Drug and Alcohol Dependence 165 (2016) 181–190

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

Full length article

Trends in cannabis use disorders among racial/ethnic population groups in the United States

Li-Tzy Wu [a,b,c,d,*], He Zhu [a], Marvin S. Swartz [a]

[a] Department of Psychiatry and Behavioral Sciences, Duke University Medical Center, Durham, NC, USA
[b] Department of Medicine, Division of General Internal Medicine, Duke University Medical Center, Durham, NC, USA
[c] Duke Clinical Research Institute, Duke University Medical Center, Durham, NC, USA
[d] Center for Child and Family Policy, Sanford School of Public Policy, Duke University, Durham, NC, USA

ARTICLE INFO

Article history:
Received 30 April 2016
Received in revised form 30 May 2016
Accepted 3 June 2016
Available online 8 June 2016

Keywords:
Asian American
Black
Cannabis use disorder
Hispanic
Mixed race
Native American

ABSTRACT

Background: Minority groups generally experience more disparities than whites in behavioral healthcare use. The population of racial/ethnic groups is growing faster than whites. Given increased concerns of cannabis use (CU) and its associations with health conditions, we examined national trends in cannabis use disorder (CUD) among adults aged ≥18 by race/ethnicity.
Methods: Data were from the 2005–2013 National Surveys on Drug Use and Health (N = 340,456). We compared CU patterns and the conditional prevalence of CUD among cannabis users by race/ethnicity to understand racial/ethnic variations in CUD.
Results: Approximately 1.5% of adults met criteria for a CUD in the past year. Regardless of survey year, cannabis dependence was more common than cannabis abuse, representing 66% of adults with a CUD. Across racial/ethnic groups, the prevalence of cannabis abuse and dependence remained stable during 2005–2013. In the total adult sample, the odds of weekly CU, monthly CU, and cannabis dependence were greater among blacks, native-Americans, and mixed-race adults than whites. Among cannabis users, the odds of cannabis abuse and dependence were greater among blacks, native-Americans, and Hispanics than whites. Logistic regression controlling for age, sex, education, and survey year indicated an increased trend in monthly CU and weekly CU in the total sample and among past-year cannabis users. Younger age, male sex, and low education were associated with increased odds of cannabis dependence.
Conclusions: The large sample provides robust information that indicates a need for research to monitor CUD and identify culturally appropriate interventions especially for targeting minority populations.

1. Introduction

Heavy or chronic cannabis use (CU) is associated with a wide range of health-related conditions, such as motor vehicle injuries, cognitive impairment, chronic bronchitis symptoms, cardiovascular diseases, or psychotic symptoms, that can result in healthcare use (Jouanjus et al., 2014; Volkow et al., 2014). Cannabis use disorder (CUD) is the most prevalent illicit drug use disorder in the United States. An estimated 4.2 million Americans aged ≥12 years had a CUD in the past year–representing an estimated 59% of individuals aged ≥12 years with a past-year illicit drug use disorder (Center for Behavioral Health Statistics and Quality (CBHSQ), 2015). To date, 24 states and Washington DC have medical cannabis, four states have legalized recreational CU, and another six states have legislation pending. As the wave of state-specific policies on cannabis legalization continues to spread across the nation, they could have unintended consequences (e.g., an increase in supply or use-related problems) with lasting implications for the health and social systems (Volkow et al., 2014, 2016). This study seeks to leverage national survey datasets to understand recent/active CUD among racial/ethnic groups to inform surveillance and intervention efforts.

Although the causal relationship between cannabis laws and CU problems is intrinsically difficult to determine, various reports suggest a pattern of growing CU problems. CU may impair motor coordination and driving skills, thereby increasing the risk of injuries (Institute for Behavior and Health, 2013; Volkow et al., 2014). Acute cannabis intoxication may increase motor vehicle crash risk (Rogeberg and Elvik, 2016). Brady and Li (2014) found a

* Corresponding author at: Department of Psychiatry and Behavioral Sciences, Duke University School of Medicine, Duke University Medical Center, Box 3903, Durham, NC 27710, USA.
E-mail address: litzy.wu@duke.edu (L.-T. Wu).

http://dx.doi.org/10.1016/j.drugalcdep.2016.06.002

significant increase in the trend of cannabis-detected fatal injuries during 1999–2010, whereas the prevalence of alcohol-detected injuries remained stable. Additionally, medical cannabis laws were associated with a 10–20% increase in cannabis arrests and CU-related treatments, suggesting a possible legalization effect on CU problems (Chu, 2014). The total physical availability of medical cannabis through dispensaries and delivery services at the city-level also was positively associated with current CU and frequent use (Freisthler and Gruenewald, 2014). Cities with comparatively high levels of medical cannabis availability showed a frequent CU pattern. Likewise, Mair et al. (2015) found that the density of local cannabis dispensaries was positively associated with an increase in CU-related hospitalizations. Moreover, cannabis potency detected in confiscated samples increased steadily from about 3% in the 1980s to 12% in 2012 (Volkow et al., 2014). Preliminary data suggested that the average potency of cannabis seized by law enforcement increased by a half percentage point on average after medical cannabis legalization (Sevigny et al., 2014). The increase in the THC content raises concerns that potential adverse effects of problem CU, such as addiction, motor-vehicle accidents, or psychotic symptoms, may be intensified (Freeman and Winstock, 2015; Monte et al., 2015).

The growing concerns of CU-related problems require the analysis of large samples to monitor the CUD (cannabis abuse or dependence) prevalence, an indicator for intervention, for adult racial/ethnic populations. Minority groups in general experience greater disparities than whites in healthcare use that is related to poor health (Cook et al., 2010; NCHS, 2012). Minority populations in the United States are growing at a faster rate than the white alone population. By 2044, more than half of all Americans will be members of a minority group, and approximately 80% of the US population will be adults aged ≥18 years (Colby and Ortman, 2015). Previously, Compton et al. (2004) examined DSM-IV CUD among adults aged ≥18 in the National Longitudinal Alcohol Epidemiologic Survey and the National Epidemiologic Survey on Alcohol and Related Conditions. They found a significant increase in the CUD prevalence between 1991 and 1992 and 2001–2002 among blacks (0.8% vs. 1.8%) and Hispanics (0.6% vs. 1.2%), but there was little change among whites (1.3% vs. 1.4%). While the reasons for the rise in CUD among minority groups are unclear, the increase in cannabis potency, changes in perceived risk of CU, as well as environmental and socioeconomic factors (e.g., deleterious effects of acculturation on drug use, lower education) may contribute to CUD (Compton et al., 2004; Sinclair et al., 2013).

