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Trends in cannabis use disorder by cigarette smoking status in the United States, 2002–2016

Andrea H. Weinberger^{a,b}, Lauren R. Pacek^c, Melanie M. Wall^{d,e,f}, Michael J. Zvolensky^{g,h}, Jan Copelandⁱ, Sandro Galea^j, Shadi Nahvi^k, Scott J. Moeller^{l,m}, Deborah S. Hasin^{d,e,n}, Renee D. Goodwin^{n,o,p,*}

^aFerkauf Graduate School of Psychology, Yeshiva University, Bronx, NY, USA

^bDepartment of Epidemiology & Population Health, Yeshiva University Albert Einstein College of Medicine, Bronx, NY, USA

^cDepartment of Psychiatry and Behavioral Sciences, Duke University School of Medicine, Durham, NC 27705, USA

^dDepartment of Psychiatry, College of Physicians and Surgeons, Columbia University, New York, NY, USA

^eNew York State Psychiatric Institute, New York, NY, USA

^fDepartment of Biostatistics, Mailman School of Public Health, Columbia University, New York, NY, USA

^gDepartment of Psychology, University of Houston, Houston, TX, USA

^hDepartment of Behavioral Sciences, University of Texas MD Anderson Cancer Center, Houston, TX, USA

ⁱDepartment of Medicine, University of New South Wales, Sydney, New South Wales 2052, Australia

^jSchool of Public Health, Boston University, Boston, MA, USA

^kDepartments of Medicine and Psychiatry & Behavioral Sciences, Albert Einstein College of Medicine/Montefiore Medical Center, Bronx, NY, USA

^lDepartments of Psychiatry and Neuroscience, Icahn School of Medicine at Mount Sinai, New York, NY, USA

*Corresponding author at: Department of Epidemiology and Biostatistics, Graduate School of Public Health and Health Policy, The City University of New York, 55 West 125th St, New York, NY, 10027, USA. renee.goodwin@sph.cuny.edu (R.D. Goodwin).

Contributors

Dr. Goodwin conceived the study and wrote the first draft of the manuscript. Dr. Weinberger managed the literature search and wrote the final version of the manuscript. Dr. Pacek conducted the statistical analyses. Drs. Wall, Zvolensky, Copeland, Galea, Nahvi, Moeller, and Hasin contributed to interpretation of results and critical revisions to the manuscript. All authors approved the final manuscript.

Conflicts of interest

The authors have no conflicts of interest to report.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi: <https://doi.org/10.1016/j.drugalcdep.2018.06.016>.

^mDepartment of Psychiatry, Stony Brook University, Stony Brook, NY, USA

ⁿDepartment of Epidemiology, Mailman School of Public Health, Columbia University, New York, NY, USA

^oInstitute for Implementation Science and Population Health, The City University of New York, New York, NY, USA

^pDepartment of Epidemiology and Biostatistics, Graduate School of Public Health and Health Policy, The City University of New York, New York, NY, USA

Abstract

Background—Cannabis use is on the rise in the United States (US) and is disproportionately common among cigarette smokers. Cannabis use disorder (CUD) occurs among a small subset of cannabis users and may impact cigarette use. The objective of this study was to estimate trends in the prevalence of CUD among daily, non-daily, former, and never cigarette smokers from 2002 to 2016.

Methods—Data were drawn from cross-sectional, nationally representative samples of individuals ages 12 and older in the US that were collected annually. The prevalence of past 12-month CUD was estimated each year from 2002 to 2016 among daily, non-daily, former, and never cigarette smokers (total analytic N=837,326).

Results—Overall, the prevalence of CUD decreased from 2002 to 2016. Yet, trends differed by cigarette smoking status. Adjusting for demographics, the prevalence of CUD increased significantly among non-daily smokers (aOR = 1.02; 95% CI = 1.01–1.03) from 2002 to 2016 and did not change among daily, former, or never smokers. CUD was significantly more common among non-daily (4.32%) and daily cigarette smokers (2.92%) compared with former (0.99%) and never smokers (1.11%) in 2016. Approximately one in five (18.11%–22.87%) youth ages 12–17 who smoke cigarettes met criteria for CUD in 2016, compared with approximately 2% of non-smoking youth.

