






Association Between Psychological Distress and Cannabis Vaping Among U.S. Adults: A Cross-Sectional Analysis

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SUMMARY

Background: Cannabis vaping has increased in prevalence among U.S. adults; however, limited evidence exists regarding its association with psychological distress. Understanding this relationship is important for informing population-level mental health and substance use interventions.

Objective: To examine the association between past-month psychological distress and past-month cannabis vaping among U.S. adults using nationally representative data.

Methods: Data were analyzed from the 2023 National Survey on Drug Use and Health (NSDUH), including 8,850 past-year cannabis users. Psychological distress was assessed using the Kessler-6 (K6) scale, with scores ≥ 13 indicating serious psychological distress. Survey-weighted logistic regression models were used to examine the association between psychological distress and cannabis vaping, adjusting for sociodemographic characteristics, medical marijuana law status, and co-occurring substance use.

Results: The weighted prevalence of past-month cannabis vaping was 33.1% (95% CI: 31.3–34.9) among individuals without psychological distress and 49.5% (95% CI: 45.4–53.6) among those with distress. In adjusted analyses, psychological distress was significantly associated with higher odds of cannabis vaping (adjusted odds ratio [AOR] = 1.75, 95% CI: 1.30–2.36, $p < 0.001$). Higher prevalence of vaping was also observed among younger adults and sexual minority individuals; patterns with tobacco and alcohol use varied.

Conclusions: Psychological distress is independently associated with increased odds of past-month cannabis vaping among U.S. adults. These findings underscore the importance of integrating mental health assessment into cannabis use prevention strategies, particularly in the context of increasing availability and potency of cannabis vaping products.

Keywords: Cannabis vaping, psychological distress, NSDUH, substance use, mental health, United States

INTRODUCTION

Cannabis use remains one of the most prevalent forms of substance use in the United States, with increasing trends observed among adults in recent years [1–3,15]. National surveillance data indicate a sustained rise in marijuana use and cannabis use disorders, particularly in the context of expanding legalization, evolving regulatory environments, and shifting social norms [2,4,5,16]. In parallel, alternative modes of cannabis administration—particularly vaping—have become increasingly common, driven by perceived advantages such as convenience, discreetness, and reduced odor relative to traditional smoking methods [10].

A substantial body of evidence has linked cannabis use to a range of adverse mental health outcomes, including depression, anxiety, suicidality, and psychotic disorders [3,5–7,9,18,19,21,25,28]. Longitudinal and meta-analytic studies further suggest that cannabis use may not only co-occur with psychological distress but may also contribute to its onset or persistence, particularly among individuals with pre-existing vulnerabilities [4,5]. In addition, polysubstance use behaviors, especially concurrent use of tobacco and alcohol, may amplify psychological distress and complicate observed associations between cannabis use and mental health outcomes [12,14,23,24].

In addition, substance use behaviors and related health-risk behaviors often occur within broader patterns of healthcare engagement and preventive health adherence, highlighting overlapping behavioral and structural determinants of health [6].

Beyond substance use, psychological distress is associated with a broader spectrum of adverse health behaviors, including poor diet, obesity, and other maladaptive lifestyle patterns, highlighting its role within a complex behavioral health framework [17]. Collectively, these findings suggest that psychological distress may function both as a correlate and a potential driver of substance use behaviors.

Theoretical models conceptualize substance use as a continuum in which early exposure to legal substances such as alcohol and tobacco may increase susceptibility to subsequent cannabis use and other illicit substances, reflecting shared psychosocial and environmental risk pathways [2,8,13].

Emerging research has begun to examine associations between psychological distress and specific cannabis use modalities. Prior studies have reported associations between psychological distress and edible cannabis use as well as general marijuana consumption patterns [2,8]. However, limited evidence exists regarding cannabis vaping specifically, despite its rapid increase in prevalence and distinct pharmacokinetic characteristics compared with other routes of administration [22].

Prior research has further documented broad mental health and public health implications of cannabis

use, including anxiety-related outcomes, co-occurring tobacco use, and population-level effects of cannabis legalization [20,33,34]. Cannabis use also commonly co-occurs with tobacco use and other substances, reflecting overlapping behavioral risk profiles [28,29]. At the population level, changes in marijuana laws have been associated with shifts in adult cannabis use patterns [35].

Previous evidence has also highlighted that psychological distress is associated with more severe mental health outcomes, including suicidal ideation and risk behaviors among adolescents [11].

METHODS

Study Design and Data Source

This study used cross-sectional data from the 2023 National Survey on Drug Use and Health (NSDUH), a nationally representative survey of the civilian, non-institutionalized U.S. population aged 18 years and older. The NSDUH employs a multistage probability sampling design to ensure nationally representative estimates.

