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State of transition: Marijuana use among young adults in the San Francisco Bay Area

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Abstract

Background—California may vote on marijuana legalization in 2016. Young adults have the highest rates of marijuana use, but little is known about the correlates of use in this age group, including factors that may be affected by policy change. We investigated whether there are differences in marijuana use by sociodemographic characteristics, psychological distress, loneliness and social support, controlling for risk factors such as alcohol and cigarette use as well as perceived harm of marijuana.

Methods—Bivariate and multivariable analysis of past 30 day marijuana use using the 2014 San Francisco Bay Area Young Adult Health Survey, a probabilistic multi-mode survey of ($N=1324$) young adults (aged 18–26 years) residing in Alameda and San Francisco Counties, stratified by race/ethnicity.

Results—291 (27%) sample participants reported current marijuana use. Compared to Non-Hispanic Whites (referent) Asian/Pacific Islander respondents were less likely to use marijuana (AOR, 0.42; 95% CI, 0.22–0.80) while multiracial participants were twice as likely (AOR, 2.27; 95% CI, 1.06–4.85). Psychological distress was not related to marijuana use, but social support (AOR, 1.42; 95% CI, 1.08–1.88) and loneliness (AOR, 1.42; 95% CI, 1.09–1.86) were. Perceived harm of marijuana was inversely related to marijuana use (AOR, 0.60; 95% CI, 0.51–.70), while smoking cigarettes (AOR, 3.95; 95% CI, 2.28–6.84) and binge drinking (AOR, 1.13; 95% CI, 1.03–1.24) were positively related.

Conclusions—Legalization policies should include public education campaigns addressing potential harms of marijuana use particularly targeting multiracial young adults who also engage in other risk behaviors, such as cigarette smoking and binge drinking.

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Conflict of Interest Statement

The authors declare that there are no conflicts of interest.

INTRODUCTION

Laws and social norms around marijuana use are changing rapidly in the United States. Twenty-four states and Washington D.C. have legalized some form of medical marijuana, four additional states have decriminalized marijuana possession, and four states with medical marijuana policies recently voted to legalize retail marijuana.¹ To inform policy efforts around marijuana, it is important to monitor the sociodemographic and psychosocial correlates of marijuana use. Nationally, young adults have the highest rates of past 30 day marijuana use, with 18.9% of 18–25 year olds using in 2013, compared to 7.1% of 12–17 year olds and 5.5% of adults 26 years old and older.²

In California marijuana use rates are even higher among young adults (21.6%), and about 7% higher than cigarette use.³ However, rates of use may differ across race/ethnicity, sex, sexual orientation, socioeconomic status and region. National data show past 30 day marijuana use is highest among non-Hispanic Native Hawaiian/Pacific Islander (12.1%) young adults ages 18–25, followed by non-Hispanic American Indians (11.8%), blacks (10.3%), whites (8.7%) and Latinos (6.7%).^{4,5} Men in this age range are also estimated to use marijuana at slightly higher rates (10.9% versus 6% of women), as are young adults with less than a high school education (21.9%).⁴ However in longitudinal studies of adolescents, including those accounting for cannabis use disorders, non-Hispanic black adolescents and young adults and those identifying with two or more racial categories appear to be at greater risk.^{6,7} Furthermore, as local data may differ significantly from findings in national data sets, closer examination of sociodemographic associations with marijuana use in a diverse population of young adults may suggest unique targets for intervention.

Young adulthood is a time of transition, in which people are navigating new roles and identities; it can also be a time of great stress.⁸ Past research has found that adolescents and young adults identify stress as a motive for using marijuana as they perceive it to be an effective coping method.^{9,10} Young adults who report using marijuana as a coping mechanism demonstrate poorer mental health outcomes and greater risk for marijuana dependence and other substance use, such as alcohol and tobacco,^{9–11} and some studies report Black and multiracial young people co-use marijuana with tobacco and alcohol more frequently.^{5,12} Psychological distress has also been shown to be related to use of marijuana in adults,¹³ but there is limited research on the relationship between psychological distress and marijuana use in young adults.¹⁴ At a population level distress is an especially useful measure as it quantifies subclinical incidence of mental illness and may provide additional insight as to how and why young adults use marijuana.¹⁵

Young adults' who are transitioning in social roles may experience heightened feelings of loneliness, or a perceived deficit in the quality or quantity of their social relationships.¹⁶ Loneliness has been found to be positively related to alcohol and marijuana use¹⁷, but not consistently.¹⁸ Conversely, perceived social support, or the idea that there are people in someone's life who can provide emotional support and help with problems,¹⁹ might be associated with a lower probability of using marijuana. However at least one study among adolescents found social support to predict an increase in substance use²⁰ while others have found inverse associations.^{21,22} Gaining better understanding how psychological distress and

social supports or deficits relate to marijuana use among young adults may inform tailored intervention development.

