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Ordinal Logistic Regression Analysis of the Frequency of Marijuana Use Among Adult Informal Caregivers in 20 U.S. States, Behavioral Risk Factor Surveillance System (BRFSS) 2021

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1 Title

2 Ordinal Logistic Regression Analysis of the Frequency of Marijuana Use Among Adult
3 Informal Caregivers in 20 U.S. States, Behavioral Risk Factor Surveillance System
4 (BRFSS) 2021

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11

12 Abstract:

13 Objectives. To examine the association between frequency of marijuana use among
14 informal caregivers of persons with dementia (PWD) and other health conditions
15 compared to non-caregivers in 20 U.S. states.

16 Methods. We used complex survey data from the optional modules Caregiver and
17 Marijuana Use of the 2021 BRFSS survey. Univariate and bivariate analyses were
18 performed to determine the frequency and distribution of sample population
19 characteristics and calculate crude relationships. Ordinal logistic regression modelled
20 the relationship between the three-level outcome and covariates.

21 Results. Frequency of marijuana use and caregiver status were not associated. There
22 was no difference in increased use among individuals who take care of PWD or other
23 health conditions, compared to non-caregivers. Being male, young, and Black were
24 predictors for increased marijuana use, as were having poor mental health days, at
25 least one chronic condition, and recent substance use.

26 Conclusions. Associations between marijuana use and mental health and other
27 substance use warrant future examination as a combination of these high-risk factors
28 pose potential public health problems, particularly among younger adults and other
29 populations at risk for frequent marijuana use.

30 Introduction

31 Advances in healthcare (resulting in longer life expectancies) and soaring
32 healthcare costs have led to a steady increase in informal, or family, caregiving to
33 address a growing population of aging and sick Americans. According to the Centers for
34 Disease Control and Prevention (CDC), 22.3% of adults reported caring for or assisting
35 someone in the past 30 days.¹ In 2020, an estimated 53 million adults identified as
36 caregivers, an increase from 43.5 million in 2015.² Americans have worse health
37 outcomes compared to residents of other wealthy countries, a situation that has
38 contributed to a demand for caregiving services.³ Informal caregivers often fill gaps in
39 care but at a potential cost to their own health. Caregivers may experience physical and
40 mental stressors associated with work that is often challenging, unanticipated, unpaid,
41 and long-term.¹ In particular, caring for loved ones with dementia is correlated with
42 poorer health outcomes and lower quality of life compared to caregivers of non-
43 dementia patients with the strongest predictors of burden being depressive symptoms,
44 anxiety, and physical health problems.⁴⁻⁷

45 Marijuana use is on the rise. According to the 2021 National Surveys on Drug
46 Use and Health (NSDUH) annual report, 52.5 million people 12 years or older used
47 marijuana in the past year, almost six times more than prescription pain relievers
48 (misuse) at 8.7 million people.⁸ The 2019 NSDUH report estimates that the daily or
49 almost daily use of marijuana in adults in the past year increased from 1.3% in 2002 to
50 3.7% in 2019.⁹ In 2021, 13.0% of individuals 12 years and older (or 36.4 million people)
51 reported marijuana use in the past month, up from 6.1% in 2008.^{8,10} These increases
52 may correspond to more states allowing legal marijuana use for medical and/or
53 recreational purposes.¹⁰

54 The use of marijuana has been cited as a stress-coping strategy and as a major
55 motive to reduce negative affect.¹¹ To mitigate caregiving-associated strain, caregivers
56 may utilize various coping means, such as seeking respite care and emotional support,
57 as well as more dysfunctional methods including substance use (drinking, smoking, and
58 prescription drugs).¹²⁻¹⁶ Currently there are gaps in the literature regarding caregivers'
59 specific use of marijuana as a coping strategy in response to job-related burdens. It is
60 not well known whether caregivers would turn to marijuana more than those who are not

61 caregivers. One article showed an association between lifetime marijuana use and the
62 likelihood of being a caregiver, but the authors theorized this association to be the result
63 of self-selection into the caregiver role and the establishment of coping strategies due to
64 lifetime marijuana use.¹⁷ Researchers in another study examined a small population of
65 older adults and thought their marijuana use was related to multiple medical conditions
66 and aging-related strains such as caregiving for others.¹⁸

67 While there are potential therapeutic benefits of marijuana (e.g. chronic pain
68 relief or chemotherapy side effects), there is mounting research about its ill effects,
69 including impaired brain functioning, increased risk of stroke, development of
70 depressive mental states and temporary psychosis, and marijuana use disorder, or
71 addiction.¹⁹⁻²⁰ With more states legalizing and decriminalizing marijuana, its use for
72 medical and recreational purposes is expected to increase, and with it a rise in health
73 risks and adverse outcomes to marijuana-using caregivers could occur.

