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DSM-5 cannabis use disorder in the National Epidemiologic Survey on Alcohol and Related Conditions-III: Gender-specific profiles

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HIGHLIGHTS

- Women demonstrated telescoping from onset of cannabis use to cocaine use disorder.
- Men and women with CUD were highly comorbid and had low quality of life.
- Odds of severe/moderate CUD among Black men/women were greater than White counterparts.
- Odds of CUD among Native American women were greater than White women.

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ABSTRACT

Objective: The objective of this study was to present current information on the prevalence, correlates, comorbidity and quality of life among men and women with cannabis use disorder (CUD).

Methods: In 2012–2013, 36,309 respondents ≥ 18 years old participated in face-to-face interviews in the National Epidemiologic Survey on Alcohol and Related Conditions-III.

Results: Prevalence of 12-month CUD was greater among men (3.5%) than women (1.7%). Women experienced shorter duration from onset of cannabis use to onset of CUD than men (mean = 5.8 years, men; mean = 4.7 - years, women). In both men and women, prevalences of CUD were greater among young adults, Blacks, and those with lower income and greater among Native American women relative to White women. CUD was highly comorbid with other substance use disorders, PTSD, ASPD and borderline and schizotypal PDs for men and women. Quality of life for individuals with CUD was low regardless of gender.

Conclusions: DSM-5 CUD among men and women is highly prevalent, comorbid and characterized by low quality of life. Results highlighted the need for integrated treatment of CUD and comorbid disorders and the urgency of identifying and implementing effective prevention and intervention approaches, especially for those sociodemographic subgroups for which both men and women are at greater risk for the disorder.

1. Introduction

Cannabis use is highly prevalent in the United States (9.5%: Hasin et al., 2016) and worldwide (3.9%: United National Office of Drug Control, 2015). Cannabis use can lead to addiction (Volkow, Baler, Compton, & Weiss, 2014) and has been associated with numerous adverse consequences including cognitive decline (Meir et al., 2012; Renard, Krebs, & Jay, 2016; Shea, McGregor, & Mallet, 2006), impaired driving ability, traffic crashes and fatalities (Brady & Li, 2014; Hartman & Huestis, 2013; Lenne, Dietze, & Triggs, 2010), low educational/occupational attainment (Compton, Gfroerer, Conway, & Finger, 2014; Lynskey & Hall, 2000), emergency room visits (Substance Abuse and Mental Health Services Administration, 2013; Zhu & Wu, 2016), poor quality of life (Lev-Ran et al., 2012), and high rates of comorbidity (Conway, Compton, Stinson, & Grant, 2006; Stinson, Ruan, Pickering, & Grant, 2006).

Cannabis use disorder (CUD) has increased in the U.S. between 2001–2002 and 2012–2013 (Hasin, Saha, et al., 2015). CUD is defined

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as problematic cannabis use leading to clinically significant impairment or distress manifested by impaired control, continued use despite social/medical problems, craving, tolerance and withdrawal (American Psychiatric Association, 2013). Despite its increasing prevalence, no study has examined sex-specific sociodemographic and clinical profiles of individuals with CUD and only two studies have reported gender differences in these correlates (Goldstein, Dawson, Chou, & Grant, 2012; Khan et al., 2013) and these data are over a decade old. The consistent observation that men have greater rates of CUD than women supports the need to examine sex-specific profiles of CUD that may identify factors contributing to the gender-related differential in prevalence of CUD. Without consideration of stratification by gender, vital information influencing the development of CUD among men and women may be missed. Examining profiles among men and women emphasizes the importance of reporting gender similarities as equally important as reporting gender differences to our understanding of the etiology of CUD and the development of gender-specific prevention and intervention programs (McCarthy & Konkle, 2005; Sanchis-Segura & Becker, 2016).

Moreover, current knowledge of differences and similarities between men and women with CUD in the U.S. is based on the Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition (DSM-IV) (American Psychiatric Association, 2000). In the DSM-5 (American Psychiatric Association, 2013), CUDs were revised to combine dependence and abuse criteria into a single disorder, drop the legal problems criterion, and add craving, withdrawal and a severity metric (Hasin et al., 2013). Changes in the definition of CUD may alter gender-specific profiles in correlates of CUD found in earlier studies based on DSM-IV. Therefore, new information on gender similarities and differences of DSM-5 CUD is needed.

Earlier studies conducted when CUD was less prevalent (and therefore more deviant) showed a high degree of comorbidity with other common psychiatric disorders (Conway et al., 2006; Stinson et al., 2006). However, increases in the prevalence of CUD may now include more individuals without vulnerability to other psychiatric disorders, suggesting that comorbidity patterns may have changed over the last decade and these changes may have differentially affected men and women (Hasin et al., 2016).

We provide the first nationally representative information on gender-specific profiles in sociodemographic and clinical correlates of DSM-5 CUD using data from 2012 to 2013 National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III) (Grant et al., 2014).

2. Method

2.1. Sample

The NESARC-III was a nationally representative face-to-face survey of the noninstitutionalized civilian population ≥ 18 years residing in households and selected group quarters (Grant et al., 2014; Grant, Goldstein, Saha, et al., 2015). Data collection and interview field methods, detailed elsewhere (Grant et al., 2014), included initial structured home study, in-person training, on-going supervision and random respondent callbacks to verify data. Respondents were selected through multistage probability sampling, including primary sampling units (counties/groups of contiguous counties); secondary sampling units (SSU – groups of Census-defined blocks); and tertiary sampling units (households within SSUs) from which respondents were selected, with Blacks, Asians, and Hispanics oversampled. Data were adjusted for nonresponse and weighted to represent the U.S. population based on the 2012 American Community Survey (Bureau of the Census, 2013). Sample size was 36,309: household response rate was 72%; person-level response rate, 84%, and overall response rate, 60.1%, comparable to other U.S. national surveys (Substance Abuse and Mental Health Services Administration, 2013; Centers for Disease Control and Prevention, 2014). Respondents received $90.00 for participation. Institutional review boards at the National Institutes of Health and Westat approved the study protocol.

2.2. Assessments

The Alcohol Use Disorder and Associated Disabilities Interview Schedule-5 (AUDADIS-5) (Grant, Goldstein, Chou, & Hasin, 2011) was the diagnostic interview. AUDADIS-5 measures DSM-5 alcohol, and drug use disorders, and selected psychiatric disorders. DSM-5 CUD diagnoses required ≥ 2 of 11 criteria within a 12-month period and were classified as mild (2–3 criteria), moderate (4–5 criteria) or severe (≥ 6 criteria).

