34.6%) said it was because "I was able to lower my dose of opioids" (35.7% White, 25% Black, 34.1% Hispanic or other race). Although income was the only statistically significant predictor such that higher income was associated with lower likelihood of using cannabis to reduce opioid dose, males (vs females) were slightly less likely to report using cannabis to reduce opioid dose ($P = .05$).

Perceived efficacy of cannabis vs opioids for pain

Of the 387 patients who ever used opioids and used cannabis instead of opioids, 183 (47.7%) reported that cannabis was better at managing pain than opioids: 44.8% White, 66.7% Black, 54.5% Hispanic or other race. The logistic regression model indicated that Black patients (vs White patients) were more likely to indicate cannabis was better at managing pain (OR = 2.46, 95% CI = 1.12 to 5.43; $P = .03$; Supplementary Table 8, available online). In the step 3 model, race and ethnicity was no longer a statistically significant predictor (Table 2). In the final model, females and those with less education were more likely to report that cannabis was more effective at managing pain than opioids.

Discussion

This study sought to describe perceptions of cannabis compared with prescription opioid medications, their co-use, and substitution of opioids with cannabis to manage pain among a sample of persons who reported using cannabis since being diagnosed with cancer. We also evaluated whether these outcomes differed by race and ethnicity. Initial stepwise models suggested that Black patients were less likely to have ever used opioids and, among those who have used opioids, were more likely to indicate that cannabis was more effective at managing pain than opioids. However, race effects were no longer statistically significant after controlling for sex, age, income, education, cancer center, and frequency of cannabis use.

Many studies have shown that race and/or ethnicity are associated with the likelihood of being prescribed opioids (25), types of opioids prescribed (26,29), and patients' opioid use patterns (27,30–33). White patients are consistently more likely to be prescribed opioids compared with non-Hispanic Black or Hispanic patients (25,34–37). Our data also suggest that compared with White patients, Black patients were less likely to report ever using opioids. Among those with prior opioid use, Black patients were also more likely to report that cannabis was more effective at managing pain than opioids, and patients who identified as Hispanic or another non-White race were more likely to substitute cannabis instead of opioids to manage pain. Consistent with other reports that the effect of race may disappear when controlling for sociodemographic variables, such as education, income, and neighborhood level deprivation (38), our findings were not statistically significant after controlling for sex, age, income, education, cancer center, and frequency of cannabis use. Nevertheless, the magnitude of effect indicates that—even after controlling for other factors—Black patients still had 30% lower odds of ever having used opioids, and almost a twofold increase in the odds of reporting cannabis was more efficacious than opioids.

A cursory explanation for these adjusted findings is that race is not an important contributor to our outcomes. However,

Table 3. Logistic regression results for self-reported reasons for using cannabis instead of opioids (n = 506)

	Cannabis is safer		Cannabis is less addictive		Cannabis has fewer side effects		I was able to lower my dose of opioids[a]	
Variable	**OR (95% CI)**	***P***	**OR (95% CI)**	***P***	**OR (95% CI)**	***P***	**OR (95% CI)**	***P***
Race and ethnicity (White = referent group)								
Black	0.51 (0.25 to 1.02)	.06	**0.37 (0.19 to 0.70)**	**<.01**	0.59 (0.31 to 1.13)	.11	0.46 (0.19 to 1.15)	.10
Hispanic or other race	0.96 (0.46 to 2.02)	.92	0.95 (0.47 to 1.91)	.88	1.01 (0.51 to 2.01)	.97	0.60 (0.28 to 1.27)	.18
Cancer center (UPenn = referent group)								
RPCCC	0.95 (0.52 to 1.75)	.87	0.84 (0.48 to 1.47)	.55	0.58 (0.34 to 1.01)	.06	0.79 (0.41 to 1.52)	.48
SKCC	1.18 (0.64 to 2.15)	.59	1.31 (0.75 to 2.27)	.34	0.91 (0.53 to 1.58)	.74	0.89 (0.48 to 1.66)	.72
OHSU	0.65 (0.32 to 1.30)	.23	1.16 (0.58 to 2.32)	.69	0.98 (0.49 to 1.97)	.95	1.77 (0.91 to 3.46)	.09
Age (younger than 65 years = referent group)								
65 years and older	0.75 (0.45 to 1.23)	.25	0.67 (0.42 to 1.08)	.10	0.81 (0.51 to 1.29)	.38	1.33 (0.79 to 2.25)	.29
Sex at birth (male = referent group)								
Female	0.85 (0.53 to 1.34)	.48	0.75 (0.49 to 1.15)	.10	0.82 (0.54 to 1.26)	.37	**1.60 (0.99 to 2.58)**	**.05**
Education (high school or less = referent group)								
Some college or technical school	0.90 (0.46 to 1.73)	.75	**1.99 (1.10 to 3.61)**	**.02**	1.24 (0.70 to 2.22)	.46	1.49 (0.72 to 3.08)	.29
College graduate	0.77 (0.37 to 1.62)	.49	1.25 (0.65 to 2.42)	.50	1.50 (0.77 to 2.91)	.24	1.37 (0.61 to 3.06)	.44
Postgraduate	0.92 (0.42 to 2.02)	.84	1.22 (0.62 to 2.42)	.57	1.31 (0.66 to 2.60)	.44	1.50 (0.65 to 3.47)	.34
Household income (<$20 000 = referent group)								
$20 000-$49 999	0.75 (0.36 to 1.56)	.45	0.60 (0.31 to 1.18)	.14	1.05 (0.54 to 2.06)	.88	1.51 (0.74 to 3.07)	.26
$50 000-$99 999	0.70 (0.34 to 1.43)	.33	0.72 (0.37 to 1.41)	.34	0.66 (0.35 to 1.25)	.20	**0.47 (0.23 to 0.96)**	**.04**
≥$100 000	0.92 (0.42 to 2.00)	.83	0.99 (0.48 to 2.06)	.98	0.93 (0.46 to 1.86)	.83	**0.43 (0.20 to 0.92)**	**.03**
Frequency of cannabis use during or after treatment	1.00 (0.84 to 1.18)	.96	1.10 (0.94 to 1.28)	.24	1.24 (1.07 to 1.44)	<.01	1.02 (0.85 to 1.22)	.84
Intercept	7.17 (2.1 to 24.5)	<.01	2.28 (0.76 to 6.81)	.14	1.36 (0.47 to 3.95)	.57	0.39 (0.11 to 1.41)	.15
Sample size	506		506		506		387	