The U.S. Treatment Episode Data Set (TEDS) collects substance-involved admissions to treatment facilities that receive public funding. The recent TEDS report showed that cannabis was the most commonly identified primary illicit drug for treatment among blacks (29%), Hispanics (22%), and Asians/Pacific Islanders (21%); while the most commonly identified drug other than alcohol among whites was opiates (34%), followed by cannabis (12%) (SAMHSA, 2015). These drug-involved treatment data suggest that CUD may disproportionally affect minority groups. TEDS data reflect treatment admission encounters that can be influenced by the frequency of multiple encounters. Individual-level data thus are needed to better understand the prevalence of CUD among the growing racial/ethnic populations to inform research and clinical efforts on screening, intervention and referral to treatment for CUD. The National Survey on Drug Use and Health (NSDUH) provides the primary source of ongoing CUD data. The independent and cross-sectional 2005–2013 NSDUHs use similar designs to allow the analysis of the same variables from the pooled sample. The large sample of NSDUH also permits analysis to produce reliable CUD estimates for racial/ethnic groups with a smaller population size in the United States and to distinguish between cannabis abuse and dependence to estimate the level of CUD for racial/ethnic groups.

We examined yearly variations in the past-year CUD prevalence (abuse, dependence) in the total adult sample and the conditional CUD prevalence among past-year cannabis users to gauge the population-level CUD prevalence and determine the likelihood of CUD given use by race/ethnicity. The latter provides information to inform prevention and intervention research. In the pooled sample, we determined racial/ethnic differences in the frequency of CU (monthly, weekly), cannabis abuse, and cannabis dependence to clarify CU patterns by race/ethnicity.

2. Methods

2.1. Data source

We analyzed adult samples (aged ≥18 years) of public-use datasets from the 2005–2013 NSDUHs to characterize national trends in CUD by race/ethnicity. We used the 2005–2013 NSDUH datasets (n = 36,965–39,133/year), as they used similar designs to allow analysis of the same variables to study CUD (SAMHSA, 2014). NSDUH is the primary national survey designed to provide ongoing estimates of drug use and drug use disorders in the United States (SAMHSA, 2006, 2014). It used multistage area probability sampling methods to select a representative sample of the civilian, noninstitutionalized population aged ≥12 years. The sample included residents of households (including shelters, rooming houses, and group homes) from the 50 states and civilians residing on military bases.

Data collection of NSDUH assessments was conducted at the respondent's home for about an hour. Study procedures and privacy protections were carefully explained, and respondents were assured that their names would not be recorded and their responses would be kept strictly confidential. Respondents' demographics were assessed by computer-assisted personal interviews. Substance use and health-related questions were assessed by an audio computer-assisted self-interviewing (ACASI) method to increase honest reports of sensitive behaviors (Turner et al., 1998). The ACASI allowed respondents to either read the questions on a computer screen or listen to the questions read aloud by the computer through headphones, and then entered their responses directly into the computer. Weighted response rates of household screening and interviewing for these years were 84–91% and 72–76%, respectively (SAMHSA, 2006, 2014).

2.2. Study variables

2.2.1. Demographics. NSDUH defined seven mutually exclusive groups based on respondents' self-reported race and ethnicity: non-Hispanic white, non-Hispanic black, non-Hispanic native-American (American Indian/Alaska-native), non-Hispanic native-Hawaiian/Pacific-Islander, non-Hispanic Asian-American, mixed-race (>1 race), and Hispanic. The public-use data did not distinguish between specific racial groups of mixed-race individuals. The US census data estimated that 83% of mixed-race individuals were white in combination with ≥1 other race (black, Asian-American, native-Hawaiian/Pacific-Islander, native-American, or other) (US Census Bureau, 2011). We examined respondents' age group, sex, and educational level to describe their key demographic and to include them as control variables in the analysis of racial/ethnic differences in CU and CUD due their association with drug use (Hasin and Grant, 2016). Survey year also was included as a covariate.

2.2.2. CU and CUD. CU was defined as any self-reported illicit (nonmedical) use of cannabis/hashish. Respondents were read the following: "*Marijuana is also called pot or grass. Marijuana is usually smoked—either in cigarettes called joints or in a pipe. It is sometimes*

Table 1
Demographic characteristics of adults aged 18 years or older: 2005–2013 NSDUH.

Race/ethnicity Sample size, unweighted	Overall N = 340,456	White n = 216,924		Black n = 41,996		Native-American n = 5022		Native- Hawaiian/ Pacific- Islander n = 1699		Asian-American n = 12,844		Mixed-Race n = 9218		Hispanic n = 52,753	
Weighted%	% (SE)	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Age in years															
18–25	14.76 (0.10)	12.93	12.71–13.16	17.96	17.51–18.42	18.28	16.76–19.90	19.23	17.11–21.55	15.56	14.74–16.41	19.23	18.07–20.44	20.18	19.63–20.73
26–34	15.84 (0.10)	13.72	13.49–13.96	17.38	16.76–18.02	16.73	14.46–19.27	19.31	16.90–21.98	20.91	19.77–22.09	16.09	14.62–17.69	23.12	22.39–23.87
35–49	27.83 (0.14)	26.66	26.33–26.98	29.11	28.38–29.85	26.91	24.42–29.56	33.37	29.08–37.95	32.29	30.65–33.98	23.39	21.47–25.42	31.31	30.65–31.99
50+	41.58 (0.20)	46.69	46.21–47.17	35.55	34.55–36.55	38.08	34.56–41.73	28.09	23.37–33.34	31.24	29.57–32.97	41.29	38.23–44.43	25.39	24.54–26.25
Sex															
Male	48.22 (0.14)	48.38	48.04–48.73	44.76	43.88–45.64	46.47	43.56–49.40	49.26	43.95–54.58	46.86	45.04–48.68	47.22	44.40–50.06	50.86	50.05–51.67
Female	51.78 (0.14)	51.62	51.27–51.96	55.24	54.36–56.12	53.53	50.60–56.44	50.74	45.42–56.05	53.14	51.32–54.96	52.78	49.94–55.60	49.14	48.33–49.95
Education															
<high school	15.16 (0.13)	10.72	10.46–10.99	19.16	18.25–20.10	25.30	22.31–28.55	13.32	10.52–16.72	6.54	5.66–7.54	16.47	14.71–18.39	36.00	35.12–36.90
High school	30.60 (0.17)	31.07	30.63–31.51	35.41	34.48–36.35	37.36	33.62–41.26	34.10	29.91–38.55	15.24	14.00–16.56	30.27	27.92–32.74	29.07	28.39–29.76
Some college	25.81 (0.12)	26.36	26.06–26.66	28.29	27.52–29.07	27.32	24.14–30.75	30.40	27.23–33.77	22.56	21.15–24.03	32.59	29.95–35.34	21.42	20.81–22.05
≥College degree	28.42 (0.20)	31.85	31.37–32.34	17.15	16.45–17.86	10.02	7.81–12.77	22.18	18.50–26.36	55.67	53.98–57.34	20.67	18.30–23.26	13.50	12.86–14.17
Cannabis use															
Yes, past year	10.97 (0.08)	11.20	10.99–11.41	13.24	12.74–13.76	15.09	13.03–17.41	12.26	9.56–15.60	4.65	4.10–5.27	18.74	17.26–20.31	9.18	8.85–9.52
Monthly cannabis use (≥12 days/yr)															
Yes	7.52 (0.07)	7.43	7.29–7.58	10.56	10.09–11.05	11.91	10.18–13.89	9.08	6.84–11.96	2.45	2.03–2.95	13.65	12.45–14.95	6.33	6.05–6.62
Weekly cannabis use (≥52 days/yr)															
Yes	5.47 (0.05)	5.36	5.23–5.49	8.06	7.68–8.45	8.80	7.46–10.36	6.20	4.57–8.37	1.68	1.36–2.08	10.31	9.27–11.45	4.53	4.30–4.77
Cannabis abuse															
Yes	0.50 (0.01)	0.46	0.42–0.49	0.78	0.68–0.90	1.13	0.76–1.67	0.39	0.19–0.79	0.20	0.15–0.28	0.74	0.54–1.02	0.55	0.48–0.63
Cannabis dependence															
Yes	0.97 (0.02)	0.86	0.82–0.92	1.63	1.48–1.80	2.08	1.59–2.72	0.91	0.67–1.23	0.44	0.32–0.61	1.77	1.39–2.25	0.98	0.88–1.10
Cannabis abuse or dependence															
Yes	1.47 (0.03)	1.32	1.26–1.38	2.41	2.21–2.63	3.21	2.53–4.06	1.30	0.95–1.77	0.65	0.49–0.84	2.52	2.05–3.08	1.53	1.41–1.67

SE: Standard error, CI: Confidence interval, yr: year.