Test-retest reliabilities of CUD diagnoses (kappa = 0.41, 0.41) and their dimensional criteria scales (intraclass correlation coefficients ([ICC] = 0.70, 0.71) were fair to substantial in a general population sample (Grant, Goldstein, Smith, et al., 2015). Procedural validity was assessed through blind clinician re-appraisal using the semi-structured, clinician-administered Psychiatric Research Interview for Substance and Mental Disorders, DSM-5 version (PRISM-5) (Hasin, Aivadyan, Greenstein, & Grant, 2011). AUDADIS-5/PRISM-5 concordance was moderate for CUD (kappa = 0.60, 0.51) and substantial for its dimensional criteria scales (ICC = 0.79, 0.78) (Hasin, Greenstein, et al., 2015).

2.3. Other psychiatric disorders

Twelve-month DSM-5 alcohol use disorder (AUD), nicotine use disorder (NUD), and other drug use disorder (DUD) diagnoses were derived similarly to CUD diagnoses. Test-retest reliabilities were fair to substantial for these disorders (kappa = 0.40–0.87), and their associated criteria scales (ICC = 0.45–0.84) (Grant, Goldstein, Smith, et al., 2015). AUDADIS-5/PRISM-5 concordance for AUD, NUD and DUD diagnoses and corresponding criteria scales was fair to substantial (kappa = 0.36–0.66; ICCs = 0.68–0.91) (Hasin, Greenstein, et al., 2015).

DSM-5 mood disorders included major depressive disorder (MDD), persistent depression, bipolar I and bipolar II disorders. Anxiety disorders included panic, agoraphobia, social and specific phobias and generalized anxiety disorder (GAD). Posttraumatic stress disorder (PTSD), antisocial personality disorder (ASPD) and schizotypal and borderline personality disorders (PDs) were also assessed. PTSD diagnoses generally followed the DSM-5 definition, but criteria C and D more strictly required ≥ 3 positive, rather than ≥ 2 positive, criteria to be met. The stricter definition of PTSD, rather than the final DSM-5 PTSD definition, was available prior to the fielding of the NESARC-III. Reliability and validity of these diagnoses and criteria scales were fair to moderate (Grant, Grant, Goldstein, Smith, et al., 2015; Hasin, Shmulewitz et al., 2015).

2.4. Quality of life

Quality of life was measured using the 12-item Short Form Health Survey, version 2 (SF-12v2) (Gandek et al., 1998). SF-12v2 scales included mental health (feeling calm/peaceful, feeling downhearted/depressed), social functioning (accomplishing less than you would like, not doing your work/activities as careful as usual), role emotional functioning, physical/emotional problems interfering with social activities, and mental component summary. The mental component summary score was computed using all 12 SF-12v2 questions. Each SF-12v2 norm-based disability score has mean = 50, standard deviation = ± 10, and range = 0–100; lower scores indicate lower quality of life.

2.5. Statistical analyses

Differences between age at first cannabis use, onset of CUD and time from onset of use to onset of CUD were assessed with Wald tests. Odds ratios (ORs) from multivariable logistic regressions stratified by gender indicated associations between CUD and each sociodemographic characteristic, adjusted for all others. ORs of CUD with psychiatric disorders were adjusted for sociodemographic characteristics and other psychiatric disorders. Relationships of 12-month CUD to SF-12v2 scales was assessed using linear regression analyses by severity level controlling for sociodemographic characteristics. All analyses used weighted data. To account for the NESARC-III complex sample design, analyses utilized SUDAAN (Research Triangle Institute, 2014).

3. Results

3.1. Prevalence and onset

Prevalence of any CUD were greater among men (3.5%) than women (1.7%) (OR = 2.2; 95% CI = 1.8–2.7). Prevalence and odds of mild, moderate and severe CUD were also greater among men (1.9%, 0.8% and 0.8%) compared with women (0.9%, 0.4% and 0.3%) (ORs = 2.2–2.8, $p < 0.05$).

Men had an earlier mean age at onset of cannabis use than women (mean = 17.5, men; mean = 18.1, women; F = 7.54, $p < 0.01$), but women had an earlier onset of CUD then men (mean = 21.9, men; mean = 20.8, women; F = 7.50, $p < 0.01$). Years from first cannabis use to onset of CUD was shorter for women than men (mean = 5.8, men; mean = 4.7, women; F = 7.73, $p < 0.01$).

3.2. Sociodemographic characteristics

Tables 1 and 2 show the prevalences and adjusted 12-month ORs of CUD by sociodemographic characteristic among men and women. The odds of overall CUD among men were lower among Asians/Pacific Islanders and greater among Blacks than Whites. Among women, the odds of overall CUD were also lower among Asians/Pacific Islanders but greater among Native Americans than Whites. Among men, the odds of mild CUD was lower among Native Americans, Asians/Pacific Islanders and Hispanics and the odds of severe CUD was greater among Blacks relative to Whites. Among women, the odds of mild CUD were lower among Asians/Pacific Islanders, while the odds of mild CUD was greater among Native Americans and odds of moderate CUD were greater among Blacks relative to Whites.

Compared with men and women aged ≥ 45 years old, odds of 12-month CUD were greater than among men and women aged < 45 years old (ORs = 3.0–17.5) overall and across severity level. Overall, previously married and never married men had a greater odds of CUD while never married women had a greater odds of CUD compared to married/cohabitating men and women, respectively. Among men, the odds of mild and moderate CUD were greater among the previously and never married relative to those married/cohabitating. For women, the odds of CUD across severity level were greater among the never married and greater among previously married for severe CUD relative to respondents who were married/cohabitating.

Overall and across severity level, the odds of CUD were greater among men and women with the lowest income (< $20,000.00) relative to those with the greatest income ($70,000.00), except among women with moderate and severe CUD. Women with less than high school education had a higher odds of CUD than women with some college education.

Overall, men residing in the Midwest and South had a lower odds of CUD than men residing in the West. Overall among women, the odds of CUD were lower in the Midwest and West. Among men, the odds of mild CUD were greater in the West than other regions of the country.

3.3. Comorbidity

Among both men and women with CUD, other substance use disorders were the most highly prevalent (83.5% and 82.9%) comorbid disorders followed by any personality disorder (48.2% and 58.6%), any mood disorder (33.3% and 48.9%), any anxiety disorder (23.4% and 36.1%) and PTSD (12.3% and 26.9%) (Table 3). With few exceptions, these findings generalized across severity level regardless of gender.

After adjustment for sociodemographic characteristics and other psychiatric disorders, CUD was associated with AUD, NUD and other DUDs among men and women and across severity level (except for severe CUD among men) (Table 4). Any and mild CUD were associated with persistent depression among men. Moderate CUD among men and mild CUD among women were associated with GAD. Twelve-month CUD among men was associated with PTSD across all severity levels (except mild CUD), whereas any and moderate CUD was associated with PTSD among women.

