Hemp-derived cannabinoid use among young adults in Lexington, Kentucky in 2024

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Abstract

Introduction

: The availability and use of hemp-derived cannabinoids (HDCs), such as delta-8-THC and CBD, have increased rapidly due to changes in US cannabis policy and their federally legal status. The health effects of HDCs remain largely unknown. Limited data exists on patterns and motivations for HDC use among young adults. This study examined prevalence, modes, and motivations for use of these products among young adults in Lexington, Kentucky.

Methods

A cross-sectional survey was completed by adults aged 18–30 living in or near Lexington, Kentucky, between February and March 2024 to assess demographic characteristics, traditional marijuana use, and HDC use, including type, frequency, modes, and motivations. Data were analyzed using descriptive statistics, chi-squared and Fisher's exact tests, and logistic regression via SAS 9.4, with significance set at $\alpha = 0.05$.

Results

The final analytic sample included 99 participants. Most were between 21 and 30 years old (77.8%), female (66.3%), white (81.3%), and had used marijuana at least once (81.8%). Lifetime use of HDCs was common (67.7%), with 24.2% of participants reporting past-month use. The most common modes of consumption were edibles (89.6%), followed by smoking (70.1%), and vaping (64.2%). The most frequently reported motivations for use were "for the high" (77.4%), followed by anxiety (63.3%) and trouble sleeping (57.2%). Those who had ever used marijuana were 4.3 times more likely to report any HDC use, even after adjusting for income and sex (aPR: 4.34, 1.54–12.28), and 10.4 times more likely to report past-month HDC use (PR: 10.35, 2.12-∞) than those who had never used marijuana.

Conclusion

This study is among the first to examine HDC use among young adults. Future studies with larger sample sizes are needed to further investigate patterns of use and examine disparities.

Introduction

Rapid changes in cannabis policy and social perceptions of use in recent years have led to popularization and greater accessibility of cannabinoid products (Bhamra et al. 2021; Cerino et al. 2021; McDonagh et al. 2022). In the United States (US), according to the Agriculture Nutrition Improvement Act of 2018—also known as the 2018 Farm Bill—*Cannabis sativa* plants that contain 0.3% delta-9-

tetrahydrocannabinol (delta-9-THC) or above are considered illegal marijuana, while all other plants and related products are considered legal hemp (US Forest Service 2022). The term “hemp-derived cannabinoids” (HDCs) is used when referring to any legal hemp-derived product containing cannabinoids other than delta-9-THC. To avoid confusion, the term “marijuana” is used when referring to traditional, federally illegal delta-9-THC.

Some HDCs, like cannabidiol (CBD), are not psychoactive, meaning that they do not produce the traditional “high” associated with marijuana (Malone 2021). The 2018 Farm Bill does not explicitly address psychoactive isomers of marijuana that are created using CBD, or other legal cannabinoids, such as delta-8-THC (Johnson et al. 2023; Leas 2021). Unlike CBD, delta-8-THC has intoxicating effects similar to marijuana and thus, some people may use delta-8-THC or other HDCs as legal alternatives (LoParco et al. 2023). While the potential health effects remain unknown, it has been estimated that past-month delta-8-THC use of 12th grade students in the US in 2023 was 11.4% (Miech et al. 2024).

Concerns about the regulations (or lack thereof) and marketing of HDC products have been noted in the literature (Leas 2021; Berg et al. 2023). In many states, a comprehensive range of these products have been accessible at pharmacies, health stores, vape shops, and online: edibles, drinks, vaporizers, concentrates, topicals, and others (Berg et al. 2022; Spindle et al. 2019). In Kentucky, the General Assembly passed House Bill 544 (HB 544) in March of 2023, which regulates delta-8-THC and other intoxicating hemp-derived products with age limits (21 + only), product testing, labeling, and retail restrictions, placing oversight with the state Cabinet for Health and Family Services (Kentucky General Assembly, 2023; BillTrack50, 2023). Many of these regulations, however, had already been implemented in Governor Beshear’s Executive Order 2022 – 799, issued in November 2022 shortly after the Kentucky Supreme Court ruled that possession and sale of products containing delta-8-THC was not prohibited. Therefore, HDCs have been de facto regulated in Kentucky since November 2022—and hence inaccessible to those under 21—though additional provisions included in HB 544 went into effect in August 2023.

However, despite evidence suggesting widespread access to these products in recent years, there are few reports in the literature regarding the epidemiology of HDC product use. Prevalence studies of marijuana use can provide some guidance (National Conference of State Legislatures 2024). In the US, for example, it is known that marijuana use is prevalent and increasing; for the first time in 2022, there were more daily or near daily marijuana users than daily or near daily alcohol users (Jeffers et al. 2021; Caulkins 2024). Young adults are more likely to report using multiple kinds of marijuana products (Jeffers et al. 2021; Doggett et al. 2021). Among those ages 19–30 years old, prevalence of past year use was 43.6%, past-month use was 28.8%, and daily use was 11.3% in 2022 (Patrick et al. 2023).