Table 2
Racial/ethnic differences in cannabis use and cannabis use disorders among adults aged 18 or older: 2005–2013 NSDUH (n = 340,456).

Adjusted logistic regression model	Past-year cannabis use (yes vs. no)		Monthly cannabis use (≥12 days/year vs. no)		Weekly cannabis use (≥52 days/year vs. no)		Cannabis abuse vs. no		Cannabis dependence vs. no		Cannabis abuse or dependence vs. no	
Adjusted odds ratio, AOR	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Race/ethnicity (vs. white)												
Black	0.98	0.93–1.03	**1.17**	**1.11–1.24**	**1.21**	**1.14–1.29**	**1.32**	**1.11–1.57**	**1.44**	**1.30–1.59**	**1.40**	**1.27–1.54**
Native-American	1.15	0.97–1.36	**1.30**	**1.09–1.54**	**1.27**	**1.06–1.51**	**1.81**	**1.21–2.69**	**1.78**	**1.34–2.36**	**1.79**	**1.39–2.30**
Native-Hawaiian/Pacific-Islander	0.80	0.59–1.09	0.89	0.64–1.24	0.82	0.59–1.14	0.59	0.30–1.16	**0.71**	**0.53–0.95**	**0.67**	**0.49–0.91**
Asian-American	**0.30**	**0.27–0.34**	**0.27**	**0.23–0.32**	**0.28**	**0.22–0.34**	**0.43**	**0.31–0.59**	**0.45**	**0.33–0.63**	**0.45**	**0.34–0.58**
Mixed-race	**1.57**	**1.41–1.75**	**1.64**	**1.47–1.83**	**1.65**	**1.45–1.88**	1.28	0.91–1.80	**1.58**	**1.23–2.03**	**1.48**	**1.19–1.85**
Hispanic	**0.51**	**0.49–0.53**	**0.51**	**0.48–0.53**	**0.49**	**0.47–0.52**	**0.69**	**0.58–0.82**	**0.66**	**0.57–0.76**	**0.67**	**0.60–0.75**
Age in years (vs. 18–25)												
26–34	**0.48**	**0.46–0.50**	**0.53**	**0.51–0.55**	**0.56**	**0.53–0.59**	**0.34**	**0.29–0.39**	**0.40**	**0.36–0.45**	**0.38**	**0.34–0.42**
35–49	**0.23**	**0.22–0.23**	**0.25**	**0.24–0.27**	**0.27**	**0.25–0.28**	**0.17**	**0.15–0.20**	**0.15**	**0.13–0.17**	**0.16**	**0.14–0.17**
50+	**0.08**	**0.08–0.09**	**0.10**	**0.09–0.10**	**0.10**	**0.10–0.11**	**0.06**	**0.04–0.08**	**0.03**	**0.02–0.05**	**0.04**	**0.04–0.05**
Sex (vs. male)												
Female	**0.54**	**0.52–0.55**	**0.46**	**0.44–0.48**	**0.43**	**0.41–0.45**	**0.33**	**0.30–0.38**	**0.48**	**0.45–0.51**	**0.43**	**0.40–0.45**
Education (vs. <high school)												
High school	**0.88**	**0.84–0.93**	**0.80**	**0.76–0.85**	**0.80**	**0.75–0.85**	**0.63**	**0.55–0.74**	**0.73**	**0.66–0.80**	**0.69**	**0.63–0.76**
Some college	0.95	0.90–1.00	**0.76**	**0.72–0.81**	**0.70**	**0.66–0.75**	**0.57**	**0.49–0.65**	**0.71**	**0.65–0.79**	**0.66**	**0.61–0.71**
≥College degree	**0.75**	**0.70–0.80**	**0.48**	**0.45–0.52**	**0.40**	**0.37–0.43**	**0.33**	**0.27–0.42**	**0.43**	**0.38–0.49**	**0.39**	**0.35–0.44**
Year (vs. 2005)												
2006	0.99	0.93–1.05	1.05	0.97–1.13	0.99	0.91–1.09	1.06	0.86–1.31	1.11	0.95–1.28	1.09	0.96–1.24
2007	0.98	0.91–1.06	1.00	0.93–1.07	0.99	0.91–1.07	1.00	0.80–1.26	1.05	0.89–1.24	1.03	0.90–1.18
2008	1.01	0.94–1.09	1.07	0.98–1.16	1.05	0.95–1.15	1.14	0.94–1.40	1.10	0.94–1.30	1.12	0.99–1.26
2009	**1.17**	**1.09–1.25**	**1.22**	**1.13–1.32**	**1.19**	**1.08–1.32**	**1.25**	**1.01–1.55**	1.12	0.94–1.33	**1.17**	**1.02–1.33**
2010	**1.19**	**1.12–1.27**	**1.28**	**1.19–1.38**	**1.28**	**1.17–1.39**	1.14	0.93–1.41	1.16	0.94–1.43	1.15	0.97–1.37
2011	**1.20**	**1.12–1.29**	**1.28**	**1.18–1.38**	**1.32**	**1.21–1.44**	1.05	0.85–1.30	1.07	0.89–1.28	1.06	0.92–1.23
2012	**1.33**	**1.25–1.42**	**1.43**	**1.33–1.54**	**1.50**	**1.38–1.64**	1.18	0.95–1.45	1.13	0.95–1.34	1.14	0.99–1.32
2013	**1.40**	**1.31–1.50**	**1.52**	**1.41–1.64**	**1.55**	**1.41–1.70**	0.95	0.75–1.20	**1.21**	**1.01–1.45**	1.12	0.98–1.29

CI: Confidence interval. Boldface: P < 0.05.

cooked in food. Hashish is a form of marijuana that is also called hash. It is usually smoked in a pipe. Another form of hashish is hash oil." The survey subsequently assessed respondents' past-year use status, frequency of use, and CUD. Standardized assessments for past-year cannabis-specific abuse and dependence symptoms were based on DSM-IV criteria (APA, 2000). Consistent with DSM-IV, cannabis abuse included presence of ≥1 abuse symptom and absence of dependence, and cannabis dependence included presence of ≥3 dependence symptoms, regardless of the abuse status (APA, 2000). Based on this hierarchical classification, abuse was considered less-severe than dependence, and any CUD included past-year cannabis abuse or dependence (APA, 2000). To understand use pattern and CUD (Wu et al., 2012), we examined frequency of CU. We calculated the mean number of days using CU in the past year and examined different levels of use, including any CU, monthly use (≥12 days/years), and weekly CU (≥52 days/years), to understand whether racial/ethnic variations in CUD were consistent with CU patterns.

