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Research Paper

Cannabinoid hyperemesis syndrome prevalence and risk factors in the U.S.

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ABSTRACT

Background: Cannabinoid hyperemesis syndrome (CHS) is characterized by intense nausea, abdominal pain, and cyclical vomiting following heavy, chronic cannabis use. With increases in cannabis legalization in the United States (U.S.), CHS is an emerging concern for cannabis users, medical professionals, and policymakers. This study is the first to examine a large, nation-wide sample of cannabis users to estimate CHS prevalence and identify risk factors and at-risk populations.

Methods: Survey data were collected in the U.S. by the International Cannabis Policy Study in 2023. The prevalence of past-year CHS was calculated among participants reporting cannabis use. Logistic multilevel modeling was used to test a-priori hypotheses for factors associated with CHS.

Results: 10,255 participants (45.82% female, $M_{age} = 39.46$ years) were included in this study. Approximately 6% reported past-year CHS. Participants who were younger, male, Hispanic, or two or more races were more likely to experience CHS. Older age of first cannabis use, more frequent use of cannabis edibles and concentrates, riskier cannabis use patterns, and past-year alcohol use were associated with higher risk. Those who grew their own cannabis, used cannabis to manage symptoms of headaches/migraines or nausea/vomiting, or experienced bipolar disorder or psychosis/dissociative identity disorder were also more likely to report CHS. Those who used cannabis for lack of appetite or experienced depression were less likely to report CHS. There was no significant effect of state-legal cannabis.

Conclusion: Ongoing surveillance, standardized definitions, and identification of underlying risk factors are essential to enhance public health awareness and accurate diagnosis.

Introduction

As the availability and use of legal cannabis continue to increase in the United States (U.S.), it is important for policymakers to consider the health consequences of cannabis use and the burden it may place on healthcare services. While the effects of chronic cannabis use are becoming more prevalent and better understood, one area of growing concern is cannabinoid hyperemesis syndrome (CHS), which is characterized by intense nausea, abdominal pain, and cyclical vomiting following heavy, chronic cannabis use (Gottlieb et al., 2025; Hall et al., 2019; Sorensen et al., 2017). A common, short-term home remedy involves compulsive bathing with hot water that temporarily relieves symptoms, which may be related to the thermoregulatory role of the endocannabinoid system (Chang & Windish, 2009; Simonetto et al., 2012), although emergency department visits and hospitalizations are frequently reported (Meltzer et al., 2025). CHS treatment is ineffective with standard antiemetics, but topical capsaicin (Dezieck et al., 2017; Hsu et al., 2025; Moon et al., 2018) and haloperidol (Witsil & Mycyk, 2017) may provide temporary relief. Currently, the most effective treatment is long-term abstinence from cannabis (Allen et al., 2004; Sorensen et al., 2017). However, this behavior modification can be difficult to achieve. Patients may not believe that cannabis is causing their symptoms, especially because the primary psychoactive compound, Δ^9-tetrahydrocannabinol (THC), is typically antiemetic in low doses and has been used to treat chemotherapy-induced nausea and vomiting (Copes et al., 2025; Pergolizzi et al., 2019; Pertwee, 2009; Ruberto et al., 2021). Patients may also be unwilling to stop using cannabis due to other benefits they experience (Copes et al., 2025). Nevertheless, re-emergence of CHS is possible if cannabis is used again after a period of abstinence (Allen et al., 2004; Ruffle et al., 2015),

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although there is limited data on long-term follow-ups with patients (Stjepanović et al., 2024).

It remains poorly understood why some individuals who use cannabis experience CHS while others do not. CHS most frequently emerges in young men ages 16 to 34 and in those who started using cannabis before age 16, although this could be a function of higher quantities of cannabis used by this population (Angulo, 2024; Sorensen et al., 2017). In Canada, there is evidence that hospitalization related to CHS is most frequent among people age 20 to 24, although rates are rising most rapidly among people age 45 to 64 (Plebon-Huff et al., 2026). CHS typically emerges in people who have been using cannabis daily or near daily for a year or longer, but there are also reports in individuals using less frequently and/or for a shorter duration (Sorensen et al., 2017). Evidence also suggests underlying genetic factors related to CHS. For example, gene mutations were found in cannabis users who had experienced CHS that were not present in cannabis users without CHS (Russo et al., 2022). These mutations suggest that individuals with CHS are at higher risk for various mental health disorders, including substance use disorders, anxiety, depression, attention-deficit hyperactivity disorder (ADHD), and psychosis. There were also mutations to genes suggesting a relationship to pain and gut motility issues (Russo et al., 2022).

