Cannabis Use Characteristics and Reasons for Product Choices Among Patients Accessing Treatment for Substance Use Disorders: A Mixed-Methods Study

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Justin Matheson[1], Harseerat Saini[1,2], Rebecca Haines-Saah[3], Marcos Sanches[4], Matthew E. Sloan[1,5-10], Adam Zaweel[1,7], Ahmed Hassan[1,5-8,10,11], Leslie Buckley[5,6], Amy Porath[12,13], James MacKillop[14-16], Christian S. Hendershot[17], Stefan Kloiber[6-8], & Bernard Le Foll[1,5-8,18, 19]

[1]Institute for Mental Health Policy Research, Centre for Addiction and Mental Health
[2]Human Biology Program, Faculty of Arts and Sciences, University of Toronto
[3]Cumming School of Medicine, University of Calgary
[4]Biostatistics Core, Centre for Addiction and Mental Health
[5]Addictions Division, Centre for Addiction and Mental Health
[6]Department of Psychiatry, University of Toronto
[7]Department of Pharmacology & Toxicology, University of Toronto
[8]Campbell Family Mental Health Research Institute, Centre for Addiction and Mental Health
[9]Department of Psychological Clinical Science, University of Toronto Scarborough
[10]Institute of Medical Science, University of Toronto
[11]Department of Psychiatry, King AbdulAziz University
[12]Knowledge Institute on Child and Youth Mental Health and Addictions
[13]Children's Hospital of Eastern Ontario Research Institute
[14]Michael G. DeGroote Centre for Medicinal Cannabis Research, McMaster University and St Joseph's Healthcare Hamilton
[15]Peter Boris Centre for Addictions Research, McMaster University and St Joseph's Healthcare Hamilton
[16]Department of Psychiatry and Behavioural Neurosciences, McMaster University
[17]Department of Population and Public Health Sciences and Institute for Addiction Science, Keck School of Medicine, University of Southern California
[18]Department of Family and Community Medicine, Faculty of Medicine, University of Toronto
[19]Waypoint Research Institute, Waypoint Centre for Mental Health Care

Corresponding Author: Justin Matheson, PhD, Center for Addiction and Mental Health, 100 Stokes Street. Toronto, Ontario, Canada, M6J 1H4. Email: justin.matheson@camh.ca

ABSTRACT

Objective: The diversity and potency of cannabis products have increased in recent years, underscoring the importance of understanding which products are being used and why. Patients with substance use disorders (SUDs) use have a high prevalence of risky cannabis use, making it especially important to understand use patterns in this group. We aimed to first describe cannabis product characteristics and then explore reasons for choosing products in our sample. **Method:** In this mixed-methods study, 472 adults who self-reported accessing SUD treatment and lifetime cannabis use completed an online survey. A subset of 22 participants completed in-depth interviews. Quantitative results focused on describing cannabis use characteristics (e.g., product types) among participants reporting past-year cannabis use (current use group) or lifetime cannabis use but no use in past year (past use group), while qualitative descriptive analysis was used to describe reasons for choosing products among participants who were currently using cannabis. **Results:** Across medical and non-medical use of cannabis, dried flower and smoked cannabis formulations were most used (e.g., 89% of the current use group reported smoking cannabis for non-medical purposes), followed by edibles (e.g., 53% of the current use group used edible formulations of cannabis for non-medical purposes), though there was considerable use of higher-potency products such as concentrates and dabs (e.g., 11% of the current use group had used dabs for non-medical purposes). Our qualitative analysis found that almost all participants were motivated by THC content when purchasing products, yet sometimes perceived medical benefits or harm reduction were reasons for using certain products (especially CBD-dominant products), while sometimes other factors (e.g., convenience, familiarity) were influential. **Conclusions:** Cannabis use characteristics (including motives for choosing products) are complex and nuanced in patients accessing SUD treatment. More work is needed to understand longitudinal relationships between use of different cannabis products and both harms and potential benefits.

Key words: = cannabis; addiction treatment; substance use disorder; medical cannabis; harm reduction

The legalization and commercial sale of non-medical cannabis has been paralleled by increasing diversity and potency of cannabis products, especially in Canada (Matheson & Le Foll, 2020). According to the 2023 Canadian Cannabis Survey, among individuals aged 16 years or older who reported past-year cannabis use, 60% had used dried flower or leaf, 54% had used edibles, and 34% had used vape pens or cartridges (Health Canada, 2023). Use of dried flower or leaf decreased between 2018 and 2023, while use of edibles, vape pens or cartridges, and beverages increased over this period (Health Canada, 2023). Similarly, in the Canadian province of Ontario, exclusive use of ingestion-based methods of cannabis use increased among adults aged 18 years or older between 2017 and 2022, while exclusive use of inhalation-based methods decreased (Nigatu et al., 2024). These trends are concerning, as prior research characterizing the health effects of cannabis use has largely focused on smoking dried flower as the primary mode of cannabis use, while growing evidence suggests that cannabis-attributable harms vary by mode of use (Gunn et al., 2020; Russell et al., 2018; Steeger et al., 2021). Furthermore, the potency of cannabis products, typically quantified as the proportion of Δ^9-tetrahydrocannabinol (THC), has been increasing in recent decades. For example, in the United States, mean THC potency increased from 9% in 2008 to 17% in 2017 (Chandra et al., 2019). This is also concerning, as higher-potency products are associated with an increased risk of psychosis and cannabis use disorder (CUD), and possibly anxiety and depression, according to a recent systematic review (Petrilli et al., 2022). Most of these data have been collected in general population or community samples, which reflect larger trends in cannabis use, potency, and impacts on mental health. However, little work to date has examined these relationships in clinical samples that are likely more vulnerable to the negative health effects of higher-potency cannabis use.

Cannabis use and CUD frequently co-occur with other substance use disorders (SUDs) (Hayley et al., 2017; Obadeji et al., 2022; Young-Wolff et al., 2021), which are often comorbid with mood and anxiety disorders (Lowe et al., 2019).