[a] Only individuals who reported using opioids were included in this model. **Bold** values are $P < .05$. CI = confidence interval; OHSU = Knight Cancer Institute at Oregon Health and Science University; OR = odds ratio; RPCCC = Roswell Park Comprehensive Cancer Center; SKCC = Sidney Kimmel Cancer Center at Thomas Jefferson University; UPenn = Abramson Cancer Center at the University of Pennsylvania.

disparities researchers have cautioned against this interpretation, as socioeconomic risk factors and disadvantages are disproportionately distributed for Black individuals and other underserved groups because of structural and systemic barriers to accessing pain care (39). For example, we found that participants with a college degree or higher were less likely to report that cannabis was better at managing pain vs those with a high school degree or less. Nearly 60% of White patients in our sample had a college degree or higher compared with 30% of Black patients and 45% of Hispanic or other race patients. The overlap among race and other socioeconomic factors are a consequence of systemic and structural racism that contribute to health disparities (40). Given common social determinants of health and their disproportionate distribution in persons of non-White race and ethnicity and socioeconomic disadvantage, it is important to disentangle these factors in understanding cancer pain and symptom outcomes (27,39).

Regarding reasons for substituting cannabis instead of opioids, Black patients were less likely to endorse that "cannabis is less addictive"—even after controlling for other factors. Patterns were similar for "cannabis is safer," "cannabis has fewer side effects," and "I was able to lower my dose of opioids." Although these findings were not statistically significant, there was a 40%-50% reduction in the odds of endorsing those reasons for using cannabis. We also found that Black patients were equally likely to use cannabis instead of opioids compared with White patients. Studies have found greater perceived risk associated with cannabis use among individuals identifying Black or Hispanic race compared with White individuals (41). However, much of this work has been done in large epidemiological samples or adolescents, not patients with cancer (41,42). Future research should evaluate why Black patients with cancer substitute cannabis instead of opioids and understand differences in clinical outcomes.

Our results contribute to a growing empirical base examining the extent to which cannabis use may lead to decreased use of prescription opioids. Some prospective research conducted among patients with chronic noncancer pain has found that new use of medical cannabis is associated with clinically significant decreases in the use of prescription opioid medications (43,44). However, the extent to which these findings translate to patients with cancer is unclear. Survey data suggest interest in cannabis use for pain and as an opioid sparing agent, at least among patients with cancer-related pain (45,46). Additional research is needed to understand the safety and effectiveness of these usage patterns.