Study Population

The analytic sample was restricted to respondents reporting past-year cannabis use, resulting in a final sample of 8,850 individuals. Participants with missing data on key study variables were excluded. All analyses accounted for the complex survey design, including sampling weights, stratification, and clustering, to produce nationally representative estimates.

MEASURES

Outcome Variable

Past-month cannabis vaping was assessed using self-reported data and coded as a binary variable (yes/no).

Exposure Variable

Psychological distress was measured using the Kessler-6 (K6) scale, a validated instrument assessing non-specific psychological distress over the past 30 days. Consistent with established epidemiological thresholds, respondents with K6 scores ≥ 13 were classified as experiencing serious psychological distress.

Covariates

Sociodemographic covariates included age, gender, race/ethnicity, sexual orientation, education, income, metropolitan status, and state-level medical marijuana laws (MMLs). Behavioral and clinical covariates included past-month tobacco use, past-month alcohol use, past-month illicit substance use excluding cannabis, and past-year participation in mental health support groups. Age, education, and income were categorized using standard NSDUH coding frameworks.

Statistical Analysis

Weighted descriptive analyses were conducted to estimate the prevalence of past-month cannabis vaping and psychological distress overall and across covariate subgroups. Weighted prevalence estimates with 95% confidence intervals (CIs) were calculated to account for sampling variability.

Survey-weighted logistic regression models were used to examine the association between past-month psychological distress and past-month cannabis vaping. Models were sequentially adjusted for sociodemographic and behavioral/clinical covariates. Adjusted odds ratios (AORs) with 95% CIs were reported. Statistical significance was defined using a two-sided alpha level of 0.05.

All analyses were conducted using appropriate survey-weighted procedures for complex survey data to ensure valid variance estimation and nationally representative inference. Analyses incorporated NSDUH sampling weights (ANALWT2_C), strata (VESTR_C), and primary sampling units (VEREP). Sensitivity analyses excluding respondents reporting concurrent tobacco, alcohol, or illicit substance use yielded similar results (results not shown).

RESULTS

Sample Characteristics

The analytic sample included 8,850 past-year cannabis users after excluding 3,729 respondents with missing data on key variables. Among the included participants, 1,738 (19.6%, unweighted) reported past-month psychological distress.

Overall, past-month cannabis vaping prevalence was higher among individuals with psychological distress compared with those without distress. As shown in Table 1, 33.1% (95% CI: 31.3–34.9) of participants without psychological distress reported past-month cannabis vaping, whereas the prevalence was 49.5% (95% CI: 45.4–53.6) among those with psychological distress.

Variable	Category	Prevalence (%)	95% CI
Psychological Distress	No distress	33.1	31.3–34.9
	Distress	49.5	45.4–53.6
Gender	Male	34.4	32.5–36.3
	Female	36.6	34.0–39.3
Sexual Orientation	Heterosexual	32.9	31.2–34.6
	Sexual minority	47.0	43.6–50.5
Tobacco Use (Past Month)	No	36.4	34.5–38.3
	Yes	34.5	31.4–37.6
Alcohol Use (Past Month)	Overall (Yes)	36.2	34.3–38.2
Age Group	18–25	50.0	47.6–52.5
	26–34	43.5	40.3–46.8
	35–49	35.3	32.9–37.8
	50+	20.0	16.1–23.8

Table 1. Weighted prevalence of past-month cannabis vaping by participant characteristics (N = 8,850)

Association Between Psychological Distress and Cannabis Vaping

Survey-weighted logistic regression showed a statistically significant association between past-month psychological distress and cannabis vaping. After adjustment for sociodemographic characteristics, state-level medical marijuana laws, and behavioral covariates, individuals with psychological distress had higher odds of cannabis vaping compared with those without distress (AOR = 1.75, 95% CI: 1.30–2.36, $p < 0.001$). Full adjusted results are presented in Table 2.

Sociodemographic and Behavioral Correlates

Age showed a strong inverse association with cannabis vaping, with progressively lower odds observed among older age groups compared with adults aged 18–25 years. Sexual minority status was associated with higher odds of vaping, while females had lower odds compared with males.

Income, metropolitan status, medical marijuana law status, tobacco use, and alcohol use were not significantly associated with cannabis vaping in adjusted models. Participation in mental health support groups showed a marginal association (AOR = 1.23, 95% CI: 0.99–1.54, $p = 0.062$).