2.3. Data analysis

We examined distributions of key demographics of the total adult sample (aged ≥18) and the prevalence of CU and CUD. We calculated the CUD prevalence in the sample and among past-year cannabis users (conditional probability of CUD given use), respectively, by survey year for each racial/ethnic group. We conducted logistic regression analysis of the total adult sample to determine racial/ethnic and yearly variations in the prevalence of CU and CUD, respectively. Among past-year cannabis users, we examined racial/ethnic differences in weekly CU, monthly CU, and CUD. We conducted logistic regression analyses to estimate associations of race/ethnicity with weekly CU, monthly CU, and CUD among cannabis users, while adjusting for age, sex, education, and survey year to lessen for their confounding effects. All analyses took into account the NSDUH's complex designs, such as weighting and clustering (StataCorp, 2013). All results are weighted except for sample sizes.

3. Results

3.1. Characteristics of the study sample aged ≥18 years (Table 1)

The total adult sample (N = 340,456) included 31.97% of non-whites (11.52% Black, 13.87% Hispanic, 6.58% others). Compared with whites, all non-white groups had higher proportions of young adults (<35 years); blacks had a higher proportion of women; and non-white groups (except for Asian-American) had lower proportions of adults with a college degree .

Overall (annual average), 10.97% of adults used cannabis in the past year, 7.52% used cannabis monthly (≥12 days/year), 5.47% used cannabis weekly (≥52 days/year), and 1.47% of adults met criteria for a past-year CUD (abuse 0.50%, dependence 0.97%). Compared with whites, blacks, native-Americans, and mixed-race adults had a higher prevalence of CU, monthly CU, weekly CU, and cannabis abuse or dependence, and the prevalence of these variables was consistently lower among Asian-Americans.

3.2. Trend in the past-year CUD prevalence (*Supplementary Tables 1–2):*

3.2.1. CUD in the sample (Fig. 1a and Supplementary Table 1). Across racial/ethnic groups, there were little yearly variations in the prevalence of cannabis abuse and dependence during 2005–2013. Regardless of year, cannabis dependence was more common than abuse; blacks, native-Americans, and mixed-race adults tended

Table 3
Racial/ethnic differences in cannabis use and disorder among past-year cannabis users aged 18 or older: 2005–2013 NSDUH.

Race/ethnicity	White		Black		Native-American		Native-Hawaiian/ Pacific-Islander		Asian-American		Mixed-race		Hispanic	
Sample size, unweighted	n = 43,238		n = 8946		n = 1394		n = 338		n = 1258		n = 2626		n = 8079	
Weighted	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI
Number of days using cannabis, past year	109.27	107.27–111.28	130.51	125.58–135.44	118.34	105.47–131.21	101.70	78.13–125.27	73.93	63.95–83.90	133.50	122.71–144.29	105.52	99.91–111.14
Weighted	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Monthly cannabis use, ≥12 days/year	66.35	65.70–66.99	**79.78**	**78.10–81.36**	**78.91**	**74.36–82.84**	**74.03**	**67.79–79.44**	**52.76**	**47.82–57.64**	72.88	69.09–76.36	68.92	66.90–70.87
Weekly cannabis use, ≥52 days/year	47.87	47.05–48.69	**60.84**	**59.02–62.63**	**58.34**	**53.16–63.35**	50.59	39.25–61.87	**36.16**	**31.18–41.46**	**55.02**	**50.76–59.21**	49.34	47.24–51.45
Cannabis abuse	4.07	3.78–4.38	**5.91**	**5.17–6.75**	**7.49**	**5.26–10.56**	3.19	1.45–6.85	4.39	3.17–6.06	3.98	2.91–5.42	**6.03**	**5.24–6.92**
Cannabis dependence	7.72	7.32–8.14	**12.32**	**11.27–13.45**	**13.79**	**10.48–17.93**	7.42	5.14–10.59	9.49	7.04–12.69	9.45	7.46–11.90	**10.68**	**9.53–11.95**
Cannabis abuse or dependence	11.79	11.30–12.31	**18.23**	**16.87–19.67**	**21.28**	**17.11–26.14**	10.60	7.10–15.54	13.88	10.93–17.48	13.42	11.00–16.29	**16.70**	**15.29–18.22**

CI: Confidence Interval. Boldface: The estimate differed from the estimate among whites.

Table 4
Racial/ethnic differences in cannabis use disorders among past-year cannabis users aged 18 or older: 2005–2013 NSDUH (n = 65,879).

Adjusted logistic regression model	Monthly cannabis use (≥ 12 days/year) vs. no		Weekly cannabis use (≥ 52 days/year) vs. no		Cannabis abuse vs. no		Cannabis dependence vs. no		Cannabis abuse or dependence vs. no	
Adjusted odds ratio, AOR	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Race/ethnicity (vs. white)										
Black	**1.70**	**1.53–1.88**	**1.44**	**1.33–1.57**	**1.39**	**1.16–1.65**	**1.56**	**1.40–1.74**	**1.50**	**1.35–1.66**
Native-American	**1.43**	**1.11–1.83**	1.16	0.93–1.46	**1.68**	**1.11–2.53**	**1.71**	**1.24–2.36**	**1.70**	**1.29–2.25**
Native-Hawaiian/Pacific-Islander	1.36	0.96–1.94	1.03	0.64–1.65	0.74	0.35–1.59	0.88	0.62–1.24	0.83	0.57–1.22
Asian-American	**0.65**	**0.53–0.80**	**0.70**	**0.55–0.90**	1.14	0.80–1.63	1.18	0.83–1.67	1.17	0.87–1.57
Mixed-race	**1.27**	**1.05–1.54**	**1.24**	**1.05–1.47**	0.99	0.70–1.42	1.25	0.95–1.63	1.16	0.91–1.48
Hispanic	0.95	0.85–1.05	**0.89**	**0.82–0.98**	**1.27**	**1.06–1.51**	**1.19**	**1.02–1.39**	**1.22**	**1.07–1.38**
Age in years (vs. 18–25)										
26–34	1.02	0.95–1.09	1.04	0.98–1.11	**0.53**	**0.45–0.63**	**0.64**	**0.57–0.72**	**0.61**	**0.55–0.67**
35–49	0.96	0.88–1.04	0.94	0.86–1.02	**0.50**	**0.43–0.59**	**0.44**	**0.38–0.52**	**0.46**	**0.41–0.52**
50+	1.02	0.89–1.18	0.99	0.87–1.12	**0.44**	**0.32–0.60**	**0.26**	**0.18–0.37**	**0.32**	**0.25–0.40**
Sex (vs. male)										
Female	**0.60**	**0.57–0.63**	**0.61**	**0.58–0.64**	**0.52**	**0.45–0.59**	**0.73**	**0.68–0.79**	**0.65**	**0.61–0.70**
Education (vs. <high school)										
High school	**0.70**	**0.64–0.76**	**0.81**	**0.74–0.88**	**0.67**	**0.57–0.77**	**0.77**	**0.69–0.85**	**0.73**	**0.66–0.80**
Some college	**0.51**	**0.46–0.56**	**0.58**	**0.53–0.63**	**0.56**	**0.48–0.65**	**0.71**	**0.64–0.78**	**0.65**	**0.60–0.71**
≥College degree	**0.29**	**0.27–0.33**	**0.33**	**0.29–0.37**	**0.39**	**0.31–0.50**	**0.51**	**0.44–0.58**	**0.46**	**0.40–0.53**
Year (vs. 2005)										
2006	**1.19**	**1.05–1.36**	1.02	0.90–1.15	1.11	0.89–1.40	1.15	0.98–1.36	1.14	0.98–1.32
2007	1.05	0.93–1.19	1.01	0.91–1.12	1.03	0.81–1.31	1.09	0.90–1.31	1.07	0.91–1.25
2008	**1.19**	**1.01–1.39**	1.09	0.97–1.23	1.19	0.95–1.49	1.13	0.96–1.34	**1.15**	**1.01–1.32**
2009	**1.18**	**1.03–1.35**	1.09	0.96–1.24	1.13	0.91–1.41	1.02	0.85–1.21	1.06	0.92–1.21
2010	**1.29**	**1.16–1.44**	**1.19**	**1.06–1.34**	1.01	0.80–1.27	1.04	0.82–1.31	1.03	0.85–1.25
2011	**1.24**	**1.10–1.39**	**1.25**	**1.13–1.38**	0.91	0.72–1.17	0.94	0.76–1.15	0.93	0.78–1.11
2012	**1.30**	**1.17–1.44**	**1.34**	**1.20–1.50**	0.95	0.76–1.19	0.92	0.77–1.10	0.93	0.80–1.09
2013	**1.40**	**1.25–1.58**	**1.33**	**1.16–1.52**	**0.75**	**0.59–0.96**	0.96	0.79–1.16	0.89	0.76–1.04