Conclusions—Despite downward trends in CUD observed at the general population level, the prevalence of CUD significantly increased among non-daily cigarette smokers from 2002 to 2016. In the US, CUD remains significantly higher among cigarette smokers relative to non-cigarette smokers.

Keywords

Cannabis; Cannabis use disorder; Cigarettes; Smoking; Epidemiology; NSDUH

1. Introduction

Cannabis is used by more than 147 million people around the world and is the most commonly used drug that is labeled “illicit” by the World Health Organization (WHO, 2017). Cannabis is in a unique situation among drugs as legalization of Cannabis use for medicinal and recreational purposes is spreading across states in the United States (US; Maxwell and Mendelson, 2016) and other countries (Room et al., 2010). The use of Cannabis has been increasing in the US in recent years (Azofeifa et al., 2016; Hasin et al.,

2015, 2017) and perceptions of risk of Cannabis use are decreasing (Azofeifa et al., 2016; Compton et al., 2016; Johnston et al., 2016; Pacek et al., 2015). A study of adolescents in 38 North American and European countries found that Cannabis “liberalization” measures (e.g., reduced legal consequences, legalization) were associated with increased Cannabis use (Shi et al., 2015). These changes in the use and risk perceptions related to Cannabis raise concerns about whether the escalation in Cannabis use may also lead to an increase in associated problems, such as Cannabis use disorder (CUD).

CUD occurs among a subset of Cannabis users and is associated with substantial impairment and increased risk of other substance use, mental health, and psychosocial problems (Foster et al., 2017; Hall, 2015). In the US population, the 12-month CUD prevalence is estimated at almost 3%, which represents approximately 7.5 million persons (Hasin et al., 2015). Over the last several years, a number of studies have reported that the prevalence of CUD has increased over time in the US general population (Hasin et al., 2015), although other studies have reported either a decline in CUD among Cannabis users or no significant change over time (Compton et al., 2016; Grucza et al., 2016).

Cannabis use and cigarette use tend to co-occur (Schauer et al., 2015). Recent findings suggest that the majority of Cannabis use occurs among cigarette smokers relative to non-cigarette-smokers (Goodwin et al., 2018). Given that Cannabis use appears disproportionately common among cigarette smokers (Goodwin et al., 2018), greater health risks are associated with co-use of both cigarettes and Cannabis (e.g., psychosocial problems, increased toxicant exposure, Peters et al., 2012; Meier and Hatsukami, 2016), and there is the potential for increased vulnerability of cigarette smoking among people with substance use disorders in general (Lewinsohn et al., 1999; Palmer et al., 2009), people who smoke cigarettes may also be at increased risk for problematic Cannabis use, including CUDs. Since Cannabis use is disproportionately common among cigarette smokers, and daily Cannabis use occurs primarily among cigarette smokers (Goodwin et al., 2018), it is conceivable that trends in CUD over time may differ by cigarette smoking status (Schauer et al., 2017). Data suggesting that Cannabis use and CUDs are barriers to quitting cigarette smoking among current cigarette users and to sustained abstinence among former cigarette smokers (Weinberger et al., 2018; Weinberger et al., 2013) indicate the importance of understanding whether and to what degree the prevalence of CUD may be increasing in cigarette smokers over time. No prior investigation has compared the recent prevalence of CUDs by cigarette smoking status or examined whether changes in CUD prevalence differed over time by cigarette smoking status.

The goal of the current study was to examine trends in the prevalence of CUD by cigarette smoking status over the past decade using data from representative samples of US persons ages 12 and older. The first aim of the study was to estimate the degree to which CUD is prevalent in 2016 among daily, non-daily, former, and never cigarette smokers in the US overall and to examine whether these relationships differ by gender, age, marital status, income, and race/ethnicity. The second aim was to estimate trends in the prevalence of CUD from 2002 to 2016 among daily, non-daily, former, and never cigarette smokers in the US, adjusting for demographics.

