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## Adverse Childhood Experiences and Current Cannabis Use among U.S. Young Adults

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# Adverse Childhood Experiences and Current Cannabis Use among U.S. Young Adults

## Abstract

Cannabis use is a significant public health issue among U.S. young adults. The objective of this study was to assess the associations between adverse childhood experiences (ACEs) and current cannabis use among U.S. young adults. We conducted a secondary analysis of the 2021 Behavioral Risk Factor Surveillance System (BRFSS) data, which involved 498 U.S. young adults 18-24 years old who had data available for analysis on ACEs and current cannabis use. Unadjusted and adjusted logistic regression models were fitted to examine the associations between ACEs and current cannabis use. Adjusted models included participants' sex, race/ethnicity, education level, and household income level. One-fourth (25.5%) of participants reported current cannabis use, and 21.3% reported one ACE, 25.2% reported 2-3 ACEs, and 38.4% reported  $\geq 4$  ACEs. Unadjusted (odds ratio [OR]=4.22, 95% confidence interval [CI]=1.91-9.33) and adjusted (adjusted OR=4.23, 95%CI=1.57-11.38) model results indicated that participants who experienced  $\geq 1$  ACE were at increased odds of reporting current cannabis use than participants with no ACEs. Unadjusted (OR=5.79, 95%CI=2.40-14.00) and adjusted (AOR=6.48, 95%CI=2.15-19.55) model results indicated that participants who experienced  $\geq 4$  ACEs were at increased odds of reporting current cannabis use than participants with no ACEs. Adjusted model results revealed that experiencing living with a household member who had a mental illness or sexual abuse increased the odds of reporting current cannabis use. Results demonstrated relations among ACEs and current cannabis use in young adulthood, especially among those who experienced  $\geq 4$  ACEs and experienced living with a household member who had a mental illness or sexual abuse.

## Keywords

adverse childhood experiences, cannabis, substance use, young adults, Behavioral Risk Factor Surveillance System

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## Adverse Childhood Experiences and Current Cannabis Use among U.S. Young Adults

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### Abstract

Cannabis use is an important public health issue among U.S. young adults. The objective of this study was to assess the associations between adverse childhood experiences (ACEs) and current cannabis use among U.S. young adults. We conducted a secondary analysis of the 2021 Behavioral Risk Factor Surveillance System (BRFSS) data, which involved 498 U.S. young adults 18-24 years old who had data available for analysis on ACEs and current cannabis use. Unadjusted and adjusted logistic regression models were fitted to examine the associations between ACEs and current cannabis use. Adjusted models included participants' sex, race/ethnicity, education level, and household income level. One-fourth (25.5%) of participants reported current cannabis use, and 21.3% reported one ACE, 25.2% reported 2-3 ACEs, and 38.4% reported  $\geq 4$  ACEs. Unadjusted (odds ratio [OR] = 4.22, 95% confidence interval [CI] = 1.91-9.33) and adjusted (adjusted OR [AOR] = 4.23, 95% CI = 1.57-11.38) model results indicated that participants who experienced  $\geq 1$  ACE were at increased odds of reporting current cannabis use than participants with no ACEs. Unadjusted (OR = 5.79, 95% CI = 2.40-14.00) and adjusted (AOR = 6.48, 95% CI = 2.15-19.55) model results indicated that participants who experienced  $\geq 4$  ACEs were at increased odds of reporting current cannabis use than participants with no ACEs. Adjusted model results revealed that experiencing living with a household member who had a mental illness or sexual abuse increased the odds of reporting current cannabis use. Results demonstrated relations among ACEs and current cannabis use in young adulthood, especially among those who experienced  $\geq 4$  ACEs and experienced living with a household member who had a mental illness or sexual abuse.

**Keywords:** adverse childhood experiences, cannabis, substance use, young adults, Behavioral Risk Factor Surveillance System

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### Introduction

Current cannabis use is an important public health issue among young adults in the United States (U.S.) (National Institute on Drug Abuse, 2019). A global report by the United Nations indicated that cannabis remained the most commonly used illicit substance worldwide in 2020, with an estimated 209 million individuals reporting past year use (United Nations Office on Drugs and Crime, 2022). Cannabis use involves the consumption

of any dried part (leaves, flowers, stems, and seeds) of the hemp plant containing psychoactive chemicals and other associated compounds (National Institute on Drug Abuse, 2019). Cannabis is commonly used among young adults through the routes of smoking, vaping, dabbing, and eating (Wadsworth et al., 2022).