CI: Confidence Interval. Boldface: P < 0.05.

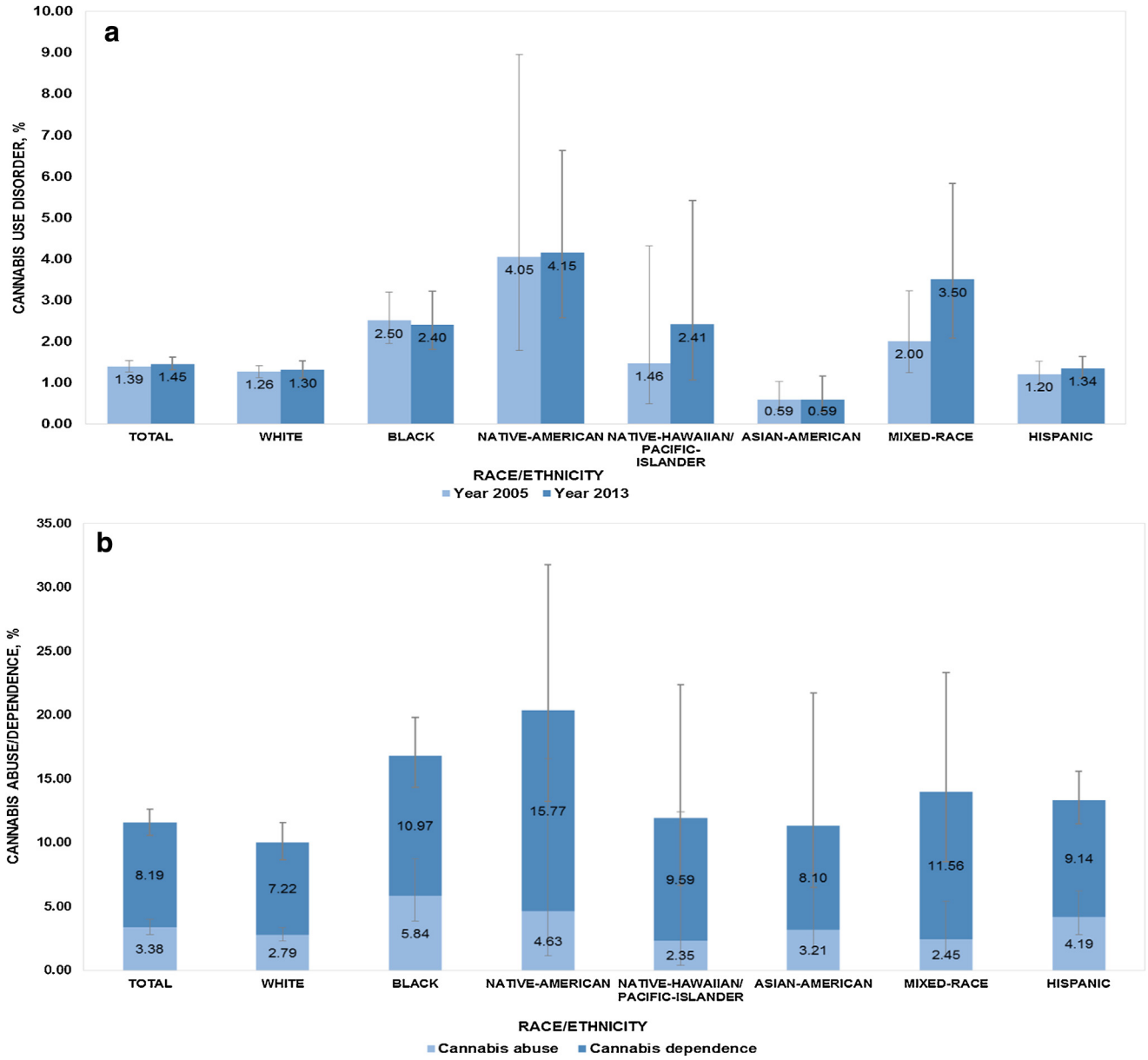

Fig. 1. (a) Past-year prevalence of cannabis abuse and dependence among adults aged ≥18 years: 2005 vs. 2013. (b) Past-year prevalence of cannabis abuse and dependence among past-year adult cannabis users aged ≥18 years in 2013.

to show a pattern of a higher prevalence of cannabis dependence than whites. In 2013, the CUD prevalence was higher among blacks (2.40%, 95% CI = 1.80–3.21%), native-Americans (4.15%, 95% CI = 2.57–6.63%), and mixed-race adults (3.50%, 95% CI = 2.08–5.83%) than whites (1.30%, 95% CI = 1.11–1.52%) (Fig. 1a).

