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Marijuana Use Disorder Symptoms among Recent Onset Marijuana Users

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Abstract

Background—With recreational marijuana having recently been legalized in a growing number of U.S. states, as well as the increasing support for its legalization among substantial segments of the American public, an understanding of the development of symptoms associated with marijuana use disorders will assist in guiding both education and policy.

Methods—This study examined the prevalence of marijuana use disorder symptoms among a nationally representative sample of recent onset marijuana users ages 12–21 drawn from the National Survey of Drug Use and Health (N= 9,697).

Results—The most frequently reported marijuana use symptoms were “tolerance”, and “time occupied acquiring, using or recovering from the effects of marijuana”. Logistic regression analyses indicated an expected positive association between marijuana use frequency and each marijuana use disorder symptom. In many cases the positive trend was quadratic or cubic, with greater increases between rates among low and moderate frequency marijuana users (i.e. 1–10 days per month) than among those using at a higher frequency (i.e. >10 days per month)..Relationships between marijuana use frequency and marijuana use symptoms were largely consistent according to age, gender and ethnicity.

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Conclusions—Recognizing symptoms of marijuana use disorders among adolescents and young adults using marijuana infrequently may assist in early identification and intervention for those at risk for problem use.

Keywords

Marijuana; Marijuana use symptoms

Introduction

With recreational marijuana having recently been legalized in a growing number of U.S. states, as well as the growing support for its legalization among substantial segments of the American public, an understanding of the development of symptoms associated with marijuana disorders will assist in guiding both education and policy. Though often viewed as less addictive than other licit and illicit substances (Nutt, King, Saulsbury, Blakemore, 2007), a diagnosis of marijuana abuse has been estimated at approximately 4% among U.S. adults ages 24–28 years (Haberstick et al., 2014), and marijuana dependence has been shown to develop in nearly one in ten (approximately 9%) of individuals who have ever tried marijuana (Wagner and Anthony, 2002). Together, prior studies suggest that extended marijuana use and/or marijuana use disorders are associated with working memory impairment (Vo, Schacht, Mintzer, Fishman, 2014; Hall and Solowij, 1998), lower educational attainment (Horwood et al., 2010), reduced lung function (Taylor et al., 2002), airway inflammation and infection (Gates, Jaffe, Copeland, 2014), increased risk of the onset and persistence of alcohol use disorders (Weinberger, Platt, Goodwin, 2016) and illicit drug use disorders (Blanco et al., 2016). Recent evidence suggests marijuana use is not associated with increased risk of anxiety and mood disorders, though marijuana use disorders appear to increase the risk of depression onset (Rey, Sawyer, Raphael, Patton, Lynskey, 2002). Further, heavy marijuana use in adolescence has been associated with increased risk of unemployment, lower income, lower relationship satisfaction and lower life satisfaction by adulthood (Fergusson and Boden, 2008).

Marijuana use most often begins in adolescence (Wagner and Anthony, 2002; Baumeister and Tossman, 2005). Research within the past decade has shown that up to 50% of adolescents have used marijuana at least once in their lifetime and that marijuana use disorders typically develop in adolescence and early adulthood (Perkonig et al., 2008). Previous research has also shown that marijuana use disorders tend to emerge sooner and progress faster for those exposed during adolescence (Chen, O'Brien, Anthony, 2005), suggesting that adolescent marijuana users may be at increased risk for both experiencing marijuana use disorder symptoms soon after initiation and developing associated problems in adulthood (Degenhardt, Hall, Lynskey, 2001; Mewton, Teesson, Slade, 2010). Data suggest that adolescents exposed to marijuana before age 15 have substantially lower educational attainment compared with those who remain unexposed by age 18 (Horwood et al., 2010). Positive initial experiences with marijuana use among adolescents has been strongly linked with onset of marijuana use disorders; those with initially positive experience are at an over 20-fold increased risk of developing marijuana use problems, even

after adjusting for the impact of a wide range of potentially confounding and mediating factors (Fergusson, Horwood, Lynskey, Madden, 2003).

Previous research focusing on tobacco and alcohol has shown that even low levels of use can result in development of substance use disorder symptoms in both adolescents (Dierker et al., 2007; Lee, Rose, Engel-Rebitzer, Selya, Dierker, 2011) and adults (Dierker and Donny, 2008). While there has been relatively little comparable research on the development of marijuana use symptoms as a function of exposure, existing work has shown that marijuana use remains fairly stable over time (Perkonig et al., 2008) and that sociodemographic characteristics such as age, gender, and ethnicity are associated with different levels of susceptibility to both marijuana use and associated symptoms. For example, the risk of marijuana use disorders has been shown to be higher among males than females (von Sydow et al., 2001). In addition, ethnic minority groups tend to have lower rates of marijuana use compared to Whites, but higher rates of past year marijuana dependence among those who use (Wu, Brady, Mannelli, Killeen, NIDA AAPI Workgroup, 2014). Given these observed differences, it is possible that sociodemographic subgroups may differ in their susceptibility to marijuana use disorder symptoms despite similar levels of marijuana use.