Several recent reviews have been published on CHS (DeVuono & Parker, 2020; Gottlieb et al., 2025; Hasler et al., 2024; Jiménez-Castillo et al., 2025; Peles et al., 2025; Pergolizzi et al., 2019; Pietrantoni et al., 2025; Smith et al., 2025; Sorensen et al., 2017; Stjepanović et al., 2024; Won & Celmins, 2025), but many existing studies tend to focus on small clinical samples (e.g., single emergency departments) and the true prevalence of CHS in the U.S. remains unknown. A convenience sample from one emergency department suggested that CHS may occur in about 2.75 million people in the U.S. annually (Habboushe et al., 2018). Some reports indicate rates of CHS are rare but increasing, particularly following cannabis legalization, indicating the importance of considering the legal status of cannabis in states when examining national samples (Sorensen et al., 2017; Stjepanović et al., 2024). For example, emergency department visits for cyclical vomiting syndrome (CVS), including CHS, almost doubled following cannabis legalization in Colorado (Kim et al., 2015). However, it is unclear to what extent this increase is due to more frequent cannabis use or to increased recognition of CHS by medical professionals (Stjepanović et al., 2024). An official diagnostic code for CHS was recently added to the International Classification of Diseases, Tenth Revision (ICD-10) in October 2025, which will improve surveillance and help distinguish CHS from similar conditions, such as CVS, in epidemiological studies (National Center for Health Statistics, 2025; Romero et al., 2026).

The present study sought to examine, for the first time, the prevalence and relative contribution of multiple risk factors associated with CHS using a population-based survey of cannabis users in the U.S. Most current research on CHS relies on case series, reports, and emergency department visits; however, there is a need to understand broader populations while controlling for multiple potential contributing factors, such as state legalization status, the types of cannabis products used, and health status. We hypothesized that people who experienced symptoms related to the genetic mutations found by Russo et al. (Russo et al., 2022) would be more likely to report experiencing CHS. Further, we also predicted that CHS would be more prevalent among people who were younger, male, and reported riskier cannabis use patterns (e.g., cannabis use disorder [CUD]), based on previous findings (Bloom et al., 2026; Ilgen et al., 2026; Jack et al., 2025; Peterson et al., 2026; Plebon-Huff et al., 2026). Finally, we also sought to build upon past research by examining frequency of use of different types of cannabis products, where participants obtain cannabis, and use of other drugs besides cannabis (i.e., alcohol, nicotine) (Copes et al., 2025; Hicks et al., 2026; Meltzer et al., 2025; Peterson et al., 2026).

To examine prevalence rates, we used results from the 2023 International Cannabis Policy Study (ICPS), which has been conducting web-based population surveys since 2018. The 2023 survey reached almost 40,000 respondents across the U.S. and was the first year that a question was asked about past-year CHS (Iraniparast et al., 2024).

Methods

Study sample

The data used in the present analysis come from cross-sectional findings of the 2023 ICPS survey conducted in the U.S. (Iraniparast et al., 2024). Data were collected via self-completed web-based surveys conducted in fall 2023 among respondents aged 16–65.

A non-probability sample of respondents was recruited through the Nielsen Consumer Insights Global Panel and their partners' panels. Nielsen panels are recruited using a variety of probability and non-probability sampling methods. For ICPS surveys, Nielsen draws stratified random samples from the online panels, with quotas based on sex, age and state of residence. Respondents provided consent prior to survey completion. Respondents received remuneration in accordance with the panel's usual incentive structure. The cooperation rate, calculated based on American Association for Public Opinion Research Cooperation Rate #2 as the percentage of respondents who completed the survey among all eligible respondents who accessed the survey link, was 55.06% (American Association for Public Opinion Research, 2022). The survey was conducted in English and median survey time was 22 min.

The 2023 ICPS survey was reviewed by and received ethics clearance through the University of Waterloo Research Ethics Committee (ORE#31330). A full description of the study methods, including data cleaning procedures and exclusion criteria, can be found in the Technical Reports and methodology paper (Iraniparast et al., 2023). In total, there were 72,382 respondents across six countries in 2023. However, the current study used the U.S. sample which comprised 39,653 respondents. Of these, 14,233 reported using cannabis in the past year. A sub-sample of past-year cannabis users in the U.S. (n = 10,255) were included in the current analysis after excluding respondents with incomplete data.

Measures

Questions from the 2023 ICPS survey were used to measure past-year CHS, demographics (age, sex at birth, ethnicity, education, income adequacy, device type), cannabis use (age of onset, product types used, source, Cannabis Use Disorder Identification Test-Revised [CUDIT-R] score, use for symptom management/improvement), other drug use, mental health, and legal status by jurisdiction. Mental health symptoms and health conditions were selected for inclusion based on their potential relationship to genetic mutations found by Russo et al. (Russo et al., 2022). All questions and their response options can be found in Appendix A.