3.2.2. CUD among cannabis users (Fig. 1b and Supplementary Table 2).. Overall (annual average), 13.39% of past-year cannabis users met criteria for a CUD (4.58% abuse, 8.81% dependence). Cannabis dependence was consistently more prevalent than abuse. Except for whites, there were little yearly variations in the prevalence of cannabis abuse and dependence among cannabis users during 2005–2013. The test for yearly trend was significant for CUD among white cannabis users, suggesting a declining prevalence in abuse or dependence ($P < 0.01$). Across years, black and native-American cannabis users showed a pattern of a higher prevalence of cannabis dependence than white cannabis users. In 2013, the CUD prevalence among cannabis users was higher among black users (16.82%, 95% CI = 13.14–21.28%) and native-American users (20.40%, 95% CI = 11.96–32.60%) than white users (10.01%, 95% CI = 8.57–11.66%) (Fig. 1b).

3.3. Adjusted odds ratio of CU and CUD among adults (Table 2)

To understand racial/ethnic differences in CU and CUD, we conducted logistic regression of any CU, monthly CU, weekly CU, and CUD (abuse, dependence, any), respectively, when adjusting for respondents' age, sex, education, and survey year.

3.3.1. Race/ethnicity. Compared with whites, blacks, native-Americans, and mixed-race adults had greater odds of monthly CU, weekly CU, and cannabis dependence, whereas Asian-Americans and Hispanics had lower odds of monthly CU, weekly CU, and cannabis dependence.

3.3.2. Age, sex, and education. For both CU and CUD variables, younger age, male sex, and low education were associated with elevated odds of use, abuse, and dependence.

3.3.3. Survey year. Compared with the prevalence in 2005, the odds of any CU, monthly CU, and weekly CU, were elevated during 2009–2013. Compared with the prevalence in 2005, the odds of cannabis dependence was elevated slightly in 2013.

3.4. CU patterns among past-year cannabis users aged ≥18 years (Table 3)

Among cannabis users (n = 65,879), blacks (mean = 130.51 days/year) and mixed-race adults (mean = 133.50 days/year) had a greater mean number of days using cannabis than whites (mean = 109.27 days/year), and Asian-Americans had a lower mean days of use (mean = 73.93 days/year) ($P < 0.05$). Compared with white cannabis users (66.35%), more black (79.78%), native-American (78.91%), native-Hawaiian/Pacific-Islander (74.03%), mixed-race (72.88%) cannabis users reported monthly CU, and fewer Asian-American cannabis users (52.76%) reported monthly CU ($P < 0.05$). A similar pattern in racial/ethnic variation was observed for weekly CU (ranging from 36.16% among Asian-American users to 60.84% among black users).

3.5. Adjusted odds ratio of CU and CUD among cannabis users (Table 4)

Finally, we conducted logistic regression analyses of CU and CUD among cannabis users, while adjusting for age, sex, education, and survey year.

3.5.1. Race/ethnicity. Among cannabis users, blacks and mixed-raced adults had greater odds than whites of monthly and weekly CU; native-Americans had greater odds than whites of monthly CU; Asians had lower odds than whites of monthly CU; and native-Americans, and Hispanics had greater odds of cannabis abuse and dependence than whites.

3.5.2. Age, sex, and education. Younger ages, male sex, and low education were associated with elevated odds of cannabis abuse and dependence, respectively

3.5.3. Survey year. Compared with the prevalence in 2005, the odds of monthly CU and weekly CU among cannabis users were elevated slightly over time. Compared with the prevalence in 2005, the odds of cannabis abuse among cannabis users was lowered slightly in 2013.

4. Discussion

Adults constitute the vast majority of the US population, and state-level cannabis legalization laws are applied directly to adults. Problem CU could affect multiple domains of adults' lives and health, such as cannabis abuse/dependence symptoms, cannabis-involved car accidents, and cardiovascular conditions as well as emergency department admissions (Asbridge et al., 2012; Blow et al., 2011; Thomas et al., 2014). Our CUD estimates from the national sample have implications for surveillance of CUD and clinical interventions. We used the largest samples (N = 340,456) of adults aged ≥18 years available to study indicators of CU problems (abuse, dependence). In the population level, blacks, native-Americans, and mixed-race adults on average were more likely than whites to have a CUD; and Asian-Americans, native-Hawaiians/Pacific-Islanders, and Hispanics were less likely to have a CUD. Among cannabis users, blacks, native-Americans, and mixed-race adults had the highest prevalence of weekly CU (range: 55.02–60.84% vs. whites 47.87%). Our results of monthly and weekly CU were consistent with the CUD patterns that added support for racial/ethnic differences in CUD. These findings were in line with racial/ethnic variations in treatment admissions in the TEDS (SAMHSA, 2015). Considered jointly, problem CU (abuse or dependence) may impact healthcare use or treatment demand.

The findings of elevated odds of weekly CU and cannabis dependence among mixed-race individuals warrant research to monitor CU and CUD trends to inform intervention. The mixed-race population, especially children/adolescents, is the fastest growing population in the United States; and it is projected to increase from 8 million (2.5%) to 26 million (6.2% of the U.S. population) between 2014 and 2060, reflecting an increase of 228% compared with an increase of 26% for the single-race population (Colby and Ortman, 2015). Although there is limited information about substance use disorders among mixed-race adults, an earlier study of youth 16–23 found that mixed-race youth had a particularly higher lifetime prevalence of illicit drug use than blacks and Hispanics (Wu et al., 2006). Recently, mixed-race adolescents were found to have a lower prevalence than whites of disapproving their peers' CU as well as perceiving their parents' and friends' disapproval of adolescents' own CU (Wu et al., 2015). In addition, low disapproval of CU was associated with elevated odds of CU, and mixed-race adolescents had greater odds than white adolescents of using CU and having a past-year CUD. Because an individual's disapproval of CU or attitudes toward use may be influenced by proximal family/social environments, and that state laws on medical or recreational cannabis may contribute to lenient CU norms (Friese and Grube, 2013; Sieving et al., 2000), future research needs to study whether contextual or community-level factors influence CU and CUD among mixed-race individuals. The TEDS has not reported treatment admissions for mixed-race individuals. The increased potency of cannabis and the fastest growing rate of the mixed-race population support the need to improve reports of substance-involved statistics for mixed-race individuals (SAMHSA, 2015).

Consistent with the TEDS data (SAMHSA, 2015), our findings reveal a need for research to elucidate factors contributing to CUD among blacks, such as community-level CU norms and blunt use (Lipperman-Kreda et al., 2014). Black race is related to an increased prevalence of blunt smoking, and blunt smoking is positively associated with cannabis abuse/dependence symptoms (Fairman, 2015; Timberlake, 2013). In addition, native-Americans as a group have a poor health status and face substantial barriers to timely healthcare (e.g., low income, low education, high rates of chronic diseases) (Liao et al., 2011; US Census Bureau, 2014). We found that approximately 9% native-American adults reported CU weekly (≥52 days/year) and 3% had a CUD in the past year. However, the national survey of household residents may not fully capture the CUD prevalence on or near reservations. Descriptive data suggested that native-Americans were over-represented in the California medical cannabis patients (Reinarman et al., 2011). The county-level of medical cannabis cards and residents' support for cannabis legalization (community CU norms) may increase residents' ease of access to cannabis, including native-Americans (Friese and Grube, 2013). In-depth research efforts for native-Americans are warranted to inform the development of evidence-based and culturally appropriate addiction prevention and treatment approaches for this vulnerable population (Novins et al., 2016).