The present study aims to (1) determine the prevalence of marijuana use disorder symptoms among a nationally representative sample of recent onset marijuana users and (2) examine the relationship between frequency of marijuana use and likelihood of marijuana use disorder symptoms; and (3) investigate differences in the relationship between frequency of marijuana use and likelihood of marijuana use disorder symptoms across different sociodemographic groups. Specifically, we were interested in whether the relationships between marijuana use and associated symptoms are consistent across gender, age, and race/ethnicity subgroups. Data were combined from thirteen annual National Surveys on Drug Use and Health (NSDUH), one of the largest, nationally representative, epidemiologic studies to date that includes substantial heterogeneity in adolescent marijuana exposure and marijuana use disorder symptoms.

Methods

Participants

Drawn from annual NSDUH surveys from 2002–2014, the sample consisted of $N = 9,697$ individuals age 12–21 (Mean = 16.7, SE 0.03) who reported (1) using marijuana at least once in the past month, and (2) having had their first exposure to marijuana within the past two years based on the participants current age and responses to the question “How old were you the first time you used marijuana or hashish?”. Length of exposure was calculated by subtracting the age at which participants reported their first use of marijuana/hashish from their current age. Those reporting having used marijuana for the first time at their current age or up to one year prior were included and yielded a sample of adolescents and young adults that had their first experience with marijuana use no more than 2 years prior to the survey. Current experienced marijuana users (i.e., used marijuana within the past month but had their first exposure to marijuana more than 2 years earlier) were excluded in order to focus on relatively novice users.

The NSDUH utilized multistage area probability methods to select a representative sample of the noninstitutionalized U.S. civilian population aged 12 or older. Persons living in households, military personnel living off bases, and residents of non-institutional group quarters including college dormitories, group homes, civilians dwellings on military installations, as well as persons with no permanent residence are included. The NSDUH oversamples adolescent 12–17 to improve precision of substance use estimates for this group.

Measures

Marijuana use frequency—Marijuana use frequency was measured by asking participants how many days they used marijuana in the past 30 days (“Number of days used marijuana/hashish in the past 30 days?”) and the number of days in the past year that participants used marijuana (“Total number of days used marijuana/hashish in the past 12 months”).

Marijuana use disorder symptoms—The NSDUH includes items used to assess 8 of the 11 marijuana use disorder symptoms from the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (used in larger amounts or over a longer period than intended (*larger/longer*), repeated failed efforts to discontinue or reduce the amount that is used (*cut down*), an inordinate amount of time is occupied acquiring, using, or recovering from the effects (*time*), continued use despite adverse consequences from its use, such as criminal charges, ultimatums of abandonment from spouse/partner/friends, and poor productivity (*continued use*), other important activities in life, such as work, school, hygiene, and responsibility to family and friends are superseded by the desire to use (*important activities*), use in contexts that are potentially dangerous (*danger*), use despite awareness of physical or psychological problems attributed to use (*health*) and need for progressively larger amounts to obtain the psychoactive effect experienced when use first commenced, or, noticeably reduced effect of use of the same amount (*tolerance*)). Table 2 presents the symptom criteria and the corresponding items. The criteria were evaluated such that a positive response to the item(s) under a given criterion was coded positively as endorsing the symptom. The survey did not include items for marijuana withdrawal or craving which are also included in the DSM-V.

Sociodemographic characteristics—Sociodemographic characteristics included age (dichotomized into 2 categories, 12–15 years old and 16–21 years old), gender, and race/ethnicity (categorized into binary variables, White, Black, and Hispanic/Latino).

Other substance use variables—Past month cigarette use (“During the past 30 days, on how many days did you smoke part or all of a cigarette?”), lifetime daily smoking (“Has there ever been a period in your life when you smoked cigarettes every day for at least 30 days?”), past month alcohol use (“During the past 30 days, on how many days did you drink one or more drinks of an alcoholic beverage?”) and any past year use of illicit substances other than marijuana (hallucinogens, heroin, cocaine, inhalants, and psychotherapeutics) were also included as covariates in the present analyses.

