Original Investigation

Prevalence of Marijuana Use Disorders in the United States Between 2001-2002 and 2012-2013

Deborah S. Hasin, PhD; Tulshi D. Saha, PhD; Bradley T. Kerridge, PhD; Risë B. Goldstein, PhD, MPH; S. Patricia Chou, PhD; Haitao Zhang, PhD; Jeesun Jung, PhD; Roger P. Pickering, MS; W. June Ruan, MA; Sharon M. Smith, PhD; Boji Huang, MD, PhD; Bridget F. Grant, PhD, PhD

IMPORTANCE Laws and attitudes toward marijuana in the United States are becoming more permissive but little is known about whether the prevalence rates of marijuana use and marijuana use disorders have changed in the 21st century.

OBJECTIVE To present nationally representative information on the past-year prevalence rates of marijuana use, marijuana use disorder, and marijuana use disorder among marijuana users in the US adult general population and whether this has changed between 2001-2002 and 2012-2013.

DESIGN, SETTING, AND PARTICIPANTS Face-to-face interviews conducted in surveys of 2 nationally representative samples of US adults: the National Epidemiologic Survey on Alcohol and Related Conditions (data collected April 2001-April 2002; N = 43 093) and the National Epidemiologic Survey on Alcohol and Related Conditions–III (data collected April 2012-June 2013; N = 36 309). Data were analyzed March through May 2015.

MAIN OUTCOMES AND MEASURES Past-year marijuana use and *DSM-IV* marijuana use disorder (abuse or dependence).

RESULTS The past-year prevalence of marijuana use was 4.1% (SE, 0.15) in 2001-2002 and 9.5% (SE, 0.27) in 2012-2013, a significant increase ($P < .05$). Significant increases were also found across demographic subgroups (sex, age, race/ethnicity, education, marital status, income, urban/rural, and region). The past-year prevalence of *DSM-IV* marijuana use disorder was 1.5% (0.08) in 2001-2002 and 2.9% (SE, 0.13) in 2012-2013 ($P < .05$). With few exceptions, increases in the prevalence of marijuana use disorder between 2001-2002 and 2012-2013 were also statistically significant ($P < .05$) across demographic subgroups. However, the prevalence of marijuana use disorder among marijuana users decreased significantly from 2001-2002 (35.6%; SE, 1.37) to 2012-2013 (30.6%; SE, 1.04).

CONCLUSIONS AND RELEVANCE The prevalence of marijuana use more than doubled between 2001-2002 and 2012-2013, and there was a large increase in marijuana use disorders during that time. While not all marijuana users experience problems, nearly 3 of 10 marijuana users manifested a marijuana use disorder in 2012-2013. Because the risk for marijuana use disorder did not increase among users, the increase in prevalence of marijuana use disorder is owing to an increase in prevalence of users in the US adult population. Given changing laws and attitudes toward marijuana, a balanced presentation of the likelihood of adverse consequences of marijuana use to policy makers, professionals, and the public is needed.

Author Affiliations: Author affiliations are listed at the end of this article.

Corresponding Author: Bridget F. Grant, PhD, PhD, Laboratory of Epidemiology and Biometry, Division of Intramural Clinical and Biological Research, National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health, 5635 Fishers Ln, Room 3077, Rockville, MD 20852 (bgrant@mail.nih.gov).

JAMA Psychiatry. 2015;72(12):1235-1242. doi:10.1001/jamapsychiatry.2015.1858
Published online October 21, 2015.

In the United States, laws and attitudes toward the use of marijuana are changing. Twenty-three states now have medical marijuana laws, and marijuana use is higher in states with such laws than in other states.[1-3] Four of these states have also legalized marijuana for recreational use. More Americans now favor legalization of marijuana use than in previous years.[4] Further, fewer Americans view marijuana use as risky,[5,6] although studies have shown that use or early use of marijuana is associated with increased risk for many outcomes,[7,8] including cognitive decline,[9-11] psychosocial impairments,[12-14] vehicle crashes,[15-18] emergency department visits,[19] psychiatric symptoms,[20,21] poor quality of life,[22] use of other drugs,[23] a cannabis-withdrawal syndrome,[24-26] and addiction risk.[7] Further, marijuana use disorders (abuse or dependence) are associated with substantial comorbidity and disability[27,28] and are consequently of substantial public health concern.

Previously, 2 large national surveys, the 1991-1992 National Longitudinal Alcohol Epidemiologic Survey[29] and the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)[30,31] were compared to determine whether the prevalence of marijuana use disorders had increased and to provide information about whether increases were due to greater prevalence of marijuana users or to greater risk for marijuana use disorders among users.[28] The prevalence of marijuana users remained stable; however, the prevalence of marijuana use disorders increased significantly, by a factor of approximately 20%. Therefore, the national increase in the prevalence of marijuana use disorders was attributed to increases in risk within users, speculatively explained by a marked strengthening of Δ-9-tetrahydrocannabinol (THC) potency in marijuana between 1991-1992 and 2001-2002.[32,33] Given the increased permissiveness in US attitudes and laws related to marijuana since 2001-2002, updated information is needed about whether the prevalence of marijuana use disorders has continued to increase over time and whether additional increases are due to further increases in risk among users or to an increase in the prevalence of users.

We addressed these questions using data from NESARC[30,31] and from the National Institute on Alcohol Abuse and Alcoholism 2012-2013 National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III), a survey of 36 309 new participants.[34,35] We examined differences between the 2 surveys in the prevalence of past-year marijuana use, in the prevalence of marijuana use disorder, and in the prevalence of marijuana use disorder among marijuana users in US adults. We examined these changes in the population overall and in major demographic subgroups.