Marijuana has become more socially acceptable in California since medical marijuana laws passed in 1996, and acceptability is likely to increase further if marijuana is legalized.^{23,24} A 2015 study of Northern California teens reported that marijuana was perceived as more socially acceptable, normative, and safer than cigarettes.²⁵ However, it remains unclear how this social context may interact with sociodemographic and psychosocial characteristics in marijuana use among young adults.

Although the evidence base for understanding the health effects of marijuana is limited as a result of the difficulties with conducting research on a drug classified as Schedule 1 under the United States Controlled Substances Act, early studies have indicated associations between long-term heavy marijuana use and increased risk of addiction, chronic bronchitis, cognitive impairment and psychosis disorders in people predisposed to them.²⁶ Additionally, studies of marijuana use among adolescents have demonstrated associations with decreased academic achievement and increases in use of other illicit drugs as well as suicide attempts.²⁷ Marijuana use has further been associated with risky health behaviors, such as tobacco use and binge drinking,^{5,28,29} and secondhand marijuana smoke has been shown to compromise vascular function similar to secondhand cigarette smoke.³⁰

This study's objective is to describe the sociodemographic correlates of marijuana use in a diverse population-based sample of young adults residing in San Francisco and Alameda Counties, and to investigate associations between psychological distress, social support, loneliness and marijuana use. Specifically, we hypothesize that: 1) there will be differences in marijuana use by sociodemographic characteristic; 2) psychological distress will be positively associated with use; and 3) social support and loneliness will moderate the association between psychological distress and marijuana use. We additionally control for known correlates of marijuana use among young adults, including perceived harms of marijuana, sleep quality, cigarette smoking, and alcohol use.

METHODS

Data

Data for this study are from the 2014 San Francisco Bay Area Young Adult Health Survey, a probabilistic multi-mode household survey of 18–26 year old young adults, stratified by race/ethnicity, in Alameda and San Francisco Counties in California. Potential respondent households were identified in two ways – first from address lists obtained from Marketing Systems Group wherein there was an approximately 40% chance that an eligible young adult resided at the selected addresses (n=15,000 addresses), and second using 2009–2013 American Community Survey and 2010 decennial census data in a multistage sampling design to identify Census Block Groups and subsequently Census Blocks in which at least 15% of residents were adults in the eligible age range; address lists were compiled for each selected block and households were randomly selected from these lists for face-to-face visits (n=1,636 housing units).

The survey was conducted using three modes – mail/web, telephone, and face-to-face interviews. Mailings, including the survey questionnaire, informed consent document, and \$2 incentive were sent to each of the 15,000 addresses identified, followed by two additional mailings. Respondents could return the questionnaire by mail, or complete it online. Subsequently, the ~13,000 households for which we had phone numbers (landline and cellular) and from which we had not already received a response received up to three calls to determine eligibility and attempt questionnaire completion. Finally, a random selection of addresses (n=1,240) was drawn from the households lacking a mail or phone response, and research assistants visited each of these households, as well as all of the randomly selected housing units from the block sample, in person up to three times. The final number of observations was 1,363 for a survey response rate of 30%. Approximately 2/3 of respondents replied via mail or online with most of the remaining responses completed in the face-to-face phase; only a handful of questionnaires were completed via telephone. Individual sample and post-stratification adjustment weights were constructed after data collection.

Measures

Outcome Variable—The outcome for this study is current marijuana use. Respondents were asked, “during the past 30 days, on how many days (0–30) did you use marijuana or hash?” Current use was coded dichotomously, with a value equal to 1 if respondents reported using marijuana between 1–30 days in the past month.