Among men, any, mild and severe CUD and among women, any and moderate CUD were associated with borderline PD. CUD was consistently associated with schizotypal PD among women (except mild CUD), and mild CUD was significantly associated with borderline PD among men. Mild and moderate CUD was associated with ASPD among men and for each severity level among women.

3.4. Quality of life

Quality of life was generally lower among men and women with any CUD relative to men and women with no CUD, and greater for individuals with 1 or more positive CUD criteria relative to those with no CUD criteria across severity level (see Table 5).

4. Discussion

Prevalence of CUD was twice as great among men (3.5%) than women (1.7%). However, consistent with prior research (Ehlers et al., 2010; Hernandez-Avila, Rounsaville, & Kranzler, 2004; Khan et al., 2013; Lopez-Quintero et al., 2011), an accelerated transition from cannabis use to CUD was demonstrated among women relative to men. Recent controlled studies showed that men and women showed similar levels of cannabis intoxication following cannabis administration but women reported higher ratings for dependence liability; such as liking the drug and willingness to use it again (Cooper & Haney, 2009, 2014). Women are also more likely to experience withdrawal symptoms and other negative consequences of cannabis use (Copersino et al., 2010; Rubino & Parolaro, 2015; Sanchis-Segura & Becker, 2016). These findings are consistent with preclinical studies using laboratory animals that demonstrated that females are more sensitive to the behavioral, psychological and reinforcing effects of cannabinoids along with faster acquisition of self-administration, higher rates of responding, and increased rates of drug-induced reinstatement than males (Craft, Marusich, & Wiley, 2013; Fattore, Spano, Altea, Fradda, & Fratta, 2010; Fattore, Spano, Angius, Fadda, & Fratta, 2007). Thus, telescoping among women may due to the greater sensitivity to the rewarding effects of cannabis (Sanchis-Segura & Becker, 2016).

Consistent with prior research on overall CUD (Hasin et al., 2016; Stinson et al., 2006), the odds of CUD was greater among younger than older age groups across severity levels, among men and women, with striking age differentials between 18 and 29 year-olds relative to those ≥ 45 years old, especially for severe CUD. Although the overall prevalence of CUD decreased as a function of age in the 2001–2002 NESARC (Khan et al., 2013; Stinson et al., 2006), the age differential is considerably more pronounced in the NESARC-III among men and women. These findings are consistent with similar trends in decreases in perceived risk of harmfulness of cannabis use and increases in those favoring legalization of cannabis for recreational use among youth and young adults, regardless of gender (Motel, 2015).

Table 1
Prevalence of 12-month DSM-5 cannabis use disorder among men and women by sociodemographic characteristics.

Characteristic	Men				Women			
	Any cannabis use disorder (n = 620)	Mild (n = 333)	Moderate (n = 147)	Severe (n = 140)	Any cannabis use disorder (n = 352)	Mild (n = 183)	Moderate (n = 95)	Severe (n = 74)
	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)
Total	3.49 (0.19)	1.90 (0.12)	0.76 (0.08)	0.83 (0.10)	1.66 (0.13)	0.90 (0.09)	0.43 (0.06)	0.32 (0.04)
Race/ethnicity								
White	3.1 (0.22)	1.9 (0.15)	0.6 (0.10)	0.6 (0.11)	1.4 (0.15)	0.8 (0.1)	0.3 (0.07)	0.2 (0.05)
Black	6.6 (0.63)	3.3 (0.41)	1.4 (0.22)	1.8 (0.38)	2.8 (0.37)	1.2 (0.21)	1.0 (0.19)	0.6 (0.17)
Native American	4.8 (1.95)	0.5 (0.37)	1.5 (0.88)	2.7 (1.59)	5.7 (2.20)	4.2 (2.16)	0.5 (0.28)	1.0 (0.57)
Asian/Pacific Islander	1.8 (0.60)	0.5 (0.35)	0.7 (0.31)	0.6 (0.28)	0.7 (0.34)	0.3 (0.17)	0.2 (0.20)	0.2 (0.15)
Hispanic	3.3 (0.36)	1.5 (0.25)	0.8 (0.18)	1.0 (0.21)	1.9 (0.29)	0.9 (0.19)	0.5 (0.15)	0.5 (0.15)
Age, y								
18–29	9.0 (0.64)	4.8 (0.43)	2.0 (0.26)	2.2 (0.30)	4.7 (0.46)	2.3 (0.29)	1.4 (0.25)	1.0 (0.17)
30–44	3.3 (0.37)	1.8 (0.26)	0.7 (0.16)	0.9 (0.22)	1.7 (0.23)	1.1 (0.21)	0.3 (0.08)	0.3 (0.07)
≥ 45	1.2 (0.12)	0.7 (0.10)	0.2 (0.05)	0.2 (0.08)	0.4 (0.08)	0.3 (0.05)	0.1 (0.04)	0.1 (0.03)
Marital status								
Married/cohabitating	1.7 (0.17)	1.0 (0.12)	0.3 (0.07)	0.4 (0.10)	0.9 (0.10)	0.5 (0.08)	0.2 (0.06)	0.1 (0.03)
Widowed/separated/ divorced	3.2 (0.38)	1.8 (0.28)	0.7 (0.17)	0.7 (0.23)	1.1 (0.23)	0.7 (0.20)	0.2 (0.08)	0.3 (0.09)
Never married	8.0 (0.55)	4.2 (0.40)	1.9 (0.23)	1.8 (0.23)	4.5 (0.45)	2.2 (0.29)	1.3 (0.25)	1.0 (0.17)
Education								
Less than high school	4.3 (0.52)	2.2 (0.35)	1.2 (0.35)	1.0 (0.24)	2.0 (0.29)	1.0 (0.19)	0.4 (0.13)	0.7 (0.17)
High school	4.3 (0.36)	2.3 (0.26)	0.9 (0.16)	1.1 (0.20)	1.7 (0.21)	0.9 (0.14)	0.5 (0.13)	0.3 (0.08)
Some college or higher	2.9 (0.20)	1.7 (0.15)	0.6 (0.07)	0.7 (0.11)	1.6 (0.16)	0.9 (0.12)	0.4 (0.08)	0.3 (0.05)
Family income, $								
0–19,999	7.4 (0.59)	3.6 (0.37)	1.7 (0.27)	2.1 (0.31)	3.0 (0.34)	1.6 (0.26)	0.7 (0.13)	0.7 (0.14)
20,000–34,999	3.7 (0.42)	2.3 (0.34)	0.7 (0.12)	0.7 (0.20)	1.5 (0.21)	0.8 (0.16)	0.3 (0.10)	0.4 (0.12)
35,000–69,999	2.8 (0.26)	1.5 (0.19)	0.6 (0.15)	0.6 (0.13)	1.4 (0.19)	0.8 (0.15)	0.4 (0.10)	0.1 (0.05)
≥ 70,000	1.6 (0.20)	1.0 (0.17)	0.4 (0.09)	0.3 (0.08)	0.8 (0.17)	0.4 (0.10)	0.3 (0.12)	0.1 (0.05)
Urbanicity								
Urban	3.7 (0.19)	2.0 (0.15)	0.8 (0.08)	0.9 (0.10)	1.8 (0.15)	1.0 (0.11)	0.5 (0.07)	0.3 (0.05)
Rural	2.7 (0.37)	1.4 (0.20)	0.7 (0.15)	0.7 (0.23)	1.0 (0.20)	0.6 (0.14)	0.2 (0.08)	0.3 (0.11)
Region								
Northeast	3.6 (0.39)	1.7 (0.29)	1.0 (0.25)	0.9 (0.21)	1.8 (0.30)	0.9 (0.17)	0.6 (0.21)	0.3 (0.09)
Midwest	3.4 (0.46)	1.7 (0.29)	0.6 (0.10)	1.0 (0.27)	1.3 (0.19)	0.7 (0.15)	0.4 (0.12)	0.2 (0.07)
South	3.1 (0.31)	1.7 (0.18)	0.7 (0.14)	0.8 (0.17)	1.5 (0.22)	0.9 (0.14)	0.4 (0.08)	0.3 (0.08)
West	4.2 (0.34)	2.6 (0.26)	0.8 (0.13)	0.7 (0.14)	2.0 (0.30)	1.1 (0.24)	0.5 (0.12)	0.4 (0.07)

