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RESEARCH ARTICLE

Association Between Cannabis Use and Subjective Cognitive Decline: Findings from the Behavioral Risk Factor Surveillance System (BRFSS)

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Abstract: ***Background*:** Cannabis consumption has rapidly increased in the United States due to more states legalizing non-medical and medical use. There is limited research, however, investigating whether cannabis may be associated with cognitive function, particularly across multiple dimensions of cannabis use.

***Objective*:** The objective of this study was to examine whether cannabis consumption reason, frequency, and method are associated with subjective cognitive decline (SCD).

***Methods*:** Data were obtained from 4,744 U.S. adults aged 45 and older in the 2021 Behavioral Risk Factor Surveillance System (BRFSS). SCD was a self-reported increase in confusion or memory loss in the past year. Odds of SCD by cannabis use reason, frequency, and methods (*e.g.,* smoke, eat, vaporize) were examined using multiple logistic regression after imputing missing data, applying sampling weights, and adjusting for sociodemographic, health, and substance use covariates.

***Results*:** Compared to non-users, non-medical cannabis use was significantly associated with 96% decreased odds of SCD (aOR=0.04, 95% CI=0.01-0.44, $p<.01$). Medical (aOR=0.46, 95% CI=0.06-3.61, $p=.46$) and dual medical and non-medical use (aOR=0.30, 95% CI=0.03-2.92, $p=.30$) were also associated with decreased odds of SCD, although not significant. Cannabis consumption frequency and method were not significantly associated with SCD.

***Conclusion*:** The reason for cannabis use, but not frequency and method, is associated with SCD. Further research is needed to investigate the mechanisms that may contribute to the observed associations between non-medical cannabis use and decreased odds of SCD.

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1. INTRODUCTION

Subjective Cognitive Decline (SCD) refers to an individual's reported experience of increased confusion or memory loss [1]. According to the United States (U.S.) Centers for Disease Control and Prevention (CDC), it is estimated that 10.8% of adults between ages 45 and 64 and 11.7% of adults over age 65 years experience SCD [2]. Epidemiological studies have found that SCD is often an early indication of cognitive impairment and dementia. One meta-analysis found that older adults who reported subjective memory complaints are at a 2.1 times higher risk of developing dementia [3]. A more recent meta-analysis found that individuals experiencing SCD have 2.5 times higher odds of developing dementia [4].

Cannabis use has been increasing in the U.S. over the past decade. As of 2023, the District of Columbia and 23 U.S. states have legalized non-medical use, whereas 38 states have legalized medical use of cannabis [5]. Cannabis use among older adults has also increased in recent years [6]. Between 2016 and 2018, the use of cannabis among adults aged 55 years and older increased by 1.7% [7]. This increase is projected to continue as a larger proportion of the population enters middle and older age [8].

There have been prior studies on the association between cannabis consumption and its effects on cognitive function, memory, and decision-making. Research has shown that cannabis use may be associated with impaired reaction, concentration, and memory [9]. In a longitudinal cohort study among adults aged 40 years and older in Australia, an association was found between long-term cannabis use and compromised verbal recall performance. However, according to the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5), the differences did not meet the threshold of being considered at risk for dementia [6]. A re-

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cent study using the Behavioral Risk Factor Surveillance System (BRFSS) data between 2016 and 2019 found a positive association between regular cannabis use over the past year and worsened cognitive function. However, the dose of cannabis was not associated with the cognitive outcome [7]. Another study on adults 50 years and older using data from the National Survey of Drug Use and Health (NSDUH) found that those who used cannabis in the past year had 1.4 times higher odds of Subjective Memory Complaints (SMC) compared to non-users [10]. Yet, a significant association was not found among those who used cannabis within the past month.