Independent Variables

Sociodemographic characteristics: We assessed respondent age, sex, race/ethnicity, sexual orientation, maternal education and marital status. Age is a continuous variable in years; self-reported race/ethnicity is measured as a categorical indicator and the remaining measures are dichotomous. Respondents were given the opportunity to select multiple race categories, and those who selected more than one category and were not Latino were classified as “multirace.” Sex was coded as ‘1’ if the respondent was male, 0 otherwise; LGBT was coded as ‘1’ if the respondent identified as homosexual or bisexual; mother’s college education was coded as ‘1’ if the respondent’s mother had at least graduated college; married was coded as ‘1’ if the respondent was currently married.

Psychological distress was measured with the K6 scale,³¹ which asks respondents how frequently in the past month they felt nervous, hopeless, restless, depressed, worthless and like everything was an effort. Participants were classified as having serious psychological distress if the K6 value was equal to or greater than the validated cutoff of 13 (out of 24).³²

Social support is a composite variable based on five items, derived from the Multidimensional Scale of Perceived Social Support,³³ indicating agreement with the following statements: 1) there are people I can count on when I need help; 2) there is a special person in my life who cares about my feelings; 3) my family really tries to help me; 4) my friends really try to help me; and 5) I get the emotional support I need from people in my life. Responses were on a five-point Likert scale from strongly disagree to strongly agree. Loneliness was measured using two items, derived from the Loneliness Scale,³⁴ employing the same Likert response scale: 1) no one really knows me well; and 2) my

interests and ideas are not shared by those around me. Each of the two composite variables were standardized, and higher response values indicate greater levels of social support and loneliness. These items were based on longer versions of validated scales; and we conducted confirmatory factor analyses to ensure that the abbreviated scales each conform to one factor (i.e. social support and loneliness).

Perceived harm of marijuana use was measured continuously with respondents indicating how harmful they think marijuana is to general health, from “not at all” harmful (1) to “extremely” harmful (7).

We assessed three other health behaviors possibly related to marijuana use: current cigarette smoking, number of days respondents engaged in binge drinking and respondent sleep quality. Current smoking was coded as ‘1’ if the respondent smoked a cigarette at least one day in the previous 30. Days binge drinking was measured continuously as the number of days respondents reported drinking five or more alcoholic beverages “within a few hours” in the past 30 days. Sleep quality was also measured continuously; respondents rated their sleep quality from “very bad” (1) to “very good” (4).

Statistical Analysis

We used Stata 13 to examine bivariate relationships between each of our predictors and marijuana use (Table 1), followed by a hierarchical logistic regression, reflected in Table 2, using the “svyset” command to adjust for the complex sampling design. Data for the analysis were retained for 1324 of the total 1363 observations. Twenty-seven respondents were missing values for marijuana use, and the remaining observations were dropped due to incomplete data across several of the independent variables in the model. In conducting the hierarchical regression, we first assessed relationships between exogenous and socioeconomic characteristics and marijuana use, before entering serious psychological distress, followed by social support and loneliness and adding perceived harm and other health behaviors in the final model. The series of models addressed how covariates and serious psychological distress were independently associated with marijuana use and whether social support or loneliness moderated those associations. We hypothesized that marijuana use would have a positive association with marijuana use and that social support would diminish this association while loneliness would amplify it.

RESULTS

Sample Characteristics

Weighted characteristics for the study sample are shown in Table 1. Average age in the young adult sample was 22.7 years and approximately half of respondents were male. The race/ethnic distribution of the sample closely mirrors the distribution found in the young adult population in Alameda and San Francisco Counties.³⁵ Approximately 10% of respondents identified as LGBT and 3.2% were married. Almost 9% of young adult respondents were classified as having serious psychological distress, which is substantially higher than the three percent of 18–64 year old adults estimated to be distressed in the most recent National Health Interview Survey.³⁶ Approximately 15% reported current cigarette

smoking, consistent with national estimates of smoking in this age group, but higher than the California adult prevalence rate of 12%.³

Marijuana users were more likely than non-users to be male (54.7% versus 47.7% of non-users) and identify as LGBT (13.5% versus 9.3%). Non-Hispanic Asian/Pacific Islanders were the least likely race/ethnic group to use marijuana with only 10% reporting past 30 day use. Marijuana users were also more likely to have a mother with at least a bachelors degree (50.9% versus 37.3%), and had higher rates of serious psychological distress (9.7% versus 8.3%), much higher smoking rates (32.7% versus 8.5%) and more reported days of binge drinking (2.3 versus 1.0 among non-users).