Analyses

Logistic regression analyses were first used to evaluate the association between past 30 day marijuana use frequency (current use) and associated marijuana use symptoms, controlling for marijuana use in the past year. We tested linear, quadratic, and cubic trends in the probability of symptom endorsement and as a function of increasing levels of past month marijuana use frequency in order to determine whether the slope of the association between current marijuana exposure and likelihood of symptoms and diagnoses changed across levels of use. Higher order trends that were significant were retained in the model. Next, sociodemographic characteristics, past year marijuana use frequency, past month cigarette frequency, lifetime daily smoking, past month alcohol use, past year illicit substance use, and survey year were added to the model. Finally, we examined two-way interactions between sociodemographic characteristics (age dichotomized into 2 categories, 12–15 years old and 16–21 years old, gender, race/ethnicity categorized into binary variables, White, Black, and Hispanic/Latino) and past month marijuana exposure to evaluate whether the relationship between marijuana use and marijuana use disorder symptoms differed as a function of sociodemographic characteristics. All analyses used appropriate sample weights to correct for the differences in the probability of selection, and adjusted for survey design effects to obtain accurate standard errors via SAS (Version 9.4) survey procedures.

Results

Characteristics of the recent-onset marijuana users included in this study, adjusted for the complex survey design, are presented in Table 1. This sample was 48.8% female and 62.6% White. Approximately 29.2% of the sample reported using marijuana only on 1 day in the past month, and on average, this sample had smoked marijuana an average of 64.6 days in the past year (SE= 1.22, range 1–365).

Next, we descriptively examined the relationship between endorsement rates of each marijuana use disorder symptom across five levels of current marijuana use frequency (1, 2–3, 4–5, 6–10, or +10 days in the past 30 days). These categories were selected based on reasonable cut points in common responses yielding groups of relatively consistent size. Fig. 1 shows the proportion of adolescents and young adults endorsing each marijuana use disorder symptom by frequency of past month use. Rates were extremely low among those using at the lowest frequency (i.e. 1 day of marijuana use in the past 30 days). Among those using only one day in the past 30 days, using more often than intended or being unable to set limits on marijuana use (*cut down*) had the lowest rate of endorsement (1.2%) while needing to use more to get the same desired effect (*tolerance*) and spending an inordinate amount of time is occupied acquiring, using, or recovering from the effects (*time*), had the highest rates at just over 10%. Among those at the highest frequency of marijuana use, over three-quarters (79.3%) reported spending a great deal of time obtaining, using, or recovering from the effect of marijuana and more than half reported experiencing tolerance (57.3%).

Logistic regression analyses examining the association between current marijuana use frequency and marijuana use disorder symptoms, controlling for past year marijuana use frequency, sociodemographic characteristics, past month smoking frequency, daily smoking, frequency of past month alcohol use, past year use of illicit substances and survey year are

presented in Tables 3 and 4. In each model, past-month marijuana use frequency (ranging from 0 to 30 days) was significantly associated with all individual marijuana use disorder symptoms. A significant quadratic trend (non-significant cubic trend) was found for marijuana used more often than intended or being unable to set limits (*larger/longer*) and use in contexts that are potentially dangerous (*danger*). A small, but significant cubic trend was found for the remaining marijuana use disorder symptoms. Notably, symptom endorsement which showed fluctuations from infrequent to frequent use, revealed generally more rapid increases in symptom endorsement between 1–5 days of marijuana use, but increased less rapidly between 5–10 days of use, and leveled off beyond 10 days of use.

Interactions between current marijuana use frequency and each sociodemographic characteristic were also included in the final models (Tables 3 and 4). While younger adolescents were significantly more likely overall to report the majority of marijuana use symptoms (i.e. repeated failed efforts to discontinue or reduce the amount that is used (*cut down*), an inordinate amount of time is occupied acquiring, using, or recovering from the effects (*time*), continued use despite adverse consequences from its use, (*continued use*), other important activities in life superseded by the desire to use (*important activities*), use despite awareness of physical or psychological problems attributed to use (*health*) and need for progressively larger amounts to obtain the psychoactive effect experienced when use first commenced, or, noticeably reduced effect of use of the same amount (*tolerance*)), only the interaction between age group and repeated failed efforts to discontinue or reduce the amount that is used (*cut down*) was statistically significant. Younger adolescents endorsed this symptom at slightly higher rates than older adolescents and young adults at fewer days of use (<10 days), after which the rate of symptom endorsement remained stable. On the other hand, the rate of symptom endorsement continued to show a modest increase beyond 10 days of use for older adolescents and young adults, such that at the most frequent levels of use, their rate of symptom endorsement was higher than it was for younger adolescents. (Figure 2).