Odds of any and severe CUD among Black men and moderate CUD among Black women were greater than their White counterparts. These finding contrast with older surveys (Khan et al., 2013; Stinson et al., 2006), that found no overall or sex-specific White-Black differences in CUD but are consistent with substantial increases in overall cannabis use and CUD among Black adults in more recent studies (Hasin, Saha, et al., 2015). Increases in cannabis use among Black men and women has been attributed to increased prevalence of blunt smoking (Schauer, Rosenberry, & Peters, 2016) which has strongly been associated with the development of CUD (Ream, Benoit, Johnson, & Dunlap, 2008; Timberlake, 2009) and to changes in community-level norms to cannabis use among Blacks (Sinclair, Foushee, Pevear, Scarinci, & Carroll, 2012). Blacks may hold different attitudes towards cannabis use than Whites, possibly viewing it as a natural, therefore safer substance (Sinclair, Foushee, Scarinci, & Carroll, 2013). Increasing economic disparities between Blacks and Whites since the 2008 recession may also have exacerbated neighborhood factors among Blacks (violence, victimization) that increase cannabis use (Reboussin, Green, & Milam, 2014), resulting in greater rates of CUD regardless of gender.

Although overall rates of CUD have been consistently greater among Native Americans than Whites over the last 30 years (Hasin, Saha, et al., 2015; Stinson et al., 2006; Wu, Zhu, & Swartz, 2016; Young & Joe, 2009), this study found, for the first time, that the disparities in CUD among Native Americans are concentrated among Native American women. Native American women have elevated rates of exposure to interpersonal violence and a greater odds of being raped, sexually assaulted or violently attacked than White women (Beals et al., 2013; Evans-Campbell, Lindhorst, Huang, & Walters, 2006; National Congress of American Indians, 2014; Oetzel & Duran, 2004) that may be associated with higher rates of cannabis use as a coping mechanism. Other factors associated with cannabis use among Native Americans, including collective generational trauma, adverse child experiences, unemployment, poverty, negative family environment and discrimination (Brave Heart, 1998; Brave Heart & DeBruyn, 1998; Brave Heart et al., 2016; Commission on Civil Rights, 2016; Manson, Beals, Klein, Croy, & Team, 2005; Rumbaugh Whitesell, Beals, Big Crow, Mitchell, & Novins, 2012; Whitbeck, Adams, Hoyt, & Chen, 2004), may more adversely affect Native American than white women leading to increases in CUD among them. Further research on CUD among Native American women are warranted, especially in the face of enduring physical health disparities (Whitbeck et al., 2004) and barriers to healthcare among them (Commission on Civil Rights, 2016).

Consistent with prior studies (Fergusson & Boden, 2008; Fergusson, Boden, & Horwood, 2015; Lemstra et al., 2008), lower income was associated with CUD among men and women. Low income may be a sequela of childhood economic disadvantage (Daniel et al., 2009; Ramanathan, Balasubramanian, & Krishnadas, 2013), low parental socioeconomic status (Melchior, Choquet, Le Strat, Hassler, & Gorwood, 2011) and current residence in high unemployment neighborhoods (Tucker, Pollard, de la Haye, Kennedy, & Green, 2013). Economic disadvantage can induce stress leading to cannabis use as a coping mechanism, thereby increasing risk of CUD among men and women with a vulnerability to the disorder. The relationship might also be reciprocal. Early cannabis use may have consequences for neurophysiological structure and functioning, compromising motivation and cognitive processes (Eldreth, Matochik, Cadet, & Bolla, 2004; Matochik, Eldreth,

Table 2
Adjusted Odds Ratios (AOR)[a] of 12-Month DSM-5 Cannabis Use Disorder Among Men and Women by Sociodemographic Characteristics.

