



Short communication

Patterns of cannabidiol use among marijuana users in the United States

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ABSTRACT

Background: As more and more states are legalizing marijuana use for medical purposes, cannabidiol (CBD) products have gained significant popularity as self-medications for treating conditions. Despite the increasing use, there is insufficient data about how CBD use varies across different populations, particularly in relation to marijuana use status. Understanding these patterns is crucial to inform public health recommendations that address appropriate CBD use.

Methods: Data came from the 2022 National Survey on Drug Use and Health (NSDUH). NSDUH is a cross-sectional national survey that provides in-depth data about drug use and mental health in the representative sample of the United States. Descriptive analyses were used to assess the prevalence of CBD use overall and by marijuana use status. Additionally, adjusted logistic regression analyses were performed to examine demographic characteristics associated with CBD use.

Results: Overall, 10.5 % of the United States population reported using CBD in the past 30 days (current use). Prevalence of current CBD use was significantly higher among marijuana users (current users: 40.7 %, past-year users: 32.2 %, ever users: 19.1 %) than among non-marijuana users (non-current users: 5.09 %, non-past year users: 4.38 %, never users: 5.09 %). Females, adults, Whites, and individuals with fair/poor health status were more likely to use CBD than their respective counterparts.

Conclusion: CBD use was commonly reported among people who use marijuana. Public health initiatives targeting individuals who use marijuana are crucial for educating them about the potential benefits and risks of CBD use, as well as the safety of using CBD in conjunction with marijuana.

1. Introduction

Cannabidiol (CBD) products are products that contain CBD, non-psychoactive compound. Unlike marijuana products that contain psychoactive compound tetrahydrocannabinol (THC), CBD products contain no or low THC levels. Therefore, CBD products do not produce a high. The 2018 Farm Bill removed hemp (i.e., CBD products containing less than 0.3 % of THC) from the definition of marijuana. This change made CBD use legal nationwide in the United States. Currently, the use of CBD products is legal in all 50 states in the United States, although regulations surrounding its use and sale vary by states.

In recent years, the popularity of CBD products has surged, largely due to their legal status. A recent study found that the use of CBD products was more prevalent in the United States (26.1 %) than Canada (16.2 %) (Goodman et al., 2022). In 2022, sales of CBD products in the United States reached \$4.17 billion, and it is expected that sales will grow to \$4.23 billion by 2026 (Conway, 2024). Another factor contributing to the increased popularity of CBD products may be related

to the perceived health benefits (Bhamra et al., 2021). Most common reasons cited by individuals who use CBD were to treat medical conditions, especially for pain, anxiety and depression (Corroon and Phillips, 2018; Moltke and Hindocha, 2021). Indeed, CBD products are often marketed as medication to manage and treat certain health conditions. Some research has found therapeutic effects of CBD in treating and managing conditions, such as anxiety disorder, schizophrenia, and sleep disturbance (Hindocha et al., 2019; McGuire et al., 2018). However, the scientific and clinical evidence supporting its effectiveness is still insufficient.

Illicit drug use is frequently reported among individuals who use CBD (Fedorova et al., 2021). In particular, marijuana use was commonly reported among individuals who used CBD products legally (Morean and Lederman, 2019). Among a Californian young adult sample ($n = 2534$), approximately 80 % of people who use CBD reported co-use of marijuana and CBD between 2019 and 2020 (Dunbar et al., 2022). While some previous studies examined the patterns of CBD use among people who use marijuana, none of them used a national representative sample.

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Furthermore, co-use of CBD and marijuana could yield other drug-related problems, such as more alcohol consumption and heavier marijuana use (Dunbar et al., 2022; Gunn et al., 2022). Therefore, understanding how CBD product use varies across different marijuana use status is especially important to inform public health regulatory and intervention efforts aimed at promoting the safe use and reducing the potential harms associated with the use of CBD products in conjunction with marijuana.

Accordingly, this study aimed to estimate the prevalence of current use of CBD products in the United States, with a specific focus on how CBD use prevalence varies across marijuana use status. This study compared the prevalence of CBD use overall and by marijuana use status (current, past-year, and ever use).

2. Methods

Data was obtained from the 2022 National Survey on Drug Use and Health (NSDUH). NSDUH is a cross-sectional national survey that assesses the use of legal and illegal drugs and mental health issues among the civilian, noninstitutionalized populations aged 12 years or older in the United States. The NSDUH excluded certain populations, including homeless people, active military personnel, and residents of institutional group quarters. Since the COVID-19 pandemic, the NSDUH used multimode data collection procedures, where some respondents completed the survey in person while others completed it via the web. For those who completed the survey in person, less sensitive questions, such as demographic characteristics and income, were interviewer-administered, while sensitive topics, such as substance use, were collected using Audio Computer-Assisted Self-Interviewing (ACASI). For respondents completing the survey via the web, all questions, including sensitive topics, were self-administered (Center for Behavioral Health Statistics and Quality, 2023). A total of 59,060 respondents aged 12 or older from the 2022 NSDUH were analyzed. There was no missing data, except for self-reported health status ($n = 13$). Missing cases were automatically excluded from the analysis. The NSDUH is the secondary dataset which is publicly available and deidentified. As such, it has been verified as not meeting the criteria necessary for review and approval as human subjects research.