Marijuana Use

Prevalence rates and frequency of marijuana use among young adults by race/ethnicity are shown in Table 2. Non-Hispanic multiracial young adults reported the highest rates and frequency of use with 46.6% of the sample indicating current use and an average of 6.8 days of use in the past 30 days. Non-Hispanic Asian/Pacific Islander young adults had the lowest prevalence (9.8%) and frequency of use (1 day).

Multivariable Logistic Regression Analysis

Across all four iterations of the model (Table 3), non-Hispanic Asian/Pacific Islanders were significantly less likely than non-Hispanic whites (referent) to have used marijuana in the previous 30 days (Adjusted Odds Ratio (AOR), 0.42; 95% CI, 0.22–0.80). Alternatively, non-Hispanic multiracial young adults were twice as likely to currently use marijuana net of all explanatory variables (AOR, 2.27; 95% CI, 1.06–4.85). Having a mother with at least a college degree was also significant and positively associated with doubled odds of marijuana use (AOR, 2.07; 95% CI, 1.27–3.36). Finally, in the last iteration of the model being at the lower end of the eligible age range (18–26) was associated with greater likelihood of marijuana use (AOR, 0.91; 95% CI, 0.84–0.99).

Contrary to our hypothesis, serious psychological distress did not appear to have an independent association with marijuana use, and we were therefore unable to measure any diminishing effect of social support on this association or amplifying effect of loneliness. Loneliness (AOR, 1.42; 95% CI, 1.08–1.88) and social support (AOR, 1.42; 95% CI, 1.09–1.86) were both significantly and positively associated with marijuana use.

Greater perceived harm of marijuana was associated with lower odds of current marijuana use (AOR, 0.60; 95% CI, 0.51–0.70) while current smokers were four times more likely to also be current marijuana users (AOR, 3.95; 95% CI, 2.28–6.84), and each additional day of binge drinking was associated with 13% higher odds of using marijuana (AOR, 1.13; 95% CI, 1.03–1.24). Greater sleep quality was inversely, but not significantly, associated with marijuana use.

DISCUSSION

We found clear associations between marijuana use and two demographic characteristics. Non-Hispanic Asian/Pacific Islander young adults had significantly lower odds of using

marijuana, while non-Hispanic multiracial young adults had twice the odds of using marijuana compared to non-Hispanic White young adults. This is relatively consistent with prior studies showing lower substance use among Asians and the limited research that exists on multiracial adults indicates higher rates of substance use in this group.^{37,38} Few studies evaluate outcomes specifically for multiracial populations, often because the data are unavailable or the sample is too small, yet people who identify as multirace are one of the fastest growing populations in the United States.³⁹ Younger populations in particular increasingly identify as multirace, and it will be important to gain better understanding of how health behavior manifests among these individuals.

Maternal education also demonstrated a significant positive correlation with marijuana use, a finding counterintuitive to prior health research suggesting protective effects of maternal education and family socioeconomic status on health outcomes.⁴⁰ However, at least one prior study has found that those in the middle income range may be most likely to use marijuana, and given how little information is currently available on the characteristics and effects of marijuana use it may be premature to expect that marijuana use behavior shares the same features as more demonstrated problematic health behaviors, such as smoking and heavy alcohol use.⁴¹ While we cannot account for other measures of family SES, in our sample marijuana use peaked among young adults whose mothers had a bachelor's degree.

We did not find support for our second hypothesis; although positive, the relationship between psychological distress and marijuana use was not significant. We could locate only one other study that assessed serious psychological distress in relation to marijuana use among young adults, and studies of this relationship in adolescents had mixed findings.⁴² As social norms around marijuana change, reasons for using marijuana may also be changing in ways not directly measured in our study. Rather than to cope with psychological distress, young adults may use marijuana for recreational purposes or to mitigate physical pain, and these and other explanatory factors warrant further investigation.

We found mixed support for our third hypothesis as social support and loneliness did not appear to moderate any association of psychological distress on marijuana use, but they both demonstrated significant positive correlations with marijuana use. While the finding concerning loneliness lends support to the idea that marijuana may be used as a coping method, the positive association with social support is less straightforward.