To determine past-year CHS, participants were asked: "*Have you ever experienced cannabinoid hyperemesis syndrome (repeated, severe vomiting from marijuana use)?*" Those who responded "Yes" were then asked, "*Did you experience cannabinoid hyperemesis syndrome in the past 12 months?*" Those who indicated they had experienced past-year CHS were coded as "1″ while those who indicated no past-year CHS or never experiencing CHS were coded as "0".

Statistical analysis

Data were weighted with post-stratification sample weights constructed using a raking algorithm to calibrate to known population proportions of age group, sex, region, ethnicity, education, and smoking status from census data. Weights were rescaled to the present analytic sample. See the ICPS 2023 Technical Report for further details (Iraniparast et al., 2023). Estimates were weighted unless otherwise specified. Analyses were conducted using SAS version 9.4 (SAS Institute

Inc., Cary, NC).

First, prevalence of past-year CHS and descriptive statistics were calculated for the subsample of interest, as well as for those reporting past-year CHS and those not. Intraclass correlations revealed clustering at the state level of 23.54%, indicating significant clustering within states. Therefore, a multilevel logistic regression model with a random intercept and fixed slope was used to predict past-year CHS (1=past-year CHS and 0=no past-year CHS) using a state-level variable for cannabis legality (1=adult use and medical, 2=medical only, 3=CBD only, 4=none/illegal) and individual predictors for demographics, patterns of cannabis use, other past year drug use, and mental health problems experienced in the past 12 months. Suspected device type was also included as a covariate as recommended in the ICPS user guide (Iraniparast et al., 2024). Age and age of onset of cannabis use were grand mean centered. All categorical variables in the model were dummy-coded (yes=1, no=0). For variables with more than two levels, the reference group is specified in the results table. In the full model, the intraclass correlation was reduced to 10.31%, indicating that 56.20% of the group-level variability was explained. Due to the large sample size and number of predictors, alpha was set at a more conservative 0.01 to reduce the likelihood of Type 1 Error (α=0.01) (Thiese et al., 2016).

Results

Demographics

Table 1 contains weighted characteristics for the full sample as well as for respondents who did and did not experience past-year CHS (see Supplemental Table S1 for unweighted sample characteristics). Of the 10,255 respondents included in the analysis, 5.98% (n = 613) reported experiencing CHS in the past 12 months. All results discussed are significant when all covariates are included in the model.

Predictors of past-year CHS

Table 2 displays the results of the multilevel logistic regression and factors that predicted past-year CHS.

Demographics

Younger individuals were more likely to report experiencing past-year CHS than older individuals. Males were more likely to experience past-year CHS than females. Hispanic respondents and individuals who were two or more races were more likely to report CHS than non-Hispanic White individuals.

Respondents with a bachelor's degree or higher were more likely to experience CHS than respondents with less than a high school education. Individuals who rated their income adequacy as 'very easy' (i.e., those who found it 'very easy' to make ends meet with their family's income) were more likely to experience CHS than individuals who selected 'neither easy nor difficult.' Finally, respondents who took the survey on a smartphone or computer were more likely to experience CHS than respondents who used a tablet.

Cannabis use patterns

Respondents who were older when they first used cannabis were more likely to experience past-year CHS than respondents who were younger when they first used cannabis. Riskier cannabis use patterns (i.e., hazardous cannabis use or CUD as defined by CUDIT-R scoring criteria) also predicted greater risk of CHS relative to respondents with less risky use patterns.

More frequent edible use and more frequent concentrate use were each associated with greater likelihood of experiencing CHS relative to less frequent use of edibles and concentrates, respectively. Conversely, respondents who used flower more frequently were *less* likely to report experiencing CHS.

Respondents who grew their own cannabis were also more likely to

Table 1
Weighted characteristics of participants in the United States reporting past-year cannabis use in 2023.