Finally, women admissions accounted for 27% of cannabis-involved treatment admissions in the TEDS report (SAMHSA, 2015). Similarly, we found lower odds of CU and CUD among women than men. However, women with a CUD tended to have comorbid depressive/anxiety problems, and they might present more severe cannabis withdrawal systems than men (Compton et al.,

2004; Herrmann et al., 2015; Khan et al., 2013). Given that cannabis withdrawal systems are related to relapse and common outcome measures in studies of pharmacotherapies for cannabis dependence (Marshall et al., 2014), sex differences in comorbidities and manifestations of CUD symptoms warrant research to inform sex-specific or tailored treatments for CUD.

4.1. Limitations and strengths

The NSDUH uses cross-sectional designs to produce national drug use estimates. Our results reflect associations, and they cannot be applied to about 2% of institutionalized or homeless individuals that are not covered by the survey's sampling plan. All drug use estimates are based on self-reports, which may be influenced by recall or reporting errors. The NSDUH also has strengths. One unique strength is about its use of the same standardized assessments of CUD during the studied years to examine CUD over time. The NSDUH also implements consistency checks in data management to ensure data quality, and develops statistical computation and analysis weights to minimize response inconsistency and non-response bias (Gfroerer et al., 2002; Harrison et al., 2007).

5. Conclusion

Across the major racial/ethnic groups, we found that the majority of adults with a CUD had cannabis dependence, indicating a need for treatment. Screening, intervention, and referral to treatment efforts may target some groups with elevated odds of CUD, such as blacks, native-Americans, and mixed-race adults, as well as less educated adults. Future work can examine how legalization differentially affects racial/ethnic populations. Adjusted analyses showed a small increase in cannabis dependence in 2013 vs. 2005 and indicated an increased trend in monthly CU and weekly CU in the total adult sample and among cannabis users. The increase in cannabis potency signifies enhanced harms of chronic CU (e.g., addiction, cannabis-involved fatal accidents) (Freeman and Swift, 2016). These findings from a very large sample reinforce the need to monitor unintended consequences of cannabis laws, especially for the faster growing racial/ethnic populations.

Role of the funding source

This work was made possible by research support from the U.S. National Institutes of Health (R01MD007658, R01DA019623, and UG1DA040317; PI, Li-Tzy Wu). The sponsoring agency had no further role in the study design and analysis, the writing of the report, or the decision to submit the paper for publication. The opinions expressed in this paper are solely those of the authors.

Contributors

L.T. Wu designed research questions and wrote the drafts of the paper. H. Zhu conducted data analyses under the supervision of L.T. Wu, and all authors contributed to critical revisions and interpretations of the findings to result in the final manuscript.

Conflicts of interest

The authors have no conflicts of interest to disclose.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.drugalcdep.2016.06.002.

References

American Psychiatric Association (APA), 2000. Diagnostic and Statistical Manual of Mental Disorders DSM-IV-TR, 4th edition. American Psychiatric Association, Washington, DC.

Asbridge, M., Hayden, J.A., Cartwright, J.L., 2012. Acute cannabis consumption and motor vehicle collision risk: systematic review of observational studies and meta-analysis. BMJ 344, e536.

Blow, F.C., Walton, M.A., Barry, K.L., Murray, R.L., Cunningham, R.M., Massey, L.S., Chermack, S.T., Booth, B.M., 2011. Alcohol and drug use among patients presenting to an inner-city emergency department: a latent class analysis. Addict. Behav. 36, 793–800.

Brady, J.E., Li, G., 2014. Trends in alcohol and other drugs detected in fatally injured drivers in the United States 1999–2010. Am. J. Epidemiol. 179, 692–699.

Center for Behavioral Health Statistics and Quality (CBHSQ), 2015. Results from the 2014 National Survey on Drug Use and Health: Detailed Tables. Substance Abuse and Mental Health Services Administration, Rockville, MD (accessed 20.03.16.) http://www.samhsa.gov/data/sites/default/files/NSDUH-DetTabs2014/NSDUH-DetTabs2014.pdf.

Chu, Y.W.L., 2014. The effects of medical marijuana laws on illegal marijuana use. J. Health Econ. 38, 43–61.

Colby, S.L., Ortman, J.M., 2015. Projections of the size and composition of the U.S. population: 2014–2060. In: Current Population Reports. U.S. Census Bureau, Washington, DC, pp. 25–1143 (accessed 02.10.16.) https://www.census.gov/content/dam/Census/library/publications/2015/demo/p 25-1143.pdf.

Compton, W.M., Grant, B.F., Colliver, J.D., Glantz, M.D., Stinson, F.S., 2004. Prevalence of marijuana use disorders in the United States: 1991–1992 and 2001–2002. JAMA 291, 2114–2121.

Cook, B.L., McGuire, T.G., Lock, K., Zaslavsky, A.M., 2010. Comparing methods of racial and ethnic disparities measurement across different settings of mental health care. Health Serv. Res. 45, 825–847.

Fairman, B.J., 2015. Cannabis problem experiences among users of the tobacco-cannabis combination known as blunts. Drug Alcohol Depend. 150, 77–84.

Freeman, T.P., Swift, W., 2016. Cannabis potency: the need for global monitoring. Addiction 111, 376–377.

Freeman, T.P., Winstock, A.R., 2015. Examining the profile of high-potency cannabis and its association with severity of cannabis dependence. Psychol. Med. 45, 3181–3189.

Freisthler, B., Gruenewald, P.J., 2014. Examining the relationship between the physical availability of medical marijuana and marijuana use across fifty California cities. Drug Alcohol Depend. 143, 244–250.

Friese, B., Grube, J.W., 2013. Legalization of medical marijuana and marijuana use among youths. Drugs (Abingdon Engl.) 20, 33–39.

Gfroerer, J., Eyerman, J., Chromy, J. (Eds.), 2002. Redesigning an Ongoing National Household Survey: Methodological Issues. DHHS Publication No. SMA 03–3768. Substance Abuse and Mental Health Services Administration, Office of Applied Studies, Rockville, MD.

Harrison, L.D., Martin, S.S., Enev, T., Harrington, D., 2007. Comparing Drug Testing and Self-Report of Drug Use among Youths and Young Adults in the General Population. DHHS Publication No. SMA 07-4249, Methodology Series M-7, Substance Abuse and Mental Health Services Administration, Office of Applied Studies, Rockville, MD.

Hasin, D.S., Grant, B., 2016. NESARC findings on increased prevalence of marijuana use disorders—consistent with other sources of information. JAMA Psychiatry 73, 532.

Herrmann, E.S., Weerts, E.M., Vandrey, R., 2015. Sex differences in cannabis withdrawal symptoms among treatment-seeking cannabis users. Exp. Clin. Psychopharmacol. 23, 415–421.

Institute for Behavior and Health, 2013. Marijuana Use is a Serious Highway Safety Threat: 5 ng/ml Marijuana Impairment Limits Give Drivers a Free Pass to Drive Stoned. Institute for Behavior and Health Website (accessed 02.08.16.) http://www.ibhinc.org/pdfs/IBHCommentaryMarijuanaandDruggedDriving61013.pdf.