Methods

Samples and Procedures

The 2012-2013 NESARC-III is a nationally representative face-to-face interview survey of 36 309 adults aged 18 years and older residing in households and selected group quarters,[34,35] with respondents selected through multistage probability sampling. Primary sampling units were counties or groups of contiguous counties, secondary sampling units were groups of Census-defined blocks, and tertiary sampling units were households within sampled secondary sampling units, within which eligible adult respondents were selected, with Hispanic, black, and Asian individuals oversampled. The household response rate was 72%; person-level response rate, 84%; and overall response rate, 60.1%, which were comparable with other current US national surveys.[36,37] Data were adjusted for nonresponse and weighted to represent the US civilian population based on the 2012 American Community Survey.[38] Weighting adjustments compensated for nonresponse. Comparing participants to the total eligible sample at the segment level, no significant differences were found in the percentage Hispanic, black, or Asian; population density; vacancy rate; and proportion in group quarters or renters. At the individual level, NESARC-III respondents did not differ from the total eligible sample on Hispanic ethnicity but differed slightly, albeit significantly ($P < .01$), on sex (men, 48.1% vs 46.2%) and age (30-39 years, 16.7% vs 17.4%; 40-49 years, 18.1% vs 18.3%; and 60-69 years, 13.7% vs 12.6%). Oral informed consent was electronically recorded, and respondents received $90.00 for participation. The National Institute on Alcohol Abuse and Alcoholism and Westat Institutional Review Boards approved the protocol and consent procedures.

The 2001-2002 NESARC was a nationally representative face-to-face interview survey of US adults (response rate, 81.0%) described elsewhere.[30,31] The target population was the US adult civilian population aged 18 years and older. The NESARC field procedures were similar to those in NESARC-III.

Assessments and Quality Assurance

In NESARC-III, past-year *DSM-IV* marijuana use (defined as any use, consistent with many studies) and marijuana use disorder were assessed using the National Institute on Alcohol Abuse and Alcoholism Alcohol Use Disorder and Associated Disabilities Interview Schedule-5 (AUDADIS-5).[39] The AUDADIS-5 is a structured interview designed for experienced survey interviewers. Past-year *DSM-IV* marijuana use disorder diagnoses were defined as positive if respondents met criteria for marijuana dependence or abuse in the past year. Dependence required 3 or more of the 6 *DSM-IV* dependence criteria (*DSM-IV* did not include marijuana withdrawal). *DSM-IV* marijuana abuse required 1 or more of the 4 *DSM-IV* abuse criteria. Abuse and dependence were combined into a single variable because extensive evidence indicates that their criteria reflect a single disorder rather than 2 different conditions.[40]

In NESARC, the AUDADIS-IV was used to measure marijuana use (also defined as any use) and marijuana use disorders. Symptom items (n = 22) that assessed *DSM-IV* marijuana use disorders in NESARC and NESARC-III were virtually identical. However, 4 items were slightly reworded, and 1 abuse item appeared in NESARC but not NESARC-III, while a different abuse item appeared in NESARC-III but not NESARC. Comparisons between *DSM-IV* past-year marijuana use disorder diagnoses with and without the additional questions in each survey yielded virtually identical prevalence (NESARC: 1.45% vs 1.45%; NESARC-III: 2.91% vs 2.91%), with corresponding near-perfect concordance ($\kappa = 0.997$ and 0.999, respectively), suggesting that these trivial differences in operation-

alization could not account for more substantial differences in prevalence between the surveys.

Test-retest reliability and validity of AUDADIS-IV marijuana use and marijuana use disorder diagnoses are documented in clinical and general population national and international studies.[41-48] Reliability and validity of NESARC-III marijuana use disorder diagnoses and criteria scales were fair to excellent.[49,50]

Interviewer quality-assurance methods were similar across the surveys. As described elsewhere,[31,35] these involved initial structured home study and in-class training. During data collection, interviewers received regular ongoing supervision by trained supervisors and random respondent callbacks were conducted to verify interview data.

Statistical Analyses

Weighted cross-tabulations estimated the prevalence of marijuana use and marijuana use disorder in the total samples and in subsamples. To account for the complex sample design of NESARC and NESARC-III, SUDAAN 11.0.1[51] was used to produce standard errors of the prevalence estimates for each survey. These were used to test differences in prevalence between the surveys, using pairwise *t* tests for independent samples.

Results

Past-Year Marijuana Use

Past-year marijuana use was reported by 4.1% in 2001-2002 and 9.5% in 2012-2013, a significant increase between 2001-2002 and 2012-2013 (**Table 1**). Significant increases were seen across all population subgroups. Comparing 2001-2002 with 2012-2013, increases were particularly notable among women (2.6% vs 6.9%), black individuals (4.7% vs 12.7%), Hispanic individuals (3.3% vs 8.4%), those in the South (2.9% vs 7.7%), and middle-aged (1.6% vs 5.9%) and older (0.04% vs 1.3%) adults.

Past-Year *DSM-IV* Marijuana Use Disorder

The prevalence of *DSM-IV* marijuana use disorder increased significantly between 2001-2002 (1.5%) and 2012-2013 (2.9%), nearly doubling between the 2 surveys (**Table 2**). Within population subgroups, increases between 2001-2002 and 2012-2013 were statistically significant with few exceptions. Groups in which the magnitude of increase was most notable included those aged 45 to 64 years (0.4% vs 1.3%); black individuals (1.8% vs 4.6%); Hispanic individuals (1.2% vs 2.8%); those with the lowest income (2.3% vs 5.4%); and those in the South (1.0% vs 2.6%).

Past-Year *DSM-IV* Marijuana Use Disorder Among Marijuana Users

The prevalence of past-year *DSM-IV* marijuana use disorder among users was 35.6% in 2001-2002 and 30.6% in 2012-2013, a significant decrease (**Table 3**). In addition, decreases were found in almost all population subgroups, although significant only in some, including men, those aged 18 to 29 years, white individuals, black individuals, those never married, those in the mid-income range, those in urban areas, and those in the Northeast and Midwest.