Characteristic	Adjusted Odds Ratio (95% confidence interval)							
	Men				Women			
	Any cannabis use disorder	Mild	Moderate	Severe	Any cannabis use disorder	Mild	Moderate	Severe
Race/ethnicity								
White	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)
Black	**1.5** (1.15–1.96)	1.3 (0.94–1.81)	1.5 (0.88–2.62)	**2.1** (1.21–3.69)	1.2 (0.83–1.84)	0.9 (0.55–1.39)	**1.9** (1.02–3.57)	1.6 (0.78–3.43)
Native American	1.2 (0.49–2.97)	**0.2** (0.04–0.99)	2.0 (0.58–6.78)	3.6 (0.98–13.17)	**3.3** (1.48–7.37)	**4.0** (1.46–10.92)	1.3 (0.34–4.55)	**3.3** (1.01–10.78)
Asian/Pacific Islander	**0.4** (0.20–0.75)	**0.2** (0.05–0.61)	0.8 (0.28–2.04)	0.8 (0.31–2.18)	**0.4** (0.14–0.92)	**0.2** (0.07–0.84)	0.4 (0.09–2.22)	0.7 (0.16–3.04)
Hispanic	**0.6** (0.46–0.80)	**0.4** (0.29–0.60)	0.8 (0.37–1.57)	1.1 (0.62–2.01)	0.8 (0.52–1.11)	**0.6** (0.36–0.99)	0.9 (0.40–2.01)	1.1 (0.56–2.32)
Age, y								
18–29	**6.4** (4.64–8.93)	**6.0** (3.82–9.43)	**6.2** (3.60–10.60)	**8.0** (3.65–17.58)	**9.0** (5.89–13.91)	**7.3** (4.20–12.87)	**8.9** (4.29–18.46)	**17.5** (5.16–59.66)
30–44	**3.2** (2.34–4.39)	**3.0** (1.96–4.45)	**3.0** (1.64–5.40)	**4.2** (1.88–9.34)	**4.5** (2.73–7.28)	**4.6** (2.53–8.29)	**3.0** (1.31–6.79)	**7.1** (2.15–23.20)
≥ 45	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)
Marital status								
Married/ cohabitating	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)
Widowed/ separated/ divorced	**2.0** (1.41–2.83)	**2.0** (1.35–3.02)	**2.5** (1.19–5.32)	1.6 (0.69–3.71)	1.7 (0.97–2.85)	1.6 (0.79–3.11)	1.1 (0.35–3.63)	**2.8** (1.09–7.19)
Never married	**1.7** (1.33–2.30)	**1.8** (1.16–2.67)	**2.4** (1.42–4.11)	1.3 (0.76–2.18)	**2.0** (1.46–2.82)	**1.8** (1.17–2.78)	**2.2** (1.10–4.46)	**2.6** (1.37–4.85)
Education								
Less than high school	1.2 (0.87–1.77)	1.3 (0.81–1.94)	1.6 (0.71–3.45)	1.0 (0.52–1.77)	1.2 (0.78–1.78)	1.0 (0.58–1.79)	0.9 (0.41–2.20)	**1.9** (1.02–3.50)
High school	1.2 (0.98–1.51)	1.2 (0.86–1.68)	1.2 (0.73–1.90)	1.3 (0.77–2.13)	1.0 (0.77–1.38)	1.0 (0.64–1.56)	1.2 (0.60–2.23)	1.0 (0.48–1.87)
Some college or higher	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)
Family income, $								
0–19,999	**2.7** (1.86–3.78)	**2.2** (1.34–3.70)	**2.4** (1.19–5.00)	**4.2** (1.98–9.12)	**2.3** (1.39–3.75)	**2.7** (1.50–5.03)	1.4 (0.50–4.18)	2.7 (0.89–8.26)
20,000–34,999	**1.5** (1.01–2.25)	1.6 (0.98–2.74)	1.1 (0.56–2.28)	1.6 (0.64–3.78)	1.4 (0.85–2.47)	1.5 (0.79–3.03)	1.0 (0.33–2.74)	2.2 (0.79–5.90)
35,000–69,999	1.3 (0.96–1.87)	1.3 (0.78–2.05)	1.4 (0.61–3.08)	1.5 (0.78–3.08)	1.4 (0.84–2.41)	1.7 (0.93–3.16)	1.4 (0.51–4.00)	0.6 (0.18–2.16)
≥ 70,000	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)
Urbanicity								
Urban	1.1 (0.85–1.41)	1.3 (0.90–1.77)	0.9 (0.56–1.37)	0.9 (0.47–1.89)	1.3 (0.85–2.08)	1.5 (0.83–2.56)	1.7 (0.65–4.64)	0.8 (0.33–1.93)
Rural	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)
Region								
Northeast	0.8 (0.58–1.08)	**0.6** (0.37–0.88)	1.1 (0.59–2.05)	1.3 (0.70–2.38)	0.9 (0.59–1.37)	0.9 (0.51–1.53)	1.1 (0.47–2.35)	0.8 (0.39–1.47)
Midwest	**0.7** (0.48–0.97)	**0.5** (0.34–0.81)	0.7 (0.42–1.07)	1.3 (0.68–2.55)	**0.6** (0.39–0.94)	0.6 (0.35–1.13)	0.7 (0.27–1.58)	0.5 (0.22–1.00)
South	**0.6** (0.43–0.77)	**0.5** (0.35–0.68)	0.6 (0.36–1.08)	0.9 (0.45–1.62)	0.7 (0.42–1.05)	0.7 (0.42–1.28)	0.6 (0.28–1.22)	0.6 (0.31–1.21)
West	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)	1.0 (Reference)

Note: Significant ($p < 0.05$) odds ratios appear in **bold font**.
[a] Odds ratios adjusted for all other sociodemographic characteristics.

Cadet, & Bolla, 2005; Solowij et al., 2002; Solowji & Battisti, 2008), impairing chances for educational and occupational achievement and higher incomes (Fergusson, Horwood, & Geautrais, 2003; Volkow et al., 2014).

Despite the increasingly normative nature of cannabis use in the U.S. (Motel, 2015), men and women with CUD continue to be vulnerable to other substance use and PDs, findings consistent with prior studies (Goldstein et al., 2007, 2012; Khan et al., 2013; Rabin & George, 2015; Stinson et al., 2006; Teesson et al., 2012). However, unlike earlier studies (Khan et al., 2013; Stinson et al., 2006), this study did not find significant associations between CUD and internalizing disorders, especially among women. Results from the present study are consistent with recent longitudinal studies that found high comorbidity between CUD and other SUDs and ASPD, but little evidence for comorbidity among CUD and common mood and anxiety disorders (Blanco et al., 2016; Feingold, Weiser, Rehm, & Lev-Ran, 2015, 2016). Development of cross-adaptions through shared mechanisms of action or neuroadaption between cannabis and other substances (Baker, Stockwell, Barnes, & Holroyd, 2011) or greater overlap of circuity across SUDs than mood or anxiety disorders (Koob & Volkow, 2010; Price & Drevets, 2010; Shin & Liberzon, 2010) may contribute to the associations found between CUD and other SUDs among men and women. High rates of comorbidity among men and women with CUD, SUDs and ASPD may also indicate that these disorders represent different manifestations of a common externalizing domain of psychopathology (Eaton, Rodriguez-Seijas, Carragher, & Krueger, 2015; Krueger, 1999). Examining CUD comorbidity within a transdiagnostic framework, including gender invariance (Eaton et al., 2012), is warranted to understand these comorbidities.

Linkages between CUD and schizotypal and borderline PDs have consistently been shown in prior research (Davis, Compton, Wang, Levin, & Blanco, 2013; Raynal & Chabrol, 2016). Associations between CUD and schizotypal PD among men and women found in this study could be due to the direct pharmacological effects of cannabis leading to schizotypal traits (Raynal & Chabrol, 2016). Schizotypal PD symptoms may also lead to problematic cannabis use through self-medication; cannabis use can temporarily alleviate symptoms while worsening them secondarily (Ferdinand et al., 2005) or could indicate the presence of underlying vulnerability to both CUD and borderline PD.