Cannabinoids are utilized in clinical practice as therapeutics for a wide range of medical conditions and, as of 2024, 38 states had legalized medical marijuana (National Conference of State Legislatures 2024). Substantial evidence demonstrates products containing marijuana can be an effective treatment for chronic pain, nausea and vomiting, and multiple sclerosis (National Academies of Sciences, E., &

Medicine 2017). Likewise, health-related benefits such as pain relief, management of anxiety, and sleep improvement are commonly cited among those who use CBD (Bhamra et al. 2021; Wheeler et al. 2020). In addition to CBD, there is evidence that people are using delta-8-THC and/or other HDCs for medical purposes, with one study finding 51% of participants used delta-8-THC to treat physical or mental health conditions (Kruger & Kruger 2023).

The primary aim of this study was to conduct a survey examining HDC use among young adults in Lexington, Kentucky, including modes of and motivations for use. The hypothesis was that respondents who used marijuana in the past would be more likely to report using HDCs and that most respondents would cite medical reasons for use. A secondary aim of this study was to compare characteristics of those who have used HDCs and marijuana.

Methods

The survey was administered via REDCap software and examined the prevalence of lifetime and past-month HDC use, including types of HDCs used, modes of use, motivations for use, and related demographic characteristics. The study was open for enrollment between February 3rd and March 1st of 2024 and was advertised on flyers with QR codes that were displayed in two local businesses. These businesses were a coffee shop and a juice bar, both within one mile of the University of Kentucky campus. A link to the survey was also shared through in-person recruitment in public spaces adjacent to these places, and on the Facebook social media application. Upon opening the QR code/link, those interested were provided more detailed information about the study and asked for their consent to participate. Eligibility was restricted to those aged 18–30 years old who resided in Kentucky. Individuals were invited to take the survey regardless of previous marijuana or HDC use.

This cross-sectional study was reviewed and approved by the University of Kentucky Medical Institutional Review Board (IRB) (protocol #91639).

Measures

The online questionnaire included 11 to 23 items depending on branching logic. Of the 23 total potential items, 8 measured demographic characteristics, 1 to 3 measured marijuana use, and 1 to 12 measured HDC use. A paragraph was included before any questions about marijuana and HDC use to disambiguate the two and remind participants that their responses will be kept strictly confidential. For all participants, the questionnaire closed with an open-ended question asking for any other information they would like to provide about their use of marijuana or HDCs. For some questions, participants were prompted to include an alternate response if none of the responses provided were applicable. For example, participants were asked to select all HDC they have ever used at any point from a pre-defined list. If the participant chose the answer “other”, they were prompted to specify other cannabinoids they have used that were not offered as answer options.

Demographic characteristics included age; sex: female, male, other; race: American Indian or Alaskan Native (AI/AN), Asian, Black or African American, Native Hawaiian or Pacific Islander (NH/PI), White, Other, Prefer not to answer; ethnicity: yes/no to identifying as Hispanic or Latino; annual household income: <$25,000, $25,000-$49,000, $50,000-$74,999, $75,000-$100,000, >$100,000, Don't know/Not sure; and county of residence with all Kentucky counties listed as answer options. The race and ethnicity categories were combined and collapsed into three categories for analysis; White and Black remained categories of their own, while those who identified as Hispanic/Latino (regardless of race), AI/AN, Asian, NH/PI and/or "other" race were combined to create an overall "other" race/ethnicity category. We also combined the two highest income groups to collapse the annual household income variable from five to four categories for analysis.

Following the demographics, all participants were asked "*Have you ever, even once, used marijuana (Delta-9-THC)*?", as previous marijuana use was considered likely to be associated with HDC use. If an affirmative response was given, participants were then asked their age at the time of first use and frequency of use over the last 30 days. Additional clarifying text in the survey identified key differences in products containing traditional marijuana and products containing HDCs. Following the questions assessing marijuana use, participants were asked if they had ever used HDCs. If an affirmative response was given, the participants answered an additional 10 items assessing HDC use. Similar to marijuana, participants were asked for their age at the time of first use and frequency of use over the last 30 days.

Participants were asked to select all cannabinoids they have ever used and then asked to select one cannabinoid that they use most often. The cannabinoids explicitly mentioned as options in the survey were cannabidiol (CBD), cannabinol (CBN), cannabigerol (CBG), delta-6-THC, delta-8-THC, delta-10-THC, delta-11-THC, hexahydrocannabinol (HHC) or hexacore (HXC), and tetrahydrocannabinolic acid (THC-A), while other types could be listed under an "other" response. Similarly, they were asked to select all ways (modes) they have ever used HDCs, then which ways they use most often. Modes of use that were explicitly mentioned as answer options were smoke, eat (edibles), drink, vaporize, dab, topicals (creams, lotions, ointments), and some other way; however, participants were allowed to select multiple modes that they currently use most often.

The remaining items assessing HDC use included questions about reasons for use and side effects experienced. Participants were asked for their main and all secondary reasons for current or past use of HDCs, with answer options pain, anxiety, depression, poor appetite, headache, inflammation, trouble sleeping, for the high (pleasure, recreational), other. They were also asked to rate on a 5-point Likert scale how beneficial HDCs were for the main reason indicated. The side effects explicitly named were cough, sputum or phlegm, wheezing, anxiety, depression, and paranoia, with the option to specify others.

Data Analysis

Participant characteristics—including demographic factors and marijuana use—were tabulated overall and relative to use of HDCs over their lifetime (i.e., "ever") and over the past month. We also tabulated participant characteristics relative to lifetime and past-month marijuana use. Significance was

determined using Fisher's Exact tests where cell sizes less than 5 were present and Chi-squared tests otherwise, set at $\alpha = 0.05$. Bar charts were created to aid in the visualization of the frequency of types of HDCs used and modes of consumption. To estimate the strength of association between participant characteristics and HDC and marijuana use, we used Poisson regression models with robust standard errors to estimate both crude and covariate-adjusted prevalence ratios (PRs), including covariates that were significant in bivariate analysis. All data analyses were conducted using SAS 9.4 (SAS Institute Inc., Cary, NC).