While main effects also revealed that males were more likely than females to report that an inordinate amount of time is occupied acquiring, using, or recovering from the effects (*time*), and a need for progressively larger amounts to obtain the psychoactive effect experienced when use first commenced, or, noticeably reduced effect of use of the same amount (*tolerance*), gender was not found to interact with marijuana use frequency in predicting marijuana use disorder symptoms. Similarly, while Black adolescents and young adults were significantly more likely than non-Black adolescents and young adults to discontinue or reduce the amount that is used (*cut down*), and both Black and White adolescents and young adults compared to non-Black and non-White adolescents and young adults were less likely to report participation in important activities was reduced or eliminated due to marijuana use, other important activities in life superseded by the desire to use (*important activities*) (Table 3 and 4), race/ethnicity was not found to interact with marijuana use frequency in predicting marijuana use disorder symptoms. The past year use of any other illicit substance predicted each of the individual marijuana use disorders symptoms.

Discussion

The present study examined marijuana use disorder symptoms among recent-onset adolescent and young adult marijuana users. Several major findings emerged. First, more frequent marijuana use was associated with higher rates of each symptom, while less frequent use was associated with lower rates. Second, despite relatively infrequent use, up to 31.1% of recent onset marijuana users, using less than 5 days in the past month endorsed marijuana disorders symptoms. Further, the relationship between marijuana use and specific symptoms was generally consistent by age, ethnicity and gender. After controlling for sociodemographic background and use of marijuana, cigarettes, alcohol and other illicit substances, the frequency of past-month marijuana use remained significantly associated with each marijuana disorder symptom. Several significant non-linear trends demonstrated fluctuations in the differences between rates of marijuana use symptoms, but in each case, greater increases between rates were seen among low and moderate frequency marijuana users (i.e. 1–10 days per month) than among those using at a higher frequency (i.e. >10 days per month).

Consistent with previous literature which has suggested that marijuana use may be less addictive than other commonly used substances (Kandel, Chen, Warner, Kessler, Grant, 1997), rates of marijuana use symptoms in the present study were in some instances reported at lower rates than have been found among adolescents who recently initiated either cigarette (Rose, Dierker and Donny, 2010) or alcohol use (Lee, Rose, Engel-Rebitzer, Selya, & Dierker, 2011). Among adolescents and young adults using marijuana more than 10 days in the past month, more than half reported experiencing tolerance (i.e. needing more marijuana to achieve a desired effect or having a markedly diminished effect with continued use of the same amount of marijuana) and more than three-quarters reported spending a large amount of time to obtain, use, or recover from marijuana use. On average, this group used marijuana approximately 21 days in the past month and less than 17% used marijuana every day. These findings are consistent with previous research on the development of alcohol use disorders in which tolerance emerges early and is experienced by many adolescent drinkers (Hartford, et al., 2005; Martin, Langenbucher, Kaczynski, Chung, 1996), and is also consistent with a study showing that tolerance emerges more rapidly in nicotine dependence than other symptoms among adolescent cigarette smokers (Zhan, Dierker, Rose, Selya, & Mermelstein, 2012).

Notably, unsuccessful efforts to quit or cut down, and using a larger amount of marijuana over a longer period than intended were the least endorsed marijuana use symptoms across the continuum of past month use. Both of these symptoms are considered common markers of “impaired control” or “loss of control” which has been found to be an early emerging dependence symptom in the context of both tobacco (DiFranza et al., 2007; DiFranza et al., 2002; DiFranza et al., 2000; Gervais, O’Loughlin, Meshefedjian, Bancej, Tremblay, 2006; Rose, Dierker, Donny, 2010) and alcohol use (Hartford et al., 2005; Lee, Rose, Engel-Rebitzer, Selya, Dierker, 2011). In particular, 80% of near-daily adolescent cigarette smokers have been found to experience “loss of control,” while approximately 65% of recent onset alcohol users who drank alcohol on more than 10 days in the past month reported having a persistent desire or unsuccessful efforts to cut down or control their

alcohol use. Comparing these rates to those from the present study for greater than 10 days of marijuana use in the past month, 11.3% reported being unable to cut down on marijuana use suggesting that marijuana may bring with it a lower risk of impaired control (thought to be an important feature of the addiction process), at least among adolescents and young adults who have recently initiated and continued to use marijuana.