74 We sought to understand the frequency by which informal caregivers use
75 marijuana, and if there was higher frequency of use compared to non-caregivers. We
76 were interested in whether the type of condition the care recipient had influenced
77 frequency of use among those who cared for patients with dementia compared to those
78 who cared for people with other health conditions or illnesses. We expect to see an
79 association between caregiving and increased use of marijuana. The adverse health
80 effects of marijuana and risk for addiction may be correlated to the frequency of use
81 among caregivers, which could negatively affect care recipient outcomes.

82 **Methods**

83 **Study Design**

84 Data for this study were taken from the Centers for Disease Control and
85 Prevention's (CDC) 2021 Behavioral Risk Factor Surveillance System (BRFSS), an
86 annual health-related survey conducted by random-digit dialing of landline and cellular
87 telephones with data collected in all 50 states, the District of Columbia (DC), and three
88 territories.²¹ The BRFSS employs a cross-sectional study design to collect data from
89 U.S. non-institutionalized adults (aged 18 and over) regarding their health-related risk
90 behaviors, chronic diseases and conditions, access to health care, and use of

91 preventive services.²¹ The 2021 BRFSS data include landline and cell phone data from
92 all 50 states, DC, Guam, Puerto Rico, and the US Virgin Islands.²²

93 Study Population

94 The core module and optional modules Caregiver and Marijuana Use were
95 utilized for the analysis. All the data sets were merged to account for different sampling
96 weights in the optional modules. Analysis was restricted to 20 states participating in the
97 optional modules Caregiver and Marijuana Use (N=189,693).

98 Self-reported Marijuana Use

99 The outcome of interest was the self-reported frequency of marijuana usage
100 during the past 30 days. This variable was divided into three categories based on a
101 grouping of days in a 30-day period. Respondents who reported no marijuana use were
102 categorized in 'none/no use (0 days).' Respondents who reported marijuana use during
103 the past 30 days were separated into two categories: 'non-daily use (1-19 days),' and
104 'daily or almost daily use (20-30 days).' The latter categories were based on NSDUH
105 data collection of cannabis use and use frequency in the past 12 months. "Daily or near
106 daily users" were past-year cannabis users reporting on average using 5 or more days
107 per week, 20 or more days per month, or 240 or more days in the past 12 months.²³

108 Caregiver Status

109 The primary exposure was caregiver status during the past 30 days. Those who
110 provided unpaid regular care or assistance to a friend or family member with a health
111 condition, illness, or disability were placed in either: 'Other caregiver' (the other referring
112 to all other conditions not including dementia) or a subset 'Caregiver of PWD' (person
113 with dementia, or someone with Alzheimer's disease, dementia, or other cognitive
114 impairment disorder). Respondents who reported no care provision were categorized as
115 'Not a caregiver.'

116 Covariates included sociodemographic characteristics: age (18-44, 45-64, 65
117 years old and up), sex, race and ethnicity (non-Hispanic White, non-Hispanic Black or
118 African American, Hispanic, and a non-Hispanic Other group which included non-
119 Hispanic American Indian or Alaska Native, Asian, or Other), educational attainment
120 level (did not graduate high school, high school graduate, attended college, college
121 graduate), income level (\$0 to \$24,999, \$25,000 to \$74,999, ≥\$75,000, not reported),

122 and marital status (married, not married). Employment status had 3 categories:
123 employed (employed or self-employed), unemployed (out of work > 1 year or out of
124 work for < 1 year, and out of the workforce (homemaker, student, retired, unable to
125 work). In the analysis, an interaction term for age and caregiver status was included as
126 age was suspected to be an effect modifier.

127 The variables that focused on health behaviors associated with a risk of illness or
128 injury were also included.²⁴ Poor mental or physical health status was grouped by the
129 number of poor mental or physical days reported in the past 30 days: 0 days, 1-13 days,
130 or 14-30 days. Tobacco use consisted of two categories of smoking status (non-smoker,
131 current smoker). We included a variable for having no chronic condition or having at
132 least one chronic condition, including heart attack, angina or heart disease, stroke,
133 history of asthma, current asthma, skin cancer, any other cancer, COPD (chronic
134 obstructive pulmonary disease)/emphysema/bronchitis, depressive disorder, kidney
135 disease, diabetes, or arthritis, excluding any missing/don't know/not sure/refused
136 responses from the analysis.²⁴ Defined as drinking in the past 30 days and having five
137 or more drinks on one or more occasions in the past month, binge drinking consisted of
138 a yes or no response regarding usage.²⁴

139 Statistical Analysis

140 All variables in this study were categorical. Weighted analyses were used to
141 account for the complex survey design of the BRFSS data. Primary sampling unit,
142 stratum, and weighting variables were included in programming statements. Univariate
143 analysis was performed to examine the distribution of individual study variables,
144 reporting the distribution and adjusted percentages of each. A bivariate analysis
145 comparing the outcome and each covariate was conducted. A bivariate analysis
146 comparing the exposure and each covariate was conducted. Weighted odds ratios were
147 calculated from these bivariate analyses. SAS Studio version 3.82 (SAS Institute, Cary,
148 NC) was used.