Social capital, broadly conceived, is generally thought to be inversely associated with poor health outcomes and potentially risky health behavior, but some research in recent years has called this into question, arguing that peers and social networks may influence substance use, including that of marijuana.^{43,44} The extent to which the association between social support and marijuana use may be a social network effect in our analysis is unknown. Another possibility is that marijuana use, unlike cigarette smoking, does not carry a distinct stigma, and young adults may not use marijuana in similar ways to tobacco, alcohol or other substances.

Similar to prior research,⁴⁵ we found lower perceived harm of marijuana to be significantly related to marijuana use. Marijuana legalization advocates argue that portraying marijuana

as safer than alcohol both in terms of health risks and societal harms (such as violent behavior) is the strategy that brought the ballot victory to the legalization attempt in Colorado,⁴⁶ and the same tactics were repeated successfully in Alaska campaign.⁴⁷ It is likely that the same arguments will be used to push for legalization in other states and may lead to reduced perceptions of harm and increased use.

Lastly, current cigarette smoking was associated with four times greater odds of using marijuana, while an additional day of binge drinking correlated to a 13% greater likelihood of using marijuana. In addition to high rates of marijuana use, young adults have higher rates of cigarette smoking, binge drinking and heavy alcohol use than any other age group.⁴⁸ As marijuana becomes more widely available, it will be imperative to monitor its use along with health risk behaviors. Substance use interventions may also benefit from addressing multiple substances at once.

Study limitations include the cross-sectional design; we cannot draw definitive conclusions about causal relationships between variables in our model and marijuana use. Second, the study was conducted with young adults in California and may not generalize to all young adults or to the population as a whole. In addition, urban young adults are notoriously difficult to reach in population surveys and our relatively low response rate (30%) reflects this challenge; though robust, the sample may suffer from unidentified nonresponse bias. Finally, marijuana use was measured using self-report, which could not be validated biologically. Nevertheless, these findings offer new insight into the correlates of marijuana use among young adults.

CONCLUSIONS

This study provides a representative baseline for rates of marijuana use and its correlates among young adults prior to legalization of retail marijuana in a state that is expected to include this on the ballot in 2016. More than a quarter of young adults in the Bay Area reported using marijuana in the past month, as did significantly higher numbers of multiracial young adults, current smokers, binge drinkers, and those with lower perceptions of harm of marijuana. Both loneliness and social support were positively related to marijuana use.

As the legalization environment changes rapidly, evaluating representative population data, such as those presented here, before policy changes occur will enable further assessment of marijuana's potential health impacts and strategizing around its regulation. Additional research will also be needed to evaluate the primary reasons young adults use marijuana, its perceived benefits, and how they view its potential for harm. Meanwhile, public education campaigns may be warranted in concert with state and local marijuana legalization efforts to ensure that young people are familiar with the potential harms of marijuana use as perceived harm clearly has a relationship with marijuana use. Finally, it will be crucial to include multiracial populations in future studies on marijuana and multiple substance use given their higher risk and growing numbers of young adults identifying as multiple races.

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Highlights

- We model associations between demographic characteristics, psychological distress and social support and marijuana use among young adults in the San Francisco Bay Area
- Non-Hispanic Asian young adults are less likely to use marijuana
- Multiracial young adults are more likely to use marijuana
- Cigarette smokers are more likely to use marijuana
- Lower perceived harm of marijuana is associated with current use

Weighted Sample Characteristics, 2014 SF Bay Area Young Adult Health Survey (n=1324)