Finally, we examined possible differences in the association between marijuana use and symptoms of marijuana use disorders as a function of socio-demographic characteristics. While younger adolescents were significantly more likely than older adolescents and young adults to report the majority of marijuana use symptoms, confirming previous research regarding the increased vulnerability based on early exposure (Chen, O'Brien, Anthony, 2005), only the interaction between age group and repeated failed efforts to discontinue or reduce the amount that is used was found to be significant. Younger adolescents may be somewhat more likely to have difficulty quitting or cutting down than older adolescents and young adults when using less frequently (i.e. < 10 times per month). In contrast older adolescence and young adults seem to be at increased risk for experiencing this symptom when engaging in more frequent use. Notably, this may in part be driven by measures of quantity not captured by our current measure of marijuana use exposure.

For both gender and race, differences were seen in two of the eight symptoms examined, yet neither race or gender were found to interact with marijuana use frequency in predicting marijuana use disorder symptoms, suggesting that the relationship between frequency of use and marijuana use symptoms is similar for males and females and among Black, White and Hispanic recent onset marijuana users. In terms of race, these findings differ from previous research showing that among past year users of marijuana, Black, Hispanic, Asian American, and Native American adults are more likely to endorse marijuana use disorders than Whites (Wu, Brady, Mannelli, Killeen, & NIDA AAPI Workgroup, 2014) and that Black and Hispanic adults endorse higher levels of marijuana use disorders than Whites (Wu et al., 2012). However, it is important to note that neither of these studies focused solely on participants under the age of 22 or those who recently began using marijuana.

Though other past year illicit substance use was included in the models as a covariate, the fact that this variable was found to significantly predict endorsement of every marijuana use disorder symptom over and above marijuana use behavior (i.e. past year and pas 30 day), daily tobacco use, and past year alcohol use suggests that substance use disorder symptoms associated with the emergence of marijuana use are likely influenced by the use of other illicit substances. For example, preclinical data suggest animals that develop tolerance to the effects of one substance may also become tolerant to the effects of the other (Funk, Marinelli, and Lee, 2006). Taken together, these findings suggest that other illicit substance use likely plays a role in the experience of marijuana use symptoms possibly as a cause or a signal of sensitivity to substance use disorder symptoms, over and above exposure to marijuana.

A major strength of this study is that it involved a large, nationally representative sample that allowed an examination of marijuana use disorder symptoms over a continuum of number of days used in the past month, and thus can generalize to a broad population of adolescent and

young adult marijuana users. The sample size also allowed us to focus exclusively on marijuana users who had begun using within the past two years, which reduced the potential confounding effect of long-term marijuana use on symptom endorsement. Finally, this study examined endorsement of marijuana use symptoms controlling for important covariates such as age, gender, race/ethnicity, and past year use of marijuana, cigarettes, alcohol and illicit substance other than marijuana.

Despite numerous strengths, there are also weaknesses that should be noted. First, though we chose marijuana use frequency in the past 30 days as the primary measure of marijuana exposure and controlled for past year marijuana use frequency in our models, an important limitation of the present study is our inability to also consider the quantity of marijuana use. Though frequency of use is a particularly salient measure in that increasing *frequency*, rather than infrequent high *quantity* of use, is believed to play a larger role in the development of substance use symptoms in that greater abuse and dependence is manifested by shorter and shorter periods between exposures, frequency remains a markedly incomplete measure of exposure. Further, the cross-sectional nature of the data cannot inform the direction of the relation between recent marijuana exposure and endorsement of marijuana abuse and dependence symptoms. It is possible that emerging symptoms lead to increased levels of marijuana use in addition to increased use leading to the emergence of symptoms. As described by Vsevolozhskaya and Anthony, 2016, focusing analyses on the first months after onset of a newly incident substance may reduce the magnitude of these feedback effects. Still, the present study was only able to examine past month marijuana use as a function of marijuana use disorder symptoms that may have been experienced at any time during the past year, possibly limiting the precision of our findings. Future longitudinal research that asks newly incident substance users to give month-by-month reports of frequency of use and occurrence of clinical features might help to avoid these inherent limitations of cross-sectional data (Vsevolozhskaya and Anthony, 2016). Finally, it is important to note that the NSDUH does not measure all marijuana use symptoms as defined by the current Diagnostic and Statistical Manual (Version 5) making prevalence of a diagnosable disorder difficult to estimate. Further, other negative consequences of marijuana use that are not adequately captured by these criteria may not be captured by these measures.

Finally, though the NSDUH has limited information on comorbid psychiatric disorders, in work based on the National Survey of Alcohol and Related Conditions, we have previously demonstrated that psychiatric disorders, particularly major depression, may act as a sign or signal of risk for substance use disorders symptoms. Specifically, we found that rates of nicotine dependence were consistently higher for those with major depression than for those without even among participants smoking as few as 3 cigarettes per day (Dierker & Donny, 2008). To date, this work has not been replicated for marijuana use behaviors and represents an important area for further inquiry.