People with SUDs may use cannabis for temporary relief of mood and anxiety symptoms, which is a commonly cited reason for medical use of cannabis (Corroon et al., 2017; Lucas & Walsh, 2017). A recent study including a large sample of participants aged 16-65 years residing in Canada (n = 10,057) or the United States (n = 17,112) found that prevalence of cannabis use was nearly twice as high among people with at least one mental health condition (not inclusive of SUD) compared to those with no conditions (Rup et al., 2021). Furthermore, participants reporting at least one mental health condition were more likely than those with no conditions to report use of several cannabis product types, especially high-potency products such as vaped oils, orally ingested oils, and concentrates (Rup et al., 2021). Use of higher-potency cannabis products has been associated with increased risk of CUD and self-report of cannabis consequences (e.g., poor memory and paranoia; Freeman & Winstock, 2015; Gunn et al., 2020). Limited research has considered relationships between cannabis product choices and other substance use; for example, vaping cannabis (compared to other methods of cannabis use) has been associated with greater use of alcohol and tobacco among adolescents and adults (Morean et al., 2021; Sun et al., 2023). However, there is a lack of information about use of cannabis products in people seeking treatment for SUDs.

The ongoing diversification of cannabis products on the market, coupled with the growing evidence that certain cannabis product types (including higher-potency products) are associated with greater risk of cannabis-attributable harm, underscores the need to understand cannabis use characteristics among populations who may experience more harms than benefits. We used data from a mixed-methods project to describe cannabis use characteristics of a sample of adults accessing SUD treatment in Ontario, Canada, with two specific goals in mind. First, using quantitative data from a cross-sectional survey, we sought to describe which cannabis products participants report using, where they purchase these products, and where they get information about products, for both self-reported medical and non-medical use. We chose to focus on both medical and non-medical use of cannabis as there is substantial overlap in use (Schauer et al., 2016). Moreover, prior work has found a high prevalence of non-medical (recreational) use among those who self-report medical use of cannabis, which is even higher among individuals reporting at least one (broadly defined) mental health condition (Morean & Lederman, 2019). Second, using qualitative data from in-depth, one-to-one interviews, we examined reasons for purchasing and using different cannabis products. We note that our focus was on understanding motives for using different cannabis products, not overall motives for using cannabis, which will be explored in a future manuscript.

METHODS

This mixed-methods study employed a convergent parallel design. The quantitative (survey) and qualitative (interview) phases of data collection occurred simultaneously; data were analyzed separately and then combined so that both data sources informed one another.

Participants

Participants accessing SUD treatment in Ontario, Canada were invited to participate in an anonymous online survey using REDCap (Research Electronic Data Capture; Harris et al., 2009). Recruitment flyers were distributed through several networks of hospitals and treatment centres offering addiction treatment services in Ontario, Canada (e.g., the Centre for Addiction and Mental Health [CAMH] in Toronto and St. Joseph's Healthcare in Hamilton). Participants interested in completing the survey were sent a link to view an electronic consent form. Participants reviewed the consent form and selected a checkbox to indicate their consent to continue. Eligibility criteria were self-reported and included: being 18 years or older, ever accessing services at an addiction-focused treatment center in Ontario, and ever having been diagnosed with or treated for any SUD. If participants were ineligible, the survey terminated and no data were collected; otherwise, eligible participants were routed to complete the survey. Survey completers were directed to a separate REDCap project to enter their email address to receive a $20 electronic gift card and to indicate if they were interested in participating in a virtual, in-depth, one-to-one interview (described more below). Data collection began in April 2022

and concluded in January 2023. This study was reviewed and approved by CAMH Research Ethics Board (protocol # 061/2021).

Quantitative Measures and Analysis

Demographic and SUD information. All demographic and SUD questions are available in the Supplementary Materials. Gender identity, sexual identity, racial/ethnic group, income, and education were all recoded from their original values. Information about SUD treatment type is presented in eTable 1.

Cannabis use characteristics. Participants were first asked if they had ever used cannabis (no = never use) and then if they had used cannabis in the past year (no = past use, yes = current use). Data from the never use group are not included here but are reported elsewhere. For most questions, the current use group was asked about past-year use (e.g., "In the past 12 months, have you used the following products…") and the past use group about lifetime use (e.g., "In the past, did you ever use the following products…"). See Supplementary Materials for all cannabis use questions.

Data analysis. All quantitative data analysis was conducted in IBM SPSS Statistics (Version 27). There were 692 total records in the survey project; 90 records were excluded because they did not provide any data beyond answering the first few demographics questions, and an additional 57 records were excluded for completing the survey in an impractically short time (less than 10 minutes, suggesting poor data quality). One participant did not answer the question about cannabis use history and 72 participants had never used cannabis, leaving 472 for this analysis (363 current use and 109 past use). Demographic and cannabis use characteristics are presented descriptively (count and percentages). Note that some participants did not answer all survey questions, thus sample sizes differ between survey items. The exact sample sizes informing the descriptive results are included in Tables 1 and 2.

Qualitative Data Collection and Analysis

Interviews. Participants who indicated interest in the interviews were sent an electronic consent form to review. Scheduling of interviews was conducted on a first-come basis. All interviews were conducted by the first author (JM) using the WebEx platform and started with a virtual consent discussion. In addition to meeting the eligibility criteria to participate in the survey, participants were required to endorse current (past-year) cannabis use to participate in the interviews. Interviews began once eligibility criteria were confirmed and once the participant signed the electronic consent form. An interview guide was developed and reviewed by the study team. In the first section, participants were asked about cannabis use motives, trajectories, and subjective experiences. In the second section, participants were asked about their cannabis product purchasing and information sources, as well as preferences. Finally, the third section focused on cannabis expectancies. The full interview guide is provided in the Supplementary Materials. Interviews were audio-recorded using WebEx software (no video recording) and transcribed verbatim by a professional transcriptionist.