149 Polytomous logistic regression was selected for the multivariate analysis. Ordinal
150 logistic regression (OLR) was selected for modeling the ordered categories. The
151 outcome variable, marijuana use frequency, fit the criteria for utilizing OLR as it is non-
152 dichotomous and has ordered categories (0 days, 1-19 days, 20-30 days). Model

153 selection was conducted using the backward selection method. A variable found to be
154 non-significant was removed unless critical to the analysis. A p-value <0.05 was
155 considered significant.

156 Effect modification by age was assessed and if found to be non-significant, the
157 term was removed. Confounding was assessed by running logistic regression models
158 for the bivariate analyses. If p-values were significant in the bivariate analyses, the
159 covariate was considered a confounder and carried forward into the multivariate model.
160 Potential confounders were controlled for in the model.

161 **Results**

162 A total of 143,416 participants (75.1%) met the inclusion criteria, i.e. persons had
163 a response for both marijuana use and caregiver status. Demographic characteristics
164 from the univariate analysis are presented in Table 1. Most of the population reported no
165 marijuana use in the past 30 days (88.02%). Those who reported non-daily marijuana
166 use (1 to 19 days) was 6.02% and those who took marijuana daily or almost daily was
167 5.96%. There were 46,277 missing responses (24.4%) for marijuana use. Much of the
168 population were not caregivers (87.52%). Caregivers who identified as providing care
169 for a person with dementia were at 2.6%, while caregivers of other health conditions
170 made up 9.88%. There were more females (51.4%) than males (48.6%), while the
171 proportion of married (50.13%) and non-married (49.87%) respondents were almost
172 evenly distributed. Most respondents were older (55% were 45 years and older),
173 employed (57.5%), non-Hispanic whites (67.61%) with a college degree (30.62%). Of
174 the population, 55.49% reported having at least one diagnosed chronic condition. Sixty-
175 five percent had income levels at \$25,000 and above, though 22.2% did not report
176 income. Respondents reported having 0 days of poor mental (60.53%) or physical
177 health (68.26%) in the past 30 days. Non-smokers made up 85.83% of the population,
178 while those who were not binge drinkers was 85.02%.

179 Bivariate analysis results comparing the covariates against the outcome are
180 presented in Table 2. Caregivers of persons with conditions other than dementia were
181 more likely to use marijuana (OR=1.21, 95% CI=1.08, 1.36). Males (OR=1.53, 95%
182 CI=1.42, 1.65), Blacks (OR=1.46, 95% CI=1.29, 1.65), and those making less than
183 \$75,000 a year were more likely to use marijuana. Individuals 18 to 44 years old had 6

184 times the odds of using marijuana (95% CI=5.47, 6.79) while those 45 to 64 years old
185 had 2.7 times the odds (95% CI=2.39, 3.04).

186 Those more likely to use marijuana had one or more chronic conditions
187 (OR=1.27, 95% CI=1.18, 1.37) and be involved in substance use (smoking: OR=3.39,
188 95% CI=3.12, 3.69; binge drinking: OR=3.75, 95% CI=3.45, 4.08). Poor mental and
189 physical health days were both associated with marijuana use. Specifically, those who
190 reported having 14 to 30 days of poor mental health had 353% greater odds of using
191 marijuana. Smokers and binge drinkers had 239% and 275%, respectively, higher
192 likelihood of using marijuana.

193 Bivariate analysis results comparing covariates and the exposure are presented
194 in Table 3. Daily or almost daily marijuana use was associated with caregiving
195 (OR=1.27, 95% CI=1.10, 1.46). Caregivers were more likely to be white, middle-aged
196 (OR=1.18, 95% CI=1.11, 1.26), married (OR=1.31, 95% CI=1.24, 1.39), female, high
197 school graduates (OR=1.42, 95% CI=1.24, 1.62) and above, with annual incomes of
198 less than \$75,000. Caregiving was significantly associated with having a chronic
199 condition (OR=1.71, 95% CI=1.61, 1.82). Caregiving was also associated with poor
200 mental health days and poor physical health days. Smoking (OR=1.48, 95% CI=1.29,
201 1.70) but not binge drinking (OR=0.91, 95%=0.82, 1.00), was associated with being a
202 caregiver.