Results

The final analytic sample included 99 participants, with a summary of demographic characteristics provided in Table 1. Most participants were between 21 and 30 years old (77.8%), female (66.3%), white (81.3%), resided in Fayette County (76.8%), and had used marijuana at least once (81.8%) (Table 1). Participants who said "prefer not to answer" for race or household income (n = 6), which included the one "other" gender, are reported in Table 1 but were excluded from all statistical analyses. In the final analytical sample, female (66.3% of sample vs. 49.8% of population) and non-Hispanic White (81.3% vs. 65.4%) individuals were over-represented compared to 2024 Census population estimates for a similar age range (ages 20–29) (Kentucky State Data Center 2024).

Table 1
Lifetime & past-month use rates of hemp-derived cannabinoids (HDCs) and marijuana (MJ) by participant demographics, 2024

		HDC use		MJ Use	
	Total Sample (N = 99)	**Lifetime (n = 67)**	**Past-month (n = 24)**	**Lifetime (n = 81)**	**Past-month (n = 50)**
Age					
18–20	22 (22.2)	15 (68.2)	8 (36.4)	18 (81.8)	15 (68.2)
21–30	77 (77.8)	52 (67.5)	16 (20.8)	63 (81.8)	35 (45.5)
Sex					
Female	65 (66.3)	**39 (60.0)**	16 (24.6)	52 (80.0)	32 (49.2)
Male	33 (33.7)	**27 (81.8)**	8 (24.2)	28 (84.9)	18 (54.6)
Other^	1	1	0	1	0
Race/Ethnicity					
Black, non-Hispanic	5 (5.2)	2 (40.0)	0 (0)	3 (60.0)	1 (20.0)
White, non-Hispanic	78 (81.3)	54 (69.2)	21 (26.9)	65 (83.3)	43 (55.1)
Other*	13 (13.5)	9 (69.2)	3 (23.1)	11 (84.6)	6 (46.2)
Prefer not to answer^	3	2	0	2	0
Household Income					
$24,999 or below	37 (38.5)	21 (56.8)	10 (27.0)	27 (73.0)	18 (48.7)
$25,000-$49,999	24 (25.0)	17 (70.8)	4 (16.7)	21 (87.5)	10 (41.7)
$50,000-$74,999	17 (17.7)	14 (82.4)	6 (35.3)	16 (94.1)	13 (76.5)
$75,000+	18 (18.8)	13 (72.2)	3 (16.7)	14 (77.8)	7 (38.9)
Don’t know/not sure^	3	2	1	3	2
KY County					
Fayette	76 (76.8)	52 (68.4)	18 (23.7)	**66 (86.8)**	39 (51.3)
Other	23 (23.2)	15 (65.2)	6 (26.1)	**15 (65.2)**	11 (47.8)

Note: Totals may not add to 100% even due to rounding. Groups with statistically significant differences are **bolded**. Statistical significance was determined using Fisher’s exact test if a cell count < 5 was present and Chi-squared test statistic otherwise. Statistical significance for lifetime groups was determined by comparing to those who never used HDCs/marijuana, and the past-month groups were compared to all participants reporting no use in the past month.

		HDC use		MJ Use	
	Total Sample (N = 99)	**Lifetime (n = 67)**	**Past-month (n = 24)**	**Lifetime (n = 81)**	**Past-month (n = 50)**
Ever Used Marijuana					
Yes	81 (81.8)	**64 (79.0)**	**24 (29.6)**	**81 (100.0)**	**50 (61.7)**
No	18 (18.2)	**3 (16.7)**	**0 (0.0)**	**0 (0.0)**	**0 (0.0)**

Note: Totals may not add to 100% even due to rounding. Groups with statistically significant differences are **bolded**. Statistical significance was determined using Fisher's exact test if a cell count < 5 was present and Chi-squared test statistic otherwise. Statistical significance for lifetime groups was determined by comparing to those who never used HDCs/marijuana, and the past-month groups were compared to all participants reporting no use in the past month.

*Other category included participants who are American Indian/Alaskan Native, Asian, and/or Hispanic/Latino.

^Not included in statistical analysis (n = 6)

Use of HDCs & marijuana

In total, 67.7% of the sample (n = 67) reported lifetime use of HDCs and 24.2% had used a HDC in the past month (Table 1). Participants who reported any lifetime use represented 81.8% of males, 69.2% of white, non-Hispanic participants, and more than 70% of those with an annual household income of at least $25,000. Of participants with any lifetime HDC use, 35.8% reported past-month use. Only 16.7% of participants who had never used marijuana reported any HDC use, with zero reporting past-month use. Participants who reported past-month use represented 36.4% of those aged 18–20 years old, 26.9% of white, non-Hispanic participants, and 29.6% of those who had ever used marijuana. Among those who used HDCs over the past month, there was a mean value of 10 days of use per month (mode: 10.0, median: 7.5).

Use of marijuana—whether lifetime or past-month—was more common than HDC use overall (81.8% vs. 67.7%), and for every group defined by participant characteristics.