2. Material and methods

2.1. Study population

Data were obtained from the 2002–2016 National Survey on Drug Use and Health (NSDUH) public use data files, for a combined total sample size of 837,326 individuals. The NSDUH was sponsored by the Substance Abuse and Mental Health Services Administration (SAMHSA) and designed to provide estimates of the prevalence of extra-medical use of legal and illegal drugs in US community-based individuals age 12 and older. The survey employed a 50-state design with an independent multistage area probability sample for each of the 50 states and the District of Columbia. Response rates for completed surveys during the aforementioned years ranged from 73%–79%.

Informed consent was obtained before the start of every interview. Participants were given a description of the study, read a statement describing the confidentiality of any information provided by participants, and assured that participation in the study was voluntary. Surveys were administered by computer-assisted personal interviewing (CAPI) conducted by an interviewer and audio computer-assisted self-interviewing (ACASI). Use of ACASI was designed to provide respondents with a private and confidential means of responding to questions, and to increase honest reporting of drug use and other sensitive behaviors. Respondents were offered US \$30 for participation. The analyses were based on de-identified publicly available data exempt from Institutional Review Board review.

Sampling weights for the NSDUH were computed to control for unit-level and individual-level non-response and were adjusted to ensure consistency with population estimates obtained from the US Census Bureau. In order to use the 15 years of combined data, a new weight was created aggregating the 15 datasets by dividing the original weight by the number of data sets combined. Further descriptions of the sampling methods and survey techniques for the NSDUH are found elsewhere (Center for Behavioral Health Statistics and Quality, 2016).

2.2. Measures

2.2.1. Sociodemographic variables—Sociodemographic variables for this study included gender (male, female), age (12–17 years old, 18–25 years old, 26 years old), marital status (married, widowed/divorced/separated, never married), total annual family income (< \$20,000, \$20,000–\$74,999, \$75,000), and race/ethnicity [[non-Hispanic White, non-Hispanic Black, Hispanic, non-Hispanic Other (i.e., Native American/Alaska Native; Native Hawaiian/Other Pacific Islander; Asian; more than one race)].

2.2.2. Cigarette smoking variables—Current cigarette smoking status was assessed using the following questions: (1) “Have you ever smoked part or all of a cigarette?” (2) “Have you smoked at least 100 cigarettes in your entire life?”; and (3) “During the past 30 days, have you smoked part or all of a cigarette?” Individuals who reported smoking at least 100 cigarettes in their lifetime and at least 1 cigarette within the past 30 days were classified as current cigarette smokers. Current cigarette smokers were then subdivided based on frequency of smoking using the following question: “During the past 30 days, that is, since

[DATEFILL], on how many days did you smoke part or all of a cigarette?” Those who reported smoking 1–29 days of the past 30 days were classified as current non-daily cigarette smokers and those who reported smoking all 30 of the past 30 days were classified as current daily cigarette smokers. Persons who had smoked at least 100 cigarettes in their lifetime but none in the past 30 days were classified as former cigarette smokers. Individuals who had never smoked part or all of a cigarette or smoked fewer than 100 cigarettes in their lifetime were classified as never smokers. Similar approaches have been utilized in prior research (Goodwin et al., 2018; Pacek et al., 2014).

2.2.3. Cannabis use disorders (CUD)—Past-year CUD was operationalized as a dichotomous variable (yes/no) as derived from DSM-IV-TR criteria for Cannabis dependence and Cannabis abuse (APA, 1994). To meet criteria for Cannabis dependence, participants had to report three or more of the following six dependence criteria: (1) spending a great deal of time over a period of a month getting, using, or getting over the effects of Cannabis; (2) being unable to keep set limits on Cannabis use or using more often than intended; (3) needing to use Cannabis more than before to get desired effects or noticing that using the same amount had less effect than before; (4) being unable to cut down or stop using Cannabis every time he or she tried or wanted to; (5) continuing to use Cannabis even though it was causing problems with emotions, nerves, mental health, or physical problems; and (6) reducing or giving up participation in important activities due to Cannabis use. A respondent was classified as having Cannabis abuse if they reported one or more of the following four abuse criteria: (1) having serious problems due to Cannabis use at home, work, or school; (2) using Cannabis and then doing an activity where substance use might have put them in physical danger; (3) repeated trouble with the law related to Cannabis use; and (4) problems with family or friends caused by Cannabis use and continued Cannabis use despite these problems. Participants who met the criteria for either past-year Cannabis dependence or Cannabis abuse were classified as having a past-year CUD.