Table 1. Past-Year Prevalence of Marijuana Use by Sociodemographic Characteristics, 2001-2013[a]

Sociodemographic Characteristics	% (SE) NESARC Wave 1, 2001-2002	% (SE) NESARC-III, 2012-2013
Total	4.1 (0.15)	9.5 (0.27)
Sex		
Male	5.6 (0.24)	12.3 (0.40)
Female	2.6 (0.15)	6.9 (0.29)
Age, y		
18-29	10.5 (0.47)	21.2 (0.67)
30-34	4.1 (0.24)	10.1 (0.41)
45-64	1.6 (0.15)	5.9 (0.28)
≥65	0.0 (0.02)	1.3 (0.22)
Race/ethnicity		
White	4.1 (0.17)	9.4 (0.34)
Black	4.7 (0.35)	12.7 (0.64)
Native American	7.0 (1.15)	17.1 (2.32)
Asian	3.1 (0.54)	5.0 (0.59)
Hispanic	3.3 (0.31)	8.4 (0.50)
Education		
<High school	4.5 (0.38)	9.7 (0.51)
High school	4.0 (0.26)	10.4 (0.43)
Some college	4.0 (0.17)	9.1 (0.32)
Marital status		
Married	2.1 (0.13)	5.5 (0.24)
Widowed/separated	3.4 (0.30)	8.3 (0.40)
Not married	10.5 (0.41)	21.0 (0.65)
Income, $		
0-19 999	6.3 (0.34)	15.6 (0.61)
20 000-34 999	4.2 (0.28)	9.8 (0.47)
35 000-69 999	3.4 (0.23)	8.4 (0.33)
≥70 000	2.8 (0.24)	5.9 (0.33)
Urbanicity		
Urban	4.3 (0.18)	10.1 (0.27)
Rural	3.3 (0.27)	7.2 (0.53)
Region		
Northeast	4.3 (0.30)	10.7 (0.53)
Midwest	4.1 (0.25)	9.0 (0.64)
South	2.9 (0.19)	7.7 (0.43)
West	5.6 (0.43)	11.9 (0.50)

Abbreviation: NESARC, National Epidemiologic Survey on Alcohol and Related Conditions.

[a] All comparisons of 2001-2002 and 2012-2013 indicate significant differences, $P < .05$.

Discussion

In 2012-2013, 9.52% of US adults used marijuana in the past year, and 2.9% had a diagnosis of *DSM-IV* marijuana use disorder. Thus, nearly 3 of every 10 marijuana users had a diagnosis of a marijuana use disorder (approximately 6 846 000

Table 2. Past-Year Prevalence of *DSM-IV* Marijuana Use Disorder (Abuse or Dependence) by Sociodemographic Characteristics, 2001-2013

Sociodemographic Characteristics	% (SE) NESARC Wave 1, 2001-2002	% (SE) NESARC-III, 2012-2013
Total	1.5 (0.08)	2.9 (0.13)[a]
Sex		
Male	2.2 (0.14)	4.2 (0.21)[a]
Female	0.8 (0.07)	1.7 (0.13)[a]
Age, y		
18-29	4.4 (0.30)	7.5 (0.45)[a]
30-34	1.2 (0.12)	2.9 (0.21)[a]
45-64	0.4 (0.08)	1.3 (0.15)[a]
≥65	0.0 (0.01)	0.3 (0.10)
Race/ethnicity		
White	1.4 (0.10)	2.7 (0.16)[a]
Black	1.8 (0.22)	4.6 (0.39)[a]
Native American	3.4 (0.78)	5.5 (1.46)
Asian	1.0 (0.37)	1.3 (0.28)[a]
Hispanic	1.2 (0.17)	2.8 (0.23)[a]
Education		
<High school	1.8 (0.23)	3.3 (0.34)[a]
High school	1.7 (0.15)	3.7 (0.27)[a]
Some college	1.2 (0.09)	2.5 (0.15)[a]
Marital status		
Married	0.6 (0.07)	1.4 (0.12)[a]
Widowed/separated	1.1 (0.17)	2.3 (0.25)[a]
Not married	4.2 (0.27)	7.3 (0.38)[a]
Income, $		
0-19 999	2.3 (0.18)	5.4 (0.35)[a]
20 000-34 999	1.4 (0.16)	2.8 (0.26)[a]
35 000-69 999	1.3 (0.14)	2.5 (0.17)[a]
≥70 000	0.9 (0.11)	1.5 (0.15)[a]
Urbanicity		
Urban	1.5 (0.09)	3.1 (0.13)[a]
Rural	1.4 (0.18)	2.3 (0.26)[a]
Region		
Northeast	1.6 (0.16)	3.1 (0.30)[a]
Midwest	1.6 (0.15)	2.8 (0.28)
South	1.0 (0.10)	2.6 (0.24)[a]
West	1.9 (0.25)	3.4 (0.22)[a]

Abbreviation: NESARC, National Epidemiologic Survey on Alcohol and Related Conditions.

[a] $P < .05$, 2001-2002 compared with 2012-2013.

Table 3. Past-Year Prevalence of *DSM-IV* Marijuana Use Disorder (Abuse or Dependence) Among Past-Year Marijuana Users by Sociodemographic Characteristics, 2001-2013

Sociodemographic Characteristics	% (SE) NESARC Wave 1, 2001-2002	% (SE) NESARC-III, 2012-2013
Total	35.6 (1.37)	30.6 (1.04)[a]
Sex		
Male	38.9 (1.86)	34.2 (1.26)[a]
Female	29.2 (2.03)	24.61 (1.46)
Age, y		
18-29	42.1 (1.97)	35.4 (1.81)[a]
30-34	27.9 (2.63)	29.0 (1.81)
45-64	25.8 (4.22)	22.6 (2.17)
≥65	27.3 (15.77)	23.8 (5.54)
Race/ethnicity		
White	34.4 (1.81)	28.9 (1.34)[a]
Black	38.6 (3.64)	35.8 (2.27)[a]
Native American	48.8 (7.82)	31.9 (6.02)
Asian	31.0 (10.23)	26.0 (4.57)
Hispanic	37.1 (3.45)	33.3 (1.89)
Education		
<High school	39.6 (3.37)	34.0 (2.86)
High school	43.1 (2.62)	35.0 (1.90)
Some college	30.3 (1.72)	27.7 (1.30)
Marital status		
Married	30.0 (2.73)	25.6 (1.80)
Widowed/separated	31.3 (3.92)	27.5 (2.36)
Not married	40.0 (1.89)	34.9 (1.46)[a]
Income $		
0-19 999	36.7 (2.27)	34.6 (1.57)
20 000-34 999	34.5 (3.02)	28.6 (2.10)
35 000-69 999	38.0 (2.80)	29.7 (1.85)[a]
≥70 000	30.8 (3.08)	26.0 (2.31)
Urbanicity		
Urban	34.4 (1.41)	30.3 (1.09)[a]
Rural	41.9 (4.01)	32.0 (2.60)
Region		
Northeast	37.9 (2.67)	29.2 (2.69)[a]
Midwest	39.4 (2.64)	30.7 (2.44)[a]
South	33.1 (2.82)	33.8 (1.75)
West	33.3 (2.63)	28.1 (1.62)

Abbreviation: NESARC, National Epidemiologic Survey on Alcohol and Related Conditions.