Types and Modes

Overall, 86.6% of those with lifetime use of HDCs reported ever using delta-8-THC, 77.6% had used CBD, 38.8% had used delta-10-THC, and 34.3% had used THC-A (Fig. 1). Over half of participants who had ever used delta-8-THC declared that it was their most frequently used cannabinoid. As mentioned earlier, some HDCs are not psychoactive; CBD and CBG are the only two we specifically mention that are not (Martínez et al. 2020). Among those who had used HDCs, 89.6% reported ever using edibles, 70.1% reported smoking, 64.2% reported vaporizing, 32.8% reported dabbing, 20.9% reported topicals, and

13.4% reported drinks (Fig. 2). Vaping and smoking were the most prevalent modes used in the past month (45.5% each), while edibles were also frequently reported (42.4%).

For these measures, participants were asked which HDCs they have ever used at any point in the past (lifetime use) and which HDCs they use most often (most frequently used); both questions were select all that apply.

For these measures, participants were asked to select all ways (modes) they have ever used HDCs, then to select the one way they use HDCs most often.

Motivations

Overall, including primary and secondary motivations, the most frequently reported motivations for HDC use were “for the high” (77.4%), followed by anxiety (63.3%) and trouble sleeping (57.2%) (Fig. 3). In total, 73.1% of participants with lifetime use of HDCs reported at least one health-related motivation for use, with 55.4% reporting a health-related reason as their primary motivation. Among those who cited anxiety as a main reason for use, 42.9% found the cannabinoids they used extremely helpful for anxiety, and an additional 50.0% stated that they helped “some” or “a lot” (Table 2). For trouble sleeping, 33.3% of participants reported that HDCs were extremely helpful, and the remaining 66.7% said they helped “some” or “a lot” (Table 2). Of those with lifetime use, 24.6% said they only use HDCs for the primary reason reported. The number of secondary reasons reported ranged from 0 to 9, with a mode of 0 and both mean and median of 2.

For these measures, participants were asked to indicate the main reason they are using or have used HDCs, then to select all other reason(s) are using or have used HDCs for.

Table 2
Frequencies of primary motivations for hemp-derived cannabinoid use and their ratings of effectiveness for main motivation for use (n = 65)

	n (%)					
	Main Reason	Extremely helpful	Helps a lot	Helps some	Helps a little	Not helpful
For the high	29 (45.3)	9 (31.0)	5 (17.2)	9 (31.0)	2 (6.9)	3 (10.3)
Anxiety	14 (21.9)	6 (42.9)	5 (35.7)	2 (14.3)	-	1 (7.2)
Trouble sleeping	9 (14.1)	3 (33.3)	5 (55.6)	1 (11.1)	-	-
Depression	7 (10.9)	1 (14.3)	4 (57.1)	2 (28.6)	-	-
Nausea	3 (4.7)	2 (66.7)	1 (33.3)	-	-	-
Headache	1 (1.6)	-	-	1 (100)	-	-
Pain	1 (1.6)	-	1 (100)	-	-	-
Appetite	1 (1.6)	1 (100)	-	-	-	-

Totals may not add up to 100% even due to rounding. Two participants who reported lifetime use of HDCs did not report their main reason for use and were not included.

Adjusted Analysis of HDC & marijuana Use

Males were 36% more likely to report lifetime use of HDCs than females (PR: 1.36, 1.06–1.76), but this association did not remain significant after adjusting for lifetime use of marijuana and household income (aPR: 1.20, 0.96–1.51) (Table 3). Lifetime prevalence of marijuana was high among the total sample (81.8%) and was significantly associated with both lifetime use of HDCs (PR: 4.74, 1.66–13.40), even after adjusting for income and sex (aPR: 4.56, 1.61–12.90), and past-month use (PR: 10.35, 2.12-∞). Household income did not remain significant after adjusting for lifetime prevalence of marijuana use, but those in the $50,000-$74,999 income category were 45% more likely to use HDCs in the unadjusted lifetime use model (PR: 1.45, 1.02–2.07). Since only one significant characteristic (previous marijuana use) was identified using unadjusted logistic regression for past-month use, an additional adjusted regression was not performed.

Table 3
Crude and adjusted prevalence ratios and 95% confidence intervals of association between selected characteristics and both lifetime and past-month use of hemp-derived cannabinoids.

	Hemp-Derived Cannabinoids			**Marijuana**	
	Any Lifetime Use		**Any Past-Month Use**	**Any Lifetime Use**	**Any Past-Month Use**
	Crude PR (95% CI)	Adjusted* PR (95% CI)	Crude PR (95% CI)	Crude PR (95% CI)	Crude PR (95% CI)
Age					
18–20	1.01 (0.73, 1.40)	-	1.73 (0.93, 3.24)	1.00 (0.80, 1.25)	**1.50 (1.11, 2.03)**
21–30	Ref	-	Ref	Ref	Ref
Sex					
Female	Ref	Ref	Ref	Ref	Ref
Male	**1.36 (1.06, 1.76)**	1.20 (0.96, 1.51)	0.72 (0.36, 1.44)	1.06 (0.88, 1.28)	1.04 (0.74, 1.48)
Race/Ethnicity					
White non-Hispanic	Ref	-	Ref	Ref	Ref
Black or AA, non-Hispanic	1.00 (0.68, 1.48)	-	0.42 (0.00, 2.40)[+]	0.60 (0.29, 1.23)	0.33 (0.07, 1.65)
Other	0.58 (0.20, 1.71)	-	0.82 (0.13, 3.60)[+]	0.85 (0.67, 1.07)	**0.55 (0.32, 0.94)**
Household Income					
$24,999 or below	Ref	Ref	Ref	Ref	Ref
$25,000-$49,999	1.25 (0.85, 1.83)	0.98 (0.72, 1.32)	0.62 (0.22, 1.74)	**0.88 (0.75, 1.02)**	**0.47 (0.30, 0.75)**
$50,000-$74,999	**1.45 (1.02, 2.07)**	1.08 (0.80, 1.46)	1.31 (0.57, 3.01)	0.94 (0.84, 1.06)	0.81 (0.64, 1.03)
$75,000 or above	1.27 (0.85, 1.90)	1.02 (0.74, 1.41)	0.62 (0.19, 1.97)	0.78 (0.61, 1.00)	**0.50 (0.30, 0.84)**