2.3. Statistical analysis

Data were weighted to reflect the complex design of the NSDUH sample and were analyzed with STATA SE version 12.0 software (StataCorp, 2011). We used Taylor series estimation methods (STATA “svy” commands) to obtain proper standard error estimates for the cross-tabulations. First, we examined the association between CUD and daily, non-daily, former, and never cigarette smoking by demographic characteristics (see Table 1). The prevalence of each of the four smoking statuses over time, from 2002 to 2016 were calculated and reported in Supplemental Table S1. Next, we examined the prevalence of CUD among the four smoking statuses across time, from 2002 to 2016. Linear time trends of CUD were assessed using logistic regression models with continuous year as the predictor (see Supplemental Table S2). Multivariate logistic regression was then used to adjust for demographics (i.e., gender, age, marital status, income, race/ethnicity). Within these analyses, odds ratios indicate the slope of the increase/decrease (i.e., rapidity of change) in CUD between 2002 and 2016. Furthermore, models with year-by-smoking status interaction terms, and F-tests to test the significance of these interactions, were used to assess differential time trends (i.e., differences in the rapidity of change between smoking statuses).

3. Results

3.1. Prevalence of Cannabis use disorders in 2016 by cigarette smoking status

3.1.1. Full sample—In 2016, the unadjusted prevalence of CUD was lowest and roughly equivalent among never and former cigarette smokers (1.11% and 0.99%, respectively), higher among daily cigarette smokers (2.92%), and highest among non-daily cigarette smokers (4.32%; see Table 1). In adjusted analyses, the prevalence of CUD was significantly higher among former cigarette smokers (adjusted odds ratio (aOR) = 2.01, 95% confidence interval (CI) = 1.42, 2.85), non-daily cigarette smokers (aOR = 4.34, 95% CI = 3.28, 5.73), and daily cigarette smokers (aOR = 3.53, 95% CI = 2.67, 4.66) compared to never cigarette smokers. Of persons with CUD in 2016, 21.42% were daily cigarette smokers, 18.53% were non-daily cigarette smokers, 12.70% were former cigarette smokers, and 47.35% were never cigarette smokers (data not shown). Linear trends of the prevalence of each of the four smoking statuses between 2002 and 2016 are shown in Supplemental Table S1.

3.1.2. Gender—Among men, the unadjusted prevalence of CUD was higher among never, non-daily, and daily cigarette smokers than among former cigarette smokers, while among women, the prevalence of CUD was lowest and comparable among never and former cigarette smokers, higher among daily cigarette smokers, and highest among non-daily cigarette smokers. In adjusted analyses, among both men and women, the prevalence of CUD was greater among former, non-daily, and daily cigarette smokers as compared to never cigarette smokers. The relationship between CUD and former cigarette smoking was stronger among women than among men ($p < 0.001$). There were no significant differences between men and women in terms of the strength of the relationship between CUD and non-daily or daily cigarette smoking.

3.1.3. Age—For persons ages 12–17, nearly one in four (22.87%) non-daily and one in five (18.11%) daily cigarette smokers met criteria for CUD while 15.57% of former cigarette smokers and only 2.06% of never cigarette smokers meet criteria for CUD. The relationship between CUD and smoking was significantly stronger among youth ($p < 0.001$) compared with both of the older age groups.

3.1.4. Marital status—Among married individuals, the prevalence of CUD was highest among former cigarette smokers, followed by non-daily and daily cigarette smokers, and lowest among never cigarette smokers. Among formerly married and never married persons, the prevalence of CUD was highest among non-daily cigarette smokers, followed by daily cigarette smokers, former cigarette smokers, and never cigarette smokers. There were no significant differences in terms of the strength of the association between CUD and cigarette smoking status among marital statuses.