2.1. Measures

The current use of CBD products was measured using two questions. First, respondents were asked, “Have you ever, even once, used any CBD or hemp products? Those who answered “yes” to this question were then asked, “How long has it been since you last used any form of CBD or hemp products?” Those who indicated that they had used such products within the past 30 days were considered as people who currently use CBD.

Similarly, marijuana use was assessed using two questions: “Have you ever, even once, used marijuana or any cannabis product?” and “How long has it been since you last used marijuana or any cannabis product?” Respondents were instructed to exclude their use of CBD or hemp products when answering these questions. Respondents who indicated that they had used marijuana within the past 30 days were classified as people who currently use marijuana. Those who used marijuana more than 30 days ago within the last 12 months were classified as people who have used marijuana in the past year, while those who last used marijuana more than 12 months ago were classified as people who have ever used marijuana.

NSDUH also collected sociodemographic information, which included the respondents’ sex (male or female), age (12–17, 18–24, 25–34, 35–49, 50–64, or 65+), and race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanics, non-Hispanic Asian, or non-Hispanic other). Due to the small sample size, non-Hispanic Native American/Alaska Native, non-Hispanic Native Hawaiian/Other Pacific Islander, non-Hispanic more than one race categories were collapsed into a single

group, which is labeled non-Hispanic other. Self-reported overall health status was assessed with the following categories: excellent, very good, good, or fair/poor.

2.2. Statistical analysis

First, the prevalence of CBD use was estimated overall and by marijuana use status. Chi-square test was conducted to determine whether the prevalence significantly differs between groups (people who use marijuana vs. people who do not use marijuana). Afterward, adjusted logistic regression was performed to examine 1) the relationship between marijuana and CBD use and 2) demographic correlates of CBD use, adjusting for all other covariates. Due to the complex survey design, all analyses were estimated with sampling weights. All analyses were conducted using Stata version 18 (StataCorp LLC, College Station, TX).

3. Results

Overall, 10.5 % of the non-institutionalized United States population aged 12 or older reported current use of CBD. Prevalence of current CBD use was significantly higher among people who use marijuana (current use: 40.7 %, past-year use: 32.2 %, ever use: 19.1 %) than among people who do not use marijuana (non-current use: 5.09 %, non-past year use: 4.38 %, never use: 2.88 %) (Table 1).

Table 2 shows the results of the adjusted logistic regression predicting the use of CBD. Current marijuana use was significantly associated with current use of CBD in fully adjusted models. After adjusting for sex, age, race/ethnicity, and self-rated health status, people who currently use marijuana had 13.29 times greater odds of using CBD than people who do not currently use marijuana (AOR = 13.29, 95 % CI: 11.85, 14.90). Demographic characteristics were also significantly associated with current use of CBD. Females had greater odds of using CBD than males (AOR = 1.42, 95 % CI: 1.25, 1.61). Compared to adolescents aged 12–17, adult age groups had greater odds of using CBD. Additionally, non-Hispanic White (AOR = 1.60, 95 % CI: 1.39, 1.83) and non-Hispanic Other (AOR = 1.60, 95 % CI: 1.23, 2.10) were 1.60 times more likely to use CBD than Hispanics, respectively. Self-rated health status was also significant factor associated with the current use of CBD. Individuals who rated their health as poor/fair were 1.32 times more likely to use CBD than those who rated their health as excellent.

4. Discussion

In this large, nationally representative sample of the United States, 10.5 % reported current use of CBD. This prevalence rate was considerably lower than those reported in the non-national young adult sample (39.7 %), probably largely due to differences in sample populations (Wheeler et al., 2020). In general, young adults are more likely to use cannabis than adolescents or older adults, which might have contributed

Table 1
Prevalence of cannabidiol use in the United States population, 2022 National Survey on Drug Use and Health (N = 59,060).

	N	Current CBD Use % (95 % CI)	Chi-Square test p-value
Overall	59,069	10.5 % (9.96, 11.0)	
Current Marijuana use			
Yes	9730	40.7 % (39.0, 42.5)	p = .00
No	49,339	5.09 % (4.64, 5.58)	
Past-year marijuana use			
Yes	14,271	32.2 % (30.8, 33.6)	p = .00
No	44,798	4.38 % (3.96, 4.84)	
Ever marijuana use			
Yes	26,093	19.1 % (18.2, 19.9)	p = .00
No	32,976	2.88 % (2.44, 3.39)	

Table 2
Demographic correlates of current cannabidiol use in the United States population, 2022 National Survey on Drug Use and Health (N = 59,056).