*Adjusted for sex, household income, and lifetime marijuana use

[+]Calculated using exact logistic regression due to cell count of 0

Bolded values have p-value < 0.05

	Hemp-Derived Cannabinoids			Marijuana	
	Any Lifetime Use		Any Past-Month Use	Any Lifetime Use	Any Past-Month Use
KY County					
Fayette	Ref	-	Ref	Ref	Ref
Other	0.95 (0.68, 1.33)	-	1.18 (0.57, 2.44)	0.75 (0.55, 1.03)	1.25 (0.86, 1.81)
Ever Used Marijuana					
No	Ref	Ref	Ref	-	-
Yes	**4.74 (1.68, 13.40)**	**4.34 (1.54, 12.28)**	**10.35 (2.12, ∞)[+]**	-	-
Past-month Marijuana Use					
No	Ref	-	Ref	-	-
Yes	1.27 (0.97, 1.66)	-	11.23 (1.63, 77.61)	-	-
*Adjusted for sex, household income, and lifetime marijuana use					
[+]Calculated using exact logistic regression due to cell count of 0					
Bolded values have p-value < 0.05					

Discussion

This study is among the first to examine HDC use among young adults. Overall, there were nine cannabinoid types, six modes of use, and nine motivations for use observed among the responses, demonstrating that young adults use these substances in diverse ways for a variety of reasons similar to marijuana use. The findings of this study are to be interpreted within the context of a rapidly evolving policy and commercial landscape surrounding marijuana products in the US; product availability, marketing practices, and consumer behaviors are likely to change. These factors highlight the importance of continued surveillance and adaptive public health strategies to respond to shifting legal frameworks.

Smoking is commonly cited as the most prevalent mode of marijuana use (Romm et al. 2021; Steigerwald et al. 2018) with estimates as high as 93%-97% among those who reported current marijuana use in a study from 2012 to 2021 (Doggett et al. 2021). Alternatively, while smoking and vaporizing were the most commonly reported modes of past-month HDC use in this study (45.5% for each), the most common mode ever tried by respondents was edibles (90.9%). Prevalence of edible use

was greater than what has been found among online delta-8-THC consumers where 64% reported edible use (Kruger & Kruger 2023). There is evidence that young adults' preference of mode is influenced by convenience, desired effects of the high, and cost, and that modes other than smoking may be used as an addition to smoking rather than as a substitution (Doggett et al. 2021; Thompson et al. 2024).

Participants in this study cited similar motivations for using HDCs as are commonly cited for marijuana products. While the most prevalent reason for use was "for the high" (77.4%), 73.1% of participants with lifetime use of HDCs reported at least one health-related motivation for use. These rates are similar to recent work examining use of marijuana in Kentucky and elsewhere (Lankenau et al. 2018), which found that citing both medical and recreational reasons for use is more prevalent than either reason alone (Shafer et al. 2024). Furthermore, this study's findings were consistent with those examining the use of marijuana for specific medical purposes, with anxiety, trouble sleeping, and depression frequently cited as reasons for use by participants. Similarly, literature examining online consumers of delta-8-THC found that delta-8-THC is being used to treat a range of mental health symptoms including anxiety and panic attacks, stress, and depression or bipolar disorder (Kruger & Kruger 2023). Marijuana products are often marketed using health-related messages which have been found to influence the perceptions of those who use them (Willoughby et al. 2024; Winstock et al. 2021). Additionally, the majority of marijuana products are perceived as having little health risk or potential for addiction (Romm et al. 2021). Further research should examine the effects of health-related advertisements and messaging for HDCs and evaluate the efficacy of them for commonly stated medical purposes.

In this sample, lifetime prevalence of both HDC and marijuana use were high at 67.7% and 81.8%, respectively. Past-month marijuana use (50.5%) was higher than past-month HDC use (24.3%). Among people reporting past-month use of each substance, marijuana use occurred on more days per month on average than HDC use (18.8 vs. 10 days, respectively). Previous research suggests that 16.0% of young adults ages 18–34 years in Kentucky indicated past-month marijuana use (Shafer et al. 2024). In our study, the prevalence of past-month marijuana use was significantly higher with 50.5% of the analytical sample indicating past-month use. Previous work has also found a mean of 9.84 days of delta-8-THC use per month among those who use marijuana, and, similar to our study, found that edibles and vaping were frequent primary methods (Livne et al. 2022). While our study did not measure past-month use of delta-8-THC specifically, prevalence of lifetime use (86.6%) and those electing delta-8-THC as their most frequently used HDC (44.8%) were high. A crowdsourcing study indicates that weekly use of delta-8-THC was reported by 35.7% of participants (Bergeria et al. 2023). Wheeler et al., 2020 determined that about 40% of young adults report lifetime use of CBD. Our study found higher rates of CBD prevalence with 77.6% of the sample reporting lifetime use.