Quantitative analysis. The goal of the qualitative data analysis was to better understand reasons for cannabis product choices and sources of information about cannabis, which led us to use a qualitative descriptive analysis approach (Doyle et al., 2020). Qualitative descriptive analysis is an ideal approach when studies do not need to be grounded in a deep theoretical context, when data coding and analysis are meant to stay close to participants' experiences (with a focus on description, not interpretation), and when qualitative analysis is conducted in conjunction with quantitative data (i.e., mixed-methods). Our coding was semantic and primarily deductive, as it was informed by our pre-existing knowledge of cannabis use and by the structure of the survey responses (i.e., where possible, we tried to align codes with specific response items in the surveys to facilitate comparisons between the quantitative and qualitative data). The entire interview transcript was considered for coding, though we did not engage in line-by-line coding, and coded only data relevant to our research question (which was primarily in the second section of the interview). Our research question that guided coding had two parts: part one focused purely on description of which cannabis products participants reported purchasing, where they purchased these products, and where they obtained information about

products; part two focused on understanding why participants had preferences for different cannabis products. The first two authors, a postdoctoral researcher (JM) and a senior undergraduate student (HS), coded the transcripts.

To guide analysis, we followed the steps of thematic analysis as developed by Braun and Clarke (2006), though we did not follow Braun and Clarke's more recent approach of reflexive thematic analysis (Braun & Clarke, 2019) given that our analysis was intended to be descriptive (not critical/interpretive). First, we read and re-read interview transcripts (in their entirety), kept notes, and had regular meetings to discuss initial findings. Next, we both independently coded a subsample of interviews, and then met to discuss and develop a working list of codes. HS then re-coded all the interviews and JM reviewed all coding and made some minor adjustments (which were mutually agreed upon). Codes related to the first part of our research question (i.e., those corresponding to survey items) were used to quantitate and tabulate cannabis use characteristics and facilitate comparison with the survey data. Once this quantitation was completed, we focused our thematic analysis on the codes that described reasons for cannabis product preferences. To develop themes, we first created a table with our central research question written at the top: "What is guiding cannabis product selection and preferences?" We then added to the table all codes along with their frequency in the dataset and associated data extracts. Next, we generated several additional blank tables and copied codes and their associated data extracts into these tables to organize data into tentative themes. To determine if the codes "fit" together and represented a coherent pattern across the entire dataset, we re-read all the data extracts within each code, wrote a new summary of each code, summarized each tentative theme, and then compared the code summaries to the theme summaries to ensure there was internal homogeneity. Finally, we named the themes, selected compelling data extracts to support each theme, and further refined each theme as we wrote the initial version of this manuscript. In order to attribute quotes, we assigned each participant a random letter and included their age, gender (note that gender was an open-ended question and the language used to identify participants' gender matches their verbatim response), and self-reported SUDs (AUD: alcohol use disorder; BUD: benzodiazepine use disorder; CUD: cannabis use disorder; CoUD: cocaine use disorder; MUD: methamphetamine use disorder; OUD: opioid use disorder).

Table 1. *Demographic Characteristics and Self-Reported SUDs, by Cannabis Use Group (n = 472)*

Characteristic	**Current Use (*n* = 363)**	**Past Use (*n* = 109)**
Sex assigned at birth (*n*, %)		
Female	134 (37%)	44 (40%)
Male	228 (63%)	64 (59%)
Intersex/Other	1 (0.3%)	1 (1%)
Gender identity (*n*, %)		
Cisgender woman	125 (34%)	45 (41%)
Cisgender man	222 (61%)	64 (59%)
Gender minority	16 (4%)	0
Sexual identity (*n*, %)		
Heterosexual	265 (73%)	100 (92%)
Sexual minority	98 (27%)	9 (8%)
Age (mean, SD, range)	35.2 (10.0) [18-69]	35.4 (12.6) [19-73]
Racial/ethnic group		
Asian	40 (11%)	31 (28%)
Black	58 (16%)	24 (22%)
Indigenous	13 (4%)	6 (6%)
Latin American	20 (5.5%)	5 (5%)

Middle Eastern	7 (2%)	2 (2%)
White	193 (53%)	35 (32%)
Mixed/Other	29 (8%)	5 (5%)
Don't know	3 (0.8%)	1 (1%)
Income		
$0 - $14 999	78 (22%)	24 (22%)
$15 000 - $29 999	100 (28%)	47 (43%)
$30 000 - $59 999	74 (20%)	13 (12%)
$60 000 or more	77 (21%)	19 (17%)
Don't know	34 (9%)	6 (6%)
Education		
Less than high school diploma	50 (14%)	17 (16%)
High school diploma	56 (15%)	19 (17%)
Some college	43 (12%)	15 (14%)
College diploma	71 (20%)	24 (22%)
Some university	40 (11%)	14 (13%)
University degree	103 (28%)	20 (18%)
Don't know	0	0
Housing[1]		
Own home	58 (16%)	33 (30%)
Renting	214 (59%)	52 (48%)
Boarding home	5 (1%)	2 (2%)
Correctional facility	2 (0.6%)	0
Unhoused	12 (3%)	3 (3%)
Group home	4 (1%)	0
Shelter/hostel	14 (4%)	2 (2%)
Supportive housing	15 (4%)	7 (6%)
Living with parents	46 (13%)	13 (12%)
SUD diagnosis[1] (n, %)		
Alcohol use disorder	207 (57%)	50 (46%)
Sedative use disorder	21 (6%)	9 (8%)
Cannabis use disorder	119 (33%)	19 (17%)
Stimulant use disorder	51 (14%)	6 (6%)
Cocaine use disorder	73 (20%)	25 (23%)
Opioid use disorder	79 (22%)	21 (19%)
Hallucinogen use disorder	20 (6%)	7 (6%)
PCP use disorder (and related)	11 (3%)	1 (1%)
Inhalant use disorder	1 (0.3%)	1 (1%)

Note. [1]Participants could select multiple options, so column does not add to 100%.