3.1.5. Income—The prevalence of CUD was higher among non-daily and daily cigarette smokers compared to former and never cigarette in all income groups. The relationship between CUD and daily cigarette smoking was significantly stronger among individuals of the \$20,000–\$74,999 ($p = 0.012$) and \$75,000 ($p = 0.001$) income groups versus individuals with an annual income of $< \$20,000$. There were no significant differences among any of the

income groups in terms of the strength of the relationship between CUD and former or non-daily cigarette smoking.

3.1.6. Race/ethnicity—Among non-Hispanic white participants, CUD was most common among non-daily cigarette smokers, followed by daily cigarette smokers, and least common among former and never cigarette smokers. Among non-Hispanic black participants, CUD was most prevalent among non-daily cigarette smokers and daily cigarette smokers, followed by never cigarette smokers, and least common among former cigarette smokers. Hispanic participants and participants who identified as other races/ethnicities exhibited a similar pattern: CUD was most common among daily cigarette smokers and less common and comparable among non-daily, former, and never cigarette smokers. The relationship between CUD and non-daily cigarette smoking was stronger among non-Hispanic White participants than among non-Hispanic Black participants ($p=0.049$). There were no significant differences among any of the other race/ethnicity groups in terms of the strength of the relationship between CUD and former, non-daily, or daily cigarette smoking.

3.2. Cannabis use disorders from 2002 to 2016 by cigarette smoking status

The prevalence of CUD declined in the overall US population age 12 and older from 2002 to 2016 in unadjusted analyses and after adjusting for demographics (see Fig. 1 for the results of the unadjusted analyses and Supplemental Table S2 for unadjusted and adjusted analyses). Among daily cigarette smokers, the prevalence of CUD appeared to decrease in unadjusted analyses, though this change was no longer statistically significant after adjusting for demographics. Among nondaily smokers, there was no significant change in CUD over time prior to adjustment for demographics. After adjusting for demographics, a significant increase in CUD was observed among non-daily smokers over time. No significant change in CUD was observed among former or never cigarette smokers in unadjusted or adjusted analyses.

4. Discussion

The current study has three key findings. First, the prevalence of CUD in the US population is substantially higher among cigarette smokers relative to never smokers. More specifically, the majority of CUD occurs among persons who smoke cigarettes; the prevalence of CUD among non-daily cigarette smokers was estimated at over four times that of never cigarette smokers and the prevalence of CUD among daily cigarette smokers was estimated at over three times that of never cigarette smokers. Second, the proportion of non-daily cigarette smokers with CUD increased significantly from 2002 to 2016 after adjusting for demographics, whereas the proportion of daily cigarette smokers appeared to decrease in unadjusted analyses though this trend was no longer significant after adjusting for demographics. The proportion of CUD among former cigarette and never smokers did not change over time. Third, strong and significant relationships between cigarette smoking and CUD were observed in all demographic groups. The most prominent disparity was evident among youth. At least one in four (25–30%) of 12–17 year olds who reported past-month cigarette smoking met criteria for CUD compared with approximately 2% of 12–17 year olds who had never smoked cigarettes.

The results suggest that CUD is increasing among non-daily cigarette smokers in the US population. This trend differs from that observed in the full sample of the NSDUH where there was an overall decline in CUD, consistent with prior reports of data up to 2013 (Compton et al., 2016; Grucza et al., 2016). Examining CUD by cigarette smoking status over time reveals trends in CUD that had not previously been observed when examining the general population as a whole. These trends in CUD prevalence are consistent with increases in daily Cannabis use among daily and non-daily cigarette smokers (Goodwin et al., 2018). It is notable that both Goodwin et al. (2018) and the current study found that daily Cannabis use and CUD are increasing among non-cigarette smokers although the disparity in CUD prevalence for smokers versus non-smokers remains sizable. It would be beneficial to continue to examine CUD-related variables (e.g., correlates, consequences, treatment) by cigarette smoking status, including daily versus nondaily smoking, in order to provide the most accurate information for all groups of people with CUDs.