Limitations and Future Directions

The results of this study have limited generalizability to young adults in Kentucky or potentially the US due to the cross-sectional design and small sample size. There were some key demographic differences between the study sample and the target population. For example, non-White and male individuals were

underrepresented in the sample compared to the target population (US Census Bureau 2022). Further, it is likely that a large portion of the sample were students, since the study was conducted near a university campus. This could contribute to sampling bias as college students are using marijuana at historically high rates (Miech et al. 2024). It is likely that those who have used HDCs were more likely to participate in this research despite attempts to recruit those who did not use them. The rates of use shown in Table 1, therefore, potentially overestimate the actual prevalence of HDC use among young adults in this population. This sample nevertheless provides some insight into motivations for HDC use and preferred modes of use during a period of minimal regulation.

Given the use of self-reported data, it is possible that participants may not be entirely honest in their responses, especially regarding illicit substance use. Recall bias may be present, particularly for the questions about lifetime use. Although verbiage was included in the survey to disambiguate marijuana and HDCs, general knowledge of cannabinoids may be incomplete. This could also have caused certain cannabinoids to be under- or over-reported.

A major challenge in this research is disambiguation of HDCs and the current state-by-state regulatory landscape. Data collection for this study occurred after Kentucky Governor Beshear's Executive Order that initiated HDC regulation, including the age 21 + restriction, but participants may have been able to purchase HDC products as a minor prior to November 2022—or even after if a store employee was not well informed. Federal policy changes flowing from Public Law 119 – 37, Continuing Appropriations and Extensions Act (signed into law in November 2025 and taking effect in November 2026), however, will restrict THC limits to 0.4 mg of total THC per container. The act also redefines "THC" to include HDCs such as delta-8-THC and THC-A (Congressional Research Service, 2024). These policy shifts indicate a broader movement toward increased regulation of intoxicating HDC products in the United States.

Conclusion

This small study contributes to early findings related to HDC use in young adults and may be used to generate hypotheses for further research. Future studies with larger sample sizes are needed to further investigate use patterns and examine disparities, though recent changes to federal and state regulations may have a substantial impact on patterns of use.

Abbreviations

United States (US), tetrahydrocannabinol (THC), cannabidiol (CBD), Institutional Review Board (IRB), cannabinol (CBN), cannabigerol (CBG), hexahydrocannabinol (HHC) or hexacore (HXC), and tetrahydrocannabinolic acid (THC-A), prevalence ratio (PR), hemp-derived cannabinoid (HDC), marijuana (MJ)

Declarations

Ethics Approval and Consent to Participate

This cross-sectional study was reviewed and approved by the University of Kentucky Medical Institutional Review Board (IRB) (protocol #91639).

Consent for Publication

Not Applicable

Availability of Data and Materials

The dataset generated and analyzed during the current study are available from the corresponding author on reasonable request.

Competing Interests Statement

All authors declare no conflicts of interest.

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CRediT Author Statement

Victoria Hamilton: Conceptualization, Methodology, Data curation, Writing – Original draft.Sydney Shafer: Methodology, Writing – Review & editing, Formal analysis, Visualization.Ava Hess: Writing – Literature Review.Sarah E. Cprek: Methodology, Writing – Review, Supervision.Krystle A. Lang Kuhs: Methodology, Writing – Review, Supervision.Kathleen Winter: Methodology, Writing – Review, Supervision.W. Jay Christian: Conceptualization, Methodology, Writing – Review, Supervision.