Cannabis use has been on the rise among young adults in the U.S. Specifically, the number of young adults in the U.S. who reported using cannabis in the past year

doubled from 10.5% to 21.2% between 2001 to 2002 and 2012 to 2013 (Hasin et al., 2015). Another study indicated an increase in cannabis use in the past month from 2002 to 2014 among young adults ages 18-25 years (Chawla et al., 2018). In 2021, cannabis consumption reached an all-time high with nearly 3 of 10 (29%) young adults using cannabis in the past month and over one in ten (11%) using cannabis daily (Patrick et al., 2022). This is concerning because the consumption of cannabis has been attributed to harmful physiological and psychological effects such as cerebrovascular and neurological complications among young adults (Archie & Cucullo, 2019). Serious negative health effects of cannabis use can include respiratory problems, cognitive deficits, and mental health issues such as anxiety, psychotic or attenuated psychotic symptoms, and suicidal thoughts (Crocker et al., 2021; Hall & Degenhardt, 2014; National Academies of Sciences et al., 2017; Volkow et al., 2014).

Adverse childhood experiences (ACEs) are another major public health problem in the U.S. ACEs provide a broad framework for a range of adverse experiences that occur during childhood, including physical, emotional, and sexual abuse, household dysfunction, and exposure to violence (Felitti et al., 1998; Sherfinski et al., 2021; Wolff et al., 2017). In the U.S., over six in ten individuals have experienced  $\geq 1$  ACE, and nearly one in four have experienced three or more ACEs (Merrick et al., 2018). Evidence indicates that ACEs have an impact on individuals' mental and physical health throughout their lifetime. For example, ACEs can lead to changes in brain development which affects cognitive and emotional functioning, and changes in the stress response system which increases the risk of chronic diseases and mental health disorders (Shonkoff et al., 2009). Consequently, there may be a dose-response association between ACEs and developmental and health

consequences, with higher cumulative ACE scores leading to poorer outcomes over time (Jacob et al., 2019). For example, one study found that individuals who experienced  $\geq 3$  ACEs were at highest risk for developing mental health disorders such as depression, anxiety, and post-traumatic stress disorder, followed by individuals who experienced two ACEs and then one ACE (Macpherson et al., 2021). Other studies have assessed the link between ACEs and long-term physical health outcomes, and report that experiencing ACEs increases the likelihood for developing a range of health problems during adulthood, including, but not limited to, heart disease, diabetes, and functional limitations (Campbell et al., 2016; Monnat & Chandler, 2015).

In addition to affecting individuals' physical and mental health, research shows a dose-response association between ACEs and illicit drug use, with greater cumulative ACE scores increasing the risk of using illicit drugs during adulthood (Dube et al., 2003; He et al., 2022). However, little is known about how ACEs, especially specific types of ACEs (e.g., physical abuse, emotional abuse) may influence current cannabis use among U.S. young adults. Much of the prior literature among young adults has not been generalizable to the U.S. young adult population. Specifically, prior studies among young adults reported that ACEs were associated with increased likelihood of engaging in cannabis use among – a sample of college students in one U.S. state (i.e., Georgia) (Windle et al., 2018); an urban sample of racially and ethnically diverse young adults in another U.S. state (i.e., Illinois) (Mersky et al., 2013); a community-based sample of Hispanic emerging adults in another U.S. state (i.e., California) (Allem et al., 2015; Forster, Vetrone et al., 2019); as well as university students in Caribbean and Latin American countries (Longman-Mills et al., 2013). ACEs also have predicted cannabis use and dependence among young adults in

Australia (Mills et al., 2017). Specific to college students, one national study using 2015 National College Health Assessment II data indicated a dose-response relationship and that a higher number of ACEs significantly predicted substance use including past-month cannabis use (Forster et al., 2018). A cross-sectional study in a younger population found that adolescents who experienced ACEs were more likely to use cannabis daily, with the highest odds reported among those with  $\geq 4$  ACEs followed by two and three ACEs and then one ACE (Duke, 2018). A longitudinal birth cohort study indicated that 0-12-year-olds in the United Kingdom who had experienced  $\geq 4$  ACEs were at increased risk of engaging in early persisting regular cannabis use, later onset regular cannabis use, and early persisting occasional cannabis use compared to no or low cannabis use (Hines et al., 2023). Therefore, the current study was conducted to fill a gap in the literature and offer information on ACEs and current cannabis use among U.S. young adults that can be addressed in future prevention and intervention efforts tailored for this at-risk population.

### Study Purpose

The main study objective was to assess the associations between ACEs and current cannabis use among U.S. young adults. We hypothesized that young adults who experienced  $\geq 1$  ACE would be at increased odds of reporting current cannabis use compared to young adults who experienced no ACEs. We also posited that young adults who experienced a higher cumulative number of ACEs (e.g.,  $\geq 4$  ACEs) would be at increased odds of reporting cannabis use compared to young adults who experienced no ACEs. Additionally, we hypothesized that young adults who experienced each individual type of ACE would be at increased odds of reporting current cannabis use compared to young adults

who did not experience each individual type of ACE.