[a] $P < .05$, 2001-2002 compared with 2012-2013.

Americans). Further, since 2001-2002, the prevalence of adult past-year marijuana use and past-year marijuana use disorders increased markedly; the prevalence of past-year marijuana use more than doubled, while the increase was nearly 2-fold in the prevalence of past-year marijuana use disorder. Because no increase in the risk for marijuana use disorders was found among users (in fact, the risk decreased among users), the increase in prevalence of marijuana use disorders can be attributed to the increase in marijuana users between the 2 surveys.

These results differ from the comparison of marijuana use and marijuana use disorders among US adults between 1991-1992 and 2001-2002.[28] In that comparison, the prevalence of marijuana use was stable, while the prevalence of marijuana use disorders increased. Thus, the increase in risk for marijuana use disorders occurred only among users. This increase among users was attributed to the increasing potency of Δ-9-THC in marijuana[28] between the 2 surveys, assuming that greater potency increases reinforcing effects. However, while Δ-9-THC potency in marijuana continued to increase from 2001-2002 to

2012-2013,[32,33] the risk for marijuana use disorder among users decreased. Perhaps for marijuana, once a certain strength is reached, further potency no longer increases the reinforcing effects, an explanation consistent with findings that marijuana users titrate smoking behaviors, eg, inhalation, to compensate for potency.[52,53] Further research is warranted to clarify this issue. Explanations for the decreased prevalence among users may also include greater medical or experimental-only users in 2012-2013. These and other explanations merit investigation.

The 2001-2002 to 2012-2013 period saw a substantial increase in the prevalence of marijuana use, and because marijuana use disorder prevalence did not increase among users, the findings indicate that the increased prevalence of marijuana use disorder over the last decade can be attributed to the increased prevalence of marijuana users in the general population. With a greater proportion of adults at risk for marijuana use disorders because they were users, a greater proportion of them developed disorders. This parallels national increases in marijuana use disorders[54] and other marijuana-related problems[17,19] found in other studies over the same general period. Identifying factors leading to these increases is crucial to reversing the trends and preventing future increases. One possible factor is changes in the belief that marijuana use is risky, the prevalence of which has decreased sharply among adults and adolescents in recent years.[5,6] Given the robust connection between beliefs about riskiness and actual use,[55] changes in such beliefs may play an important role. Therefore, public education about the risks of marijuana use, presented in a reasonable, balanced manner,[56] appears increasingly important to counteract public beliefs that marijuana use is harmless.

Further, changing attitudes may also underlie the movement toward marijuana legalization, now enacted in 23 states for medical purposes and in 4 states for recreational purposes.[1-3] Passage of these and additional laws may further change attitudes and beliefs in a permissive direction, as suggested in one study,[57] an issue requiring further research. Further, while the details of state marijuana laws vary[58,59] and arguments are made both for and against these legal changes,[60-62] all forms of legalization increase the availability of marijuana in some manner. Medical marijuana laws have little effect on adolescent recreational marijuana use[3,63-66] but may affect adult risk.[66] A concern about greater legalization for recreational use is that financial interests in marijuana sales and tax revenue could promote increased use. Our study clearly cannot predict the impact of further legalization. However, using alcohol and nicotine as models, changes in laws and policies (eg, minimum legal drinking age and smoke-free laws) do appear related to changes in use and consequences, suggesting that the legal status of marijuana could influence the risk for marijuana use disorders, particularly if legalization of recreational marijuana alters attitudes and permits financial interests to override public health and safety concerns.[61,67] Thus, advocating for public health interests and educating policy makers and the public about the risk of marijuana use disorders and other consequences appears crucial in the ongoing debate over marijuana legalization.

Black and Hispanic individuals showed especially notable increases in the prevalence of marijuana use and marijuana use disorders, trends consistent with other studies showing that adolescent marijuana use is now more prevalent in black than white individuals.[68-70] Reasons for this are important to identify. Part of the explanation may lie in the widening income gap between white and black and Hispanic individuals during[71] and after[72] the 2008 recession, possibly leading to increased minority stress and demoralization and substance use as a coping mechanism.[73-75] Increasing economic disparity of black and Hispanic individuals relative to white individuals may also have exacerbated neighborhood environmental factors (neighborhood disorder, violence, and visible drug sales) that increase the risk for adolescent marijuana use[75] and may also apply to adults. Compared with white individuals, minorities may also hold different attitudes toward marijuana (eg, viewing marijuana positively as a "natural" product[76]) also warranting investigation.

When examined by age, young adults were at highest risk for marijuana use disorder in both surveys. Clearly, concerns about this age group continue,[7] with prevention and intervention efforts for this group critically needed. However, the relative increases in adults aged 45 to 64 years and 65 years and older were much greater than the increases in young adults. Older adults are also at increased risk for adverse consequences of marijuana use, including intoxicated driving,[77] injury other than road crash,[78] and worse treatment outcome for trauma[79] and depression.[80] Therefore, concerns about increases in marijuana use and marijuana use disorder among middle-aged and older adults are warranted.

The findings of this study contrast with National Survey on Drug Use and Health (NSDUH) data suggesting that the prevalence of marijuana use increased only 12% from 2002 to 2012,[6] and that the prevalence of marijuana use disorders did not increase (1.6% in 2002[81] and 1.5% in 2012[70]). The explanation of these different findings is not clear. The AUDADIS reliability and validity are supported through extensive published testing.[41-50] The AUDADIS includes many more items on marijuana use disorders than the NSDUH instrument; thus, more thorough probing of substance disorder criteria may give AUDADIS better sensitivity than the NSDUH measure,[82] potentially enabling NESARC/NESARC-III to better detect increases in marijuana use disorder over time than NSDUH. The NESARC/NESARC-III findings are more consistent than NSDUH with other studies showing increases (eg, marked national increases of cannabis use disorders in US veterans [2002-2009],[54] a 62% increase in emergency department visits involving marijuana [2004-2011],[19] and a 3-fold increase in cannabis involvement in fatal car crashes [1999-2010]).[17] The consistency of the NESARC/NESARC-III findings with these other national increases supports the validity of the NESARC/NESARC-III findings. Further, NSDUH prevalence estimates before 2002 cannot be used in time trend analyses owing to changes in NSDUH methods, and no other sources of information are available on long-term time trends in the prevalence of past-year *DSM-IV* marijuana use disorder. Therefore, the combined information from the earlier 1991-1992 National Longitudinal Alcohol Epidemiologic Survey/NESARC comparison[28] with the present NESARC/NESARC-III comparison represents a unique resource for examining change in prevalence of marijuana use disorders from studies with similar methods and measures during a period spanning 20 years.