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Figures

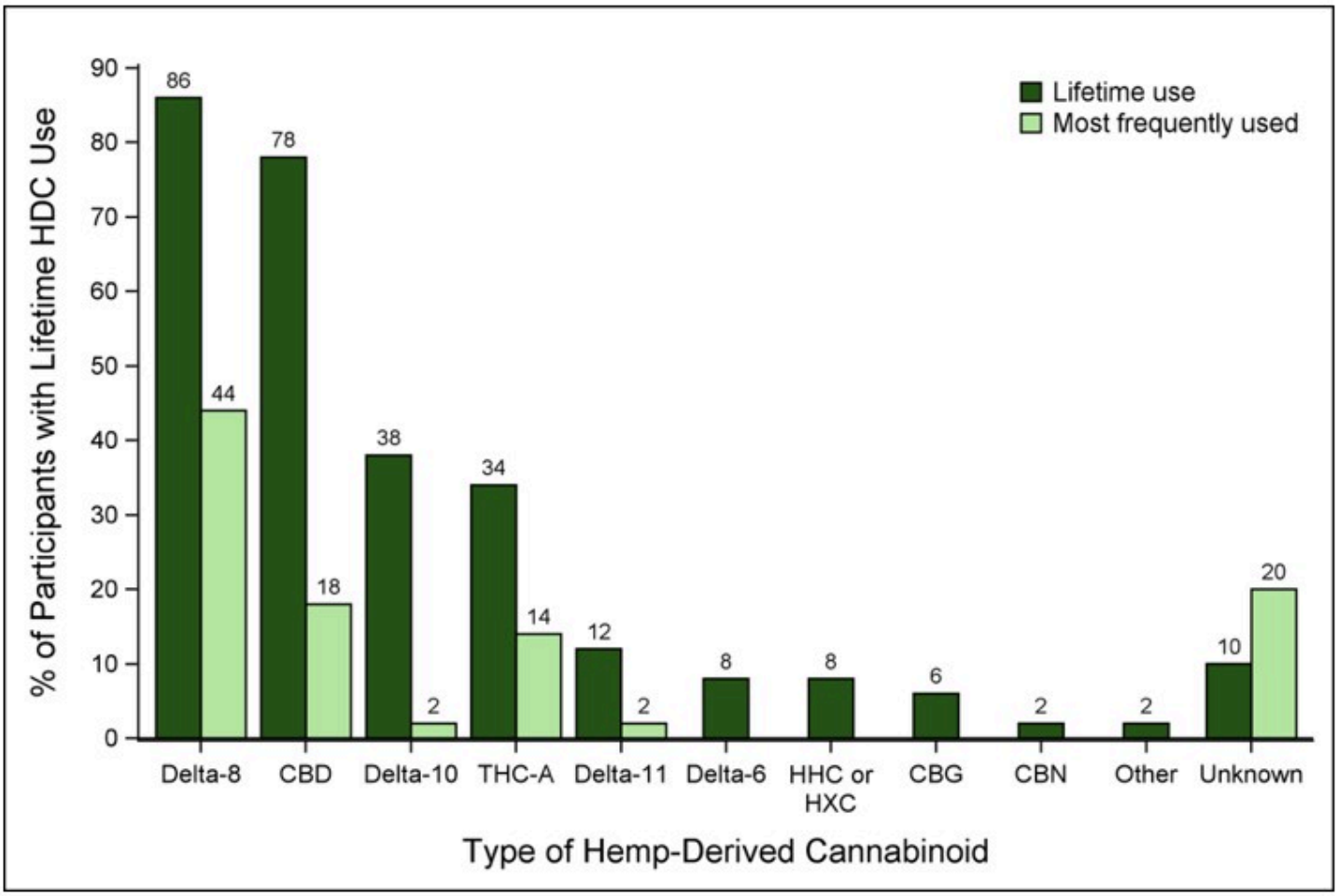

Figure 1

Proportion using each hemp-derived cannabinoid (HDC) type (n=67)

For these measures, participants were asked which HDCs they have ever used at any point in the past (lifetime use) and which HDCs they use most often (most frequently used); both questions were select all that apply.