This study identified important differences in the rates of marijuana use disorder symptoms in recent onset marijuana users across a continuum of marijuana exposure, ranging from infrequent use (1 day per month) to frequent use (more than 10 days per month). Though marijuana use symptoms were found at somewhat lower rates than previously reported for tobacco and alcohol use, some recent onset adolescent marijuana users, even those who used

less frequently (i.e. fewer than 5 days per month) did experience marijuana related symptoms, most commonly tolerance and spending a large amount of time obtaining, using, or recovering from marijuana use. More generally, these results demonstrate a considerable amount of heterogeneity in both frequency of use as well as prevalence of associated symptoms among individuals who have been using marijuana for a relatively short amount of time.

There is widespread belief among adolescents and young adults that only those who use marijuana daily are at risk for marijuana disorder symptoms and that they are generally invulnerable to this risk if they use marijuana only occasionally. Our results suggest that this may not be the case. Thus, prevention and early intervention efforts that address these beliefs and teach adolescents that even minimal or infrequent use can increase risk of marijuana use symptoms and disorders may help to reduce the likelihood that adolescents will develop chronic, heavy use. For at least some recent onset adolescent and young adult marijuana users, what might appear to be benign experimentation puts them at much greater risk for developing dependent use.

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Highlights

- Among 12–21 year olds in the US, the most frequently reported marijuana use symptoms were “tolerance”, and “time spent in activities necessary to obtain marijuana or recover from its effect”.
- Logistic regression analyses indicated an expected positive association between marijuana use frequency and each marijuana use disorder symptom.
- In many cases the positive trend was quadratic or cubic, with greater increases between rates among low and moderate frequency marijuana users (i.e. 1–10 days per month) than among those using at a higher frequency (i.e. >10 days per month).
- Relationships between marijuana use frequency and marijuana use symptoms were largely consistent according to age, gender and ethnicity.

Figure 1.

The association between past month marijuana use and marijuana disorder symptoms among recent-onset marijuana users.

Figure 2.

Repeated failed efforts to discontinue or reduce the amount of marijuana that is used (cut down) as a function of marijuana use frequency and age group.

Table 1

Sample characteristics (N = 9,697).

Variable	N (%) for categorical data; M (SE) for continuous data
Gender	
Female	4795 (48.8%)
Male	4902 (51.2%)
Age	
12 – 15 years	3288 (30.1%)
16 – 21 years	6409 (69.9%)
Race	
White	6022 (62.6%)
Black	1359 (14.3%)
Native American	150 (0.5%)
Asian/Pacific Islander	252 (3.3%)
Multiracial	422 (2.3%)
Hispanic/Latino	1492 (17.0%)
Past month cigarette use	5.5 days (0.15)
Lifetime daily smoking	1766(17.1%)
Past month alcohol use	3.8 days (0.08)
Any other Illicit substance use in past year	3407 (34.9%)
Past month marijuana use	
1 day	2810 (29.2%)
2 days	1636 (17.4%)
3 – 4 days	1584 (16.2%)
5 – 10 days	1706 (17.9%)
> 10 days	1910 (19.4%)
Past year marijuana use	64.6 days (1.23)

Table 2

Mapping marijuana symptoms with DSM-V criterion.