While numerous studies have investigated the relationship between cannabis use and cognitive function, the majority of previous research has focused on the frequency of cannabis use as the primary predictor. For example, most cross-sectional studies using national survey data such as the BRFSS and NSDUH examined the frequency of recent cannabis use (past month or year) and cannabis use status (never, former, or current) [7]. However, the cognitive implications of cannabis are not only determined by the frequency of cannabis consumption. Other factors could impact the cognitive effects associated with cannabis use. For instance, cannabis is composed of more than 140 cannabinoids, of which tetrahydrocannabinol (THC) and cannabidiol (CBD) are the most common ingredients. The purpose of using cannabis often dictates the type of cannabis selected [11]. Additionally, factors such as methods of administration could impact the cognitive effects caused by cannabis use [12]. Despite these complexities, limited research has investigated how these factors may impact SCD [10]. Our study addresses these knowledge gaps by comprehensively examining how reason, frequency, and method of cannabis use are associated with SCD among U.S. middle-aged and older adults.

2. MATERIALS AND METHODS

2.1. Data Source

This study retrieved data from the 2021 Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is a cross-sectional survey that captures data on health behaviors, chronic health conditions, and the use of preventive services among U.S. adults. The BRFSS cognitive decline module was restricted to respondents aged 45 years and older in Washington D.C. and 14 U.S. states (GA, HI, MS, OR, PA, TN, TX, WI, CO, MD, MI, OH, OK, and NY). Thus, our unweighted sample includes 4,744 observations with valid SCD responses.

2.2. Subjective Cognitive Decline Variable

The dependent variable in this study was SCD from the BRFSS cognitive decline module. Information on SCD was obtained by the survey question, "During the past 12 months, have you experienced confusion or memory loss that is happening more often or is getting worse?". The response options were Yes, No, Don't Know/Not Sure, and Refused. Responses of "Don't know" and "Refused" were coded as missing. Previous research has noted a high specificity and adequate sensitivity for the BRFSS SCD variable [13].

2.3. Cannabis Variables

Three cannabis variables were examined in our analyses. The first was the frequency of cannabis use in the past 30 days, ranging from 0 to 30 days. The second was the reason for cannabis use, which included four responses: Non-user, Medical, Non-medical, and Both Medical and Non-Medical. The third was the method of cannabis use, which included seven categories: Non-user, Smoke, Eat, Drink, Vaporize, Dab, and Other. The "Other" category was omitted during the analysis due to the small sample size. Responses of "Don't know" and "Refused" were coded as missing.

2.4. Covariates

Sociodemographic, health, and substance use covariates were adjusted in our regression analyses. Sociodemographic covariates included age group (45-49, 55-54, 55-59, 60-64, 65-69, 70-74, 75-79, or 80+), sex (male or female), race and ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, non-Hispanic Asian, or Other), education level (less than high school, high school, some college, and college), and metropolitan residence. Health covariates included self-rated general health (excellent, very good, good, fair, or poor), heart disease history, stroke history, diabetes history, depression history, and frequency of experiencing poor mental health (range 0-30 days). Substance use covariates include a binary variable of whether or not the respondent consumed alcohol in the past 30 days and a categorical variable for smoking status (never smoked, former smoker, or current smoker). All unknown and refused responses were recoded as missing values.

2.5. Data Analysis

Three bivariate tests were conducted to examine the associations between each cannabis variable and SCD. Chi-square tests were conducted for categorical variables (reason and method), and t-tests were used for a continuous variable (frequency). We constructed four multiple logistic regression models that sequentially adjusted for sociodemographic, health, and substance use covariates. Model A was an unadjusted crude model containing only cannabis variables. Model B was adjusted for sociodemographic covariates (age, sex, race and ethnicity, education level, metropolitan residence). Model C adjusted for sociodemographic and health covariates (general health, history of diabetes, stroke, depression, heart disease, and days of poor mental health). Model D was the full regression model adjusted for sociodemographic, health, and substance covariates (alcohol consumption and smoking status). The average variance inflation factor (VIF) of 1.31 in our fully adjusted regression model indicated the presence of no multicollinearity.

To maximize the full number of respondents in the data set and minimize bias because of missing data, multiple imputation by chained equations (MICE) generated 100 imputed data files with 10 iterations each for regression analyses.

Sampling weights were applied to ensure all results were generalizable to U.S. adults 45 years and older. The analyses were conducted using IBM SPSS version 28.0.1.1 and Stata version 18, with a 0.05 significance level and two-tailed tests.