	CHS+ (n = 613.07) $M(SD)$	CHS- (n = 9641.93) $M(SD)$	Total (N = 10,255) $M(SD)$
Age	34.35 (11.30)	39.78 (13.44)	39.46 (13.42)
Age of Onset	23.01 (11.62)	19.50 (8.81)	19.71 (8.98)
Days used in past year			
Cannabis flower	89.22 (157.39)	127.24 (152.56)	124.97 (153.02)
Vape oil/liquid	99.86 (169.40)	54.16 (110.04)	56.89 (113.58)
Edibles	84.58 (148.61)	38.27 (84.50)	41.04 (88.71)
Concentrate (e.g., wax, shatter)	72.04 (144.69)	19.32 (67.82)	22.48 (73.62)
Sex	**%**	**%**	**%**
Female	25.79%	47.10%	45.82%
Male	74.21%	52.90%	54.18%
Device	**%**	**%**	**%**
Smartphone	65.20%	70.22%	69.92%
Tablet	0.58%	2.73%	2.60%
Computer	34.22%	27.05%	27.48%
Education	**%**	**%**	**%**
Less than high school	5.19%	7.12%	7.01%
High school diploma or equivalent	15.89%	25.50%	24.93%
Some college, university or professional training	24.76%	39.54%	38.65%
Bachelor's degree or higher	54.16%	27.84%	29.41%
Ethnicity	**%**	**%**	**%**
American Indian or Alaskan Native	1.02%	1.24%	1.23%
Asian	4.81%	2.16%	2.32%
Black or African American	19.27%	16.08%	16.27%
Native Hawaiian or Pacific Islander	0.91%	0.15%	0.20%
White (Hispanic)	19.60%	11.05%	11.56%
White (non-Hispanic)	51.31%	65.01%	64.19%
Other / 2+ Races	2.60%	3.61%	3.54%
Unstated	0.50%	0.70%	0.69%
Income Adequacy	**%**	**%**	**%**
Very difficult	16.90%	13.78%	13.97%
Difficult	15.09%	25.92%	25.27%
Neither easy nor difficult	17.07%	33.45%	32.47%
Easy	18.74%	17.57%	17.64%
Very easy	32.21%	9.28%	10.65%
Cannabis Use Frequency	**%**	**%**	**%**
Past 12-month user	16.73%	25.50%	24.98%
Monthly user	27.73%	18.14%	18.72%
Weekly user	18.51%	16.38%	16.51%
Daily/almost daily user	37.02%	39.98%	39.80%
CUDIT-R Score	**%**	**%**	**%**
0 – 7	10.36%	67.44%	64.03%
8 – 11 (Hazardous Cannabis Use)	9.42%	16.96%	16.51%
12+ (Cannabis Use Disorder)	80.22%	15.60%	19.46%
Medical vs. Recreational (Adult) Use*	**%**	**%**	**%**
Medical use only	33.10%	13.01%	14.21%
Recreational (adult) use only	31.14%	35.52%	35.25%
Both medical and recreational (adult) use	33.96%	49.83%	48.88%
Smoking Status	**%**	**%**	**%**
Past-Year Cigarette Use	30.60%	33.91%	33.71%
Past-Year e-Cigarette Use	32.46%	24.77%	25.23%
Alcohol Use	**%**	**%**	**%**
Past-Year Alcohol Use	97.43%	81.34%	82.30%

CHS+, experienced cannabinoid hyperemesis syndrome in past 12 months; CHS-, did not experience cannabinoid hyperemesis syndrome in past 12 months.

* Totals do not add to 100% because some participants responded "Don't know" or refused to respond.

Table 2
Predictors of past-year CHS among participants in the United States in 2023 ($n = 10,255$).

Predictor	Estimate	*SE*	*t*-value	*p*-value
Intercept	**−13.69**	**3.07**	**−4.46**	**<.001**
Demographics				
Age (centered)	**−0.03**	**0.01**	**−5.10**	**<.001**
Sex (female = 0, male = 1)	**0.70**	**0.13**	**5.26**	**<.001**
Ethnicity				
White (non-Hispanic) (reference)	—	—	—	—
American Indian or Alaskan Native	0.10	0.55	0.19	.853
Asian	0.16	0.34	0.46	.648
Black or African American	−0.12	0.16	−0.75	.452
Native Hawaiian or Pacific Islander	0.63	0.75	0.82	.403
White (Hispanic)	**0.65**	**0.17**	**3.96**	**<.001**
Other / 2+ Races	**0.85**	**0.32**	**2.62**	**.009**
Unstated	0.66	0.67	0.98	.326
Education				
Less than high school (reference)	—	—	—	—
High school diploma or equivalent	−0.11	0.30	−0.37	.711
Some college, university or professional training	0.31	0.29	1.07	.285
Bachelor's degree or higher	**0.85**	**0.29**	**2.87**	**.004**
Income Adequacy				
Neither easy nor difficult (reference)	—	—	—	—
Very Difficult	0.47	0.19	2.50	.012
Difficult	0.27	0.18	1.48	.138
Easy	0.09	0.18	0.51	.610
Very easy	**0.82**	**0.18**	**4.48**	**<.001**
Device				
Tablet (reference)	—	—	—	—
Smartphone	**2.19**	**0.66**	**3.34**	**.001**
Computer	**2.14**	**0.67**	**3.21**	**.001**
Cannabis Use				
Age of Onset (centered)	**0.05**	**0.01**	**7.85**	**<.001**
CUDIT-R Score				
0 – 7 (reference)	—	—	—	—
8 – 11 (hazardous cannabis use)	**1.05**	**0.21**	**4.95**	**<.001**
12+ (Cannabis Use Disorder)	**2.77**	**0.17**	**16.52**	**<.001**
Product Use Frequency				
Cannabis flower	**−0.005**	**0.0005**	**−9.57**	**<.001**
Vape oil/liquid	0.001	0.0005	2.26	.024
Edibles	**0.004**	**0.0005**	**6.60**	**<.001**
Concentrate (e.g., wax, shatter)	**0.002**	**0.0006**	**3.80**	**<.001**
Cannabis Source				
Home grown	**0.62**	**0.15**	**4.08**	**<.001**
Family/friend	−0.32	0.13	−2.46	.014
Dealer (in person)	−0.11	0.14	−0.84	.401
Internet (delivered)	0.16	0.14	1.11	.268
Retail store	−0.12	0.14	−0.86	.391
Medical Cannabis Use				
Headaches/Migraines	**0.81**	**0.12**	**6.45**	**<.001**
Pain (including arthritis, neuropathy, or premenstrual syndrome)	0.30	0.13	2.34	.019
Nausea/vomiting	**1.18**	**0.14**	**8.29**	**<.001**
Lack of appetite	**−0.39**	**0.14**	**−2.69**	**.007**
Digestion/Gastrointestinal Issues	0.35	0.17	2.08	.037
Cannabis Legality (state-level)				
None/illegal (reference)	—	—	—	—
Recreational (adult) Use	3.59	2.97	1.21	.226
Medical Use Only	3.40	2.97	1.14	.253
CBD Only	3.00	2.98	1.01	.314
Past-Year Drug Use				
Cigarette use (no = 0, yes = 1)	0.14	0.14	0.97	.333
E-cigarette use (no = 0, yes = 1)	−0.13	0.14	−0.96	.336
Alcohol use (no = 0, yes = 1)	**1.43**	**0.28**	**5.11**	**<.001**
Mental Health Problems				
Anxiety	0.35	0.14	2.54	.011
Depression	**−0.38**	**0.14**	**−2.71**	**.007**
Bipolar disorder	**1.18**	**0.16**	**7.55**	**<.001**
Psychosis or Dissociative Identity Disorder	**1.06**	**0.20**	**5.23**	**<.001**
Alcohol or Other Drug Use	0.08	0.23	0.35	.730
ADD/ADHD	−0.49	0.22	−2.23	.024