## Methods

### Participants and Procedures

We conducted a secondary data analysis of the 2021 Behavioral Risk Factor Surveillance System (BRFSS) (Centers for Disease Control and Prevention, 2022a), which involved 498 U.S. young adults 18-24 years old who had data available for analysis on ACEs and current cannabis use. Specifically, 2,556 18-24-year-olds had ACE data available for analysis, and of those, 498 had current cannabis use data available for analysis. The Centers for Disease Control and Prevention administers the BRFSS annually via a computer-assisted telephone interview technique to collect health-related data from adults who live in the 50 U.S. states and the District of Columbia, the U.S. Virgin Islands, Guam, and Puerto Rico (Centers for Disease Control and Prevention, 2022e). In 2021, the BRFSS median cellular and landline telephone combined response rate was 44.0% (Centers for Disease Control and Prevention, 2022b).

### Measures

#### *Independent Variables: ACEs*

ACEs, the independent variables of interest, were assessed in the “Adverse Childhood Experiences” module and asked participants 11 questions with no/yes response options, “Now, looking back before you were 18 years of age...” (1) “Did you live with anyone who was depressed, mentally ill, or suicidal?” (2) “Did you live with anyone who was a problem drinker or alcoholic?” (3) “Did you live with anyone who used illegal street drugs or who abused prescription medications?” (4) “Did you live with anyone who served time or was sentenced to serve time in a prison, jail, or

other correctional facility?” (5) “Were your parents separated or divorced?” (6) “How often did your parents or adults in your home ever slap, hit, kick, punch or beat each other up?” (7) “Not including spanking, (before age 18), how often did a parent or adult in your home ever hit, beat, kick, or physically hurt you in any way?” (8) “How often did a parent or adult in your home ever swear at you, insult you, or put you down?” (9) “How often did anyone at least 5 years older than you or an adult, ever touch you sexually?” (10) “How often did anyone at least 5 years older than you or an adult, try to make you touch them sexually?” and (11) “How often did anyone at least 5 years older than you or an adult, force you to have sex?” (Centers for Disease Control and Prevention, 2022d).

The total number of ACEs (range 0-11) was initially dichotomized as no ACEs (i.e., 0 ACEs) and  $\geq 1$  ACE (i.e., 1-11 ACEs), and then further assessed as cumulative ACE scores using the categories of 0 ACEs, one ACE, 2-3 ACEs, and  $\geq 4$  ACEs. Additionally, we assessed each ACE individually, with the exception of the three ACEs about sexual abuse that were combined into one category due to the low numbers who responded “yes” to these individual questions.

### ***Dependent Variable: Current Cannabis Use***

Current cannabis use, the dependent variable, was assessed in the “marijuana use” module and asked participants one question about their past 30-day use, “During the past 30 days, on how many days did you use marijuana or cannabis?” (Centers for Disease Control and Prevention, 2022d). After assessment of the distribution of responses that were skewed, cannabis use was dichotomized as no current use (i.e., “none”) and current use (i.e., 1-30 days).

### ***Sociodemographic Covariates***

Sociodemographic covariates assessed in this study were young adults’ sex, race/ethnicity (non-Hispanic White, non-Hispanic Black, non-Hispanic Other/Multiracial, Hispanic), education level (high school graduate or less, some college, college graduate), and income level (< \$25,000, \$25,000-\$49,999,  $\geq$  \$50,000, unspecified). Unspecified income level included “don’t know” and “not sure” responses.

### ***Data Analysis***

Statistical analyses were performed using the SPSS Complex Samples package (version 28.0). The BRFSS provided sampling weights that were applied to allow for results to be generalizable to the U.S. 18-24-year-old population (Centers for Disease Control and Prevention, 2022c). We conducted weighted descriptive statistics for all variables of interest and present unweighted sample counts and weighted column percentages. We conducted weighted chi-square tests to assess the associations between the sociodemographic covariates and current cannabis use among U.S. young adults, and present unweighted counts, weighted column percentages, and *p*-values.