203 Multivariate analysis results are presented in Table 4. Employment was non-
204 significant (p-value=0.07). The test for effect modification by age was also not significant
205 (p-value=0.81). The covariate employment and the effect modification term were
206 removed from the model. In the final model, caregiving was not statistically significant at
207 the threshold of 0.05. Because we used ordinal logistic regression, cumulative odds
208 ratios (COR) were output. Compared to the reference group (non-caregivers),
209 caregivers of persons with dementia had a non-significant association with increased
210 marijuana use (COR=0.94, 95% CI=0.77, 1.16), as did caregivers of other conditions
211 (COR=1.00, 95% CI=0.88, 1.15).

212 There were significant associations for several of the sociodemographic
213 covariates. Males had 1.71 the odds of being in the next higher category of marijuana
214 use (daily or almost daily use) than females (95% CI=1.57, 1.87). Blacks were likelier to

215 be in the higher category of marijuana use than Whites (COR=1.41, 95% CI=1.23,
216 1.62). The younger age groups were 339% (18-44) and 125% (45-64) more likely to be
217 in the higher category of frequency marijuana use compared to adults 65 years of age
218 and older. Married people were less likely to be in the highest category of marijuana use
219 (COR=0.59, 95% CI=0.54, 0.64).

220 In terms of health, all covariates in the model had significant results. There was a
221 relationship between having one or more chronic conditions and being in the higher
222 category of the outcome (COR=1.44, 95% CI=1.31, 1.58). Having poor mental health
223 was associated with being in the most frequent marijuana use category, with those
224 reporting 14 to 30 days having a higher likelihood (COR=2.53, 95% CI=2.24, 2.86) than
225 those who reported 1 to 13 days (COR=1.64, 95% CI=1.48, 1.81). Similarly, adults with
226 poor physical health were likely to be in the higher category of marijuana use (1 to 13
227 days: COR=1.22, 95% CI=1.11, 1.35; 14 to 30 days: COR=1.37, 95% CI=1.18, 1.58).
228 Adults who identified as smokers had 2.32 the odds (95% CI=2.09, 2.57) and binge
229 drinkers 2.58 the odds (95% CI=2.34, 2.83), of higher frequency marijuana use
230 compared to non-smokers and non-binge drinkers, respectively.

231 **Discussion**

232 A population-based sample was used to explore the association between
233 caregiving and frequency of marijuana use. Our hypothesis proposed that the frequency
234 of marijuana use would be associated with being a caregiver (i.e. that the expected
235 frequency of marijuana usage would be higher among caregivers, specifically of
236 persons with dementia, as a response to caregiving stressors), but we found no
237 significant association between marijuana use and caregiver type after adjusting for all
238 other variables. Based on the evidence, there does not appear to be a difference
239 between caregivers and non-caregivers in terms of how often marijuana is used. This
240 suggests that overall, this population does not engage in marijuana use any more or
241 less than the general population in the study sample.

242 In our analysis, marijuana use frequency was predicted by factors such as sex,
243 race/ethnicity, age, presence of chronic conditions, poor mental and physical health,
244 smoking, and binge drinking. When examining sex, males were more likely to engage in
245 frequent marijuana use than females. In the literature, females comprise more than half

246 the population of informal caregivers (58%) and make up 66% of caregivers of persons
247 with dementia.²⁵⁻²⁶ It is reasonable to assume that female caregivers engage in less
248 frequent marijuana use and that in the context of caregiving, perhaps women cope with
249 stressors differently from men.

250 Adults in the younger and middle age groups were associated with increased
251 marijuana usage compared to adults 65 years and up. There was a dose-response
252 relationship (with increased use in the younger group compared to the middle group),
253 which was corroborated in the literature.²⁷ The median age in the U.S. was 38.9
254 between 2021 and 2022, while on average, informal caregivers of adults are 49.4 years
255 old, with a median age of 51.0 years.²⁸⁻²⁹ Given these statistics, caregiver age tends to
256 skew towards middle to early old age (35% among 50-64 year old adults compared to
257 24% among 18-34 year old individuals),²⁹ and we would have expected less marijuana
258 use in this cohort compared to the youngest group of adults. Our results show that the
259 middle group, composed of respondents 45 to 64 years old, had half the odds of
260 increased use of marijuana compared to those in the 18 to 44 group, so while less, this
261 group was still likelier to use marijuana more compared to adults 65 and older. While
262 the 45–65-year-old group (which comprised a large part of the caregiver population)
263 engaged in frequent marijuana use, we were unable to say that this behavior is
264 associated with being a caregiver.