Variable	Category	AOR	95% CI	p-value
Psychological Distress	Yes vs No	1.75	1.30–2.36	<0.001
Age	26–34 vs 18–25	0.76	0.61–0.96	0.024
	35–49 vs 18–25	0.53	0.43–0.66	<0.001
	50+ vs 18–25	0.26	0.18–0.38	<0.001
Gender	Female vs Male	0.76	0.61–0.96	0.021
Sexual Minority	Yes vs No	1.31	1.06–1.60	0.013
Income	Mid vs Low	1.10	0.84–1.43	0.471
	High vs Low	1.30	1.00–1.70	0.053
Metro Status	Urban vs Rural	0.99	0.79–1.25	0.952
MMLs	Yes vs No	1.06	0.84–1.34	0.609
Tobacco Use	Yes vs No	1.09	0.88–1.36	0.405
Mental Health Support	Yes vs No	1.23	0.99–1.54	0.062

Table 2. Adjusted Odds Ratios for Past-Month Cannabis Vaping (N = 8,850)

Prevalence by Key Covariates

Weighted prevalence estimates indicated substantial variation in cannabis vaping across demographic subgroups, with the highest prevalence observed among younger adults and progressively lower prevalence with increasing age. Sexual minority individuals also demonstrated higher prevalence compared with heterosexual individuals.

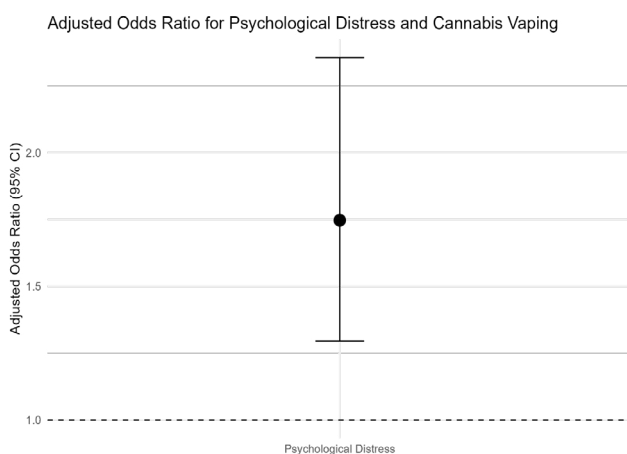


Figure 1. Adjusted odds ratios (95% CI) from survey-weighted logistic regression examining the association between psychological distress and past-month cannabis vaping among U.S. adults (N = 8,850)

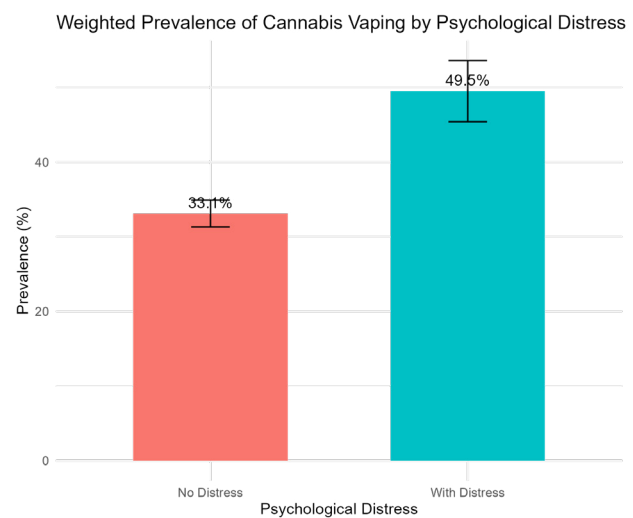


Figure 2. Weighted prevalence (95% CI) of past-month cannabis vaping by psychological distress status among U.S. adults (N = 8,850)

DISCUSSION

In this nationally representative study of U.S. adults, psychological distress was strongly and independently associated with past-month cannabis vaping. Individuals experiencing psychological distress had 75% higher odds of vaping cannabis compared with those without

distress, even after adjustment for sociodemographic characteristics, medical marijuana law status, and co-occurring substance use. These findings are consistent with prior literature identifying psychological distress as a key correlate of cannabis use behaviors and extend the evidence base by focusing specifically on vaping as a distinct and increasingly prevalent mode of cannabis consumption [4,7,22].

One plausible explanation for this association is the self-medication hypothesis, which suggests that individuals experiencing psychological distress may use cannabis to cope with symptoms such as anxiety, depressed mood, or sleep disturbances. However, this coping pathway may be maladaptive in the context of vaping, given that cannabis vaping products can deliver high concentrations of Δ^9 -tetrahydrocannabinol (THC). High-THC exposure has been linked to increased anxiety, paranoia, affective dysregulation, and long-term neurocognitive impairment, suggesting that cannabis vaping may not alleviate psychological distress and may instead exacerbate it over time [19,3]. This raises the possibility of a reinforcing cycle in which distress contributes to vaping initiation or continuation, while vaping in turn worsens mental health symptoms.