If the prevalence of marijuana users in the adult general population continues to increase, then the numbers of those with marijuana use disorders may increase as well. As is the case for addiction to other substances, most individuals with marijuana use disorders in the general population go untreated. Less is known about the efficacy of evidence-based behavioral treatments for marijuana use disorders than for other substances, although reviews suggest the efficacy of such treatments.[83,84] In addition, a review suggested the potential value for pharmacotherapy with preparations containing THC, although indicating that additional studies were needed given increasing demand.[85] Development of efficacious treatments and the methods to disseminate them into community health care settings are critically needed.

Study limitations were noted. NESARC/NESARC-III lacked biological testing for substances and excluded the literally homeless[86] and some institutionalized individuals, as do most large general population surveys. Also, AUDADIS-5 interviewers were not clinicians. However, AUDADIS *DSM-IV* marijuana use diagnoses are related to considerable disability and comorbidity.[22,87,88] Further, a NESARC-III substudy comparing AUDADIS and clinician diagnoses of 12-month marijuana disorder showed nearly identical prevalence and good concordance,[50] suggesting valid diagnostic assessment of a clinically meaningful condition. Additionally, the NESARC-III response rate was acceptable (60.1%) but lower than for NESARC. Weighting that compensated for nonresponse facilitated comparisons between the surveys. However, surveys with lower response rates may miss more substance abusers,[89] potentially leading to lower prevalence. If this happened in NESARC-III, then the NESARC/NESARC-III differences we found may actually underestimate the true differences. Additionally, employers of NESARC and NESARC-III interviewers differed (Census and Westat, respectively); whether having different employers of the interviewers affected participant responses is unknown. However, NESARC and NESARC-III were both presented to respondents as voluntary surveys conducted under the auspices of the US government, possibly mitigating this difference. Finally, this study did not examine changes in past-year frequency of use, specific *DSM-IV* abuse or dependence criteria, severity of disorder, other aspects of use, or risk factors. Future studies should address changes in these to determine whether they assist in explaining the results. The study also did not examine NESARC/NESARC-III differences by *DSM-5* severity levels. The *DSM-5* marijuana disorder criteria, published in 2013, were not known in 2001, and thus not all *DSM-5* criteria were included in the 2001-2002 NESARC.

The limitations of the study were counterbalanced by numerous strengths, including use of AUDADIS in both surveys, assessment of more than 79 000 participants, and the fact that this was a unique source of information on time trends during a period when laws and attitudes toward marijuana were changing rapidly. The study findings provide a context for investigation of how demographic, clinical, and other risk factors for marijuana use disorders may have changed over time.

Conclusions

In summary, while many in the United States think prohibition of recreational marijuana should be ended,[4] this study and others suggest caution and the need for public education about the potential harms in marijuana use, including the risk for addiction. As is the case with alcohol, many individuals can use marijuana without becoming addicted. However, the clear risk for marijuana use disorders among users (approximately 30%) suggests that as the number of US users grows, so will the number of those experiencing problems related to such use. This information is important to convey in a balanced manner to health care professionals, policy makers, and the public.

ARTICLE INFORMATION

Submitted for Publication: June 11, 2015; final revision received August 12, 2015; accepted August 14, 2015.

Published Online: October 21, 2015. doi:10.1001/jamapsychiatry.2015.1858.

Author Affiliations: Department of Psychiatry, College of Physicians and Surgeons, Columbia University, New York, New York (Hasin); Mailman School of Public Health, Columbia University, New York, New York (Hasin); New York State Psychiatric Institute, New York (Hasin); Laboratory of Epidemiology and Biometry, Division of Intramural Clinical and Biological Research, National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health, Rockville, Maryland (Saha, Goldstein, Chou, Zhang, Jung, Pickering, Ruan, Smith, Huang, Grant); Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, New York (Kerridge).

Author Contributions: Dr Grant had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. All authors played a role in agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work were appropriately investigated and resolved.
Study concept and design: Hasin, Kerridge, Pickering, Grant.
Acquisition, analysis, or interpretation of data: Hasin, Saha, Goldstein, Chou, Zhang, Jung, Pickering, Ruan, Smith, Huang, Grant.
Drafting of the manuscript: Hasin.
Critical revision of the manuscript for important intellectual content: All authors.
Statistical analysis: Hasin, Saha, Kerridge, Goldstein, Chou, Pickering, Ruan, Huang.
Obtained funding: Grant.
Administrative, technical, or material support: Hasin, Saha, Goldstein, Zhang, Jung, Ruan, Smith, Huang, Grant.
Study supervision: Grant.

Conflict of Interest Disclosures: None reported.

Funding/Support: The National Epidemiologic Survey on Alcohol and Related Conditions–III was sponsored by the National Institute on Alcohol Abuse and Alcoholism, with supplemental support from the National Institute on Drug Abuse. Support for this study was received from National Institute on Drug Abuse grant R01DA034244-01 and New York State Psychiatric Institute (Dr Hasin); National Institute on Drug Abuse grant F32DA0364431 (Dr Kerridge); and the intramural program, National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health.

Role of the Funder/Sponsor: The funders had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Disclaimer: The views and opinions expressed in this report are those of the authors and should not be construed to represent the views of any of the sponsoring organizations or agencies or the US government.

REFERENCES

1. Cerdá M, Wall M, Keyes KM, Galea S, Hasin D. Medical marijuana laws in 50 states: investigating the relationship between state legalization of

medical marijuana and marijuana use, abuse and dependence. *Drug Alcohol Depend*. 2012;120(1-3):22-27.

2. Wall MM, Poh E, Cerdá M, Keyes KM, Galea S, Hasin DS. Adolescent marijuana use from 2002 to 2008: higher in states with medical marijuana laws, cause still unclear. *Ann Epidemiol*. 2011;21(9):714-716.