RESULTS

Demographic and SUD Characteristics

In both cannabis use groups (current use and past use groups), over half of participants were cisgender men (current use, 61%; past use, 59%), the majority were heterosexual (current use, 73%; past use, 92%), and the mean age was 35 years. The largest percentage of participants self-identified as white for both groups (current use, 53%; past use, 32%), followed by Black (current use, 16%; past use, 22%) and Asian (current use, 11%; past use, 28%). In both groups, the most common self-reported SUD was alcohol use disorder (current use, 57%; past use, 46%), with similar proportions reporting cocaine use disorder (current use, 20%; past use, 23%) and opioid use disorder (current use, 22%; past use, 19%), and more cannabis use disorder in the current use group (33%) relative to the past use group (17%). See Table 1.

Table 2. *Cannabis Use Characteristics, by Cannabis Use Groups (n = 465)*

Cannabis use characteristic[1]	**Current Use (n = 356)**	**Past Use (n = 109)**
Reason for use (*n*, %)		
Medical reasons	35 (10%)	9 (8%)
Recreational reasons	132 (37%)	78 (72%)
Both	177 (50%)	15 (14%)
Don't know	12 (3%)	7 (6%)
Physician or NP recommended medical cannabis (*n*, %)	n=338	n=68
Yes	104 (31%)	11 (16%)
No	234 (69%)	57 (84%)
Authorization for medical cannabis (*n*, %)	n=337	n=66
Yes	82 (24%)	9 (14%)
No	255 (76%)	57 (86%)
Products used for medical purpose[2] (*n*, %)	n=284	n=39
Dried flower	235 (83%)	26 (67%)
Hashish	67 (24%)	6 (15%)
Liquid concentrate	67 (24%)	7 (18%)
Oil or disposable vape	110 (39%)	9 (23%)
Solid concentrate	38 (13%)	4 (10%)
Edible	129 (45%)	14 (36%)
Liquid	50 (18%)	5 (13%)
Other	29 (10%)	6 (15%)
THC and CBD content for medical use[2] (*n*, %)	n=298	n=46
CBD only	53 (18%)	16 (35%)
THC only	126 (42%)	17 (37%)
High CBD/low THC	56 (19%)	8 (17%)
High THC/low CBD	131 (44%)	9 (20%)
Balanced THC and CBD	90 (30%)	7 (15%)
Other	8 (3%)	5 (11%)
Source of cannabis product for medical use[2] (*n*, %)	n=298	n=45
Self-grown	24 (8%)	2 (4%)
Grown by others	21 (7%)	1 (2%)
Shared with a group of friends	34 (11%)	15 (33%)
From family or friend	52 (17%)	12 (27%)
From an acquaintance	33 (11%)	10 (22%)
From a dealer or storefront	222 (74%)	23 (51%)
Health Canada licensed producer by mail order	63 (21%)	4 (9%)
Other	10 (3%)	3 (7%)
Don't know	8 (3%)	0
Source of information for medical cannabis use[2] (*n*, %)	n=260	n=54
From a friend	99 (38%)	20 (37%)
From a physician/nurse practitioner	70 (27%)	31 (57%)
From a newspaper article	29 (11%)	5 (9%)
From social media	55 (21%)	10 (18%)
From websites	108 (42%)	22 (41%)
Other	35 (14%)	1 (2%)
Method of non-medical cannabis use[2] (*n*, %)	n=350	n=105
Smoking	313 (89%)	90 (86%)
Eating	187 (53%)	42 (41%)
Drinking	83 (24%)	12 (11%)

Vaporizing (non-portable)	50 (14%)	11 (10%)
Vaporizing (portable)	118 (34%)	10 (10%)
Dabbing	39 (11%)	11 (10%)
Other	20 (6%)	4 (4%)
Source of cannabis product for non-medical use[2] (n, %)	n=349	n=108
Self-grown	31 (9%)	5 (5%)
Grown by others	26 (7%)	5 (5%)
Shared with a group of friends	70 (20%)	60 (56%)
From family or friend	79 (23%)	32 (30%)
From an acquaintance	60 (17%)	21 (19%)
From a dealer or storefront	263 (75%)	40 (37%)
Health Canada licensed producer by mail order	69 (20%)	4 (4%)
Other	4 (1%)	2 (2%)

Note. [1]Current users were asked about their cannabis use characteristics in the past 12 months, while past users were asked about their characteristics over their lifetime. [2]Participants were instructed to select no option if none applied, thus the total n for each question is different; participants could also select more than one option, so columns do not add up to 100%.

Cannabis Use Characteristics (Survey)

Overall, the majority of participants reported recreational use (current use, 37%; past use, 72%) or mixed recreational/medical use (current use, 50%; past use, 14%). Medical use only was rare in both groups (current use, 10%; past use, 8%). All participants were asked additional questions about both medical and non-medical use of cannabis, regardless of their endorsement of medical/non-medical use in this initial question. See Table 2.

Medical use. A minority of participants had received a recommendation from a physician or a nurse practitioner to use cannabis for medical purposes (current use, 31%; past use, 16%) and a slightly lower percentage self-reported receiving an authorization to use medical cannabis (current use, 24%; past use, 14%). Among both groups, the most common product used for medical purposes was dried flower (current use, 83%; past use, 67%), followed by edibles (current use, 45%; past use, 36%), and then oil or disposable vape (current use, 39%; past use, 23%). In the current use group, the most common cannabinoid profile of medical cannabis was High THC/Low CBD (44%), followed closely by THC Only (42%), and then Balanced THC and CBD (30%). In the past use group, the most common profile was THC Only (37%), followed by CBD Only (35%), and then High THC/Low CBD (20%). The current use group predominantly sourced cannabis products for medical purposes from a dealer (presumably illicit source) or storefront (74%), while the past use group reported more a range of sources, mixed between a dealer or storefront (51%), shared with a group of friends (33%), or from family/friends (27%). The most common source of information about cannabis for medical purposes among the current use group was websites (42%), followed by friends (38%), and then from a physician or nurse practitioner (27%). Among the past use group, physician/nurse practitioner was the most common source (57%), followed by websites (41%), and then friends (37%).