Jouanjus, E., Lapeyre-Mestre, M., Micallef, J., 2014. French Association of the Regional Abuse and Dependence Monitoring Centres (CEIP-A) Working Group on Cannabis Complications, Cannabis use: signal of increasing risk of serious cardiovascular disorders. J. Am. Heart Assoc., 3, e000638.

Khan, S.S., Secades-Villa, R., Okuda, M., Wang, S., Pérez-Fuentes, G., Kerridge, B.T., Blanco, C., 2013. Gender differences in cannabis use disorders: results from the national epidemiologic survey of alcohol and related conditions. Drug Alcohol Depend. 130, 101–108.

Liao, Y., Bang, D., Cosgrove, S., Dulin, R., Harris, Z., Taylor, A., White, S., Yatabe, G., Liburd, L., Giles, W., 2011. Division of Adult and Community Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention (CDC), Surveillance of health status in minority communities—Racial and Ethnic Approaches to Community Health Across the U.S. (REACH U.S.), Risk Factor Survey, United States, 2009. MMWR Surveill. Summ. 60, 1–44.

Lipperman-Kreda, S., Juliet, P.L., Morrison, C., Bridget, F., 2014. Availability of tobacco products associated with use of marijuana cigars (blunts). Drug Alcohol Depend. 134, 337–342.

Mair, C., Freisthler, B., Ponicki, W.R., Gaidus, A., 2015. The impacts of marijuana dispensary density and neighborhood ecology on marijuana abuse and dependence. Drug Alcohol Depend. 154, 111–116.

Marshall, K., Gowing, L., Ali, R., Le Foll, B., 2014. Pharmacotherapies for cannabis dependence. Cochrane Database Syst. Rev. 12, 1–64.
Monte, A.A., Zane, R.D., Heard, K.J., 2015. The implications of marijuana legalization in Colorado. JAMA 313, 241–242.
National Center for Health Statistics (NCHS), 2012. Healthy People 2010 Final Review. National Center for Health Statistics: Hyattsville, MD, http://www.cdc.gov/nchs/data/hpdata2010/hp2010_final_review.pdf, (accessed 02.04.16.).
Novins, D.K., Croy, C.D., Moore, L.A., Rieckmann, T., 2016. Use of evidence-based treatments in substance abuse treatment programs serving American Indian and Alaska Native communities. Drug Alcohol Depend. 161, 214–221.
Reinarman, C., Nunberg, H., Lanthier, F., Heddleston, T., 2011. Who are medical marijuana patients? Population characteristics from nine California assessment clinics. J. Psychoact. Drugs 43, 128–135.
Rogeberg, O., Elvik, R., 2016. The effects of cannabis intoxication on motor vehicle collision revisited and revised. Addiction, http://dx.doi.org/10.1111/add.13347.
Substance Abuse and Mental Health Services Administration (SAMHSA), 2006. Results from the 2005 National Survey on Drug Use and Health: National Findings. NSDUH Series H-30, DHHS Publication No. SMA 06-4194. Substance Abuse and Mental Health Services Administration, Rockville, MD, http://www.dpft.org/resources/NSDUHresults2005.pdf, (accessed 03.02.16.).
Substance Abuse and Mental Health Services Administration (SAMHSA), 2014. Results from the 2013 National Survey on Drug Use and Health: Summary of National Findings. NSDUH Series H-48, HHS Publication No. (SMA) 14-4863. Substance Abuse and Mental Health Services Administration, Rockville, MD, http://www.samhsa.gov/data/sites/default/files/NSDUHresultsPDFWHTML2013/Web/NSDUHresults2013.pdf, (accessed 03.02.16.).
Substance Abuse and Mental Health Services Administration (SAMHSA), 2015. Treatment Episode Data Set (TEDS): 2003–2013. National Admissions to Substance Abuse Treatment Services. BHSIS Series S-75, HHS Publication No. (SMA) 15-4934. Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality, Rockville, MD, http://www.samhsa.gov/data/sites/default/files/2013_Treatment_Episode_Data_Set_National/2013_Treatment_Episode_Data_Set_National.pdf, (accessed 03.02.16.).
Sevigny, E.L., Pacula, R.L., Heaton, P., 2014. The effects of medical marijuana laws on potency. Int. J. Drug Policy 25, 308–319.
Sieving, R.E., Perry, C.L., Williams, C.L., 2000. Do friendships change behaviors, or do behaviors change friendships? Examining paths of influence in young adolescents' alcohol use. J. Adolesc. Health 26, 27–35.
Sinclair, C.F., Foushee, H.R., Scarinci, I., Carroll, W.R., 2013. Perceptions of harm to health from cigarettes, blunts, and marijuana among young adult African American men. J. Health Care Poor Underserved 24, 1266–1275.
StataCorp, 2013. Stata Statistical Software: Release 13. StataCorp LP, College Station, TX.
Thomas, G., Kloner, R.A., Rezkalla, S., 2014. Adverse cardiovascular cerebrovascular, and peripheral vascular effects of marijuana inhalation: what cardiologists need to know. Am. J. Cardiol. 113, 187–190.
Timberlake, D.S., 2013. The changing demographic of blunt smokers across birth cohorts. Drug Alcohol Depend. 130, 129–134.
Turner, C.F., Ku, L., Rogers, S.M., Lindberg, L.D., Pleck, J.H., Sonenstein, F.L., 1998. Adolescent sexual behavior, drug use, and violence: increased reporting with computer survey technology. Science 280, 867–873.
US Census Bureau, 2011. Overview of Race and Hispanic Origin 2010. Economics and Statistics Administration, US Department of Commerce, Washington, DC (accessed 23.04.2016) http://www.census.gov/prod/cen2010/briefs/c2010br-02.pdf.
US Census Bureau, 2014. Facts for Features: American Indian and Alaska Native Heritage Month: November 2014. US Census Bureau Website, https://www.census.gov/content/dam/Census/newsroom/facts-for-features/2014/cb14ff-26_aian_heritage_month.pdf, (accessed 23.04.16.).
Volkow, N.D., Baler, R.D., Compton, W.M., Weiss, S.R., 2014. Adverse health effects of marijuana use. N. Engl. J. Med. 370, 2219–2227.
Volkow, N.D., Swanson, J.M., Evins, A.E., DeLisi, L.E., Meier, M.H., Gonzalez, R., Bloomfield, M.A., Curran, H.V., Baler, R., 2016. Effects of cannabis use on human behavior, including cognition, motivation, and psychosis: a review. JAMA Psychiatry 73, 292–297.
Wu, L.T., Schlenger, W.E., Galvin, D.M., 2006. Concurrent use of methamphetamine MDMA, LSD, ketamine, GHB, and flunitrazepam among American youths. Drug Alcohol Depend. 84, 102–113.
Wu, L.T., Swartz, M.S., Wu, Z., Mannelli, P., Yang, C., Blazer, D.G., 2012. Alcohol and drug use disorders among adults in emergency department settings in the United States. Ann. Emerg. Med. 60 (172–180), e5.
Wu, L.T., Swartz, M.S., Brady, K.T., Hoyle, R.H., NIDA AAPI Workgroup, 2015. Perceived cannabis use norms and cannabis use among adolescents in the United States. J. Psychiatr. Res. 64, 79–87.