We conducted unadjusted and adjusted logistic regression analyses to examine the association between experiencing  $\geq 1$  ACE and current cannabis use, and present unadjusted odds ratios (ORs) or adjusted ORs (AORs), 95% confidence intervals (CIs) and *p*-values. We also conducted unadjusted and adjusted logistic regression analyses to examine the association between cumulative ACE scores and current cannabis use. Adjusted models included the sociodemographic covariates of sex, race/ethnicity, education level, and household income level. To determine statistical significance and reduce Type I error

**Table 1**

*Sociodemographic characteristics overall and based on current cannabis use among U.S. young adults, 2021 BRFSS*

Sociodemographic Characteristic	Overall (N = 498) <i>n</i> (%) <sup>a</sup>	Current Cannabis Use		<i>p</i> -value <sup>b</sup>
		No Current Cannabis Use ( <i>n</i> = 385) <i>n</i> (%) <sup>a</sup>	Current Cannabis Use ( <i>n</i> = 113) <i>n</i> (%) <sup>a</sup>	
<b>Sex</b>				<b>.045</b>
Male	287 (56.9)	218 (52.4)	69 (70.0)	
Female	211 (43.1)	167 (47.6)	44 (30.0)	
<b>Race/Ethnicity</b>				.208
Non-Hispanic White	353 (50.4)	280 (50.1)	73 (51.1)	
Non-Hispanic Black	20 (5.8)	17 (7.2)	3 (1.6)	
Non-Hispanic Other/Multiracial	67 (14.3)	42 (11.8)	21.8 (21.8)	
Hispanic	58 (29.5)	46 (30.9)	12 (25.5)	
<b>Education Level</b>				.709
High school graduate or less	217 (45.1)	166 (45.5)	51 (43.9)	
Some college	186 (38.9)	144 (39.9)	42 (36.1)	
College graduate	95 (16.0)	75 (14.6)	20 (20.0)	
<b>Household Income Level</b>				.956
<\$25,000	65 (11.3)	46 (10.6)	19 (13.4)	
\$25,000-\$49,999	134 (33.7)	104 (34.4)	30 (31.7)	
≥\$50,000	182 (35.5)	146 (35.8)	36 (34.8)	
Unspecified <sup>c</sup>	117 (19.5)	89 (19.2)	28 (20.1)	

Note.

Abbreviation: BRFSS, Behavioral Risk Factor Surveillance System.

<sup>a</sup> *n* refers to unweighted sample counts and weighted column percentages.

<sup>b</sup> Chi-square test results and bold font indicates statistical significance  $p < .05$ .

<sup>c</sup> Unspecified defined as unknown and not sure.

probability, the *p*-value was set to the .05 level for these four regression analyses.

We conducted nine separate unadjusted and nine separate adjusted logistic regression analyses to examine the associations between the nine individual types of ACEs and current cannabis use, and present either ORs or AORs, 95% CIs, and *p*-values. To determine statistical significance and reduce Type I error probability, we applied the Bonferroni correction to adjust for multiple comparisons, and the *p*-value was set to the .0028 level.

## Results

Of the 498 participants, 43.1% were female and 50.4% were non-Hispanic White followed by 29.5% Hispanic, 14.3% non-Hispanic Other/Multiracial, and 5.8% non-Hispanic Black (Table 1). Concerning education level, 45.1% were high school graduates or less, 38.9% had some college, and 16.0% were college graduates. Household income level varied with over one-third having an income level of either  $\geq$  \$50,000 (35.5%) or \$25,000-\$49,000 (33.7%). Over one-fourth (25.5%, *n* =

**Table 2**

*Sociodemographic characteristics based on experiencing greater  $\geq 1$  ACE among U.S. young adults, 2021 BRFSS*

	$\geq 1$ ACE ( <i>n</i> = 382)
<b>Sociodemographic Characteristic</b>	<i>n</i> (%) <sup>a</sup>
<b>Sex</b>	
Male	207 (81.0)
Female	175 (90.3)
<b>Race/Ethnicity</b>	
Non-Hispanic White	262 (82.8)
Non-Hispanic Black	17 (80.2)
Non-Hispanic Other/Multiracial	52 (88.2)
Hispanic	51 (88.0)
<b>Education Level</b>	
High school graduate or less	169 (83.2)
Some college	147 (88.1)
College graduate	66 (82.4)
<b>Household Income Level</b>	
< \$25,000	58 (94.7)
\$25,000-\$49,999	111 (88.2)
$\geq$ \$50,000	131 (84.2)
Unspecified <sup>b</sup>	82 (75.1)

Note.

Abbreviations: ACE, adverse childhood experience; BRFSS, Behavioral Risk Factor Surveillance System.

<sup>a</sup> *n* refers to unweighted sample counts and weighted row percentages.

<sup>b</sup> Unspecified defined as unknown and not sure.