265 Being Black or African American was associated with higher frequency marijuana
266 use. Blacks currently make up about 14% of the caregiver population, often working
267 alone with no assistance and experiencing greater burden due to higher-intensity care
268 needs.^{2, 30} However, Blacks were more likely to report a sense of purpose in providing
269 care, and in general may be better able to cope with the demands of caregiving, as one
270 study concluded that Black dementia caregivers to have better psychological well-being
271 than their White counterparts.³⁰⁻³¹ The higher frequency marijuana use in Blacks may
272 not be related to caregiving at all, but rather to reasons linked to marijuana legalization
273 and the criminal justice system.²⁷

274 Health-related variables were significantly associated with increased marijuana
275 use. Those with chronic conditions were likely to use marijuana frequently, perhaps for
276 medical purposes related to their comorbidity.³² The potential therapeutic effects for

277 marijuana have been demonstrated in the management of various health conditions,
278 stimulating medical cannabis programs in legal states.³³ Those reporting poor mental
279 health status (and to a lesser degree, physical health) were likelier to use marijuana
280 frequently. A dose response relationship was observed, indicating that having more
281 unhealthy mental and physical days was correlated to increased marijuana use.
282 Numerous studies have highlighted the impact of caregiver strain, with a strong
283 consensus that the demands of caregiving can, to different degrees, adversely affect the
284 mental and/or physical health of the caregiver.³⁴ In light of the insignificant association of
285 caregiving and marijuana use in this study, it is possible that individuals already at risk
286 of poor health outcomes may opt into the caregiver role. Other variables not related to
287 caregiving could partially explain varying states of health and stress experienced by
288 caregivers.

289 Polysubstance use was apparent in our study as both tobacco smoking and
290 binge drinking were associated with increased marijuana use. One article reported that
291 9.4% of the general population with past month marijuana use had concurrent
292 consumption of other substances, including tobacco, alcohol, and other drugs.³⁵
293 Caregivers experiencing job-related stress are at great risk for engaging in unhealthy
294 activities such as smoking and drinking.

295 **Limitations**

296 The sample included 20 states, restricted to those who participated in the
297 optional modules Marijuana Use and Caregiver. Marijuana was illegal in 5 states at the
298 time of the 2021 BRFSS survey, and only 7 of the 20 states had both medical and
299 recreational use laws in place in 2021. Additionally, this study did not distinguish
300 between medical or recreational use among respondents. Therefore, the sample may
301 not be generalized to populations in other states or be nationally representative.

302 Marijuana use had a high degree of missingness (24.4%) which could indicate
303 that many participants skipped the question or chose not to answer. This may be a
304 consequence of lingering societal stigma associated with marijuana, which may result in
305 social desirability bias. Self-reported data collection may be subject to recall bias. Due
306 to these biases, results cannot be generalized to the population.

307 The cross-sectional nature of the data did not allow investigation of causal
308 relationships between marijuana use and caregiving. In future studies, other indicators
309 of caregiving may represent another measure of caregiver burden, such as time spent
310 providing care or length of time in the caregiver role. A comparison of caregivers to
311 expectant caregivers rather than to non-caregivers may provide meaningful insight.
312 Some non-caregiving individuals may not be able or willing to accept a caregiving role,
313 and thus they differ in ways from individuals who could provide care.

314 **Public Health Importance**

315 Several findings of this study call for further research. The association between
316 marijuana use and other harmful substances (alcohol and tobacco) warrant future
317 examination as a combination of these high-risk behaviors poses potential public health
318 problems. As both marijuana and alcohol have psychoactive effects, dual use of these
319 substances may impair a person's ability to drive, with potentially unsafe consequences.
320 A combination of smoking marijuana and tobacco may have health-related implications,
321 such as cancer and cardiovascular and respiratory issues. Understanding whether a
322 bidirectional relationship exists between mental health and marijuana merits further
323 study given those with reported poor mental health were likelier to use marijuana more
324 frequently. Assessment and evaluation of the public health impacts of marijuana are
325 needed considering the rapid pace of legalization (translating into increased availability
326 and accessibility), with particular focus on the effects among younger adults and other
327 populations identified in this study to be more at risk for frequent marijuana use.