3. RESULTS

3.1. Sample Characteristics

Using survey sampling weights for the BRFSS data, the 4,744 respondents represented an estimated 563,339 U.S. adults aged 45 years and older. Approximately 10.9% reported experiencing SCD. Within the eight age groups, the largest proportion of individuals was those in the 60-64 age group, accounting for 15.8% of the total sample (Table **1**). Females constitute a slight majority of the sample at 52.7%. Approximately 46.2% self-identified as Asian, 26.5% White, 5.9% Hispanic, and 1.5% Black. The majority of the sample were college graduates (34.9%) and resided in metropolitan counties (78.1%). In terms of general health, the largest portion reported very good health (33.9%). The most prevalent health condition was a history of diabetes (15.4%). On average, respondents experienced poor mental health for 2.8 days within the last 30 days. Regarding substance use, 42.8% consumed alcohol in the past 30 days, and the majority had never smoked (60.7%).

About 7.5% of the respondents were cannabis users (Table **2**). Approximately 3.2% used it for medical purposes, 2.1% used cannabis for non-medical reasons, and around 2.2% for both medical and non-medical reasons. The data include five methods of cannabis use, with smoking being the most common at 5.4%. The other four methods were less frequent for eating (1.2%), drinking (0.2%), vaporizing (0.3%), and dabbing (0.3%). The weighted average of cannabis use in the past 30 days was about 1.4 days (SD=5.92).

3.2. Bivariate Tests

There was a statistically significant association between reasons for cannabis use and SCD in a weighted chi-square test ($p<.001$) (Table **2**). Specifically, SCD was more common among those who used cannabis for medical (8.7%) and both medical and non-medical reasons (4.5%), compared to those who used cannabis for non-medical reasons (0.5%).

The weighted t-test indicated a statistically significant association between cannabis use frequency and SCD ($p<.01$). The average days of cannabis consumption for those who had SCD (mean=8.68, SD=3.14) was significantly higher than the average days of cannabis use for those who did not have SCD (mean=5.44, SD=1.20).

A significant association was also found between the method of cannabis use and SCD in a weighted chi-square test ($p<.001$). In general, SCD was more common among those who used cannabis through any method. Especially for cannabis smokers, there was a higher prevalence of SCD (11.2%) compared to no reported SCD (4.7%).

3.3. Multiple Logistic Regression

There was a statistically significant association between cannabis use reason and subjective cognitive decline in all models. In the final model (Model D), after adjusting for all covariates, non-medical use of cannabis was associated with 96% significantly decreased odds of SCD (aOR=0.04, 95% CI=0.01-0.44, $p<.05$) (Table **3**). The magnitude of this association was relatively consistent across all four models. Cannabis use for medical reasons (aOR=0.46, 95% CI=0.06-3.61, $p=.46$) and for dual reasons (aOR=0.30, 95% CI=0.03-2.92, $p=.30$) were associated with lower odds of SCD, but not statistically significant.

There was a slight positive, but not significant, association between cannabis consumption frequency and SCD (aOR=1.01, 95% CI=0.96-1.05, $p=.82$). All of the methods of cannabis use were associated with increased odds of SCD when compared to non-users, but no associations were statistically significant. For example, in the fully adjusted model, those who consumed cannabis by smoking had 4.5 times higher odds of SCD compared to non-users (aOR=4.50, 95% CI=0.66-30.65, $p=.12$).

Among the covariates, education was significantly associated with SCD. For example, adjusted for all covariates, those who finished college had 58% decreased odds of SCD when compared to those with less than high school education (aOR=0.42, 95% CI=0.20-0.91, $p<.05$). Additionally, respondents with good physical and mental health had lower odds of SCD. Those who reported excellent general health were 63% less likely to experience SCD (aOR=0.37, 95% CI=0.06-0.88, $p<.05$). In contrast, respondents who had a history of heart disease had about two times increased odds of having SCD compared to those who never had heart disease. Respondents with a history of depression had 2.7 times higher odds of having SCD than those who never had depression (aOR=2.70, 95% CI=1.83-3.98, $p<.001$). For each additional day experiencing poor mental health, the odds of having SCD increased by five percent (aOR=1.05, 95% CI=1.03-1.06, $p<.001$). Although cannabis use may be related to other substances, such as alcohol and cigarette smoking, our fully adjusted model found no associations between SCD and these two substance use behaviors.