**Table 3***Experiencing  $\geq 1$  ACE and current cannabis use among U.S. young adults, 2021 BRFSS*

Young Adult Characteristic	Current Cannabis Use			
	Unadjusted Logistic Regression Model		Adjusted Logistic Regression Model	
	OR (95% CI)	<i>p</i> -value <sup>a</sup>	AOR (95% CI)	<i>p</i> -value <sup>b</sup>
<b>ACE Score</b>				
0 ACEs	Ref	Ref	Ref	Ref
$\geq 1$ ACE	<b>4.22 (1.91-9.33)</b>	<b>&lt; .001</b>	<b>4.23 (1.57-11.38)</b>	<b>.004</b>
<b>Sex</b>				
Male	-	-	Ref	Ref
Female	-	-	0.56 (0.24-1.35)	.196
<b>Race/Ethnicity</b>				
Non-Hispanic White	-	-	Ref	Ref
Non-Hispanic Black	-	-	0.23 (0.04-1.33)	.100
Non-Hispanic Other/Multiracial	-	-	1.63 (0.55-4.86)	.381
Hispanic	-	-	0.72 (0.27-1.95)	.519
<b>Education Level</b>				
High school graduate or less	-	-	Ref	Ref
Some college	-	-	0.52 (0.23-1.19)	.121
College graduate	-	-	1.31 (0.41-4.18)	.651
<b>Household Income Level</b>				
< \$25,000	-	-	Ref	Ref
\$25,000-\$49,999	-	-	0.92 (0.28-3.00)	.891
$\geq$ \$50,000	-	-	0.38 (0.12-1.21)	.101
Unspecified <sup>c</sup>	-	-	1.02 (0.28-3.72)	.973

Note.

Abbreviations: ACEs, adverse childhood experiences; BRFSS, Behavioral Risk Factor Surveillance System; OR, odds ratio; CI, confidence interval; AOR, adjusted odds ratio; Ref, reference category.

<sup>a</sup> Bold font indicates statistical significance  $p < 0.05$ .<sup>b</sup> Adjusted logistic regression model adjusting for the sociodemographic covariates of sex, race/ethnicity, education level, and income level. Bold font indicates statistical significance  $p < 0.05$ .<sup>c</sup> Unspecified defined as unknown and not sure.

**Table 4***Cumulative ACEs and current cannabis use among U.S. young adults, 2021 BRFSS*

Young Adult Characteristic	Current Cannabis Use			
	Unadjusted Logistic Regression Model		Adjusted Logistic Regression Model	
	OR (95% CI)	<i>p</i> -value <sup>a</sup>	AOR (95% CI)	<i>p</i> -value <sup>b</sup>
<b>ACE Score</b>				
0 ACEs	Ref	Ref	Ref	Ref
1 ACE	<b>4.73 (1.63-13.76)</b>	<b>.004</b>	3.14 (0.81-12.16)	.097
2-3 ACEs	2.02 (0.74-5.52)	.168	2.12 (0.68-6.67)	.196
≥ 4 ACEs	<b>5.79 (2.40-14.00)</b>	<b>&lt; .001</b>	<b>6.48 (2.15-19.55)</b>	<b>&lt; .001</b>
<b>Sex</b>				
Male	-	-	Ref	Ref
Female	-	-	0.50 (0.21-1.20)	.120
<b>Race/Ethnicity</b>				
Non-Hispanic White	-	-	Ref	Ref
Non-Hispanic Black	-	-	0.25 (0.04-1.67)	.151
Non-Hispanic Other/Multiracial	-	-	1.48 (0.52-4.23)	.466
Hispanic	-	-	0.77 (0.29-2.07)	.601
<b>Education Level</b>				
High school graduate or less	-	-	Ref	Ref
Some college	-	-	0.66 (0.29-1.48)	.311
College graduate	-	-	1.38 (0.39-4.83)	.617
<b>Household Income Level</b>				
< \$25,000	-	-	Ref	Ref
\$25,000-\$49,999	-	-	1.06 (0.29-3.85)	.926
≥ \$50,000	-	-	0.36 (0.10-1.32)	.121
Unspecified <sup>c</sup>	-	-	1.06 (0.28-4.03)	.934

Note.

Abbreviations: ACEs, adverse childhood experiences; BRFSS, Behavioral Risk Factor Surveillance System; OR, odds ratio; CI, confidence interval; AOR, adjusted odds ratio; Ref, reference category.

<sup>a</sup> Bold font indicates statistical significance  $p < .05$ .<sup>b</sup> Adjusted logistic regression model adjusting for the sociodemographic covariates of sex, race/ethnicity, education level, and income level. Bold font indicates statistical significance  $p < .05$ .<sup>c</sup> Unspecified defined as unknown and not sure.