Table 1 – Distribution of Study Characteristics in 20 states, Behavioral Risk Factor Surveillance System (BRFSS), 2021

Characteristic	N	Adjusted %
Marijuana use frequency		
None	128797	88.02
Non-daily	7217	6.02
Daily or almost daily	7402	5.96
Caregiver status		
Not a caregiver	165724	87.52
Caregiver of PWD	5322	2.6
Other caregiver	18647	9.88
Sex		
Male	87414	48.6
Female	102279	51.4
Race/ethnicity		
White, non-Hispanic	146237	67.61
Black, non-Hispanic	12033	11.72
Hispanic	11153	11.65
Other, non-Hispanic	15498	9.02
Age		
18-44 years	54038	45.05
45-64 years	66455	32.18
65+ years	69200	22.77
Marital status		
Not married	88564	49.87
Married	98875	50.13
Educational level		
Did not graduate HS	9575	10.83
High school grad	49190	28.64
Attended college	51906	29.92
College graduate	77948	30.62
Employment status		
Employed	97715	57.5
Unemployed	8959	6.88
Out of workforce	79430	35.63
Income level		
\$0 to \$24,999	22854	12.53
\$25,000 to \$74,999	66416	33.89
≥\$75,000	59421	31.36
Not reported	37093	22.22
Chronic condition		
No	70980	44.51
Yes	118713	55.49
Poor mental health days		
0 days	118782	60.53
1 to 13 days	44679	25.25
14 to 30 days	22819	14.23
Poor physical health days		
0 days	125810	68.26
1 to 13 days	38655	21.00
14 to 30 days	21152	10.73
Smoking status		
Non-smoker	155153	85.83
Current smoker	23395	14.17
Binge drinker		
Not a binge drinker	150811	85.02
Binge drinker	22762	14.98

N=population; PWD=person

Table 2 – Bivariate Analysis of Marijuana Use Frequency by Caregiver Status and Sociodemographic Characteristics in 20 States, BRFSS 2021

Characteristic	None N(A %)	Non-daily N(A%)	Daily/almost daily N(A%)	Crude OR (95% CI)
Caregiver				
Not a caregiver	111454 (75.56)	6228 (5.16)	6235 (4.94)	REFERENCE
Caregiver of PWD	3989 (2.74)	205 (0.15)	237 (0.17)	0.88 (0.73, 1.07)
Other caregiver	13354 (9.72)	784 (0.71)	930 (0.85)	1.21 (1.08, 1.36)*
Sex				
Male	57288 (41.22)	3934 (3.33)	4235 (3.54)	1.53 (1.42, 1.65)*
Female	71509 (46.80)	3283 (2.68)	3167 (2.42)	REFERENCE
Race/ethnicity				
White, non-Hispanic	100861 (61.90)	5488 (4.13)	5500 (4.04)	REFERENCE
Black, non-Hispanic	7958 (9.41)	519 (0.89)	502 (0.92)	1.46 (1.29, 1.65)*
Hispanic	6802 (9.13)	444 (0.63)	440 (0.50)	0.94 (0.81, 1.09)
Other, non-Hispanic	10338 (7.59)	634 (0.40)	781 (0.47)	0.88 (0.77, 0.996)*
Age (years)				
18-44	32114 (35.06)	3514 (4.05)	3757 (4.04)	6.10 (5.47, 6.79)*
45-64	45258 (29.70)	2416 (1.51)	2528 (1.51)	2.69 (2.39, 3.04)*
65+	51425 (23.26)	1287 (0.46)	1117 (0.41)	REFERENCE
Marital status				
Married	70090 (47.42)	2804 (1.89)	2532 (1.82)	0.38 (0.35, 0.41)*
Not married	57422 (40.53)	4361 (4.16)	4825 (4.17)	REFERENCE
Educational level				
Did not graduate HS	5839 (8.69)	305 (0.56)	539 (0.78)	REFERENCE
High school	31859 (24.45)	1751 (1.73)	2497 (2.17)	1.03 (0.87, 1.22)
Attended college	34770 (26.80)	2185 (2.01)	2445 (2.07)	0.97 (0.82, 1.15)
College graduate	55804 (28.10)	2955 (1.71)	1901 (0.95)	0.60 (0.51, 0.70)*
Employment status				
Employed	65288 (49.54)	4409 (3.82)	4155 (3.64)	0.59 (0.51, 0.67)*
Unemployed	5355 (5.16)	575 (0.59)	732 (0.72)	REFERENCE
Out of workforce	57089 (33.28)	2179 (1.63)	2475 (1.62)	0.38 (0.33, 0.44)*
Income level				
\$0 to \$24,999	14551 (9.88)	1108 (0.88)	1561 (1.12)	1.85 (1.65, 2.08)*
\$25,000 to \$74,999	45768 (30.01)	2670 (2.06)	3135 (2.60)	1.42 (1.30, 1.55)*
≥ \$75,000	43548 (29.44)	2435 (1.95)	1666 (1.33)	REFERENCE
Not reported	24930 (18.69)	1004 (1.12)	1040 (0.91)	0.98 (0.87, 1.11)
Chronic condition				
No	47117 (38.22)	2665 (2.52)	2202 (2.02)	REFERENCE
Yes	81680 (49.79)	4552 (3.50)	5200 (3.95)	1.27 (1.18, 1.37)*
Poor mental health days				
0 days	83675 (55.81)	2945 (2.25)	2819 (2.13)	REFERENCE
1 to 13 days	29612 (21.67)	2677 (2.22)	2136 (1.68)	2.27 (2.08, 2.48)*
14 to 30 days	13418 (10.56)	1485 (1.53)	2311 (2.15)	4.53 (4.10, 5.00)*
Poor physical health days				
0 days	86758 (60.80)	4190 (3.45)	3940 (3.30)	REFERENCE
1 to 13 days	25812 (18.19)	1989 (1.84)	1841 (1.55)	1.66 (1.53, 1.81)*
14 to 30 days	13688 (9.05)	930 (0.70)	1502 (1.11)	1.85 (1.65, 2.07)*
Smoking status				
Non-smoker	114260 (77.76)	5361 (4.63)	4638 (3.74)	REFERENCE
Current smoker	13579 (10.26)	1815 (1.38)	2714 (2.23)	3.39 (3.12, 3.69)*
Binge drinking				
Not a binge drinker	112975 (77.61)	4648 (3.79)	5146 (4.06)	REFERENCE
Binge drinker	13355 (10.44)	2431 (2.23)	2073 (1.87)	3.75 (3.45, 4.08)*