Criterion	Item(s)
<i>Larger/longer:</i> Difficulty containing use of cannabis- the drug is used in larger amounts and over a longer period than intended.	During the past 12 months, <ul style="list-style-type: none"> Were you able to keep to the limits you set, or did you often use marijuana more than you intended to?
<i>Cut down:</i> Repeated failed efforts to discontinue or reduce the amount of cannabis that is used	During the past 12 months, <ul style="list-style-type: none"> Were you unable to stop or cut down every time you wanted to or tried to?
<i>Time:</i> An inordinate amount of time is occupied acquiring, using, or recovering from the effects of cannabis.	During the past 12 months, <ul style="list-style-type: none"> Was there a month or more where you spent a lot of your time getting or using marijuana? Was there a month or more where you spent a lot of your time getting over the effects of marijuana?
<i>Cravings</i> or desires to use cannabis. This can include intrusive thoughts and images, and dreams about cannabis, or olfactory perceptions of the smell of cannabis, due to preoccupation with cannabis.	Not included in the survey
<i>Continued use:</i> Continued use of cannabis despite adverse consequences from its use, such as criminal charges, ultimatums of abandonment from spouse/partner/friends, and poor productivity.	During the past 12 months, <ul style="list-style-type: none"> Did you continue to use marijuana even though you thought it caused problems with your family or friends?
<i>Important activities:</i> Other important activities in life, such as work, school, hygiene, and responsibility to family and friends are superseded by the desire to use cannabis.	During the past 12 months, <ul style="list-style-type: none"> Did using marijuana cause you to give up or spend less time with family and friends, working, going to school, or doing other important activities?
<i>Danger:</i> Cannabis is used in contexts that are potentially dangerous, such as operating a motor vehicle.	During the past 12 months, <ul style="list-style-type: none"> Did you do things that might have put you in physical danger due to marijuana use?
<i>Health:</i> Use of cannabis continues despite awareness of physical or psychological problems attributed to use- e.g., anergia, amotivation, chronic cough.	During the past 12 months, <ul style="list-style-type: none"> Did you continue to use marijuana even though you thought marijuana use was causing you to experience physical problems? Did you continue to use marijuana even though you thought marijuana use was causing you to experience emotional problems?
<i>Tolerance</i> to Cannabis, as defined by progressively larger amounts of cannabis are needed to obtain the psychoactive effect experienced when use first commenced, or, noticeably reduced effect of use of the same amount of cannabis	During the past 12 months, <ul style="list-style-type: none"> Did you need to use more marijuana than you used to in order to get the same desired effect? Did you notice that using the same amount of marijuana had less effect on you than before?
<i>Withdrawal</i> , defined as the typical withdrawal syndrome associate with cannabis, or cannabis or a similar substance is used to prevent withdrawal symptoms.	Not included in the survey

Table 3
Logistic regression for marijuana use disorder symptoms. Odds ratios and 95% confidence intervals

	Larger/Longer	Cut down	Time	Continued use
<i>Past 30 day marijuana use</i>	1.2(0.87–1.58)	1.3(0.92–1.73)	1.3(0.99–1.63)	1.3(0.99–1.64)
<i>Past 30 day marijuana use – quadratic trend</i>	0.9 (0.994–0.998) **	0.9(0.97–0.99) **	0.9(0.97–0.99) ***	0.9(0.97–0.99) ***
<i>Past 30 day marijuana use – cubic trend</i>	--	1.0(1.00–1.001) **	1.0(1.00–1.001) ***	1.0(1.00–1.001) **
<i>Past year marijuana use</i>	1.003(1.001–1.005) *	1.0(0.99–1.01)	1.0(1.006–1.009) ***	1.0(1.002–1.005) ***
<i>Age group</i> 12 –15 year vs. 16 – 21	1.3(0.83–1.95)	1.9(1.23–3.00) **	1.3(1.06–1.55) *	2.1(1.51–2.91) ***
<i>Gender</i> Male vs. Female	1.1(0.73–1.72)	1.4(0.94–2.12)	1.3(1.09–1.69) **	0.8(0.59–1.17)
<i>Race</i> White vs. non-White	0.8(0.32–2.02)	1.6(0.72–3.42)	1.0(0.72–1.55)	1.4(0.69–3.01)
Black vs. non-Black	0.9(0.32–2.44)	3.0(1.22–7.34) *	0.7(0.47–1.15)	1.1(0.44–2.65)
Hispanic vs. non-Hispanic	0.8(0.32–2.44)	1.0 (0.36–2.80)	1.1(0.70–1.63)	1.2(0.51–2.74)
<i>Past 30 day cigarette use</i>	1.0(0.99–1.03)	1.0(0.98–1.01)	1.0(0.99–1.01)	1.0(0.99–1.02)
<i>Daily cigarette smoking</i>	0.9(0.61–1.56)	0.9(0.51–1.50)	1.6(1.12–2.19) **	1.5(1.03–2.08) *
<i>Past month alcohol use</i>	1.0(0.96–1.01)	1.0(0.96–1.01)	0.9(0.96–0.99) **	0.9(0.96–1.004)
<i>Past year illicit substance use (other than marijuana)</i>	1.5(1.14–1.98) **	1.7(1.19–2.31) **	2.0(1.74–2.36) ***	1.9(1.54–2.41) ***
<i>Survey year</i>	0.9(0.93–0.99)	0.9(0.93–0.99) **	1.0(0.98–1.02)	1.0(0.96–1.02)
<i>Age group * Past 30 day marijuana use interaction</i>	1.0 (0.99–1.04)	1.1(1.02–1.09) **	1.0(0.99–1.05)	1.0(0.98–1.02)
<i>Gender * Past 30 day marijuana use interaction</i>	1.0(0.98–1.03)	1.0(0.99–1.05)	1.0(0.99–1.04)	1.0(0.98–1.02)