**Table 5***ACE type and current cannabis use among U.S. young adults, 2021 BRFSS*

ACE Type	Overall <i>n</i> (%) <sup>a</sup>	Current Cannabis Use			
		Unadjusted Logistic Regression		Adjusted Logistic Regression	
		OR (95% CI)	<i>p</i> -value <sup>b</sup>	AOR (95% CI)	<i>p</i> -value <sup>c</sup>
<b>Child Emotionally Abused by Parent</b>					
No	36 (20.7)	Ref	Ref	Ref	Ref
Yes	77 (29.7)	1.61 (0.76-3.41)	.211	2.25 (1.00-5.07)	.050
<b>Parents Divorced</b>					
No	58 (25.4)	Ref	Ref	Ref	Ref
Yes	55 (25.7)	1.02 (0.51-2.04)	.967	1.41 (0.68-2.92)	.353
<b>Household Member with Alcohol Problem</b>					
No	64 (19.7)	Ref	Ref	Ref	Ref
Yes	49 (34.3)	2.13 (1.02-4.45)	.045	2.07 (0.93-4.62)	.076
<b>Household Member with Mental Illness</b>					
No	47 (16.9)	Ref	Ref	Ref	Ref
Yes	66 (38.7)	3.10 (1.49-6.45)	.003	<b>4.52 (1.92-10.62)</b>	<b>&lt; .001</b>
<b>Child Physically Abused by Parent</b>					
No	69 (22.4)	Ref	Ref	Ref	Ref
Yes	44 (32.4)	1.66 (0.79-3.49)	.179	1.86 (0.81-4.24)	.141
<b>Household Members Engaged in Physical Violence</b>					
No	79 (22.5)	Ref	Ref	Ref	Ref
Yes	34 (36.8)	2.01 (0.86-4.66)	.105	2.74 (1.10-6.82)	.031
<b>Household Member used Illicit Drugs</b>					
No	78 (22.2)	Ref	Ref	Ref	Ref
Yes	35 (38.1)	2.16 (0.97-4.83)	.061	2.54 (1.02-6.33)	.046
<b>Household Member was Incarcerated</b>					
No	83 (22.5)	Ref	Ref	Ref	Ref
Yes	30 (37.7)	2.09 (0.88-4.97)	.095	2.10 (0.82-5.37)	.121
<b>Child Sexually Abused</b>					
No	85 (21.2)	Ref	Ref	Ref	Ref
Yes	28 (54.2)	4.40 (1.64-11.80)	.003	<b>5.58 (2.14-14.55)</b>	<b>&lt; .001</b>

Note.

Abbreviations: ACE, adverse childhood experience; BRFSS, Behavioral Risk Factor Surveillance System; OR, odds ratio; CI, confidence interval; AOR, adjusted odds ratio; Ref, reference category.

<sup>a</sup> *n* refers to unweighted sample counts and weighted row percentages.<sup>b</sup> Nine unadjusted logistic regression models. Bold font indicates statistical significance  $p < .0028$  after adjustment for multiple comparisons.<sup>c</sup> Nine adjusted logistic regression models adjusting for the sociodemographic covariates of sex, race/ethnicity, education level, and income level. Bold font indicates statistical significance  $p < .0028$  after adjustment for multiple comparisons.

113) of participants reported current cannabis use, and the majority of participants (85.0%,  $n = 382$ ) reported  $\geq 1$  ACE. Concerning cumulative ACE scores, 21.3% of participants ( $n = 94$ ) reported one ACE, 25.2% ( $n = 123$ ) reported 2-3 ACEs, and 38.4% ( $n = 165$ ) reported  $\geq 4$  ACEs.

### **Sociodemographic Covariates Based Current Cannabis Use**

Table 1 also presents differences between sociodemographic characteristics and current cannabis use. Only participants' sex was significant ( $p = .045$ ), with a higher proportion of male participants reporting current cannabis use compared to female participants. Thus, there were no statistically significant differences between participants' race/ethnicity, education level, and household income level and current cannabis use.

### **Sociodemographic Covariates Based on Experiencing $\geq 1$ ACE**

Table 2 presents the percentages of participants who reported  $\geq 1$  ACE by sociodemographic characteristics. Most female (90.3%) and male (81.0%) participants, in addition to participants of all racial/ethnic, educational, and income level backgrounds reported experiencing  $\geq 1$  ACE.

### **Experiencing $\geq 1$ ACE and Current Cannabis Use**

Unadjusted logistic regression model results indicated that participants who experienced  $\geq 1$  ACE were at 4.22 times higher odds (95% CI = 1.91-9.33) of reporting current cannabis use compared to participants who experienced no ACEs (Table 3).

Similarly, in the adjusted logistic regression model that controlled for the sociodemographic covariates, results indicated that participants who experienced  $\geq 1$  ACE

were at 4.23 times higher odds (95% CI = 1.57-11.38) of reporting current cannabis use compared to participants who experienced no ACEs (Table 3). No covariates were statistically significant in this adjusted model.

### **Cumulative ACEs and Current Cannabis Use**

Unadjusted logistic regression model results indicated that participants who experienced one ACE were at 4.73 times higher odds (95% CI = 1.63-13.76) of reporting current cannabis use compared to participants who experienced no ACEs (Table 4). Additionally, participants who experienced  $\geq 4$  ACEs were at 5.79 times higher odds (95% CI = 2.40-14.00) of reporting current cannabis use compared to participants who experienced no ACEs.