Non-medical (recreational) use. For recreational purposes, the vast majority of both the current use group (89%) and the past use group (86%) reported smoking, while the second most common method was eating cannabis (current, 53%; past use, 41%). Portable vaporizers and drinking cannabis were also relatively common in the current use group only (34% and 24%, respectively). The current use group predominantly sourced non-medical cannabis from a dealer or storefront (75%), while the past use group shared cannabis with friends or family (56%), obtained from a dealer or storefront (37%), or from a friend or family (30%).

Qualitative Results (Interviews)

In terms of gender, age, and self-reported SUD diagnosis, the interview sample was very similar to the survey sample. We provide in Table 3 quantitation of the qualitative interview transcript coding. Overall, the interview data triangulate with the survey data: purchasing from

a legal storefront was the most common method of accessing cannabis (90.9%), smoking was the most common mode of use (72.7%), and dried flower was the most commonly reported product (86.4%). The only notable difference was source of information: in the interviews, most participants reported getting information about cannabis products from non-government websites (59.1%) or directly from legal storefronts (50.0%). In the survey (see Table 2), 27% of participants in the current use group reported getting information about medical cannabis from a physician or nurse practitioner, yet no interviewed participants mentioned obtaining any information about cannabis from a healthcare provider. Obtaining information directly from legal storefronts was not an option in the survey, though it could have been included in the "other" option reported by 14% of participants in the current use group. Thus, it is likely that our survey missed capturing the high proportion of cannabis consumers obtaining cannabis information from storefront dispensaries, an important insight gained from the interviews.

Table 3. *Sociodemographic, Clinical, and Cannabis Use Characteristics of the Interview Sample (n = 22)*

Pre-interview questions	
Gender[1] (*n*, %)	
Female	9 (40.9%)
Male	12 (54.5%)
Genderfluid	1 (4.54%)
Age (mean, SD, range)	34 (7.0) [21-47]
SUD diagnosis[2] (*n*, %)	
Cannabis Use Disorder	11 (50.0%)
Alcohol Use Disorder	13 (59.1%)
Cocaine Use Disorder	3 (13.6%)
Methamphetamine Use Disorder	2 (9.09%)
Benzodiazepine Use Disorder	1 (4.54%)
MDMA Use Disorder	1 (4.54%)
Opioid Use Disorder	3 (13.6%)
Ketamine Use Disorder	1 (4.54%)
Quantitation of qualitative coding	
Where do you access cannabis? (*n*, %)	
Legal storefront	20 (90.9%)
Government website	2 (9.09%)
Illicit source	3 (13.6%)
Friends or family	5 (22.7%)
Grow at home	2 (9.09%)
Where do you get information about cannabis? (*n*, %)	
Legal storefront	11 (50.0%)
Friends or family	5 (22.7%)
Government website	1 (4.54%)
Non-government website	13 (59.1%)
Other	1 (4.54%)
No info needed	3 (13.6%)
Mode of cannabis use (*n*, %)	
Dabbing	5 (22.7%)
Oral	14 (63.6%)
Smoking	16 (72.7%)
Topical	1 (4.54%)
Vaping	12 (54.5%)
Product type (*n*, %)	

Capsules or oils	4 (18.2%)
CBD-dominant or CBD-only	6 (27.3%)
Concentrates	4 (18.2%)
Dried flower	19 (86.4%)
Drinks	1 (4.54%)
Edibles	14 (63.6%)
Vape pen	13 (59.1%)

Note. [1]"What is your gender?" was an open question; participants' preferred/self-reported language is used here. [2]Participants could indicate multiple SUD options.

In addition to quantitation of the codes used to describe cannabis use characteristics, which was intended to complement the survey data, we used thematic analysis to determine what was guiding participants in making decisions about purchasing cannabis products. We developed three themes.

Our first theme, *THC to Feel High*, describes how THC content was by far the most consistent factor guiding cannabis product decisions. Nearly all participants (n = 19) were interested in knowing the THC content of cannabis products when making purchasing decisions. Some participants wanted the highest possible THC content, such as Participant A (31, Female, CUD), "I base mine on the highest percentage of THC," and Participant C (47, Female, MUD/OUD), "I always look for a higher THC level." Other participants had specific preferences for THC content. Six participants who primarily purchased dried flower explicitly stated their preferred THC content, which ranged from 16% to 30% THC. Other participants were less specific, but wanted more THC than CBD or no CBD at all, such as Participant F (31, Female, CUD), "I typically try to go for the strains that have more THC than CBD," and Participant V (40, Male, AUD/BUD/CUD), "I'm not looking for it [CBD]… because it takes away from the THC in the weed." Some participants noted changes in their THC preferences, e.g., Participant E (33, Male, CUD): "If you would have asked me a month ago, I would have told you that I'm looking for the highest THC level. But now that I've been dealing with getting sick from smoking so much, I'm actually trying to keep it around, like, 20 at highest."

While most participants spoke about THC content independently of specific product types, product type and route of administration came up more often in relation to the speed or intensity of the THC high. Using cannabis concentrates with a vape pen or by dabbing (which typically deliver very high doses of THC) were preferred for the immediate feeling of high and the intensity of the high. For example, Participant N (28, Female, AUD/CUD) noted, "I also have been, like, smoking dabs more recently" because "It's a way faster high." Similarly, Participant C (47, Female, MUD/OUD) noted, "Smoking, like, the distillate, or the pens, it's really intense. It gets me, like, it gives me an intense feeling, right?" She also noted that "oils, or, like, the shatter products…intensify the feeling of the other drugs." She went on to explain that the choice to use "more intense products" was dependent on setting: "So, I'll smoke that [high-potency products] in, like, a social situation, if I'm having company over, you know, whereas I'll smoke the flower when I'm by myself. I'll take a hit off a bong, just to relax, chill out, you know. I'm by myself." Some participants reported disliking edibles because of the delayed onset of effects or because of a blunted or non-existent high. For example, Participant P (25, Male, AUD/CUD/CoUD) explained that "just having to wait for an hour and having it last for longer periods of time than smoking flower is not as ideal for me." One participant, however, did have a dissenting opinion on edibles: Participant L (40, Male, OUD) noted, "for the longest time I was very apprehensive to getting edibles because my experience with them has been that they're way too strong, like they're uncomfortably strong."