	Larger/Longer	Cut down	Time	Continued use
<i>White* Past 30 day marijuana use interaction</i>	1.0(0.94–1.05)	1.0(0.97–1.07)	1.0(0.97–1.06)	1.0(0.99–1.07)
<i>Black* Past 30 day marijuana use interaction</i>	1.0(0.92–1.05)	1.0(0.97–1.10)	1.0(0.97–1.07)	1.0(0.97–1.07)
<i>Hispanic* Past 30 day marijuana use interaction</i>	1.0(0.92–1.04)	0.9(0.91–1.03)	1.0(0.78–1.09)	1.0(0.96–1.07)

* p < .05,

** p < .001,

*** p < .0001

Table 4

Logistic regression for marijuana use disorder symptoms. Odds ratios and 25% confidence intervals.

	Important activities	Danger	Health	Tolerance
<i>Past 30 day marijuana use</i>	1.7(1.27–2.17) **	1.1(0.79–1.39)	1.2(0.87–1.57)	1.1(0.89–1.37)
<i>Past 30 day marijuana use – quadratic trend</i>	0.9(0.97–0.99) ***	0.9(0.996–0.998) *	0.9(0.98–0.99) **	0.9(0.97–0.99) ***
<i>Past 30 day marijuana use – cubic trend</i>	1.0(1.00–1.001) **	--	1.0(1.00–1.001) *	1.0(1.00–1.001) ***
<i>Past year marijuana use</i>	1.0(1.002–1.004) **	1.0(1.001–1.004) *	1.0(1.001–1.004) **	1.0(1.004–1.007) ***
<i>Age group</i> 12 – 15 vs. 16 – 21 years	1.7(1.33–2.23) ***	1.4(0.97–1.86)	1.7(1.17–2.50) **	1.7(1.37–2.06) ***
<i>Gender</i> Male vs. Female	1.2(0.90–1.52)	1.1(0.82–1.38)	0.8(0.54–1.17)	1.4(1.11–1.69) **
<i>Race</i> White vs. non-White	0.5(0.31–0.95) *	1.2(0.65–2.15)	0.8(0.43–1.55)	0.9(0.62–1.55)
Black vs. non-Black	0.4(0.20–0.90) *	0.7(0.32–1.49)	0.9(0.42–2.14)	1.3(0.78–2.16)
Hispanic vs. non-Hispanic	0.9(0.47–1.65)	1.1(0.33–2.19)	0.9(0.43–2.21)	1.0(0.62–1.74)
<i>Past 30 day cigarette use</i>	1.0(0.99–1.02)	1.02(1.001–1.03) *	0.9(0.99–1.01)	1.0(0.99–1.01)
<i>Daily cigarette smoking</i>	1.4(0.95–1.98)	1.0(0.68–1.39)	1.4(0.95–1.96)	1.2(0.96–1.62)
<i>Past month alcohol use</i>	0.9(0.97–1.006)	1.0(0.99–1.03)	0.9(0.97–1.01)	1.0(0.98–1.006)
<i>Past year illicit substance use</i>	1.9(1.52–2.29) ***	1.8(1.44–2.18) ***	1.8(1.48–2.18) ***	1.7(1.42–2.00) ***
<i>Survey year</i>	0.9(0.96–1.004)	0.9(0.93–0.98) **	0.9(0.94–0.99) *	1.0(0.98–1.02) ***
<i>Age group * Past 30 day marijuana use interaction</i>	1.0(0.99–1.04)	0.9(0.97–1.01)	1.0(0.99–1.04)	1.0(0.99–1.04)
<i>Gender * Past 30 day marijuana use interaction</i>	1.0(0.99–1.04)	1.0(0.98–1.02)	1.0(0.99–1.05)	1.0(0.99–1.03)

	Important activities	Danger	Health	Tolerance
<i>White</i> * <i>Past 30 day marijuana use interaction</i>	0.9(0.92–1.03)	1.0(0.95–1.07)	1.0(0.96–1.06)	1.0(0.98–1.06)
<i>Black</i> * <i>Past 30 day marijuana use interaction</i>	0.9(0.89–1.003)	1.0(0.95–1.08)	0.9(0.94–1.06)	1.0(0.99–1.09)
<i>Hispanic</i> * <i>Past 30 day marijuana use interaction</i>	0.9(0.93–1.02)	1.0(0.97–1.09)	1.0(0.95–1.08)	1.0(0.98–1.07)

* p < .05,
** p < .001,
*** p < .0001