Variables	AOR (95 % CI)
Gender:	
Male (ref.)	1.00
Female	1.42 (1.25, 1.61)**
Age:	
12–17 (ref.)	1.00
18–25	1.43 (1.24, 1.64)**
26–34	1.27 (1.04, 1.55)*
35–49	1.45 (1.25, 1.69)**
50–64	1.28 (1.03, 1.58)*
65+	1.50 (1.18, 1.90)**
Race/Ethnicity:	
Non-Hispanic White	1.60 (1.39, 1.83)**
Non-Hispanic Black	0.96 (0.79, 1.15)
Hispanics	1.00
Non-Hispanic Asian	0.97 (0.57, 1.65)
Non-Hispanic Other ¹	1.60 (1.23, 2.10)**
Self-rated health status²:	
Excellent	1.00
Very Good	1.46 (0.96, 1.37)
Good	1.16 (0.94, 1.42)
Fair/Poor	1.32 (1.07, 1.62)**
Current marijuana use:	
Yes	13.29 (11.85, 14.90)**
No (ref.)	1.00

CI = Confidence Interval; AOR = Adjusted Odds Ratio; ref. = Reference group.

¹ Non-Hispanic other includes non-Hispanic American Indians and Alaska Natives, non-Hispanic Native Hawaiians/ Pacific Islanders, and non-Hispanic more than one race.

² Missing data for self-reported health status (n = 13). * $p < .05$, ** $p < .01$.

to such large differences.

This study also found that CBD use was relatively common among people who use marijuana than people who do not use marijuana (40.7 % vs. 5.09 %). These results raise a significant public health concern, particularly regarding the potential for increased marijuana use, as well as health risks associated with using CBD and marijuana together. A previous study has shown that CBD use could lead to increased marijuana consumption (Dunbar et al., 2022). Moreover, co-use of marijuana and CBD products can lead to significant drug-drug interactions (Rong et al., 2018). Despite these concerns, public health initiatives to address the co-use of CBD and marijuana remain insufficient. It is essential to raise public awareness about both the benefit and risks of CBD use, especially its potential health effects when used in combination with marijuana, to help individuals make informed decision. Furthermore, patterns of CBD use should be assessed in clinical practices as part of marijuana use screening to ensure safe use, avoid potential adverse drug-drug interactions, and prevent misuse or overuse.

Individuals who use marijuana may have higher levels of positive attitudes and perceptions towards CBD, particularly for therapeutic effects (Spinella et al., 2023). Individuals who use marijuana might use CBD as a self-medication to relieve health conditions. It is also possible that they might use CBD as an alternative to replace marijuana (Shannon and Opila-Lehman, 2015), or in conjunction with marijuana to enhance THC intoxicating effects (Pennypacker and Romero-Sandoval, 2020). Due to the limitations of the available data, this study could not determine the specific motivations behind the co-use of these substances. It is unknown whether individuals who use marijuana consume CBD to replace marijuana, relieve health conditions, or simply to enhance recreational effects. Further research is warranted to explore and understand the reasons behind the co-use of marijuana and CBD.

Consistent with previous studies (Goodman et al., 2020; Vilches et al., 2021; Wheeler et al., 2020), females, non-Hispanic Whites, non-Hispanic others, and individuals who rated their health status as poor/fair had greater odds of reporting CBD use than their respective

counterparts. One possible explanation is that females tend to proactively seek out cannabis as a self-medication more than males (Bruce et al., 2021). It is not surprising that individuals with poor/fair health status are more likely to use CBD than those with good health status given that CBD is primarily used for treating health conditions (Corroon and Phillips, 2018; Moltke and Hindocha, 2021). This study found that all adult age groups were more likely to use CBD than adolescents, which contradicts findings from a previous study reporting that older adults were less likely to use CBD than adolescents (Goodman et al., 2020). Further research is needed to better understand the patterns of CBD use across different age groups.

This study has some limitations. First, the use of marijuana was assessed using self-reported measures. Some respondents may not have honestly reported their CBD use due to social desirability, which could result in inaccurate estimate (Young-Wolff et al., 2020). Additionally, due to the nature of cross-sectional study, this study could only establish association, not causality. Caution is needed to interpret study findings. It is unclear whether marijuana users were already using CBD before they began using marijuana.

Despite its limitation, this study has significant contributions. This is the first study to date that provide the prevalence of CBD use in the general United States population and shows its associations with marijuana use status and demographic characteristics. Despite different psychoactive effects, CBD use was prevalent among people who use marijuana. Given the widespread use of CBD products and evolving landscape surrounding marijuana legalization, addressing co-use of CBD and marijuana should be a public health priority. It is important to implement public health education targeting the public about safe use, effectiveness, and efficacy of CBD products and potential drug interaction effects when used in conjunction with marijuana.

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CRedit authorship contribution statement

Ji-Yeun Park: Writing – review & editing, Writing – original draft, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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