In summary, our first theme identified THC content as the most consistently self-reported factor in determining cannabis product choices across our dataset. Nearly all participants often looked for higher-THC products, and many preferred inhaled products with very high THC levels such as vape pens and dabs, which suggests that the speed and intensity of the THC high are major motives for choosing between products. However, is it important to note that not all participants were interested in high-THC

products, and among those who were, preferences for products changed both in the short-term (e.g., when in a social setting compared to using alone) and the long-term (e.g., in response to experiencing physical or mental health challenges). In general, choosing cannabis products based on THC content was unrelated to other substance use or SUD symptoms, with the exception of one participant who felt that higher-potency products intensified the effects of other drugs.

Our second theme, *Health and Harm Reduction*, describes how participants are often concerned about their physical and mental health when choosing cannabis products, which leads to a focus on CBD content or avoiding certain products that have had negative effects in the past. Under half of participants (n = 8) specifically mentioned CBD content as an important factor guiding cannabis product decisions. Unlike with THC content, no participants had a numeric CBD content in mind when purchasing products, but rather looked for any "high-CBD" or "balanced" (CBD-THC equivalent) products. Of the seven participants who mentioned potential medical benefits as a factor when deciding which cannabis products to purchase, five specifically mentioned CBD, which was perceived as being useful for pain management, anxiety reduction, and improved sleep. For example, Participant R (29, Female, MUD) noted that "higher CBD is better for pain. So, I was smoking higher CBD in my weed, and it was helpful... And it was nicer than taking the Percocets because I didn't like how they made me feel". Similarly, Participant Q (47, Male, CUD) noted, "it's all mainly CBD-based… I take it if I have anxiety or, you know, my back's killing me, and stuff like that."

Other participants used different cannabis products (especially high-CBD products) as a harm reduction strategy, such as Participant P (25, Male, AUD/CUD/CoUD): "I sometimes use CBD if I'm just taking a break from smoking [cannabis], whether it's for, you know, a week or a month…it's a good substitute because it doesn't get me high. And it can also help with, like, the general withdrawal of not smoking weed, just the anxiety, the lack of sleep, all those things. CBD helps a lot with that." Participant K (34, Male, AUD) described gravitating towards higher-CBD products because "it gives me kinda something to do with my hands" during periods of reducing use of THC. He made an analogy with alcohol: "[CBD] is like, non-alcoholic beer or something like that, you know?" Similarly, Participant G (29, Male, AUD) noted, "I tend to go for higher CBD and then lower THC strains because I do not know my limits and I will smoke an entire joint to myself. And if I smoke something that's far too concentrated in THC, then I will be, like it will take my entire day away from me."

Some participants felt that the use of specific cannabis products helped them avoid or reduce alcohol use. Participant T (38, Female, AUD/CoUD) explained that, "I will buy the weed drinks just for the social aspect, if my friends are drinking beer or something." She elaborated that consuming cannabis-infused beverages substituted for drinking alcohol in social situations because she "[felt] more involved" when others were drinking alcohol. Similarly, Participant J (39, Male, AUD) described using certain products to avoid drinking alcohol: "In my current moments when I feel like I would rather go binge drinking, to not be drinking, I use concentrates, like a lot, like maybe one gram of concentrate with, like, 80% of THC." While he perceived this use of high-THC products as harmful to his health, it was still reduced harm compared to using alcohol: "I would rather relapse on using too much cannabis rather than using any amount of alcohol, which leads to painful abstinence syndrome later."

Under half of participants (n = 9) were motivated by avoiding or reducing negative effects when purchasing cannabis products. Choosing products based on their anxiolytic effects was common, which was sometimes linked to the distinction of Indica or Sativa products. For example, Participant A (31, Female, CUD) explained, "So, if I smoke an Indica, I know it's gonna come. The anxiety is, or the paranoia may set in more. When I'm smoking a sativa or a sativa hybrid profile, I don't feel as much anxiety and paranoia… Versus if I'm smoking an indica, then I'm locked in my chair just sitting there, thinking, like, why did I do this to myself?" For other participants, more CBD and less THC was a strategy to avoid anxiety, as described by Participant F (31, Female, CUD): "And then just in certain circumstances when I have experienced anxiety from strains that have maybe a little bit too much THC, I will try to do a little bit more of the CBD." For some participants, edibles were

preferred over dried flower products to avoid inhaling smoke, such as Participant G (29, Male, AUD): "I got into edibles for a little bit, because I got sick, and I felt like it wasn't smart to be smoking. So, I started buying any kind of edible that I could find at the dispensary, and keeping my dosage to maybe, like, 50 milligrams max, because I know I'm super sensitive to edibles."

Others preferred vaping for health reasons, such as Participant E (33, Male, CUD): "Um, vaping's kind of, like, the middleman. Like, he's in-between to help with the cravings, or if I'm sick and would rather vape than smoke to, you know, not hurt my throat or lungs as much - as much. Like, it's just something to puff on through the day." In contrast, two participants were concerned about potential harmful effects of vaping. For example, Participant M (30, Genderfluid, AUD/CUD) described an unpleasant experience with vaping: "It was a more intense kind of burning and kind of spasming that I felt, I felt in my lungs. And I had a way more severe kind of, very bronchial kind of chest cough that I hadn't had before."

In summary, our second theme demonstrates how participants perceive the relationship between cannabis products and their physical and mental health, which can influence product choices. For some participants, products with more CBD were perceived as having some direct medical benefits or as being useful for reducing THC intake. A few participants used specific cannabis products (beverages or high-potency concentrates) as a strategy to avoid or reduce use of alcohol. Edibles and vaping were sometimes preferred over smoking cannabis to avoid some of the perceived physical health consequences of smoking. In some cases, participants had negative experiences with certain products, which led them to find alternative products.