In the adjusted logistic regression model, results indicated that participants who experienced  $\geq 4$  ACEs were at 6.48 times higher odds (95% CI = 2.15-19.55) of reporting current cannabis use compared to participants who experienced no ACEs (Table 4). No covariates were statistically significant in this adjusted model.

### **Current Cannabis Use and ACE Type**

The five most common ACE types reported by participants were experiencing emotional abuse from a parent who swore at them, insulted them, or put them down (53.5%,  $n = 269$ ), having parents who separated or divorced (50.2%,  $n = 197$ ), living with a household member who had an alcohol problem (39.6%,  $n = 159$ ), living with a household member who had a mental illness (39.4%,  $n = 202$ ), and experiencing physical abuse from a parent (31.5%,  $n = 134$ ). The next common ACE type was living with household members who engaged in physical violence with each other (21.3%,  $n = 93$ ), which was closely followed by living with a household

member who used illicit drugs (20.8%,  $n = 92$ ) and lived with a household member who was incarcerated (20.0%,  $n = 85$ ). Thirteen percent ( $n = 59$ ) of participants reported experiencing sexual abuse.

Adjusted logistic regression model results indicated that participants who experienced living with a household member who had a mental illness were at 4.52 times higher odds (95% CI = 1.92-10.62) of reporting current cannabis use compared to participants who did not experience living with a household member who had a mental illness (Table 5). Additionally, adjusted model results indicated that participants who experienced sexual abuse were at 5.58 times higher odds (95% CI = 2.14-14.55) of reporting current cannabis use compared to participants who did not experience sexual abuse (Table 5).

### Discussion

In the current study, we assessed the associations between ACEs and current cannabis use among a national sample of U.S. young adults, extending the literature by finding critical associations among trauma related to household members and sexual abuse with current cannabis use. Most (85%) U.S. young adults had experienced  $\geq 1$  ACE. Specifically, about 21% of young adults experienced one ACE, 25% experienced 2-3 ACEs, and 39% experienced  $\geq 4$  ACEs. These percentages are higher than another study that used older 2011-2015 BRFSS data and found that about 62% of adults ages 18 years and older experienced one ACE, and of those, 25% experienced  $\geq 3$  ACEs (Merrick et al., 2018). The prior study reported that the most prevalent ACEs were emotional abuse, having parents who separated or divorced, and household substance abuse (Merrick et al., 2018). The top two reported ACEs among the current study's sample of U.S. young adults were the same (i.e., emotional abuse from a parent and having parents who separated or

divorced), but the third most prevalent ACE was living with a household member who had a mental illness.

This study has found that there is a significant relationship between the presence of ACEs and current cannabis use among U.S. young adults. Specifically, our results indicated that U.S. young adults who experienced  $\geq 1$  ACE were more likely and over four-fold odds to report current cannabis use compared to participants who experienced no ACEs. This relationship remained statistically significant even after controlling for young adults' sociodemographic characteristics of sex, race/ethnicity, education level, and household income level. Another study using national Add Health data reported that endorsing one ACE significantly increased the odds of having a cannabis use disorder during young adulthood (Moss et al., 2020). Concerning cumulative ACE scores, U.S. young adults in this study who experienced  $\geq 4$  ACEs were at increased odds of reporting cannabis use than young adults who experienced no ACEs after covariate adjustment. Findings align with a review of the literature that reported a strong, graded association between ACEs and cannabis use among young adults (Rogers et al., 2022). This also expands upon prior studies that solely included college students and revealed there is a dose-response association between family-based ACEs and substance use behaviors including cannabis use by focusing on a U.S. young adult population (Forster et al., 2018; Forster, Rogers et al., 2019).

We also identified two different ACE types that significantly predicted cannabis use among young adults in the U.S. More specifically, we found that U.S. young adults who lived with family members who had a mental illness or who were sexually abused had more than a four-fold odds of reporting current cannabis use, after adjusting for the sociodemographic covariates. In a study in Australia, young adults who experienced any

maltreatment, and this included sexual abuse, were at increased likelihood to report lifetime cannabis use (Mills et al., 2017). Prior research with young adults who were Hispanic (average age = 22 years) found that those who reported household mental illness and substance abuse including illicit drugs and alcohol problems were at increased probability of reporting past month cannabis use (Allem et al., 2015). However, we did not find differences between young adults who resided in homes where household members used illicit drugs or had alcohol problems and current cannabis use. Additionally, a systematic review of the literature indicated that sexual abuse and physical abuse predicted cannabis use among individuals up to 26 years of age (De la Peña-Arteaga et al., 2021). However, in the current study, we did not find a statistically significant association between experiencing physical abuse as a child and cannabis use.