3. Hasin DS, Wall M, Keyes KM, et al. Medical marijuana laws and adolescent marijuana use in the USA from 1991 to 2014: results from annual, repeated cross-sectional surveys. *Lancet Psychiatry*. 2015;2(7):601-608.

4. Saad L. Majority continues to support pot legalization in US. *Gallup*. http://www.gallup.com/poll/179195/majority-continues-support-pot-legalization.aspx. Published November 6, 2014. Accessed June 8, 2015.

5. Johnston LD, Miech RA, O'Malley PM, Bachman JG, Schulenberg JE. Use of alcohol, cigarettes, and number of illicit drugs declines among US teens. http://www.monitoringthefuture.org/data/14data.html#2014data-drugs. Published December 16, 2014. Accessed June 8, 2015.

6. Pacek LR, Mauro PM, Martins SS. Perceived risk of regular cannabis use in the United States from 2002 to 2012: differences by sex, age, and race/ethnicity. *Drug Alcohol Depend*. 2015;149:232-244.

7. Volkow ND, Baler RD, Compton WM, Weiss SR. Adverse health effects of marijuana use. *N Engl J Med*. 2014;370(23):2219-2227.

8. Hall W. The adverse health effects of cannabis use: what are they, and what are their implications for policy? *Int J Drug Policy*. 2009;20(6):458-466.

9. Meier MH, Caspi A, Ambler A, et al. Persistent cannabis users show neuropsychological decline from childhood to midlife. *Proc Natl Acad Sci U S A*. 2012;109(40):E2657-E2664.

10. Renard J, Krebs MO, Jay TM, Le Pen G. Long-term cognitive impairments induced by chronic cannabinoid exposure during adolescence in rats: a strain comparison. *Psychopharmacology (Berl)*. 2013;225(4):781-790.

11. O'Shea M, McGregor IS, Mallet PE. Repeated cannabinoid exposure during perinatal, adolescent or early adult ages produces similar longlasting deficits in object recognition and reduced social interaction in rats. *J Psychopharmacol*. 2006;20(5):611-621.

12. Lynskey M, Hall W. The effects of adolescent cannabis use on educational attainment: a review. *Addiction*. 2000;95(11):1621-1630.

13. Substance Abuse and Mental Health Services Administration. 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. http://www.samhsa.gov/data/sites/default/files/NSDUHresultsPDFWHTML2013/Web/NSDUHresults2013.pdf. 2014. Accessed April 15, 2015.

14. Compton WM, Gfroerer J, Conway KP, Finger MS. Unemployment and substance outcomes in the United States 2002-2010. *Drug Alcohol Depend*. 2014;142:350-353.

15. Lenné MG, Dietze PM, Triggs TJ, Walmsley S, Murphy B, Redman JR. The effects of cannabis and alcohol on simulated arterial driving: influences of driving experience and task demand. *Accid Anal Prev*. 2010;42(3):859-866.

16. Hartman RL, Huestis MA. Cannabis effects on driving skills. *Clin Chem*. 2013;59(3):478-492.

17. Brady JE, Li G. Trends in alcohol and other drugs detected in fatally injured drivers in the United States, 1999-2010. *Am J Epidemiol*. 2014;179(6):692-699.

18. Ramaekers JG, Berghaus G, van Laar M, Drummer OH. Dose related risk of motor vehicle crashes after cannabis use. *Drug Alcohol Depend*. 2004;73(2):109-119.

19. Substance Abuse and Mental Health Services Administration. *Drug Abuse Warning Network, 2011: National Estimates of Drug-Related Emergency Department Visits: HHS Publication No. (SMA) 13-4760: DAWN Series D-39*. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2013.

20. Davis GP, Compton MT, Wang S, Levin FR, Blanco C. Association between cannabis use, psychosis, and schizotypal personality disorder: findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *Schizophr Res*. 2013;151(1-3):197-202.

21. Di Forti M, Marconi A, Carra E, et al. Proportion of patients in south London with first-episode psychosis attributable to use of high potency cannabis: a case-control study. *Lancet Psychiatry*. 2015;2(3):233-238.

22. Lev-Ran S, Imtiaz S, Taylor BJ, Shield KD, Rehm J, Le Foll B. Gender differences in health-related quality of life among cannabis users: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Drug Alcohol Depend*. 2012;123(1-3):190-200.

23. Secades-Villa R, Garcia-Rodríguez O, Jin CJ, Wang S, Blanco C. Probability and predictors of the cannabis gateway effect: a national study. *Int J Drug Policy*. 2015;26(2):135-142.

24. Hasin DS, Keyes KM, Alderson D, Wang S, Aharonovich E, Grant BF. Cannabis withdrawal in the United States: results from NESARC. *J Clin Psychiatry*. 2008;69(9):1354-1363.

25. Budney AJ, Hughes JR, Moore BA, Vandrey R. Review of the validity and significance of cannabis withdrawal syndrome. *Am J Psychiatry*. 2004;161(11):1967-1977.

26. Haney M. The marijuana withdrawal syndrome: diagnosis and treatment. *Curr Psychiatry Rep*. 2005;7(5):360-366.

27. Stinson FS, Ruan WJ, Pickering R, Grant BF. Cannabis use disorders in the USA: prevalence, correlates and co-morbidity. *Psychol Med*. 2006;36(10):1447-1460.

28. Compton WM, Grant BF, Colliver JD, Glantz MD, Stinson FS. Prevalence of marijuana use disorders in the United States: 1991-1992 and 2001-2002. *JAMA*. 2004;291(17):2114-2121.

29. Grant BF, Harford TC, Dawson DA, et al. Prevalence of *DSM-IV* alcohol abuse and dependence: United States, 1992. *Alcohol Health Res World*. 1992;18:243-248.

30. Grant BF, Moore TC, Kaplan K. *Source and Accuracy Statement: Wave 1 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)*. Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism; 2003.

31. Grant BF, Stinson FS, Dawson DA, Chou SP, Ruan WJ, Pickering RP. Co-occurrence of 12-month alcohol and drug use disorders and personality disorders in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Arch Gen Psychiatry*. 2004;61(4):361-368.

32. Mehmedic Z, Chandra S, Slade D, et al. Potency trends of Δ9-THC and other cannabinoids in confiscated cannabis preparations from 1993 to 2008. *J Forensic Sci*. 2010;55(5):1209-1217.