Several limitations warrant mention. First, we combined data across 4 cancer centers in 3 states, each of which had different cannabis-related laws. Our sensitivity analysis suggested that this did not substantially impact our findings. Second, previous studies have found differences in cannabis risk perceptions between Black men and Black women (41). Our sample was predominantly White individuals, limiting our ability to examine interactions with sex. Additionally, only a small number of patients identified as Hispanic, and we were unable to evaluate this group separately. Last, this was a cross-sectional survey relying on self-reported cannabis and opioid use, and the time frames for cannabis and opioid use questions differed. Specifically, cannabis use referred to anytime since cancer diagnosis, whereas the opioid use outcome combined individuals

reporting current, recent, and lifetime use. Moreover, our sample size precluded evaluating differences between individuals who reported current and former opioid use. Although opioid-related questions referred to pain (not specifically cancer pain), questions regarding substitution were specific to individuals who used cannabis since their cancer diagnosis. Future studies should focus on longitudinal, prospective associations between cannabis and opioid use among patients with cancer.

In this multisite, multistate survey, we evaluated opioid and cannabis co-use, substitution, and perception of opioids and cannabis among patients who reported using cannabis since their cancer diagnosis. Although we found descriptive evidence for differences across race and ethnicity, findings for lifetime prescription opioid use, cannabis substitution for opioids, and perceived efficacy of cannabis vs opioids were no longer statistically significant when controlling for sociodemographics. We propose that this may reflect broader systemic factors that result in overlap between race and social determinants of health, including education and income, and future research should attempt to disentangle these factors (39,47,48). We also found that Black patients were less likely to endorse the reasons provided for substituting cannabis for opioids. Because our survey did not include an open-ended option, future work should identify reasons for substitution that may be more relevant to Black patients. Understanding the patterns and reasons for co-use and substitution and perceptions of opioids and cannabis will be critical to identify and mitigate disparities in cancer pain and symptom outcomes.

Data availability

The authors follow the FAIR principles (Findability, Accessibility, Interoperability, Reproducibility) for data access. Data included in this publication are from four study sites. Data files, codebooks and analysis code will be shared with requests and Institutional Data Use Agreements through the University of Pennsylvania, Oregon Health & Science University, Thomas Jefferson University and Roswell Park Comprehensive Cancer Center. Requests should be sent to Drs. Ashare and Meghani (rlashare@buffalo.edu and salimahm@nursing.upenn.edu). Data will be provided through digital, secure data transfer within one month following the request, given no delays in executing data use agreements.

Author contributions

Rebecca Ashare, PhD (Conceptualization; Formal analysis; Funding acquisition; Methodology; Writing—original draft; Writing—review & editing), Brooke Worster, MD (Conceptualization; Funding acquisition; Methodology; Writing—original draft; Writing—review & editing), Shannon M. Nugent, PhD (Conceptualization; Funding acquisition; Methodology; Writing—original draft; Writing—review & editing), Danielle M. Smith, PhD (Conceptualization; Funding acquisition; Methodology; Writing—original draft; Writing—review & editing), Benjamin J. Morasco, PhD (Funding acquisition; Writing—review & editing), Amy E Leader, PhD (Funding acquisition; Writing—review & editing), Amy A. Case, MD (Funding acquisition; Writing—review & editing), and Salimah H. Meghani, PhD (Conceptualization; Funding acquisition; Methodology; Writing—original draft; Writing—review & editing).

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Conflicts of interest

RLA has received funding from Novo Nordisk, Inc, for an investigator-initiated study unrelated to the current paper. The other authors report no conflicts of interest.

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Recent work in several fields of science has identified a bias in citation practices such that papers from women and other minority scholars are undercited relative to the number of such papers in the field (49–57). Here, we sought to proactively consider choosing references that reflect the diversity of the field in thought, form of contribution, gender, race, ethnicity, and other factors. First, we obtained the predicted gender of the first and last author of each reference by using databases that store the probability of a first name being carried by a woman (50,58). By this measure and excluding self-citations to the first and last authors of our current paper, our references contain 34.29% woman(first)/woman(last), 17.14% man/woman, 28.57% woman/man, and 20.0% man/man. This method is limited in that 1) names, pronouns, and social media profiles used to construct the databases may not, in every case, be indicative of gender identity, and 2) it cannot account for intersex, nonbinary, or transgender people. Second, we obtained predicted racial and ethnic category of the first and last author of each reference by databases that store the probability of a first and last name being carried by an author of color (59,60). By this measure (and excluding self-citations), our references contain 9.9% author of color (first)/author of color (last), 17.99% White author/author of color, 24.04% author of color/White author, and 48.08% White author/White author. This method is limited in that 1) names and Florida voter data to make the predictions may not be indicative of racial and ethnic identity, and 2) it cannot account for indigenous and mixed-race authors, or those who may face differential biases because of the ambiguous racialization or ethnicization of their names. Citations listed in the statement above were not included in this analysis. We look forward to future work that could help us better understand how to support equitable practices in science.

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