Our third and final theme, *Convenience, Familiarity, and Price*, describes how participants are not always concerned about the cannabinoid content or specific effects of cannabis products. Under half of participants ($n = 8$) highlighted the convenience of either purchasing or using a product as an important factor guiding purchasing behaviour. For example, Participant K (34, Male, AUD) noted the convenience of using vape pens: "If I'm out and about and I want a quick puff, I'll just have my vape pen in my bag." Similarly, Participant G (29, Male, AUD) noted, "Ah, if I'm lazy, [I'll buy] pre-rolled joints."

A similar minority of participants ($n = 7$) noted that their choice of products was rooted in familiarity. For nearly all of these participants, smoking dried flower was their introduction to using cannabis and this remained their preferred mode of use. For example, when Participant P (25, Male, AUD/CUD/CoUD) was asked why he preferred purchasing dried flower, he explained: "Just the way I've always been consuming weed is I prefer it that way." Similarly, Participant M (30, Genderfluid, AUD/CUD) explained (about smoking dried flower), "I think there's an aspect that that's kind of how I was introduced into weed. I don't really know any other way. I did, for a while, when I was trying to get off smoking and I was vaping for a while, I did vape some weed, and didn't really like the effect that I felt on it, on my lungs and stuff." Finally, some participants ($n = 7$) focused mostly on the price of products when deciding which to purchase. Often, the price influenced where participants would purchase products, but sometimes price also influenced which types of products to purchase. For example, Participant V (40, Male, AUD/BUD/CUD) noted that his continued purchase of one specific strain of dried flower was because "that's the biggest bang for your buck."

In summary, our third theme demonstrates that THC and CBD content and expected drug effects are not always guiding factors when choosing between products. Sometimes, the convenience of purchasing or using certain products supersedes other factors, or the price is more salient. For some participants, familiarity with one mode of cannabis use (usually smoking dried flower) led to a consistent preference when making purchasing decisions. It is important to note that, across all three themes, most participants reported multiple (sometimes opposing) reasons for choosing certain products over others, which varied depending on factors such as social setting and changes in mental or physical health.

DISCUSSION

Growing evidence suggests that risks associated with cannabis use vary by product type, yet little research has examined cannabis use characteristics of patients accessing SUD

treatment, who are likely at elevated risk of experiencing cannabis-attributable harms. Using data from a mixed-methods project of patients accessing SUD treatment, our goal was to use quantitative survey data to describe cannabis use characteristics and qualitative in-depth interview data to better understand why certain cannabis products are preferred. Overall, we found that the most common mode of using cannabis was smoking dried flower, yet there was considerable use of edibles and higher-potency products such as concentrates. In our qualitative analysis, we found that nearly all participants looked to THC content when purchasing products and often favored products and modes of use that led to faster or more intense highs. Yet, some participants were motivated by avoiding negative effects (e.g., titrating down THC content to avoid ill health) or by perceived medical effects when purchasing certain products (especially CBD-dominant products). Further, other motives such as convenience, familiarity, and price were occasionally more salient when choosing cannabis products.

Most of the cannabis characteristics (based on both the survey and the interview data) followed expected patterns that mirror large population surveys such as the 2018-2023 Canadian Cannabis Surveys (Health Canada, 2023). The most commonly reported cannabis products for medical purposes were dried flower and edibles, the most common method of recreational cannabis use was smoking (followed by eating), and most common source of cannabis was legal storefronts or dealers (though there was a higher proportion of the past use group that reported obtaining cannabis from friends and family). There were notable percentages of participants reporting using liquid concentrates (24% of the current use group), oils or disposable vapes (39%), and solid concentrates (13%) for self-reported medical purposes. This is concerning since these product categories are typically associated with increased harms (Matheson & Le Foll, 2020), yet is in line with prior work. For example, results from the International Cannabis Policy Study revealed a higher likelihood of using higher-potency cannabis products (including concentrates) in survey respondents reporting mental health conditions compared to those with no conditions (Rup et al., 2021). In the 2023 Canadian Cannabis Survey, 22% of respondents who had used cannabis for mixed (medical and non-medical) purposes reported use of concentrates or extracts, compared to just 9% of respondents reporting either medical or non-medical use only (Health Canada, 2023).

The prevalent use of high-potency cannabis products in this sample of patients accessing SUD treatment could present an important opportunity for better knowledge exchange between clinicians and patients. In the current cannabis use group, only 27% reported getting information about medical cannabis from a physician or nurse practitioner (while 42% reported getting information from websites and 38% from friends). This finding was corroborated in the qualitative interviews where not a single participant mentioned getting any kind of information about cannabis from their clinicians (most participants asked budtenders at legal storefronts or relied on websites like Reddit for medical information). One potential reason patients are not discussing their cannabis use with clinicians and healthcare providers is stigma. In prior qualitative research from Canada, people who used cannabis for medical purposes reported experiencing skepticism and dismissal from healthcare providers, which likely eroded trust in patient-provider relationships and may have led to increased covert use of cannabis (Bottorff et al., 2013). Relatedly, lack of sufficient training and education about cannabis use (including potential medical uses) could make clinicians hesitant to ask patients about cannabis, especially given the rapidly evolving cannabis landscape (Fehr et al., 2024). More work is needed to overcome barriers related to cannabis knowledge exchange between patients and clinicians, which will hopefully present opportunities for clinicians to counsel patients to limit their use of high-potency products and other potentially risky or harmful cannabis use patterns. Improved knowledge exchange will also be necessary if medical cannabis is to be considered in the context of SUD treatment, given the complexity of evidence for balancing harms and potential medical benefits of cannabis in patients with SUDs (Fehr et al., 2024).