4. DISCUSSION

This study examined the relationship between various facets of cannabis use, encompassing reasons, frequency, and methods of administration; and SCD in a national U.S. sample of middle-aged and older adults. We found that non-medical cannabis use was significantly associated with reduced odds of SCD in comparison to non-users. Several factors might explain this observation. Non-medical use of cannabis often contains THC, which has a psychoactive component that creates the “high” sensation. Whereas CBD is non-psychoactive and often used for anxiety and chronic

Table 1. Weighted sample characteristics.

-	Mean (SD) or % (n)[a]
Sociodemographics	
Age Group	
45-49	11.72% (66.02)
50-54	14.21% (80.05)
55-59	12.38% (69.74)
60-64	15.84% (89.23)
65-69	14.01% (78.92)
70-74	12.75% (71.83)
75-79	10.52% (59.26)
80+	8.57% (48.28)
Female	52.7% (296.88)
Race and Ethnicity	
White, non-Hispanic	26.5% (147.04)
Black, non-Hispanic	1.5% (8.10)
Hispanic	5.9% (32.52)
Asian, non-Hispanic	46.22% (256.46)
Other	19.96% (110.75)
Highest Level of Education	
Less than high school	9.38% (52.20)
High school degree	22.91% (128.86)
Some college	32.86% (184.83)
College degree	34.85 (196.02)
Metropolitan Residence	78.09% (439.91)
Health	
General Health	
Excellent	16.46% (92.66)
Very good	33.94% (191.05)
Good	33.30% (187.45)
Fair	12.59% (70.87)
Poor	3.71% (20.88)
Heart Disease History	7.52% (41.88)
Diabetes History	15.43 (86.79)
Stroke History	4.91% (27.62)
Depression History	10.24% (57.48)
Days of Poor Mental Health (range 0-30) (mean, SD)	2.83 (7.04)
Substance Use	
Alcohol Consumption	42.76% (239.28)
Smoking Status	-
Never	60.71% (341.19)
Former	29.43% (165.31)
Current	9.85% (55.35)

Note:[a]All frequencies in thousands.

Table 2. Weighted cannabis use stratified by subjective cognitive decline[a].

-	Whole Sample (N=563.3)	No Subjective Cognitive Decline (N=501.9, 89.1%)	Subjective Cognitive Decline (N=61.4, 10.9%)	Bivariate Test[b]
Reason (%, N)				
Non-user	92.46% (520.86)	93.22% (467.90)	86.25% (52.96)	
Medical	3.23% (18.20)	2.56% (12.85)	8.74% (5.37)	*P*<.001
Non-medical	2.11% (11.89)	2.31% (11.59)	0.49% (0.30)	
Medical and non-medical	2.19% (12.34)	1.90% (9.54)	4.53% (2.78)	
Frequency (mean, SD)	5.92 (1.41)	5.44 (1.20)	8.68 (3.14)	*P*<.01
Method (%, N)				
Non-user	92.46% (520.86)	93.26% (467.92)	86.25% (52.94)	
Smoke	5.41% (30.47)	4.71% (23.63)	11.16% (6.85)	
Eat	1.16% (6.53)	0.12% (5.92)	1.01% (0.62)	*P*<.001
Drink	0.21% (1.18)	0.18% (0.90)	0.41% (0.25)	
Vaporize	0.29% (1.69)	0.29% (1.46)	0.40% (0.25)	
Dab	0.28% (1.58)	0.24% (1.20)	0.65% (0.40)	
Other	0.13% (0.73)	0.14% (0.70)	0.12% (0.07)	

Note:[a]All frequencies in thousands. [b]Chi-square for categorical variables and t-test for continuous variables.