Bold indicates statistical significance ($p < .01$).
CHS, Cannabinoid Hyperemesis Syndrome; CUDIT-R, Cannabis Use Disorder Identification Test-Revised.

report past-year CHS relative to respondents who did not.

Finally, respondents who reported using cannabis to manage symptoms of headaches/migraines or nausea/vomiting were more likely to report CHS, while respondents who used cannabis for lack of appetite were less likely to report CHS.

Other drug use

Alcohol use in the past year was associated with greater likelihood of experiencing CHS.

Past-Year mental health problems

Respondents who reported experiencing bipolar disorder or psychosis/dissociative identity disorder were more likely to report past-year CHS, while respondents who reported experiencing depression were less likely to report CHS.

Discussion

This study investigated the prevalence and predictors of CHS using a population-based survey that reached respondents across the U.S. to examine this difficult-to-study and rare condition. In one of the largest investigations of CHS to date, we found that approximately 6% of cannabis users reported experiencing CHS in the past year. This indicates that our prevalence estimate for CHS is slightly higher than previous estimates of ~5% in the U.S. (Habboushe et al., 2018; National Center for Drug Abuse Statistics, 2025), although this prior estimate was extrapolated from a patient population and may not be generalizable to the overall population. However, the estimate of 6% in this study is similar to a previously published estimate of 6% from a national sample of Canadian cannabis consumers (Marquette et al., 2024). Notably, CHS is commonly misdiagnosed with CVS due to the similarities between conditions, particularly when cannabis use is not disclosed (DeVuono & Parker, 2020). It is possible some people who experience CHS do not report to emergency departments with their symptoms, but would report them in an anonymous, online survey because cannabis use is sometimes not disclosed to medical professionals due to concerns about stigma (King et al., 2024). Moreover, previous estimates from emergency department rates may be underestimated since an ICD-10 code specific to CHS was only recently added in October 2025 (National Center for Health Statistics, 2025). There are also reports that rates of CHS are increasing, particularly with expanding state legalization (Stjepanović et al., 2024; Swartz & Franceschini, 2025), so the prevalence found in this sample could reflect a continued increase in prevalence over time.

Individuals were more likely to have reported experiencing CHS if they were younger and male, which is supported by the existing literature and could be related to higher rates of cannabis use in this group (Peles et al., 2025; Plebon-Huff et al., 2026; Swartz & Franceschini, 2025). The average age of participants in this study was roughly 34, which is also similar to other studies (Meltzer et al., 2025; Plebon-Huff et al., 2026; Shalaby et al., 2025). Surprisingly, results showed that later age of cannabis initiation was associated with greater risk of CHS. Other studies have found that the median age of initiation for CHS patients is 16, although our finding could be related to rising prevalence of CHS in older age groups (Peles et al., 2025; Plebon-Huff et al., 2026). More research is needed to determine the relationship between age of cannabis initiation and likelihood of developing CHS later in life.