As stated above, over one-third of 12–17 year olds who reported non-daily cigarette use met criteria for CUD in 2016, with one in four who smoke daily meeting criteria for CUD, relative to approximately 2% of those who do not smoke cigarettes. Similar to the previous finding of a particularly high prevalence of daily Cannabis use among young cigarette smokers (Goodwin et al., 2018), the current study suggests that young cigarette smokers are also vulnerable to CUD. In fact, the prevalence of CUD among 12–17-year old cigarette smokers appears to be reaching epidemic levels if between a quarter to one third of these youth meet criteria for CUD. Moreover, this younger age group is at higher risk of an earlier onset of an addictive disorder and increased vulnerability for neurodevelopmental abnormalities that impact social and academic functioning (Silins et al., 2014). The high prevalence of CUD among youth who use cigarettes has public health implications given the increasing prevalence of Cannabis among this age group and the negative consequences of CUD (Foster et al., 2017; Hall, 2015). It may be useful to screen youth who smoke cigarettes for CUD and/or provide outreach education about risks of CUD among youth who smoke cigarettes. There is also a need for research on variables that allow the more explicit identification of youth at risk for CUD beyond the use of cigarettes (e.g., examining modifiers of the relationship between smoking and CUD such as gender, race/ethnicity, socioeconomic status).

Prior work suggests that substance use disorders are associated with persistence of cigarette use (Goodwin et al., 2014) and the observation in this study of an increasing proportion of non-daily smokers reporting CUD over time may signal an increase in one barrier to quitting smoking at a population level. This is particularly noteworthy for at least two reasons. First, a number of studies suggest that non-daily smokers do not see themselves as “smokers” and are less likely to express interest in smoking cessation treatment (Berg et al., 2012; Lenk et al., 2009; Robertson et al., 2016; Rubinstein et al., 2014; Schauer et al., 2014). Therefore, CUDs in non-daily smokers may be less likely to be observed (with less opportunity for intervention) in clinical settings since non-daily smokers may be less likely to seek smoking cessation treatment. Second, the particularly high prevalence of CUD among youth who smoke cigarettes is especially alarming given that this is also a group unlikely to be seen for tobacco treatment. It would suggest that intervention and/or outreach may be needed (e.g.,

public health messages in community or school settings) to reach non-daily cigarette smokers including young non-daily smokers.

There are several mechanisms that may underlie the high rates of co-use of nicotine and Cannabis that may be applicable to the association of cigarette smoking and CUDs (see Agrawal et al., 2012; Rabin and George, 2015; and Subramaniam et al., 2016 for reviews). Cannabis and nicotine are both typically inhaled and are often used simultaneously through blunts which allows for greater THC to be inhaled (Meng et al., 1997). The neurobiological systems involved with nicotine and Cannabis demonstrate significant overlap (see Subramaniam et al., 2016; Rabin and George, 2015). Relatedly, nicotine appears to enhance rewarding Cannabis effects (e.g., greater self-report rating of feeling “stimulated” and “high”; Penetar et al., 2005) and Cannabis users report using cigarettes or other forms of tobacco to magnify and lengthen the effects of Cannabis (Tullis et al., 2003). Further, the use of nicotine may alleviate negative cognitive or withdrawal effects of Cannabis and vice versa (Hindocha et al., 2017; Levin et al., 2010; Schuster et al., 2015, 2016). Understanding the mechanisms involved in the co-use of Cannabis and cigarette may help to identify targets for treatments of CUDs among cigarette smokers.