We found that about 26% of young adults reported current cannabis use, which was similar to the national prevalence of past month cannabis use (29%) using other national data (Patrick et al., 2022). Interestingly, we found that only participant sex was a statistically significant predictor of current cannabis use. Specifically, we found that a higher percentage of male young adults reported current cannabis use compared to female young adults. This suggests that male young adults are more likely to report current cannabis use, which aligns with other national research that used 2016-2019 BRFSS data and reported that cannabis use is more frequently reported among male adults than female adults (Jeffers et al., 2021). Similarly, other research indicates that men use cannabis at higher quantities and frequencies compared to women (Cuttler et al., 2016).

This study has strengths such as using nationally representative data that included a sample of U.S. young adults. There are several factors that may limit the generalizability of study findings. First, we assessed ACEs and

cannabis use using secondary, cross-sectional survey data and cannot establish causal or longitudinal associations. This study also relies on self-reported responses of young adults, which may have introduced social desirability or recall biases about these sensitive questions. Thus, ACEs were assessed via self-report, and data were not collected from other family members or mental health professionals to corroborate the experience of the trauma or the extent to which the trauma impacted their functioning. Similarly, it is important to note that assessing primary cannabis use by using biochemically confirmed biomarkers (Hubbard et al., 2021), and ACEs by using potential ACE-related biomarkers of inflammation (e.g., c-reactive protein) and endocrine systems (e.g., cortisol) (Deighton et al., 2018), would have provided more detailed, objective information. To comprehend the direction, nature, and potential causes of this relationship, additional research using objective measurements for ACEs and cannabis use is suggested. Furthermore, the experience of varying combinations of ACEs (e.g., child physical abuse and child emotional abuse), and the importance of these different levels of trauma, and how these factors predict cannabis use are suggested areas for future research. Additionally, we were unable to assess frequency of cannabis use in days due to the skewed distribution. Therefore, cannabis use frequency should be assessed in further research because there may be a potential dose-response relationship between the cumulative number of ACEs and current cannabis use (Scheidell et al., 2018). Finally, the public use data file did not include participants' age and only provided age groups (i.e., young adults 18-24 years), and therefore, we were unable to adjust for this important covariate. Whereas we adjusted for other important sociodemographic covariates, there may be other covariates to consider in future research that were unavailable in the 2021

BRFSS data set, such as the availability and accessibility to cannabis especially in states where recreational use has been legalized (Farrelly et al., 2023), peer perceptions of cannabis use (Duke, 2018), and parental ACEs and mental health (Letourneau et al., 2019; Narayan et al., 2021).

In conclusion, study results demonstrated relations among ACEs and current cannabis use in young adulthood, an association that is supported in the literature (De la Peña-Arteaga et al., 2021). Specifically, we report that young adults who experienced  $\geq 1$  ACE in their lifetime were more likely to report current cannabis use compared to young adults who experienced no ACEs in their lifetime. We also report a potential dose-response association because young adults who experienced  $\geq 4$  ACEs were at increased odds of reporting current cannabis use compared to U.S. young adults who experienced no ACEs. Our results also provide essential information on childhood risks related to young adult cannabis use. Specifically, potential traumatic experiences such as living with a household member who had a mental illness or sexual abuse were associated with increased odds of engaging in cannabis use among U.S. young adults.

### **Implications for Health Behavior Research**

Current cannabis use is an important public health issue among young adults and understanding factors such as ACEs related to this risk behavior will provide information for prevention messaging. Specifically, it is important for health behavior researchers to consider messaging to young adults, such as seeking support for trauma rather than using cannabis as a potential coping mechanism. Additionally, health behavior professionals are encouraged to screen for ACEs and refer young adults for treatment when needed. Additionally, mental health professionals should be educated on trauma-informed care

(Leitch, 2017), and discussing family issues when treating young adults who use cannabis. Future longitudinal research, including using both quantitative and qualitative methods, is needed to assess relationships between comorbid ACEs or multiple ACEs, cannabis use, and functioning of U.S. young adults more completely. Moreover, studies are encouraged to assess how resilience factors are related to cannabis use, especially when U.S. young adults face a higher number of ACEs. Identifying protective resilience factors could then be used to enhance development for young adults exposed to ACEs during childhood.

### **Discussion Question**

The current study's results indicate that young adults who experience adverse childhood experiences had increased odds of engaging in current cannabis use. What are types of messaging that health educators and other professionals can use to address adverse childhood experiences to reduce current cannabis use among young adults?

### **Ethical Approval**

The university Institutional Review Board (IRB) reviewed this study and provided a "not human subjects research" determination due to the use of these publicly available BRFSS data with no identifiers.

### **Conflict of Interest Statement**

The authors have no conflicts of interest to declare.

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