33. ElSohly MA. *Potency Monitoring Program Quarterly Report Number 124: Reporting Period: 12/16/2013-03/15/2014*. Bethesda, MD: National Institute on Drug Abuse; 2014.

34. Grant BF, Amsbary M, Chu A, et al. *Source and Accuracy Statement: National Epidemiologic Survey on Alcohol and Related Conditions-III (NESARC-III)*. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism; 2014.

35. Grant BF, Goldstein RB, Saha TD, et al. Epidemiology of *DSM-5* alcohol use disorder: results from the National Epidemiologic Survey on Alcohol and Related Conditions III. *JAMA Psychiatry*. 2015;72(8):757-766.

36. Substance Abuse and Mental Health Services Administration. *Results from the 2012 National Survey on Drug Use and Health: Summary of National Findings, Appendix B: Statistical Methods and Measurement*. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2012.

37. Adams PF, Kirzinger WK, Martinez ME; National Center for Health Statistics. Summary health statistics for US adults: National Health Interview Survey. *Vital Health Stat 10*. 2012;(259):2013.

38. Bureau of the Census. *American Community Survey, 2012*. Suitland, MD: Bureau of the Census; 2013.

39. Grant BF, Goldstein RB, Chou SP, et al. *The Alcohol Use Disorder and Associated Disabilities Interview Schedule-Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition Version (AUDADIS-5)*. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism; 2011.

40. Hasin DS, O'Brien CP, Auriacombe M, et al. *DSM-5* criteria for substance use disorders: recommendations and rationale. *Am J Psychiatry*. 2013;170(8):834-851.

41. Canino G, Bravo M, Ramírez R, et al. The Spanish Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS): reliability and concordance with clinical diagnoses in a Hispanic population. *J Stud Alcohol*. 1999;60(6):790-799.

42. Chatterji S, Saunders JB, Vrasti R, Grant BF, Hasin D, Mager D. Reliability of the alcohol and drug modules of the Alcohol Use Disorder and Associated Disabilities Interview Schedule–Alcohol/Drug-Revised (AUDADIS-ADR): an international comparison. *Drug Alcohol Depend*. 1997;47(3):171-185.

43. Cottler LB, Grant BF, Blaine J, et al. Concordance of *DSM-IV* alcohol and drug use disorder criteria and diagnoses as measured by AUDADIS-ADR, CIDI and SCAN. *Drug Alcohol Depend*. 1997;47(3):195-205.

44. Grant BF, Harford TC, Dawson DA, Chou PS, Pickering RP. The Alcohol Use Disorder and Associated Disabilities Interview schedule (AUDADIS): reliability of alcohol and drug modules in a general population sample. *Drug Alcohol Depend*. 1995;39(1):37-44.

45. Hasin D, Carpenter KM, McCloud S, Smith M, Grant BF. The Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS): reliability of alcohol and drug modules in a clinical sample. *Drug Alcohol Depend*. 1997;44(2-3):133-141.

46. Nelson CB, Rehm J, Ustün TB, Grant B, Chatterji S. Factor structures for *DSM-IV* substance disorder criteria endorsed by alcohol, cannabis, cocaine and opiate users: results from the WHO reliability and validity study. *Addiction*. 1999;94(6):843-855.

47. Pull CB, Saunders JB, Mavreas V, et al. Concordance between *ICD-10* alcohol and drug use disorder criteria and diagnoses as measured by the AUDADIS-ADR, CIDI and SCAN: results of a cross-national study. *Drug Alcohol Depend*. 1997;47(3):207-216.

48. Vrasti R, Grant BF, Chatterji S, et al. Reliability of the Romanian version of the alcohol module of the WHO Alcohol Use Disorder and Associated Disabilities: Interview Schedule–Alcohol/Drug-Revised. *Eur Addict Res*. 1998;4(4):144-149.

49. Grant BF, Goldstein RB, Smith SM, et al. The Alcohol Use Disorder and Associated Disabilities Interview Schedule-5 (AUDADIS-5): reliability of substance use and psychiatric disorder modules in a general population sample. *Drug Alcohol Depend*. 2015;148:27-33.

50. Hasin DS, Greenstein E, Aivadyan C, et al. The Alcohol Use Disorder and Associated Disabilities Interview Schedule-5 (AUDADIS-5): procedural validity of substance use disorders modules through clinical re-appraisal in a general population sample. *Drug Alcohol Depend*. 2015;148:40-46.

51. Research Triangle Institute. *Release 11*. Vol 1 and 2. Research Triangle Park, NC: Research Triangle Institute; 2012. SUDAAN Language Manual.

52. van der Pol P, Liebregts N, Brunt T, et al. Cross-sectional and prospective relation of cannabis potency, dosing and smoking behaviour with cannabis dependence: an ecological study. *Addiction*. 2014;109(7):1101-1109.

53. Ramesh D, Haney M, Cooper ZD. Marijuana's dose-dependent effects in daily marijuana smokers. *Exp Clin Psychopharmacol*. 2013;21(4):287-293.

54. Bonn-Miller MO, Harris AH, Trafton JA. Prevalence of cannabis use disorder diagnoses among veterans in 2002, 2008, and 2009. *Psychol Serv*. 2012;9(4):404-416.

55. Keyes KM, Schulenberg JE, O'Malley PM, et al. The social norms of birth cohorts and adolescent marijuana use in the United States, 1976-2007. *Addiction*. 2011;106(10):1790-1800.

56. Mason WA, Hanson K, Fleming CB, Ringle JL, Haggerty KP. Washington State recreational marijuana legalization: parent and adolescent perceptions, knowledge, and discussions in a sample of low-income families. *Subst Use Misuse*. 2015;50(5):541-545.

57. Palamar JJ, Ompad DC, Petkova E. Correlates of intentions to use cannabis among US high school seniors in the case of cannabis legalization. *Int J Drug Policy*. 2014;25(3):424-435.

58. Pacula RL, Powell D, Heaton P, Sevigny EL. Assessing the effects of medical marijuana laws on marijuana use: the devil is in the details. *J Policy Anal Manage*. 2015;34(1):7-31.

59. Pacula RL, Hunt P, Boustead A. Words can be deceiving: a review of variation among legally effective medical marijuana laws in the United States. *J Drug Policy Anal*. 2014;7(1):1-19.