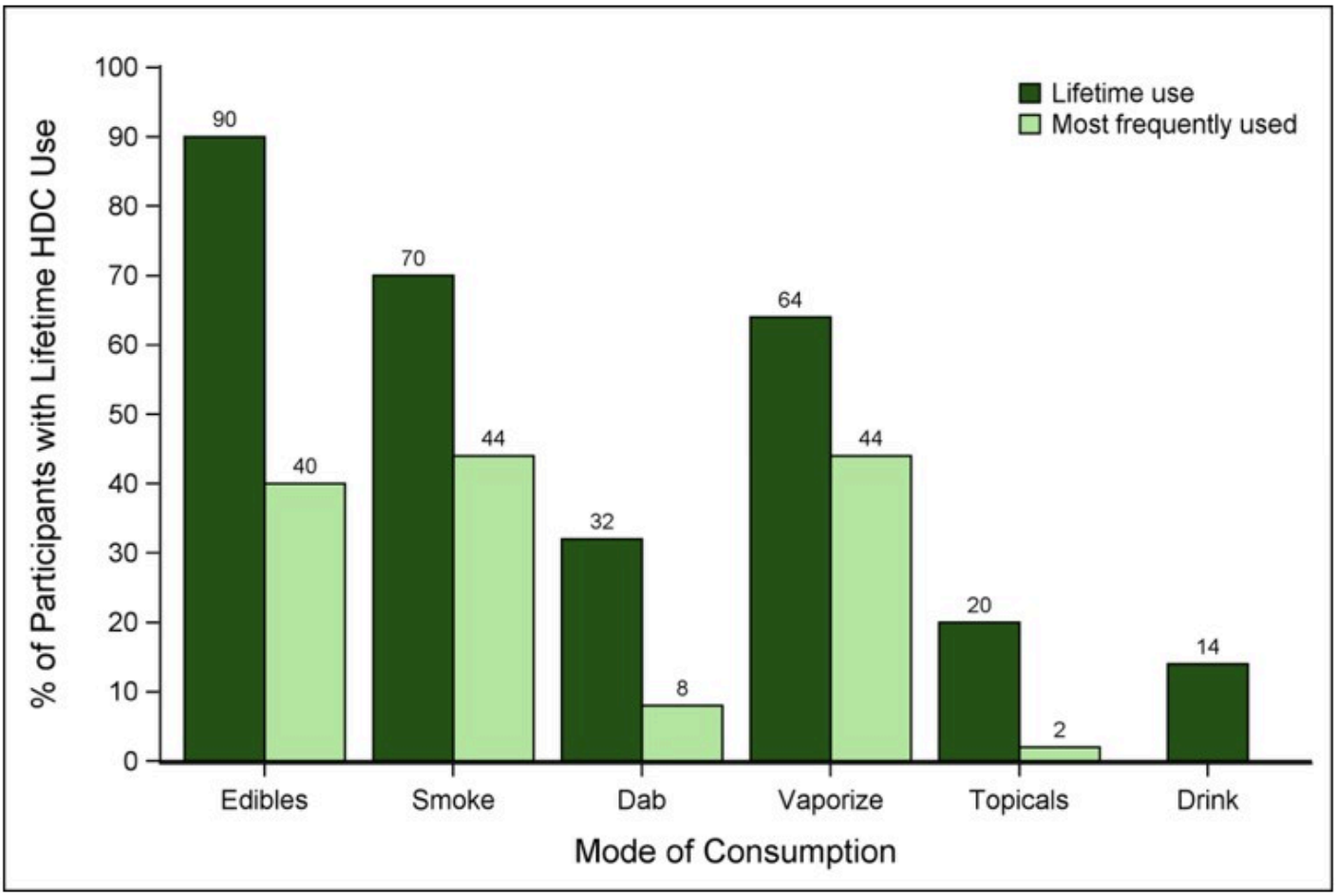

Figure 2

Proportions for lifetime use and most frequently used hemp-derived cannabinoid (HDC) modes (n=67)

For these measures, participants were asked to select all ways (modes) they have ever used HDCs, then to select the one way they use HDCs most often.

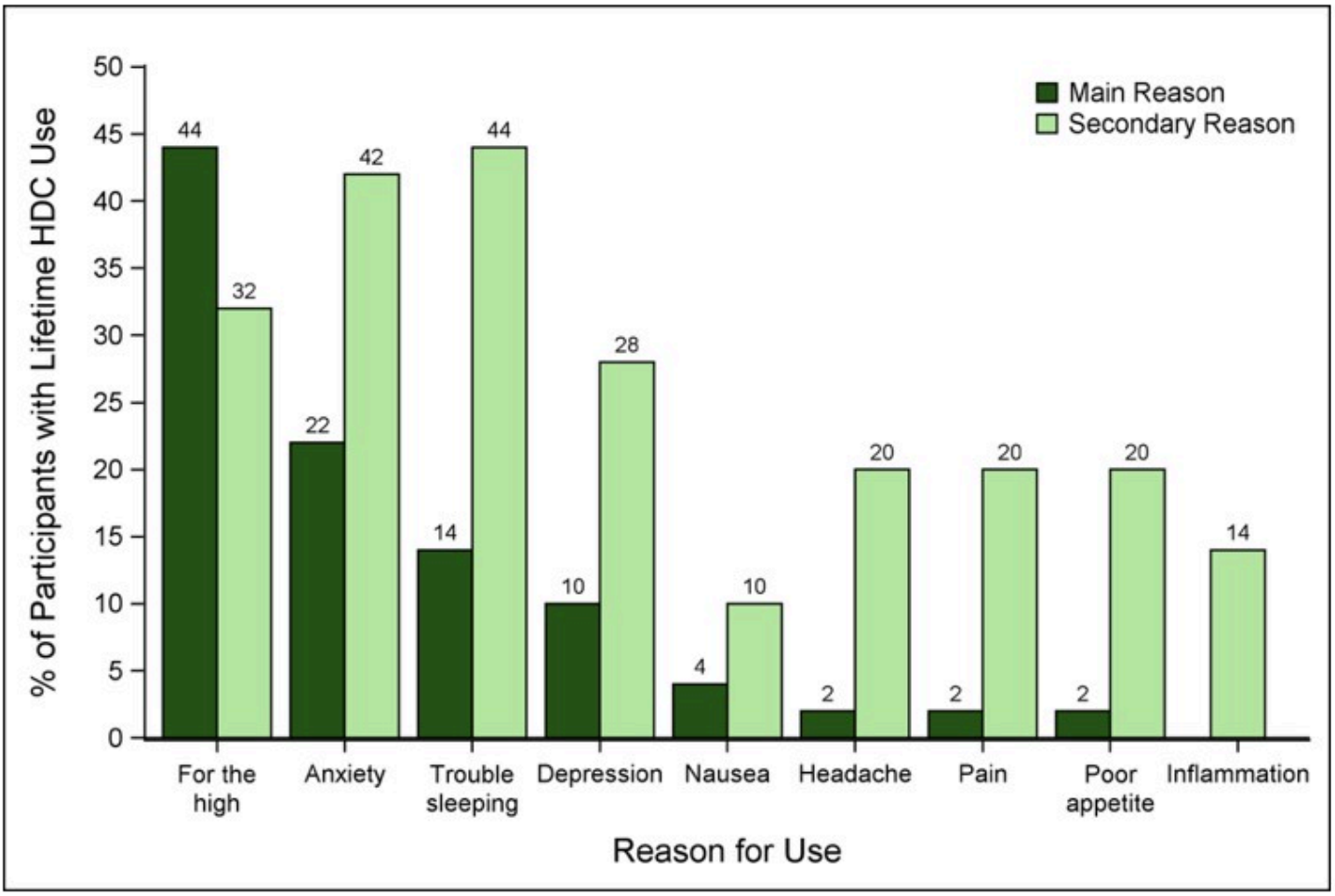

Figure 3

Proportion of main and secondary reasons reported by those who reported any hemp-derived cannabinoid (HDC) use (n=67)

For these measures, participants were asked to indicate the main reason they are using or have used HDCs, then to select all other reason(s) are using or have used HDCs for.