One of the most novel findings in this study is that frequency of use of certain types of cannabis products was associated with greater likelihood of past-year CHS. This included more frequent use of edibles and concentrates. More frequent use of cannabis vape oil/liquid was also near our significance level (p=.02, α=0.01). Conversely, more frequent use of dried cannabis flower was associated with *decreased* likelihood of CHS. These findings suggest that greater use of products with high concentrations of THC and/or products that are more heavily processed are associated with higher risk relative to dried flower, the most commonly used type of cannabis product overall. Two other studies have found that flower is the most commonly used cannabis product among participants reporting past experiences with CHS, although these studies did not have a non-CHS group for comparison (Meltzer et al., 2025; Peterson et al., 2026). When comparing participants who reported exclusive use of one product type, however, there was evidence that exclusive use of vape cartridges was associated with more rapid onset of CHS symptoms compared to smoking flower, supporting our hypothesis (Peterson et al., 2026). One chart review of emergency department visits found that CHS was more common in patients who inhaled cannabis compared to those who used edible products (Monte et al., 2019). However, it is important to note that inhalation is the most common method of cannabis use and the review did not examine differences between different types of inhalable products (e.g., concentrates vs. flower), which could have masked the effect of inhalable products with higher THC concentrations. This finding is particularly important for public health and regulators as recent evidence suggests that cannabis concentrates with very high THC concentrations (90–95%) may carry greater harm compared to less concentrated products (Bidwell et al., 2021). Further, cannabis concentrates are more common in states where cannabis is legal (Hasin et al., 2021).

Respondents who reported growing their own cannabis were also at higher risk of CHS relative to respondents who did not grow cannabis. Further research is needed to explore mechanisms underlying this association. This could be related to more frequent cannabis use, as those who use cannabis daily or near daily are more likely to grow their own cannabis, but this was controlled for in the present analysis (Cristiano et al., 2022). Other concerns about home cultivation include poor air quality, especially if cannabis is grown indoors (e.g., indoor mold exposure, carbon monoxide), and poor quality products that are used on cannabis (Eykelbosh & Steiner, 2018). For example, home growers may use hazardous pesticides or consume cannabis that is not safe to use. Recent research highlights that current pesticide safety thresholds for cannabis are often derived from non-cannabis crops, creating a toxicological gap and leaving the true health risks of human consumption of pesticides in cannabis unknown (Watson et al., 2026). Others have suggested that mycotoxin contamination of cannabis could result in symptoms that resemble CHS, warranting further investigation (Romero et al., 2026). Determining the underlying mechanism for this potential relationship with CHS will be important to regulators in states where it is legal to grow cannabis at home as well as medical professionals exploring treatment options for patients who may not be willing to abstain from cannabis use completely.

As legal cannabis markets continue to expand in the U.S., understanding the extent to which various products have differential safety profiles is imperative for regulatory agencies. Surprisingly, no differences were found based on state legality of cannabis. However, there was significant group-level clustering before predictor variables were added. This suggests that CHS is better explained by other covariates examined in this study, many of which are heavily influenced by state regulatory structure, such as cannabis source, the availability of specific products (e.g., concentrates vs. flower), and ability to legally grow cannabis at home. Therefore, the present findings will be important for regulators to weigh when considering legislation that would either expand or limit access to cannabis concentrates or homegrown cannabis due to the impacts it may have on the prevalence of CHS.

This study also examined several self-reported mental health problems and medical reasons for cannabis use to further investigate the influence of genetic mutations related to CHS. Russo et al. found five mutations in a sample of CHS patients that were not present in controls (Russo et al., 2022). The present study examined the association between disorders related to these mutations and CHS. We found that headaches/migraines, nausea/vomiting, past-year alcohol use, CUD, bipolar disorder, and psychosis were all related to increased likelihood of experiencing CHS. Of the identified genetic mutations, catechol-*o*-methyltransferase (COMT) is associated with substance use disorders, particularly alcohol use disorder, as well as psychotic

disorders. Additionally, transient receptor potential vanilloid receptor 1 (TRPV1) is associated with pain responses, including headaches and migraines, while the dopamine-2 receptor (DRD2) is associated with gut motility disturbances and nausea and vomiting. However, cannabis use to manage symptoms of pain or digestion/gastrointestinal issues were not significant predictors of CHS, though both trended towards significance, predicting increased likelihood of CHS and would have been significant had a less stringent alpha level been used (p=.02 and 0.04, respectively). Interestingly, depression was found to be related to lower risk of CHS, although it was hypothesized to be related to higher risk based on its relation to COMT, DRD2, and cytochrome P450 isozyme 2C9 (CYP2C9) mutations (Russo et al., 2022). More research will be needed to determine the complex relationship between CHS and underlying genetic mutations.