Table 3. Weighted logistic regression of association between cannabis use and subjective cognitive decline

-	Model A aOR (95% CI), P	Model B aOR (95% CI), P	Model C aOR (95% CI), P	Model D aOR (95% CI), P
Cannabis Use Reason				
Non-User	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)
Medical	0.62 (0.11, 3.48), .59	0.69 (0.12, 3.91), .67	0.51 (0.07, 3.83), .51	0.46 (0.06, 3.61), .46
Non-Medical	0.04 (0.005, 0.33), <.01	0.04 (0.004, 0.31), <.01	0.05 (0.004, 0.48), <.01	0.04 (0.01, 0.44), <.05
Medical and non-Medical	0.38 (0.52, 2.78), .34	0.45 (0.06, 3.31), .43	0.34 (035, 3.19), .34	0.30 (0.03, 2.92), .30
Cannabis Use Frequency	1.02 (0.99, 1.06), .23	1.02 (0.98, 1.06), .35	1.00 (0.96, 1.05), .88	1.01 (0.96, 1.05), .82
Cannabis Use Method				
Non-User	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)
Smoke	4.69 (0.89, 24.55), .07	4.10 (0.79, 21.42), .09	4.33 (0.66, 28.41), .13	4.50 (0.66, 30.65), .12
Eat	1.55 (0.22, 10.83), .66	1.67 (0.23, 11.97), .61	2.19 (0.26, 17.75), .47	2.27 (0.26, 20.15), .46
Drink	4.64 (0.32, 66.76), .26	5.40 (0.37, 78.91), .22	7.86 (0.43, 143.04), .16	9.07 (0.49, 166.34), .14
Vaporize	2.17 (0.27, 17.19), .46	1.91 (0.27, 13.53), .52	1.96 (0.22, 17.71), .55	2.12 (0.23, 19.73),.51
Dab	5.51 (0.64, 47.21), .12	4.81 (0.48, 48.07), .18	3.26 (0.23, 45.54), .38	3.52 (0.25, 50.60), .36
Sociodemographic				
Age (years)				
45-49	-	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)
50-54	-	0.92 (0.44,1.92), .82	0.81 (0.37, 1.77), .59	0.80 (0.36, 1.78), .59
55-59	-	1.15 (0.56, 2.38), .70	0.93 (0.41, 2.11), .86	0.92 (0.40, 2.12), .85
60-64	-	0.92 (0.45, 1.90), .82	0.77 (0.35, 1.72), .53	0.77 (0.34, 1.73), .53
65-69	-	0.99 (0.47, 2.06), .97	0.86 (0.38, 1.95), .71	0.85 (0.37, 1.97), .71
70-74	-	1.19 (0.59, 2.42), .63	0.99 (0.45, 2.16), .98	0.99 (0.44, 2.22), .98
75-79	-	2.05 (0.99, 4.26), .05	1.81 (0.79, 4.15), .16	1.84 (0.78, 4.36), .17
80+	-	1.70 (0.77, 3.73), .19	1.42 (0.59, 3.43), .44	1.43 (0.58, 3.60), .44
Female	-	0.81 (0.61, 1.07), .14	0.75 (0.56, 1.00), .05	0.77 (0.57, 1.05), .10
Race and Ethnicity				
White, non-Hispanic	-	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)
Black, non-Hispanic	-	0.91 (0.18, 4.63), .91	1.11 (0.19, 6.63), .09	1.18 (0.20, 7.12), .86
Hispanic	-	0.99 (0.52, 1.91), .99	0.79 (0.39, 1.58), .50	0.81 (0.40, 1.64), .56

(Table 3) Contd....