Several limitations need to be considered: (1) The present data cannot address the use of tobacco products other than cigarettes (e.g., little cigars, cigarillos, smokeless tobacco), which are commonly used with Cannabis and may be replacing cigarettes or used concurrently with cigarettes in the US population. Relatedly, the NSDUH does not include information over this time span on the use of alternative nicotine products, such as e-cigarettes, the use of which is increasing especially among youth (Noland et al., 2018). Thus, the number of adolescents with CUD who use tobacco products is likely underreported. (2) The NSDUH is a cross-sectional survey, which limits our ability to infer causality and examine mediators and moderators of longitudinal trends. (3) DSM-IV criteria were used to assess CUD rather than the newer DSM-5 criteria. While DSM-IV and DSM-5 criteria for substance use disorders are generally applicable and demonstrate good concordance (Goldstein et al., 2015; Schmulewitz et al., 2015), there were some changes (e.g., Cannabis withdrawal was added as a CUD criterion in the DSM-5) and it is possible that some participants would differ in meeting criteria for CUD based on DSM-IV versus DSM-5 criteria. (4) While the substance use information in the NSDUH is reliable and efforts were made to increase validity (e.g., the ACASI data collection system; Center for Behavioral Health Statistics and Quality, 2017), data collected for this study were based on self-report which may be subject to a number of biases and errors in reporting. In addition, current Cannabis use and cigarette smoking were not biochemically confirmed and illegal behaviors or behaviors viewed as potentially undesirable (e.g., Cannabis use) may have been underreported. Finally, (5) these analyses exclude persons outside of the US and certain high-risk segments of the US population, including persons who are homeless, in the military, and in acute or prolonged medical care.

Overall, the present findings suggest that the prevalence of CUD in the US population is dramatically higher among cigarette smokers relative to non-cigarette smokers. Further, CUD is increasing over time among non-daily cigarette smokers while the prevalence of CUD has not changed significantly among daily, former, or never cigarette smokers. The

disparity in CUD among smokers versus never smokers is most prominent among youth with 25–30% of 12–17-year olds who smoke cigarettes meeting CUD criteria, compared with 2% who have never smoked. While tobacco use and Cannabis use remains illegal for those under 18 or 21 years old (depending on the state), public health goals related to tobacco and Cannabis should be to develop innovative strategies for reducing the use and harmful consequences of these products such as restricting and/or deterring youth access, providing users with evidence-based information on the risks of these products, and using differential taxes and marketing controls (Hall and Kozlowski, 2018). These data highlight that cigarette smokers—especially younger cigarette smokers—are increasingly bearing the burden of CUD.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Fig. 1.
Prevalence of Cannabis use disorder over time, by smoking status.

Table 1

Cannabis use disorder among daily, non-daily, former, and never cigarette smokers by demographic characteristics (National Survey on Drug Use and Health, 2016).