60. Fischer B, Kuganesan S, Room R. Medical Marijuana programs: implications for cannabis control policy: observations from Canada. *Int J Drug Policy*. 2015;26(1):15-19.

61. Kalant H. Cannabis control policy: no rational basis yet for legalization. *Clin Pharmacol Ther*. 2015;97(6):538-540.

62. Rehm J, Fischer B. Cannabis legalization with strict regulation, the overall superior policy option for public health. *Clin Pharmacol Ther*. 2015;97(6):541-544.

63. Lynne-Landsman SD, Livingston MD, Wagenaar AC. Effects of state medical marijuana laws on adolescent marijuana use. *Am J Public Health*. 2013;103(8):1500-1506.

64. Choo EK, Benz M, Zaller N, Warren O, Rising KL, McConnell KJ. The impact of state medical marijuana legislation on adolescent marijuana use. *J Adolesc Health*. 2014;55(2):160-166.

65. Anderson DM, Hansen B, Rees DI. Medical marijuana laws and teen marijuana use [published online April 24, 2015]. *Am Law Econ Rev*. doi:10.1093/aler/ahv002.

66. Wen H, Hockenberry JM, Cummings JR. The effect of medical marijuana laws on adolescent and adult use of marijuana, alcohol, and other substances. *J Health Econ*. 2015;42:64-80.

67. Pacula RL, Kilmer B, Wagenaar AC, Chaloupka FJ, Caulkins JP. Developing public health regulations for marijuana: lessons from alcohol and tobacco. *Am J Public Health*. 2014;104(6):1021-1028.

68. Centers for Disease Control and Prevention. Youth risk behavior surveillance—United States 2011: surveillance summaries. *MMWR*. 2012;61(SS-4).

69. Johnston LD, O'Malley PM, Bachman JG, Schulenberg JE. *Monitoring the Future National Results on Adolescent Drug Use: Overview of the Key Findings, 2012*. Ann Arbor: Institute for Social Research, The University of Michigan; 2013.

70. Substance Abuse and Mental Health Services Administration. *Results from the 2012 National Survey on Drug Use and Health: Summary of National Findings*. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2013.

71. Kochhar R, Fry R, Taylor P. Wealth gaps rise to record highs between whites, blacks, Hispanics: twenty-to-one. Pew Research Center. http://www.pewsocialtrends.org/2011/07/26/wealth-gaps-rise-to-record-highs-between-whites-blacks-hispanics/. July 26, 2011. Accessed June 8, 2015.

72. Kochhar R, Fry R. Wealth inequality has widened along racial, ethnic lines since end of Great Recession. Pew Research Center. http://www.pewresearch.org/fact-tank/2014/12/12/racial-wealth-gaps-great-recession/. Published December 12, 2014. Accessed June 8, 2015.

73. Lindenberg CS, Gendrop SC, Reiskin HK. Empirical evidence for the social stress model of substance abuse. *Res Nurs Health*. 1993;16(5):351-362.

74. Rhodes JE, Jason LA. A social stress model of substance abuse. *J Consult Clin Psychol*. 1990;58(4):395-401.

75. Reboussin BA, Green KM, Milam AJ, Furr-Holden CD, Ialongo NS. Neighborhood environment and urban African American marijuana use during high school. *J Urban Health*. 2014;91(6):1189-1201.

76. Sinclair CF, Foushee HR, Scarinci I, Carroll WR. Perceptions of harm to health from cigarettes, blunts, and marijuana among young adult African American men. *J Health Care Poor Underserved*. 2013;24(3):1266-1275.

77. Choi NG, DiNitto DM, Marti CN. Risk factors for self-reported driving under the influence of alcohol and/or illicit drugs among older adults [published online July 25, 2014]. *Gerontologist*. doi:10.1093/geront/gnu070.

78. Barrio G, Jiménez-Mejías E, Pulido J, Lardelli-Claret P, Bravo MJ, de la Fuente L. Association between cannabis use and non-traffic injuries. *Accid Anal Prev*. 2012;47:172-176.

79. Lank PM, Crandall ML. Outcomes for older trauma patients in the emergency department screening positive for alcohol, cocaine, or marijuana use. *Am J Drug Alcohol Abuse*. 2014;40(2):118-124.

80. Satre DD, Sterling SA, Mackin RS, Weisner C. Patterns of alcohol and drug use among depressed older adults seeking outpatient psychiatric services. *Am J Geriatr Psychiatry*. 2011;19(8):695-703.

81. Substance Abuse and Mental Health Services Administration. *Results from the 2002 National Survey on Drug Use and Health: National Findings*. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2003.

82. Grucza RA, Abbacchi AM, Przybeck TR, Gfroerer JC. Discrepancies in estimates of prevalence and correlates of substance use and disorders between two national surveys. *Addiction*. 2007;102(4):623-629.

83. Dutra L, Stathopoulou G, Basden SL, Leyro TM, Powers MB, Otto MW. A meta-analytic review of psychosocial interventions for substance use disorders. *Am J Psychiatry*. 2008;165(2):179-187.

84. Danovitch I, Gorelick DA. State of the art treatments for cannabis dependence. *Psychiatr Clin North Am*. 2012;35(2):309-326.

85. Marshall K, Gowing L, Ali R, Le Foll B. Pharmacotherapies for cannabis dependence. *Cochrane Database Syst Rev*. 2014;12:CD008940.

86. Link BG, Susser E, Stueve A, Phelan J, Moore RE, Struening E. Lifetime and five-year prevalence of homelessness in the United States. *Am J Public Health*. 1994;84(12):1907-1912.

87. Rubio JM, Olfson M, Villegas L, Pérez-Fuentes G, Wang S, Blanco C. Quality of life following remission of mental disorders: findings from the National Epidemiologic Survey on Alcohol and Related Conditions. *J Clin Psychiatry*. 2013;74(5):e445-e450.

88. Conway KP, Compton W, Stinson FS, Grant BF. Lifetime comorbidity of DSM-IV mood and anxiety disorders and specific drug use disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *J Clin Psychiatry*. 2006;67(2):247-257.

89. Zhao J, Stockwell T, Macdonald S. Non-response bias in alcohol and drug population surveys. *Drug Alcohol Rev*. 2009;28(6):648-657.