-	Model A aOR (95% CI), P	Model B aOR (95% CI), P	Model C aOR (95% CI), P	Model D aOR (95% CI), P
Asian, non-Hispanic	-	0.78 (0.54, 1.14), .20	0.96 (0.64, 1.58), .85	1.01 (0.65, 1.56), .97
Other	-	1.06 (0.69, 1.63), .79	0.98 (0.62, 1.56), .93	1.03 (0.64, 1.65), .91
Highest Level of Education				
Less than high school	-	1.0 (Referent)	1.0 (Referent)	1.0 (referent)
High school	-	0.60 (0.31, 1.14), .12	0.57 (0.28, 1.17), .13	0.55 (0.27, 1.13), .11
Some college	-	0.43 (0.22, 0.82), <.05	0.45 (0.22, 0.93), .03	0.42 (0.21, 0.87), .02
College	-	0.40 (0.20, 0.78), <.05	0.46 (0.21, 0.99), <.05	0.42 (0.20, 0.91), <.05
Metropolitan Residence	-	1.09 (0.81, 1.47), .58	1.12 (0.82, 1.52), .48	1.13 (0.83, 1.53), .45
Health				
General Health				
Poor	-	-	1.0 (Referent)	1.0 (Referent)
Fair	-	-	1.21 (0.67, 2.21), .53	1.16 (0.63, 2.12), .64
Good	-	-	0.84 (0.47, 1.51), .56	0.79 (0.44, 1.44), .44
Very good	-	-	0.63 (0.34, 1.19), .15	0.59 (0.31, 1.12), .11
Excellent	-	-	0.39 (0.17, 0.91), <.05	0.37 (0.16, 0.88), .02
Heart disease history	-	-	1.97 (1.34, 2.90), <.05	1.98 (1.35, 2.91), <.05
Diabetes history	-	-	0.95 (0.66, 1.38), .79	0.96 (0.66, 1.39), .83
Stroke history	-	-	0.93 (0.55, 1.56), .79	0.94 (0.56, 1.60), .82
Depression history	-	-	2.70 (1.82, 4.01), <.001	2.70 (1.83, 3.98), <.001
Days of Poor Mental Health	-	-	1.05 (1.03, 1.06), <.001	1.05 (1.03, 1.06), <.001
Substance Use				
Alcohol	-	-	-	1.29 (0.95, 1.76), .11
Smoking Status				
Never	-	-	-	1.0 (Referent)
Former	-	-	-	1.05 (0.75, 1.47), .77
Current	-	-	-	0.96 (0.56, 1.65), .89
Model Significance	F(9, 4723)=4.66 p<.001	F(25, 4723)=3.26 p<.001	F(34, 4721)=7.91 p<.001	F(37, 4721)=7.33 p<.001

Abbreviation: aOR=adjusted odds ratio.

pain management [14]. Notably, a 2017 mouse study observed that very low doses of THC exposure might improve cognitive impairment among older female mice, although the effect may not be long-term, and the human applicability of this effect merits further exploration [15].

Another consideration is that coping with insomnia is a commonly reported motivation for cannabis use. This is important given that a recent study found that more frequent sleep disturbances were associated with higher dementia risk in a national U.S. older adult sample [16]. While its efficacy is debated and has limitations, some studies have associated the non-medical use of THC with a decrease in insomnia, particularly when precipitated by factors such as nightmares and PTSD [17, 18]. Additionally, several studies have found that cannabis use might enhance sleep quality, expedite sleep onset, and reduce sleep disturbances [19]. Non-medical cannabis use could have contributed to the observed decrease in SCD due to its potential benefit on sleep quality. Moreover, many people use cannabis to alleviate stress. Research has shown that CBD could effectively reduce stress [9, 11], and elevated stress levels could be associated with reduced cognitive function among older adults [20].

Although the bivariate tests suggested that cannabis use frequency was positively associated with SCD, the association was not found after adjusting for the reason and method of cannabis use, and other covariates in the regression models. While existing research generally indicates that heavier use of cannabis is associated with cognitive impairment [21], many of the studies have not found significant associations, potentially due to varied assessments of cognitive performance [22]. In addition, some studies indicate that the adverse cognitive effects linked to cannabis use might be more pronounced in younger populations [23], while its impact on cognitive performance in older adults may not be as significant [24]. This is particularly relevant for our study, as the BRFSS cognitive decline module targeted only adults aged 45 and older, with nearly half of the respondents being 65 years and older.

Our study revealed that various methods of cannabis use were not significantly associated with the odds of experiencing SCD compared to non-users. Previous research has largely focused on smoking as the primary method of cannabis use. It's important to note that smoking cannabis produces more immediate effects than other methods, such as edibles or beverages, due to the rapid absorption of chemicals through the lungs. The delayed onset of eating or drinking cannabis often results in higher overall consumption compared to smoking [21]. While vaping can expose users to

higher concentrations of THC. Another factor attributed to this finding might be that prior studies using the BRFSS data indicate that a significant proportion of cannabis users employ multiple methods of consumption. For example, one in three of those who smoke cannabis also use other methods, such as edibles or dabbing [25].