TABLE 1

	Non-Users	Marijuana Users
	μ or %/(SE)	
	n = 1,033	n = 291
	N = 220,990	N = 81,374
Age, y	22.8 (0.08)	22.5 (0.14)
Male	47.7 (0.02)	55.0 (0.03)
Race/Ethnicity		
Hispanic	21.9 (0.01)	30.0 (0.03)
White, non-Hispanic	30.0 (0.01)	36.8 (0.03)
Black, non-Hispanic	9.3 (0.01)	12.0 (0.02)
Asian/Pacific Islander, non-Hispanic	34.0 (0.01)	10.0 (0.02)
Multirace, non-Hispanic	4.7 (0.01)	11.2 (0.02)
Lesbian, Gay, Bisexual or Transgender	9.3 (0.01)	13.5 (0.02)
Maternal Education		
Less than high school	13.4 (0.01)	6.7 (0.01)
High school grad	18.1 (0.01)	16.6 (0.02)
Some college, no degree	31.3 (0.01)	26.0 (0.03)
College graduate or higher	37.3 (0.02)	51.0 (0.03)
Married	3.5 (0.01)	2.3 (0.01)
Serious psychological distress	8.3 (0.01)	9.7 (0.02)
Social support (0–20; low to high)	16.2 (0.11)	16.4 (0.21)
Loneliness (0–8; low to high)	2.5 (0.06)	2.8 (0.11)
Perceived harm of marijuana (1–7; low to high)	4.5 (0.06)	2.7 (0.09)
Current smoker	8.5 (0.01)	32.7 (0.03)
# of days of binge drinking, past 30 days	1.0 (0.06)	2.3 (0.20)
Sleep quality (1–4; very bad to very good)	2.9 (0.02)	2.8 (0.04)

TABLE 2

Prevalence and Frequency of Marijuana Use by Race/Ethnicity, 2014 SF Bay Area Young Adult Health Survey
(n=1324)

	Prevalence %	C.I.	Average No. of Days in Past 30	C.I.
Overall	26.9	[24.5, 29.3]	3.2	[2.8, 3.6]
NH Multirace	46.6	[34.7, 58.4]	6.8	[4.1, 9.6]
Latino	33.5	[28.4, 38.6]	4.8	[3.7, 5.8]
NH Black	32.1	[22.3, 41.8]	4.0	[2.2, 5.9]
NH White	31.1	[25.6, 36.7]	3.0	[2.2, 3.8]
NH Asian/PI	9.8	[7.3, 12.2]	1.0	[0.61, 1.4]

Multivariable Logistic Regression Analysis

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TABLE 3
Correlates of Marijuana Use in Multivariable Models, 2014 SF Bay Area Young Adult Health Survey (n=1324)

	Model 1		Model 2		Model 3		Model 4	
	AOR	(95% CI)	AOR	(95% CI)	AOR	(95% CI)	AOR	(95% CI)
Sociodemographic characteristics								
Age (continuous)	0.97	[0.89, 1.05]	0.97	[0.89, 1.05]	0.97	[0.90, 1.05]	0.91	[0.84, 0.99]
Male	1.36	[0.91, 2.01]	1.36	[0.92, 2.02]	1.35	[0.90, 2.02]	1.17	[0.73, 1.87]
Non-Hispanic White (reference)								
Latino	1.34	[0.81, 2.22]	1.33	[0.80, 2.19]	1.32	[0.80, 2.17]	1.66	[0.92, 3.00]
Non-Hispanic Black	1.17	[0.55, 2.52]	1.18	[0.55, 2.54]	1.05	[0.49, 2.22]	0.99	[0.38, 2.57]
Non-Hispanic Asian/Pacific Islander	0.27	[0.15, 0.49]	0.27	[0.15, 0.48]	0.26	[0.14, 0.48]	0.42	[0.22, 0.80]
Non-Hispanic Multirace	1.94	[0.88, 4.28]	1.95	[0.88, 4.30]	2.05	[0.96, 4.38]	2.27	[1.06, 4.85]
Lesbian, Gay, Bisexual, Transgender	1.36	[0.75, 2.47]	1.34	[0.74, 2.42]	1.29	[0.71, 2.34]	0.95	[0.46, 1.96]
Mother graduated college	1.66	[1.09, 2.54]	1.66	[1.08, 2.53]	1.66	[1.09, 2.52]	2.07	[1.27, 3.36]
Married	0.65	[0.22, 1.94]	0.66	[0.22, 1.98]	0.70	[0.23, 2.12]	1.14	[0.32, 4.08]
Serious psychological distress			1.18	[0.59, 2.37]	1.16	[0.55, 2.43]	1.12	[0.48, 2.61]
Social support					1.22	[0.95, 1.56]	1.42	[1.08, 1.88]
Loneliness					1.35	[1.08, 1.68]	1.42	[1.09, 1.86]
Perceived harm of marijuana							0.60	[0.51, 0.70]
Current smoker							3.95	[2.28, 6.84]
Days binge drinking							1.13	[1.03, 1.24]
Sleep quality							0.89	[0.60, 1.32]

Note. AOR = adjusted odds ratio; CI = confidence interval