This study found strong associations between CUD and PTSD among men and women, a result found in prior research (Goldstein et al., 2012; Kevorkian, Belendiuk, Bonn-Miller, Carney, & Roberson-Nay, 2015). Cannabis intoxication, often associated with CUD, can increase the risk of trauma exposure and PTSD by providing riskier environments (e.g.,

Table 3
Prevalence of 12-month DSM-5 substance use and psychiatric disorders among respondents with 12-month DSM-5 cannabis use disorder.

	Men % (SE)				Women % (SE)			
	Any cannabis use disorder	Mild	Moderate	Severe	Any cannabis use disorder	Mild	Moderate	Severe
Any other substance use disorder	83.5 (1.51)	79.4 (2.17)	89.0 (3.00)	88.0 (3.35)	82.9 (2.62)	82.2 (3.51)	80.7 (4.95)	87.8 (4.79)
Alcohol use disorder	59.4 (2.46)	55.5 (3.41)	65.7 (4.63)	62.5 (5.38)	59.5 (3.52)	56.4 (5.07)	62.9 (7.25)	63.7 (6.30)
Any other drug use disorder	13.8 (1.71)	12.0 (2.24)	18.4 (3.75)	13.9 (4.01)	18.2 (2.94)	11.5 (3.35)	17.2 (5.60)	38.1 (6.70)
Nicotine use disorder	63.4 (2.31)	56.9 (3.27)	65.3 (5.11)	76.6 (3.81)	64.8 (3.24)	62.4 (4.42)	65.0 (5.07)	70.9 (6.68)
Any mood disorder	33.3 (2.76)	26.5 (2.87)	26.3 (4.01)	55.0 (5.11)	48.9 (3.46)	43.0 (4.64)	53.7 (5.70)	58.9 (7.27)
Major depressive disorder	20.3 (2.11)	17.1 (2.68)	19.5 (3.61)	28.4 (5.35)	35.7 (3.24)	30.9 (4.22)	40.3 (5.19)	43.1 (7.14)
Persistent depression	9.2 (1.70)	9.2 (1.99)	4.5 (1.53)	13.6 (3.59)	10.2 (2.10)	10.4 (2.71)	9.4 (3.33)	10.6 (3.74)
Bipolar I	8.8 (1.44)	6.1 (1.66)	5.1 (1.56)	18.2 (4.17)	9.0 (1.69)	6.7 (2.18)	10.4 (3.63)	13.6 (4.10)
Bipolar II	0.8 (0.41)	0.4 (0.41)	1.4 (1.40)	1.0 (0.72)	1.5 (0.89)	2.2 (1.56)	1.0 (1.01)	–
Any anxiety disorder	23.4 (2.30)	16.5 (2.54)	26.4 (4.05)	36.7 (5.58)	36.1 (3.74)	38.5 (5.58)	31.0 (6.21)	36.1 (6.35)
Panic disorder	7.4 (1.20)	4.3 (1.11)	4.8 (2.29)	16.6 (4.56)	15.2 (2.81)	14.8 (4.52)	13.9 (4.23)	17.9 (5.37)
Agoraphobia	1.6 (0.50)	1.2 (0.55)	3.1 (1.81)	1.2 (0.57)	9.0 (2.11)	9.5 (2.64)	8.9 (5.05)	7.6 (2.96)
Social phobia	7.1 (1.42)	3.0 (1.15)	9.6 (2.92)	14.0 (4.65)	7.2 (1.76)	6.7 (2.08)	10.6 (4.35)	4.1 (2.10)
Specific phobia	8.6 (1.50)	7.6 (2.16)	9.9 (3.27)	9.5 (2.78)	9.9 (1.93)	7.8 (2.19)	13.7 (4.07)	10.5 (2.76)
Generalized anxiety disorder	12.2 (1.88)	6.1 (1.34)	14.1 (2.97)	24.2 (5.92)	19.9 (3.19)	25.1 (5.15)	13.4 (4.18)	14.1 (4.57)
Posttraumatic stress disorder	12.3 (1.66)	4.7 (1.31)	12.6 (3.30)	29.2 (5.37)	26.9 (3.37)	19.4 (4.16)	37.6 (6.74)	33.7 (7.09)
Any personality disorder	48.2 (2.51)	44.1 (2.69)	40.8 (5.53)	64.3 (6.11)	58.6 (3.17)	55.3 (4.73)	60.8 (6.18)	64.7 (6.87)
Schizotypal	24.9 (2.17)	21.6 (2.46)	19.3 (4.08)	37.4 (5.85)	33.5 (3.21)	29.7 (4.65)	34.9 (4.70)	42.0 (6.86)
Borderline	39.1 (2.32)	34.4 (2.64)	31.5 (5.14)	56.9 (5.94)	49.9 (3.21)	44.4 (5.07)	56.1 (6.74)	56.8 (6.62)
Antisocial	21.8 (2.12)	19.9 (2.69)	23.2 (4.64)	24.8 (4.75)	16.1 (1.95)	15.8 (3.04)	12.3 (3.86)	21.8 (5.02)

Note: Zero prevalence, SE = Standard error.

Table 4
Adjusted Odds Ratios[a] of 12-month dsm-5 cannabis use disorder and psychiatric disorders among men and women.