The findings for our non-cannabis variables aligned with previous research. For instance, like past studies, we found that higher education levels were associated with reduced odds of SCD [10]. The significant finding was consistent across all four models. Additionally, both days of experiencing poor mental health in the past month and a history of mental health issues showed positive associations with SCD. This mirrors prior research showing that poor mental health elevates the odds of SCD [26]. The study also found that those with a history of heart disease had nearly twice the odds of experiencing SCD, a finding in line with studies done using previous BRFSS data [27].

Despite the advancement of medicine and technology, dementia remains incurable and non-preventable. While some medications can slow symptom progression, they are only effective if started during early stages and cannot reverse its course. Thus, it is critical for health professionals to diagnose dementia early. Additionally, early diagnosis is crucial for timely intervention and lifestyle adaptation for individuals with dementia, their families, and caregivers [28]. SCD serves as a clinically important precursor to dementia, as it is associated with an increased risk of the condition [3]. Accordingly, one of the Healthy People 2030 objectives set by the U.S. Department of Health and Human Services aims to increase the percentage of adults with SCD seeking medical advice, thereby facilitating early diagnosis and intervention for dementia [29].

As an early marker of dementia, the mechanism underlying the progression from SCD to dementia is complex and not yet fully understood. Research in this area has produced varied results. Identification of these mechanisms is crucial for both health implications and the potential development of effective early interventions at the onset of dementia [4]. Public health research plays a vital role in exploring the social determinants that affect the development of dementia. Given the widespread use of cannabis in the U.S., it is imperative to pursue further research to understand the mechanism underlying the reduced odds of SCD among non-medical cannabis users. Concurrently, other measures of cannabis usage, such as frequency and methods, are worth further exploration as well.

This study has limitations. One limitation of this study is that the analysis did not explicitly consider variations resulting from geographical locations due to U.S. states that have varying cannabis regulations. Some states have legalized cannabis for non-medical purposes, while some other states only permit medical use. A report found that the increase in cannabis use over the last decade was more significant in states that legalized cannabis use [30]. Thus, potential selection bias could arise if the population of certain states is either over or underrepresented due to varying measures of cannabis use.

Moreover, bias could be introduced among respondents residing in states where cannabis use for non-medical reasons is illegal. Given that the information on cannabis usage was self-reported, individuals in such states may be more likely to underreport or misreport their cannabis use. Another limitation to consider is that the BRFSS cognitive decline module only included adults 45 years and older. The younger population may have different cannabis use behaviors and potentially different susceptibility to cognitive decline. Finally, all questions in the BRFSS cognitive decline module are self-reported by the respondent, including the SCD variable. Thus, further research is needed to examine whether our observed associations may remain for more objective measures of cognitive impairment.

Our study has notable strengths. First, by using a national data set with applied sampling weights, the results can be applied to the broader U.S. population of 45 years and older, which increases the generalizability of the findings. In addition, the primary focus of this study was to explore three different facets of cannabis use measures, including reasons, frequency, and methods of administration. Prior research often focused only on the frequency of cannabis use and its effects. To our knowledge, our study is the first to comprehensively examine the associations between SCD and all these three key components of cannabis use measures.

CONCLUSION

This study revealed that non-medical cannabis use is associated with reduced odds of SCD. Although increased frequency and different methods of cannabis use showed positive associations with SCD, these relationships were not statistically significant. Prior research on the link between cannabis use and SCD has produced mixed results. Our findings underscore the importance of considering multiple factors, such as reasons for cannabis use, when examining the relationship between cannabis and SCD. Further research is needed to explore the underlying mechanisms contributing to these associations.

LIST OF ABBREVIATIONS

BRFSS = Behavioral Risk Factor Surveillance System

CBD = Cannabidiol

SCD = Subjective Cognitive Decline

THC = Tetrahydrocannabinol

ETHICAL STATEMENT

This study uses public data and was deemed exempt by the SUNY Upstate Institutional Review Board for the Protection of Human Subjects (#2052641-1).

CONSENT FOR PUBLICATION

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

The data and supportive information are available within the article.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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