The association between alcohol use and CHS is also supported by recent survey findings, currently available as a preprint, that respondents who reported symptoms of CHS had significantly higher rates of problematic alcohol use compared to cannabis users and those who had not used cannabis in the past year (Hicks et al., 2026). However, they also found higher rates of depression, anxiety, nicotine use, and pain ratings, which were not significant predictors of CHS in this study. These differences could be due to a number of factors, most notably that participants were not directly asked whether they had experienced CHS but rather were asked whether they had used cannabis daily in the past five years and experienced periods of severe nausea, vomiting, or abdominal pain to create a symptom group that resembled CHS (Hicks et al., 2026). Nevertheless, these findings together provide important insights for health providers that CHS may be more common among those with comorbid substance use.

Limitations

This study is subject to limitations common to survey research, including a cross-sectional sample and self-reported responses, and causality cannot be inferred. Respondents were recruited using non-probability-based sampling; therefore, the findings do not necessarily provide nationally representative estimates. Compared to the national population, the present sample had fewer respondents with low education levels and Hispanic ethnicity. Cannabis use estimates were generally similar to or lower than national estimates for youth/young adults, and higher than national estimates for adults. The sample also had poorer self-reported general health compared to the national population, which is a feature of many non-probability samples and may be partly due to the use of online surveys, which provide greater perceived anonymity than in-person or telephone-assisted interviews often used in national surveys (Fahimi et al., 2018).

The CHS questions asked in the ICPS survey do not represent a formal diagnosis. They also did not reference the compulsive bathing behavior that can be used to distinguish CHS from CVS, or distinguish CHS from nausea/vomiting in response to acute overconsumption of cannabis or THC. CHS follows a more prolonged time course, with different phases in its progression (i.e., prodromal, hyperemetic, and recovery phases), in contrast to individual exposures where a person may consume too much cannabis or THC in a short period of time, resulting in nausea and vomiting (DeVuono & Parker, 2020). Therefore, the prevalence rates found here should be interpreted with caution, and future studies would be aided with more specific and standardized descriptions of CHS that include how it differs from CVS and acute cannabis overconsumption to prevent confusion among participants. The recent addition of CHS to the ICD-10 will also assist with recognition and more consistent diagnosis and will support more accurate population-level estimates (National Center for Health Statistics, 2025).

Finally, this study sought specifically to examine mental health problems and conditions related to genetic mutations found by Russo et al. (Russo et al., 2022). Therefore, we did not examine other conditions that are commonly associated with medical cannabis use (e.g., post-traumatic stress disorder (PTSD), seizure disorders). We also did not include other/please specify response options due to low group counts. Future research should perform a more comprehensive examination of other conditions that are associated with cannabis use and CHS.

Future directions

This study was the first to examine a large, nation-wide sample of cannabis users to estimate CHS prevalence, examine the influence of a wide range of risk factors, and identify at-risk populations. These findings can help inform policymakers about health risks related to cannabis use that may result from state legalization; however, further research is needed. Systematic, longitudinal surveillance of CHS is essential to determine how the prevalence changes as cannabis legalization and use continues to expand in the U.S. Recent recognition of CHS in the ICD-10 will further pave the way for future clinical trials to assess diagnosis, pathophysiology, and treatment of CHS. Finally, more research is needed to learn about the cause(s) of CHS and why certain populations are more likely to experience this syndrome.

Conclusions

This study investigated the prevalence and risk factors associated with CHS in a large, population-based survey of cannabis users. We found that approximately 6% of cannabis users experienced past-year CHS, which is slightly higher than other U.S. estimates that analyzed patient data. Furthermore, this study supports several known risk factors (e.g., younger and male) and identified new risk factors (e.g., more frequent use of edibles and concentrates), with potential implications for groups at higher risk of this syndrome. More research is needed to uncover the underlying mechanisms of CHS and understand why some people who use cannabis are at greater risk than others, and continued surveillance is needed to monitor its rising prevalence amidst an ever-changing legal cannabis landscape.

Disclaimer

This article does not reflect any opinions or official positions of the Washington State Liquor and Cannabis Board.

CRediT authorship contribution statement

Nicholas C. Glodosky: Writing – original draft, Methodology, Formal analysis, Conceptualization. **Sarah A. Okey:** Writing – review & editing, Conceptualization. **Tyler D. Watson:** Writing – review & editing. **David Hammond:** Writing – review & editing, Investigation.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

David Hammond reports financial support was provided by Canadian Institutes of Health Research and the Washington State Liquor and Cannabis Board. David Hammond reports a relationship with University of Waterloo that includes: paid expert testimony. The other 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.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.drugpo.2026.105307.