N=population; A%=adjusted %; OR=odds ratio; CI=confidence interval; PWD=person with dementia; *p-value <0.05

Table 3 – Bivariate analysis of Caregiver Status by Marijuana Use Frequency and Sociodemographic Characteristics in 20 States, BRFSS 2021

Characteristic	Not a caregiver N(A%)	Caregiver of PWD N(A%)	Other caregiver N(A%)	Crude OR (95% CI)
Marijuana use frequency				
None	111454 (75.56)	3989 (2.74)	13354 (9.72)	REFERENCE
Non-daily	6228 (5.16)	205 (0.15)	784 (0.71)	1.02 (0.88, 1.18)
Daily or almost daily	6235 (4.94)	237 (0.17)	930 (0.85)	1.27 (1.10, 1.46)*
Sex				
Male	78277 (43.56)	1823 (0.96)	7314 (4.08)	0.69 (0.66, 0.81)*
Female	87447 (43.96)	3499 (1.64)	11333 (5.80)	REFERENCE
Race/ethnicity				
White, non-Hispanic	127329 (58.15)	4156 (2.01)	14743 (7.45)	REFERENCE
Black, non-Hispanic	10753 (10.48)	298 (0.25)	982 (1.00)	0.73 (0.66, 0.81)*
Hispanic	10134 (10.75)	194 (0.15)	825 (0.74)	0.52 (0.45, 0.59)*
Other, non-Hispanic	13329 (8.11)	537 (0.20)	1632 (0.71)	0.69 (0.62, 0.76)*
Age				
18-44	48733 (40.62)	868 (0.60)	4437 (3.84)	0.72 (0.67, 0.77)*
45-64	56333 (27.19)	2500 (1.27)	7622 (3.73)	1.18 (1.11, 1.26)*
65+	60658 (19.72)	1954 (0.73)	6588 (2.32)	REFERENCE
Marital status				
Married	85145 (43.10)	3252 (1.63)	10478 (5.40)	1.31 (1.24, 1.39)*
Not married	78535 (44.39)	2033 (0.98)	7996 (4.50)	REFERENCE
Educational level				
Did not graduate HS	8637 (9.83)	181 (0.16)	757 (0.83)	REFERENCE
High school graduate	43398 (25.04)	1154 (0.71)	4638 (2.88)	1.42 (1.24, 1.62)*
Attended college	44550 (25.64)	1609 (0.89)	5747 (3.39)	1.64 (1.45, 1.87)*
College graduate	68150 (26.98)	2360 (0.85)	7438 (2.80)	1.33 (1.17, 1.51)*
Employment status				
Employed	85656 (50.68)	2594 (1.38)	9465 (5.44)	0.82 (0.72, 0.93)*
Unemployed	7586 (5.91)	270 (0.14)	1103 (0.82)	REFERENCE
Out of workforce	69087 (30.76)	2417 (1.11)	7926 (3.76)	0.96 (0.84, 1.09)
Income level				
\$0 to \$24,999	19688 (10.87)	672 (0.32)	2494 (1.34)	1.14 (1.04, 1.24)*
\$25,000 to \$74,999	56981 (28.83)	2079 (1.03)	7356 (4.03)	1.30 (1.22, 1.40)*
≥ \$75,000	52062 (27.63)	1743 (0.87)	5616 (2.86)	REFERENCE
Not reported	33084 (19.88)	828 (0.44)	3181 (1.90)	0.88 (0.80, 0.96)*
Chronic condition				
No	63964 (40.36)	1461 (0.77)	5555 (3.37)	REFERENCE
Yes	101760 (47.16)	3861 (1.83)	13092 (6.51)	1.71 (1.61, 1.82)*
Poor mental health days				
0 days	105714 (54.01)	2802 (1.37)	10266 (5.15)	REFERENCE
1 to 13 days	38108 (21.79)	1526 (0.72)	5042 (2.73)	1.31 (1.23, 1.41)*
14 to 30 days	18910 (11.70)	915 (0.52)	2994 (2.00)	1.79 (1.65, 1.93)*
Poor physical health days				
0 days	111055 (60.55)	3255 (1.63)	11500 (6.09)	REFERENCE
1 to 13 days	32943 (17.92)	1302 (0.63)	4410 (2.45)	1.35 (1.26-1.45)*
14 to 30 days	18049 (9.01)	684 (0.36)	2419 (1.36)	1.50 (1.38-1.63)*
Smoking status				
Non-smoker	135347 (75.13)	4475 (2.27)	15331 (8.43)	REFERENCE
Current smoker	19387 (11.56)	809 (0.500)	3199 (2.11)	1.48 (1.29-1.70)*
Binge drinking				
Not a binge drinker	112975 (77.61)	4648 (3.79)	5146 (4.06)	REFERENCE
Binge drinker	13355 (10.44)	2431 (2.23)	2073 (1.87)	0.91 (0.82, 1.00)