Characteristic	Unadjusted prevalence of Cannabis use disorder ^a				Former cigarette smoking vs. never smoking		Non-daily cigarette smoking vs. never smoking		Daily cigarette smoking vs. never smoking	
	Never cigarette smokers N = 41,046	Former cigarette smokers N = 6,681	Non-daily cigarette smokers N = 3,591	Daily cigarette smokers N = 5,579	OR ^b (95% CI)	P _{int}	OR ^b (95% CI)	P _{int}	OR ^b (95% CI)	P _{int}
Total sample	1.11 (0.07)	0.99 (0.11)	4.32 (0.41)	2.92 (0.22)	2.01 (1.42, 2.85)	< 0.001	4.34 (3.28, 5.73)	< 0.001	3.53 (2.67, 4.66)	< 0.001
<i>Gender</i>										
Male	1.66 (0.12)	1.28 (0.18)	5.50 (0.56)	4.03 (0.38)	1.71 (1.15, 2.53)	Ref	3.72 (2.79, 4.95)	Ref	2.99 (2.21, 4.05)	Ref
Female	0.65 (0.05)	0.65 (0.15)	2.72 (0.54)	1.78 (0.23)	2.93 (1.58, 5.42)	< 0.001	6.40 (3.85, 10.66)	0.306	5.15 (3.37, 7.86)	0.425
<i>Age (years)</i>										
12–17	2.06 (0.17)	15.57 (5.83)	22.87 (4.59)	18.11 (6.80)	8.77 (3.38, 22.71)	Ref	14.45 (8.47, 24.67)	Ref	10.52 (4.06, 27.27)	Ref
18–25	3.46 (0.26)	8.08 (1.48)	12.26 (1.36)	9.58 (1.11)	2.43 (1.54, 3.83)	0.014	3.35 (2.44, 4.60)	< 0.001	2.81 (2.09, 3.79)	0.020
26 and older	0.39 (0.07)	0.72 (0.11)	2.39 (0.40)	2.04 (0.23)	2.01 (1.26, 3.20)	0.010	4.15 (2.39, 7.21)	0.002	4.05 (2.49, 6.62)	0.100
<i>Marital status</i>										
Married	0.16 (0.06)	4.00 (0.11)	1.59 (0.55)	1.61 (0.42)	2.65 (0.98, 7.15)	Ref	9.39 (3.44, 25.69)	Ref	11.34 (4.57, 28.15)	Ref
Widowed/divorced/separated	0.26 (0.09)	0.35 (0.21)	2.16 (0.73)	1.37 (0.29)	1.08 (0.21, 5.59)	0.494	6.59 (1.88, 22.35)	0.825	3.25 (1.14, 9.29)	0.329
Never married	2.43 (0.14)	4.65 (0.76)	7.84 (0.78)	5.92 (0.55)	2.13 (1.44, 3.15)	0.974	3.69 (2.79, 4.86)	0.089	2.81 (2.09, 3.78)	< 0.001
<i>Total annual family income</i>										
< \$20,000	1.85 (0.20)	1.55 (0.51)	4.70 (0.96)	3.30 (0.45)	1.21 (0.55, 2.64)	Ref	2.83 (1.58, 5.04)	Ref	2.44 (1.48, 4.03)	Ref
\$20,000–\$74,999	1.02 (0.10)	1.08 (0.20)	4.20 (0.54)	3.11 (0.33)	3.18 (1.81, 5.57)	0.293	5.29 (3.36, 8.31)	0.203	4.97 (3.47, 7.12)	0.012
\$75,000	0.92 (0.09)	0.72 (0.14)	4.18 (0.82)	2.06 (0.53)	1.70 (0.92, 3.17)	0.419	5.17 (2.77, 9.67)	0.146	2.91 (1.43, 5.95)	0.001

Unadjusted prevalence of Cannabis use disorder ^a					Former cigarette smoking vs. never smoking		Non-daily cigarette smoking vs. never smoking		Daily cigarette smoking vs. never smoking	
Characteristic	Never cigarette smokers N = 41,046	Former cigarette smokers N = 6,681	Non-daily cigarette smokers N = 3,591	Daily cigarette smokers N = 5,579	OR ^b (95% CI)	P _{int}	OR ^b (95% CI)	P _{int}	OR ^b (95% CI)	P _{int}
<i>Race/ethnicity</i>										
Non-Hispanic White	0.91 (0.08)	0.95 (0.13)	3.91 (0.05)	2.59 (0.25)	2.44 (1.60, 3.73)	Ref	4.89 (3.39, 7.07)	Ref	3.74 (2.79, 5.02)	Ref
Non-Hispanic Black	1.94 (0.21)	1.13 (0.42)	4.48 (0.81)	4.11 (0.78)	0.92 (0.37, 2.31)	0.080	2.48 (1.44, 4.26)	0.049	2.57 (1.45, 4.56)	0.398
Hispanic	1.17 (0.13)	1.12 (0.39)	1.16 (0.14)	3.84 (1.19)	2.29 (1.18, 4.44)	0.765	5.98 (3.24, 11.06)	0.550	4.44 (2.16, 9.12)	0.744
Non-Hispanic Other	0.97 (0.22)	1.29 (0.67)	1.01 (0.18)	4.24 (1.93)	1.73 (0.26, 11.32)	0.772	3.81 (1.72, 8.41)	0.854	4.93 (1.05, 23.04)	0.476

Key: CI, confidence interval; OR, odds ratio; Pint, p-value for the interaction term; s.e., standard error; wt%, weighted percentage.

Note:

^a Cannabis use disorder was defined as Cannabis dependence and/or Cannabis abuse

^b adjusted for gender, age, marital status, income, and race/ethnicity.