	Adjusted Odds Ratio (95% confidence interval)							
	Men				Women			
	Any cannabis use disorder	Mild	Moderate	Severe	Any cannabis use disorder	Mild	Moderate	Severe
Any other substance use disorder	**5.9** (4.70–7.37)	**4.7** (3.63–6.20)	**10.6** (5.62–19.98)	**6.5** (3.48–12.09)	**8.1** (5.47–12.09)	**8.4** (5.02–13.90)	**6.8** (3.52–13.09)	**9.9** (4.00–24.60)
Alcohol use disorder	**2.8** (2.19–3.60)	**2.6** (1.87–3.66)	**3.8** (2.27–6.28)	**2.5** (1.45–4.24)	**3.8** (2.60–5.58)	**3.9** (2.33–6.48)	**4.0** (1.76–9.11)	**3.4** (1.85–6.11)
Any other drug use disorder	**3.0** (2.00–4.52)	**2.9** (1.75–4.70)	**5.1** (2.92–8.81)	2.0 (0.88–4.61)	**4.3** (2.74–6.68)	**2.6** (1.27–5.15)	**3.8** (1.45–9.96)	**11.9** (5.91–24.06)
Nicotine use disorder	**3.0** (2.43–3.66)	**2.4** (1.82–3.28)	**3.2** (1.94–5.28)	**4.9** (3.25–7.32)	**3.7** (2.61–5.26)	**3.6** (2.32–5.54)	**4.0** (2.26–6.93)	**3.7** (1.73–7.98)
Any mood disorder	**1.9** (1.34–2.64)	**1.6** (1.14–2.29)	1.3 (0.71–2.29)	**3.4** (1.85–6.40)	**1.5** (1.05–2.23)	1.2 (0.74–2.05)	1.9 (0.98–3.61)	2.1 (0.97–4.46)
Major depressive disorder	1.3 (0.94–1.79)	1.1 (0.69–1.81)	1.6 (0.86–3.00)	1.4 (0.72–2.82)	1.2 (0.85–1.76)	1.0 (0.62–1.67)	1.5 (0.82–2.69)	1.5 (0.68–3.39)
Persistent depression	**1.9** (1.09–3.30)	**2.7** (1.51–4.72)	0.8 (0.33–1.91)	1.7 (0.57–5.21)	1.0 (0.50–1.89)	1.1 (0.47–2.53)	0.9 (0.32–2.29)	0.9 (0.31–2.40)
Bipolar I	1.6 (0.93–2.59)	1.2 (0.61–2.34)	1.0 (0.51–2.00)	2.5 (0.99–6.36)	1.3 (0.75–2.18)	1.1 (0.47–2.35)	1.4 (0.55–3.50)	1.7 (0.78–3.71)
Bipolar II	0.9 (0.28–3.07)	0.6 (0.06–5.35)	1.9 (0.29–12.26)	0.9 (0.17–4.92)	1.3 (0.32–5.40)	2.0 (0.41–9.64)	1.1 (0.12–9.45)	–[b]
Any anxiety disorder	1.2 (0.88–1.56)	0.9 (0.62–1.33)	**1.9** (1.11–3.20)	1.2 (0.68–2.26)	0.8 (0.58–1.23)	1.1 (0.71–1.86)	0.5 (0.28–1.03)	0.7 (0.33–1.34)
Panic disorder	1.3 (0.83–2.10)	1.0 (0.55–1.88)	0.9 (0.31–2.65)	2.0 (0.81–5.12)	0.9 (0.50–1.57)	0.8 (0.36–1.92)	0.8 (0.34–2.03)	1.1 (0.46–2.66)
Agoraphobia	**0.3** (0.16–0.73)	0.4 (0.13–1.17)	0.8 (0.18–3.44)	0.1 (0.04–0.41)	1.3 (0.67–2.50)	1.4 (0.67–2.79)	1.4 (0.28–6.75)	1.0 (0.40–2.49)
Social phobia	1.0 (0.61–1.67)	0.5 (0.22–1.10)	1.8 (0.76–4.40)	1.4 (0.62–3.00)	0.6 (0.32–1.04)	0.5 (0.23–1.09)	1.1 (0.43–2.96)	0.3 (0.09–0.87)
Specific phobia	1.0 (0.66–1.55)	1.2 (0.68–2.20)	1.2 (0.57–2.66)	0.6 (0.30–1.31)	0.5 (0.32–0.87)	0.4 (0.20–0.85)	0.8 (0.42–1.49)	0.5 (0.28–1.04)
Generalized anxiety disorder	1.2 (0.79–1.92)	0.7 (0.37–1.36)	**2.2** (1.06–4.56)	1.6 (0.81–3.08)	1.3 (0.83–2.19)	**2.3** (1.31–3.96)	0.6 (0.29–1.42)	0.7 (0.26–1.79)
Posttraumatic stress disorder	**1.7** (1.12–2.57)	0.7 (0.33–1.29)	**2.0** (1.08–3.81)	**3.7** (1.98–7.02)	**1.6** (1.01–2.48)	0.9 (0.48–1.75)	**3.4** (1.69–6.98)	1.9 (0.93–4.05)
Any personality disorder	**2.0** (1.56–2.65)	**2.3** (1.79–2.91)	1.4 (0.79–2.39)	2.2 (1.00–4.71)	**3.1** (2.14–4.35)	**3.1** (2.02–4.82)	**3.1** (1.46–6.48)	**2.8** (1.24–6.37)
Schizotypal	1.3 (0.98–1.85)	**1.5** (1.04–2.26)	1.0 (0.57–1.81)	1.3 (0.69–2.38)	**2.0** (1.26–3.18)	1.9 (0.95–3.66)	**1.8** (1.10–2.94)	**2.7** (1.20–6.24)
Borderline	**2.0** (1.46–2.67)	**2.1** (1.47–2.86)	1.4 (0.79–2.42)	**2.4** (1.17–5.07)	**1.9** (1.14–3.02)	1.6 (0.79–3.08)	**2.8** (1.14–7.02)	1.7 (0.62–4.79)
Antisocial	**1.5** (1.08–2.02)	**1.6** (1.07–2.39)	**1.9** (1.10–3.14)	1.1 (0.64–1.77)	**1.7** (1.13–2.58)	**2.0** (1.03–3.70)	**1.1** (0.48–2.60)	**2.0** (1.07–3.82)

Note: Significant ($p < 0.05$) odds ratios appear in **bold font**.
[a] Adjusted for sex, age, race/ethnicity, marital status, education, family income, urban/rural, and region (Midwest, Northeast, South, West) and other psychiatric disorders.
[b] Zero prevalence.

driving under the influence) (Kevorkian et al., 2015). PTSD could also increase the risk of cannabis use due to increased motivation to alleviate distress associated with PTSD symptoms (Bonn-Miller, Babson, & Vandrey, 2014; Zer-Aviv, Segev, & Akirav, 2016). Men and women with co-occurring CUD and PTSD may experience alterations in their emotional processing in response to trauma cue; current PTSD was associated with greater subjective emotional reactivity among individuals without CUD, but there were no differences in reactivity

Table 5
Twelve-month DSM-5 cannabis use disorders and mean norm-based disability scores among men and women.