The higher prevalence of cannabis vaping among younger adults and sexual minority populations observed in this study is consistent with established epidemiologic patterns of substance use disparities. Younger individuals may be more exposed to evolving cannabis products, more receptive to novel consumption modalities such as vaping, and more likely to engage in risk-taking behaviors. Similarly, sexual minority populations often experience higher levels of stress exposure, including minority stress, which may contribute to elevated substance use as a coping mechanism.

Sex workers experience disproportionately high rates of physical and sexual violence, ranging from 45% to 75%, which are strongly associated with increased psychological distress and substance use behaviors, including cannabis use [31]. Additionally, the COVID-19 pandemic was associated with nearly a 25% increase in anxiety and depression symptoms worldwide, alongside rising substance use as a coping response to stress, isolation, and uncertainty [32].

The co-occurrence of cannabis vaping with other substance use behaviors, including tobacco and alcohol use, further highlights the clustering of risk behaviors. This pattern supports a polysubstance use framework in which cannabis vaping is not an isolated behavior but part of a broader constellation of substance use practices [12,14, 23, 24]. However, after multivariable adjustment, associations with tobacco and alcohol use were attenuated. Cannabis use has also been linked to initiation of cigarette and e-cigarette use [35], suggesting overlapping behavioral pathways.

From a public health perspective, these findings have important implications. Psychological distress may serve as a potential marker for identifying

individuals at elevated risk of cannabis vaping. Given the rapid expansion of high-potency cannabis vaping products, individuals with psychological distress may be particularly vulnerable to adverse mental health outcomes. Integrating mental health screening into substance use prevention and intervention efforts may therefore enhance early identification of at-risk populations.

This study contributes to a growing body of literature examining the intersection between mental health and evolving cannabis use modalities. As cannabis markets continue to diversify and vaping becomes increasingly prevalent, understanding modality-specific associations is critical for informing surveillance systems, clinical screening practices, and public health policy responses.

Although vaping has been positioned as a distinct mode of cannabis consumption, other product types such as edibles may present unique psychological risks. Emerging evidence suggests that delayed onset and higher cumulative THC exposure associated with edibles may exacerbate anxiety and distress symptoms [8].

These findings also align with a broader public health literature demonstrating that substance use behaviors frequently intersect with healthcare engagement and preventive health continuity [6,8].

This study has several limitations. First, the cross-sectional design precludes causal inference. Second, all measures were self-reported and subject to recall and reporting bias. Third, residual confounding may remain despite adjustment for key covariates.

CONCLUSION

Psychological distress was significantly associated with past-month cannabis vaping among U.S. adults in this nationally representative study. Individuals experiencing psychological distress had substantially higher odds of vaping cannabis, independent of sociodemographic characteristics and co-occurring substance use. These findings suggest that cannabis vaping may be embedded within a broader pattern of coping-related substance use among individuals with elevated psychological distress.

The results highlight the potential value of integrating mental health screening into cannabis use prevention and intervention strategies to improve early identification of high-risk populations and reduce potential psychiatric and substance-related harms. Given the rapid expansion of high-potency cannabis vaping products, further longitudinal research is warranted to clarify temporal and causal pathways and to inform evidence-based public health and clinical responses.

AUTHOR CONTRIBUTIONS

Zeesan Ul Haq: Led the conceptualization and design of the study, developed the methodology, conducted statistical analyses, interpreted the data, and drafted the original manuscript.

Md Rakibul Hasan: Contributed to critical revision of the manuscript for important intellectual content and supported interpretation of clinical and conceptual findings.

Usman Mustafa: Contributed to statistical support, data validation, and critical review of the analytical approach.

Fahad Bin Halim: Contributed to critical revision of the manuscript for important intellectual content and assisted in interpretation of findings.

M. Tayyeb Ayyoubi: Supervised the study, contributed to study design and interpretation of results, and provided critical revisions to the manuscript.

FUNDING

This study did not receive any funding.

DATA AVAILABILITY

Publicly available data from the 2023 National Survey on Drug Use and Health (NSDUH) can be accessed through the Substance Abuse and Mental Health Services Administration (SAMHSA) datafiles page: <https://www.samhsa.gov/data/data-we-collect/nsduh-national-survey-drug-use-and-health/datafiles>

ETHICS DECLARATIONS

Consent to Participate: Not applicable; this study analyzed de-identified, publicly available data from the 2023 National Survey on Drug Use and Health (NSDUH).

Human Ethics and Consent to Participate: This study used publicly available, de-identified data from the National Survey on Drug Use and Health (NSDUH) and was exempt from institutional review board approval.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AI ASSISTANCE STATEMENT

The authors used an AI-based tool to improve grammar, clarity, and language style. No new scientific content was generated by the tool. All changes were verified by the authors, who remain fully responsible for the content of the manuscript.

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