N=population; A%=adjusted %; OR=odds ratio; CI=confidence interval; PWD=person with dementia; *p-value <0.05

Table 4 – Ordinal Logistic Regression Analysis of Marijuana Use Among Informal Caregivers and Non-caregivers and Sociodemographic Characteristics, 20 states, BRFSS 2021

Characteristic	Crude Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)
Caregiver		
Not a caregiver	REFERENCE	REFERENCE
Caregiver of PWD	0.88 (0.73, 1.07)	0.94 (0.77, 1.16)
Other caregiver	1.21 (1.08, 1.36)*	1.00 (0.88, 1.15)
Sex		
Male	1.53 (1.42, 1.65)*	1.71 (1.57, 1.87)*
Female	REFERENCE	REFERENCE
Race/ethnicity		
White, non-Hispanic	REFERENCE	REFERENCE
Black, non-Hispanic	1.46 (1.29, 1.65)*	1.41 (1.23, 1.62)*
Hispanic	0.94 (0.81, 1.09)	0.77 (0.65, 0.92)*
Other, non-Hispanic	0.88 (0.77, 0.996)*	0.85 (0.74, 0.97)*
Age		
18-44	6.10 (5.47, 6.79)*	4.39 (3.86, 4.98)*
45-64	2.69 (2.39, 3.04)*	2.25 (1.95, 2.58)*
65+	REFERENCE	REFERENCE
Marital status		
Married	0.38 (0.35, 0.41)*	0.59 (0.54, 0.64)*
Not married	REFERENCE	REFERENCE
Educational level		
Did not graduate HS	REFERENCE	REFERENCE
High school graduate	1.03 (0.87, 1.22)	1.10 (0.91, 1.33)
Attended college	0.97 (0.82, 1.15)	1.07 (0.88, 1.29)
College graduate	0.60 (0.51, 0.70)*	0.88 (0.72, 1.06)
Income level		
0-\$24,999	1.85 (1.65, 2.08)*	1.10 (0.95, 1.28)
\$25,000-\$74,999	1.42 (1.30, 1.55)*	1.09 (0.99, 1.21)
\$75,000+	REFERENCE	REFERENCE
Not Reported	0.98 (0.87, 1.11)	0.87 (0.75, 1.01)
Chronic condition		
No	REFERENCE	REFERENCE
Yes	1.27 (1.18, 1.37)*	1.44 (1.31, 1.58)*
Poor mental health		
0 days	REFERENCE	REFERENCE
1 to 13 days	2.27 (2.08, 2.48)*	1.64 (1.48, 1.81)*
14 to 30 days	4.53 (4.10, 5.00)*	2.53 (2.24, 2.86)*
Poor physical health		
0 days	REFERENCE	REFERENCE
1 to 13 days	1.66 (1.53, 1.81)*	1.22 (1.11, 1.35)*
14 to 30 days	1.85 (1.65, 2.07)*	1.37 (1.18, 1.58)*
Smoking status		
Non-smoker	REFERENCE	REFERENCE
Current smoker	2.38 (2.09, 2.72)*	2.32 (2.09, 2.57)*
Binge drinker		
Not a binge drinker	REFERENCE	REFERENCE
Binge drinker	2.63 (2.33, 2.97)*	2.58 (2.34, 2.83)*

CI=confidence interval; PWD=person with dementia; *p-value <0.05

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