Characteristic	Mean norm-based score (SE)							
	Mental health		Social functioning		Role/emotional functioning		Mental component summary	
	Men	Women	Men	Women	Men	Women	Men	Women
No cannabis use disorder	53.1 (0.11)	50.8 (0.11)	51.5 (0.12)	50.0 (0.11)	49.4 (0.14)	47.7 (0.13)	52.1 (0.11)	50.0 (0.10)
Any cannabis use disorder	48.2 (0.56)[a]	43.9 (0.80)[a]	48.0 (0.59)[a]	44.3 (0.91)[a]	45.5 (0.63)[a]	41.8 (0.78)[a]	47.0 (0.59)[a]	42.0 (0.82)[a]
Mild	49.8 (0.64)[a]	45.2 (1.14)[a]	49.1 (0.75)[a]	46.0 (1.24)[a]	46.4 (0.74)[a]	43.3 (1.06)[a]	48.4 (0.73)[a]	44.0 (1.15)[a]
Moderate	47.9 (1.12)[a]	43.3 (1.57)[a]	49.6 (1.11)	42.6 (1.49)[a]	46.5 (1.24)[a]	40.8 (1.15)[a]	47.2 (1.13)[a]	40.2 (1.43)[a]
Severe	44.9 (1.37)[a]	40.9 (1.61)[a]	44.3 (1.46)[a]	41.8 (1.56)[a]	42.6 (1.43)[a]	38.8 (1.47)[a]	43.7 (1.22)[a]	38.7 (1.61)[a]
Number of cannabis use disorder criteria								
0	53.1 (0.11)	50.9 (0.11)	51.6 (0.12)	50.1 (0.11)	49.5 (0.15)	47.8 (0.13)	52.1 (0.11)	50.1 (0.10)
1	50.4 (0.63)[a]	46.1 (0.80)[a]	49.6 (0.53)[a]	46.1 (0.95)[a]	48.0 (0.53)[a]	45.8 (0.85)[a]	49.2 (0.60)[a]	45.0 (0.79)[a]
2	49.2 (0.83)[a]	46.5 (1.34)[a]	48.9 (0.87)[a]	46.6 (1.57)	46.6 (0.90)[a]	43.7 (1.38)[a]	48.2 (0.95)[a]	44.8 (1.34)[a]
3	50.6 (0.96)[a]	42.3 (1.95)[a]	49.3 (1.05)[a]	44.7 (1.86)[a]	46.1 (1.02)[a]	42.6 (1.57)[a]	48.7 (0.87)[a]	42.3 (1.81)[a]
4	48.4 (1.23)[a]	42.9 (1.96)[a]	50.5 (1.22)	41.0 (2.04)[a]	47.2 (1.54)	40.3 (1.87)[a]	48.1 (1.11)[a]	39.1 (2.03)[a]
5	47.0 (1.97)[a]	43.8 (2.27)[a]	47.9 (2.06)	44.9 (2.80)[a]	45.1 (2.12)	41.6 (1.72)[a]	45.7 (2.30)[a]	41.6 (1.82)[a]
6	44.8 (2.96)[a]	44.1 (2.50)[a]	43.4 (3.25)[a]	45.8 (1.88)[a]	45.1 (2.60)	40.1 (1.79)[a]	46.0 (2.13)[a]	41.7 (2.27)[a]
7	47.2 (1.55) [a]	45.0 (2.81)	44.8 (2.72)[a]	43.2 (2.75)[a]	44.2 (2.94)	41.3 (2.76)[a]	45.7 (2.43)[a]	41.9 (2.20)[a]
8	47.1 (2.27)[a]	36.7 (3.22)[a]	48.9 (2.35)	42.6 (3.11)	43.3 (2.43)[a]	36.5 (1.83)[a]	44.3 (1.92)[a]	36.9 (2.71)[a]
9	39.9 (2.91)[a]	36.3 (3.15)[a]	42.3 (3.84)[a]	36.8 (4.55)[a]	39.6 (2.50)[a]	40.4 (2.31)[a]	38.2 (2.53)[a]	35.5 (4.13)[b]
10	43.7 (2.36)[a]	33.3 (4.24)[a]	45.2 (5.30)	23.1 (2.54)[a]	35.9 (3.60)[a]	25.6 (6.93)[a]	40.0 (2.17)[a]	23.9 (3.74)[a]
11	45.2 (4.28)[a]	43.5 (2.14)[a]	38.4 (5.97)[a]	41.9 (3.54)[a]	36.5 (6.47)[a]	39.8 (3.92)	36.9 (6.48)[a]	40.1 (4.21)[a]

[a] Significantly different ($p < 0.05$) from score for individuals with no cannabis use disorder/zero cannabis use disorder criteria, after adjusting for sociodemographic characteristics.

among those with CUD (Tull, McDermott, & Gratz, 2016). Familial liability may also account for the association (Wolf et al., 2010) and future studies using genetically-informative models are warranted.

Among men and women, quality of life was lower among individuals with CUD than those without CUD. These results, consistent with earlier studies (Lev-Ran et al., 2012; Lozano, Rojas, & Fernandez Calderon, 2017), underscore the need to take into account both functional and emotional outcomes affecting quality of life among men and women with CUD. Further research is warranted to understand lower quality of life among men and women with CUD relative to those without CUD despite increasing normalization of cannabis use in the US. Although, to date, this differential has not been attributed to gender differences in the amount of cannabis used (Lev-Ran et al., 2012), a recent study points to the impact of psychiatric comorbidity on quality of life among dependent individuals (Lozano et al., 2017).

Study limitations are noted. Only common psychiatric disorders were assessed. Some population segments were not included, (e.g., prisoners, homeless). NESARC-III was also cross-sectional and prospective surveys are needed to investigate the stability over time. The study also did not examine gender-specific associations explained by greater use of cannabis or greater risk of a disorder given such use; future studies should address these issues. Self-report data used in this study is subject to recall and other biases. However, use of past 12-month estimates minimized the impact of recall bias on the survey estimates. Although it is not possible to completely rule out the impact of other biases (e.g., social stigma bias) on the survey estimates, it is unclear whether such biases would be gender-specific. NESARC-III also had important strengths, including a large sample, reliable and valid measures, rigorous field methodology and comprehensive information on DSM-5 CUD among men and women in the US.

In summary, among both men and women, CUD was associated with psychiatric comorbidity, and low quality of life. Taken together, these findings highlight the need for integrated treatment of CUD and comorbid disorders and attention to adverse functional and emotional outcomes among men and women with CUD. Differences were also found between men and women with CUD including the accelerated transition from cannabis use to CUD among women relative to men. Differences in the behavioral and reinforcing effects of cannabinoids on men and women that may underlie the telescoping effect, suggest gender-specific pathways that influence the course of CUD which may give rise to clues about its etiology. Further, research examining the determinants of the telescoping effect among women is warranted since those factors may adversely contribute to relapse and poor treatment response. This study also highlighted the need to target CUD prevention and intervention efforts to subgroups of the population at higher risk of CUD, especially Native American women and Blacks, younger individuals, those with lower income and previously or never married men and women. Understanding both similarities and differences in correlates of CUD among men and women will be critical to integrating gender in future theoretical frameworks and to improve prevention and intervention programs, especially during a time of rising rates of cannabis use and CUD and increasing normalization of cannabis use in the US.

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Disclaimer

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Contributors

Dr. Kerridge wrote the initial draft of the manuscript. All authors contributed to the study design and conception, critical revisions of the manuscript, and interpretation of the data. Drs. Saha, Pickering and Kerridge conducted statistical analyses. All authors provided technical and material support.

Conflict of interest

No conflicts declared.

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