Appendix A. Survey Questions and Response Options from the International Cannabis Policy Study Conducted in 2023

Construct	Question	Coded Responses
Cannabinoid Hyperemesis Syndrome		
Cannabinoid Hyperemesis Syndrome	Did you experience cannabinoid hyperemesis syndrome in the past 12 months? *Derived from "Have you ever experienced cannabinoid hyperemesis syndrome (repeated, severe vomiting form marijuana use)?" and "Did you experience cannabinoid hyperemesis syndrome in the past 12 months?"*	0 = No 1 = Yes
Demographics		
Age	How old are you today?	*Numeric*
Sex at Birth	What sex were you assigned at birth, on your original birth certificate?	0 = Female 1 = Male
Ethnicity	What race do you consider yourself to be?	1 = White (non-Hispanic) 2 = White (Hispanic) 3 = American Indian or Alaskan Native 4 = Asian 5 = Black or African American 6 = Native Hawaiian or Pacific Islander 7 = Other / 2+races 8 = Unstated
Education	What is the highest level of formal education that you have completed?	1 = Less than high school 2 = High school diploma or equivalent 3 = Some college or technical / vocational training or certificate / diploma or apprenticeship, or some university 4 = Bachelor's degree or higher
Income Adequacy	Thinking about your family's income, how difficult or easy is it to make ends meet?	1 = Very difficult 2 = Difficult 3 = Neither easy nor difficult 4 = Easy 5 = Very Easy
Device Type	N/A (suspected device type used to complete the survey based on browser information)	1 = Smartphone 2 = Tablet 3 = Computer
Cannabis Use		
Age of Onset	How old were you when you first used marijuana?	*Numeric*
CUDIT-R Score	Responses to items from the CUDIT-R were scored and classified as described in Adamson et al. (2010)	0 = No cannabis use problems 1 = Hazardous cannabis use 2 = Cannabis use disorder
Product Types Use Frequency	Approximately how many days over the past 12 months did you use (product type)? • Dried herb • Vape cannabis / marijuana oil or liquid • Edibles • Concentrates (e.g., wax, shatter, budder, etc.)	*Numeric*
Cannabis Source	In the past 12 months have you gotten any type of marijuana from the following sources? • I made or grew my own • From a family member or friend • From a dealer (in person) • Internet delivery service or mail order (delivered to me) • From a store, co-operative or dispensary	0 = No 1 = Yes
Cannabis Use for Symptom Improvement / Management	Have you ever used marijuana to improve or manage symptoms for any of the following? • Headaches / migraines • Pain (including arthritis, neuropathy or premenstrual syndrome) • Nausea / vomiting or chemotherapy symptoms • Lack of appetite • Digestion / gastrointestinal issues	0 = No 1 = Yes
Other Drug Use		
Past-Year Cigarette Use	Did you use tobacco cigarettes in the past year? *Derived from "Have you ever used tobacco cigarettes?" and "When was the last time you used tobacco cigarettes?"*	0 = No 1 = Yes
Past-Year E-Cigarette Use	Did you use e-cigarettes / vaped nicotine in the past year? *Derived from "Have you ever used* e-cigarettes */ vaped nicotine?" and "When was the last time you used* e-cigarettes */ vaped nicotine?"*	0 = No 1= Yes
Past-Year Alcohol Use	Did you drink alcohol in the past year? *Derived from "During the past 12 months, how often did you usually have any kind of beverage containing alcohol?"*	0 = No 1 = Yes
Mental Health		

(continued on next page)

(*continued*)

Construct	Question	Coded Responses
Mental Health Problems	Have you experienced any of the following mental health problems in the past 12 months? • Anxiety (including phobia, obsessive-compulsive disorder, or a panic disorder) • Depression (including dysthymia) • Bipolar disorder • Psychosis or dissociative identity disorder • Problems with alcohol or other drug use • Attention deficit disorder or attention-deficit / hyperactivity disorder	0 = No 1 = Yes
Legal Status of Cannabis		
Legal Status of Cannabis	What state do you currently live in?	1 = Adult-use (recreational) and medical use legal: Alaska, Arizona, California, Colorado, Connecticut, Delaware, Illinois, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nevada, New Jersey, New Mexico, New York, Oregon, Rhode Island, Vermont, Virginia, Washington State, Washington D.C. 2 = Only medical use legal: Alabama, Arkansas, Florida, Hawaii, Louisiana, Mississippi, New Hampshire, North Dakota, Ohio, Oklahoma, Pennsylvania, South Dakota, Utah, West Virginia 3 = CBD legal: Georgia, Indiana, Iowa, Kansas, Kentucky, North Carolina, South Carolina, Tennessee, Texas, Wisconsin, Wyoming 4 = Illegal: Idaho, Nebraska

CUDIT-R = Cannabis Use Disorder Identification Test-Revised

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