In our thematic analysis, we found that THC content was the most common deciding factor when choosing products, where a high THC content was preferred. Modes of use that increase the speed or intensity of the cannabis high (e.g.,

dabbing or vaping concentrates) were often (but not always) preferred over modes with slow onset of effects (e.g., edibles). Conversely, about half of participants were also motivated by avoiding negative effects or by perceived medical benefits of certain cannabis products, especially CBD products (e.g., effects on sleep, pain, or anxiety, or reduction of harms associated with THC use). A prior survey of adults self-reporting medical use of cannabis found that use of vaporized concentrates was significantly higher when participants reported mixed (recreational/medical) use of cannabis compared to medical use only (46% vs. 25%), which led the authors to suggest that use of concentrates might facilitate recreational use among individuals reporting primarily medical use of cannabis (Morean & Lederman, 2019). Our data lend partial support to this interpretation; while none of our interviewed participants used cannabis exclusively for medical reasons, many reported using certain cannabis products (e.g., edibles, high-CBD products) for perceived medical effects, despite also using higher-THC products (including concentrates) for non-medical purposes, usually on different days or for different periods of time. Use of different products for different reasons at different times presents a substantial challenge to interpreting data examining the health effects of cannabis, yet prior work has employed different methodologies to capture this level of nuance. For example, a study using ecological momentary assessment (EMA) daily diary data found that individuals who reported mixed use of cannabis used less cannabis and alcohol on days when cannabis was used for medical reasons, while they reported greater use of both cannabis and alcohol on days when cannabis was used for exclusively non-medical reasons (Coelho et al., 2023). Furthermore, the reduction in both cannabis and alcohol use on days of medical reasons for using cannabis was not accompanied by a change in the number of different types of cannabis used, suggesting that decreased use of dried flower for medical reasons was not accompanied by an increase in use of other cannabis product types (Coelho et al., 2023).

The use of cannabis as harm reduction has received a lot of attention in the literature (Adinoff & Cooper, 2019; Chaiton et al., 2022; Fehr et al., 2024), which was echoed in a minority of participant interviews, where reducing harms was a major motivating factor for some participants when deciding which products to use. Among participants who perceived specific cannabis products as potential harm reduction, the majority focused on CBD-containing products as a strategy for reducing harms associated with THC use. Some participants perceived CBD as a substitute for THC, while some had the perception that CBD helped manage withdrawal symptoms when abstaining from or reducing use of THC. This is similar to the findings of a cross-sectional study in France, where a minority of participants who used cannabis (11%) reported that their primary motive for using CBD was to reduce cannabis consumption, and this was reportedly due to CBD reducing withdrawal symptoms (Fortin et al., 2022). Whether or not CBD is an effective treatment for SUD symptoms is beyond the scope of our paper (readers are directed to recent reviews on this topic [Elsaid et al., 2019; Karimi-Haghighi et al., 2022; Kloiber et al., 2020; Nona et al., 2019; Paulus et al., 2022]), but our data suggest that CBD may have some value as a harm reduction approach for some patients with CUD. Relatedly, two participants shared experiences of using specific cannabis products to reduce or avoid alcohol use. One participant who was abstinent from alcohol used THC-infused beverages to feel "included" in social situations where friends were drinking alcohol, while another participant used high-potency cannabis concentrates during periods of strong alcohol cravings to reduce the chances of returning to alcohol use. These findings are not meant to be generalized to imply that CBD or other cannabis products are useful for harm reduction for all patients with SUDs, but rather provide examples of how individual patients in SUD treatment who use cannabis may benefit from considering alternative cannabis products as part of their therapeutic journey in reducing substance-related harms.

This work should be interpreted with certain limitations in mind. These data are cross-sectional, and thus we cannot infer causality or direction of effects. Due to the anonymous nature of the survey, we relied on self-report to identify individuals with SUDs, so we cannot be sure all participants meet DSM-5 criteria for a SUD. While it was an intentional decision to recruit participants in SUD treatment without specifying SUD type, it is possible that our findings may differ by substance of choice (e.g., product motives

might differ for patients with OUD vs. AUD). There were some differences in the cannabis use questions for medical and non-medical use (e.g., participants were asked about product types for medical use but modes of use for non-medical use), which limited some of the comparisons we could make. Relatedly, the current cannabis use group was asked about past-year use of cannabis while the past cannabis use group was asked about lifetime use of cannabis, which precluded any statistical comparison between those two groups. In our survey questions about cannabis access, "from a dealer or storefront dispensary" was a single response option, so we unfortunately could not distinguish between legal and non-legal access of cannabis in the survey. Since the survey was anonymous and we did not repeat the demographics questionnaire with interviewed participants, the interview sample is missing more comprehensive demographic information (e.g., we do not know the race/ethnicity of the participants we interviewed). Further work is needed to extend our findings in different demographic groups and to characterize cannabis product choices from an intersectional perspective. Finally, while our qualitative results give important insights into some potential factors that guide cannabis product decisions among people accessing SUD treatment, our results are not meant to generalize beyond the interview sample and cannot speak to causal mechanisms underlying purchasing decisions. Future work employing human experimental paradigms (e.g., placebo-controlled laboratory studies comparing addiction liability across cannabis product types) will serve as an important complement to our mixed-methods approach.

Conclusion

We described cannabis use characteristics and reasons for choosing specific products among patients accessing SUD treatment. In line with prior surveys, dried flower was the most commonly reported cannabis product type and smoking was the most common mode of use, though edibles were common as well, with high-potency products such as concentrates and disposable vapes reported by about a quarter of participants for self-reported medical use. Importantly, only about a quarter of participants currently using cannabis reported obtaining information about medical use of cannabis from a clinician, which was corroborated in the in-depth interviews where not a single participant sought cannabis information from healthcare professionals. Instead, storefront dispensaries and non-government websites seem to be predominant sources of information about cannabis products (including medical use). In thematic analysis of interviews, we found that THC content was a primary reason for choosing cannabis products, with many participants preferring cannabis products (e.g., dabs, concentrates) for faster or more intense high. Yet, some participants' product choices depended on perceived medical effects or harm reduction, while other participants were more concerned with convenience, familiarity, or price. These results contribute to an evolving cannabis literature demonstrating the complexity of cannabis use characteristics, here in a clinical sample of adults accessing SUD treatment. Future work should examine longitudinal relationships between cannabis product types and cannabis-attributable harms among patients with SUDs and explore how to encourage cannabis knowledge exchange among clinicians to improve communication about patients' cannabis use.p

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