



Published in final edited form as:

*Addict Behav.* 2019 December ; 99: 106029. doi:10.1016/j.addbeh.2019.106029.

## Trends in cannabis use among immigrants in the United States, 2002–2017: Evidence from two national surveys<sup>★</sup>

Christopher P. Salas-Wright<sup>a,b,\*</sup>, Rachel John<sup>a</sup>, Michael G. Vaughn<sup>c,d</sup>, Rob Eschmann<sup>a</sup>, Mariana Cohen<sup>a</sup>, Millan AbiNader<sup>a</sup>, Jorge Delva<sup>a</sup>

<sup>a</sup>School of Social Work, Boston University, Boston, MA, 02215, United States

<sup>b</sup>Department of Public Health Sciences, Division of Prevention Science & Community Health, University of Miami, Miami, Florida, United States

<sup>c</sup>School of Social Work, College for Public Health and Social Justice, Saint Louis University, St Louis, MO 63103, United States

<sup>d</sup>Graduate School of Social Welfare, Yonsei University, Seoul, Republic of Korea

### Abstract

**Background and aims:** Findings from recent studies suggest that, among the general population of adults, the prevalence of cannabis use has increased over the last decade in the United States (US). And yet, there is much we do not know regarding the trends in cannabis use *among immigrants*. We address this important shortcoming by examining data on immigrants vis-à-vis US-born individuals using two national surveys.

**Methods:** We examine trend data from the National Epidemiologic Study on Alcohol and Related Conditions (NESARC, 2001–2013) and the National Survey on Drug Use and Health's Restricted Data Analysis System (NSDUH, 2002–2017). Main outcomes were past year cannabis use and cannabis use disorder with survey adjusted prevalence estimates generated for immigrants and US-born individuals.

**Results:** In the NESARC, significant increases in the past year prevalence of cannabis use were observed both among US-born (2001–2002: 4.53%, 2012–2013: 10.74%) and immigrant participants (2001–2002: 1.67%, 2012–2013: 3.32%). We also found significant increases among immigrants arriving before age 12 and among immigrants from Latin America and Europe. In the NSDUH, we observed a significantly higher prevalence of cannabis use in 2016–2017 (6.3%) when compared to 2002–2003 (4.4%).

**Conclusions:** Findings make clear that cannabis use among US-born individuals has consistently been higher than that of immigrants since the early 2000s. However, while rates of cannabis use have declined among US-born adolescents in recent years, the prevalence of cannabis

\*Corresponding author at: School of Social Work, Boston University, 264 Bay State Road, Boston, MA 02215, United States, cpsw@bu.edu (C.P. Salas-Wright).

<sup>★</sup>Author Note: Research reported in this publication was supported by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) of the National Institutes of Health (NIH) under Award Number K01AA026645. The content is solely the responsibility of the authors and does not necessarily represent the official views of NIAAA or the NIH.

Declarations of Competing Interest

The authors have no conflicts to disclose.

use has remained stable among immigrant adolescents. At the same time, cannabis use increased two-fold among both US-born and immigrant adults.

## Keywords

Cannabis; Marijuana; Immigrants; Immigration; Trends; United States; Adolescents

---

## 1. Introduction

We are in the midst of an historic shift in cannabis-related public opinion and policy in the United States (US). Data from the General Social Survey show that, in 1990, only 16% of American adults believed the use of cannabis should be made legal; however, by 2000, the prevalence of the adult population endorsing legalization had nearly doubled to 31% (Hartig & Geiger, 2018). As shown by the results of a recent Gallup poll, this trend has only continued with two in three Americans (66%) supporting legalization of cannabis use in 2018 (McCarthy, 2018). Recent years have also seen many US states enact measures to decriminalize cannabis use and the possession of small amounts of the drug, approve the medical use of cannabis for specific conditions, and legalize cannabis for nonmedical or recreational purposes (Drug Policy Alliance, 2019). Concomitantly, findings from a number of national studies suggest that, among the general population of adults, the prevalence of cannabis use has increased over the last decade in the US (Compton, Han, Jones, Blanco, & Hughes, 2016; Hasin & Grant, 2015; Salas-Wright et al., 2017).

Despite compelling evidence on cannabis use trends in the general population, there is much that we do not understand regarding the secular trends in cannabis use *among immigrants*. This is noteworthy as findings from a bevy of national studies indicate that immigrants are far less likely than US-born individuals to be drug (including cannabis) or alcohol users, to have a substance use disorder, and to take part in risky behaviors under the influence of psychoactive substances (Alegría et al., 2008; Almeida, Johnson, Matsumoto, & Godette, 2012; Salas-Wright, Vaughn, Clark, Terzis, & Córdova, 2014; Salas-Wright, Vaughn, Goings, Miller, et al., 2018). This research is consistent with a burgeoning body of literature suggesting that, beyond substance use, immigrants are substantially less likely to take part in an array of risky and criminal behaviors (Ewing, Martínez, & Rumbaut, 2015; Vaughn, Salas-Wright, DeLisi, & Maynard, 2014).

At present, our understanding of the trends in cannabis use among immigrants vis-à-vis US-born individuals remains quite limited. Prior studies have examined trends in cannabis use among the general population (see Salas-Wright et al., 2017; Salas-Wright & Vaughn, 2016), but we are aware of no studies that have examined trends among immigrants. This is remarkable as the US is home to > 40 million immigrants such that nearly one in every eight individuals in the US was born in another country (Geiger, 2019). As such, the aim of this study is to examine the temporal trends in cannabis use among immigrants vis-à-vis US-born individuals using data from two large national studies in the US: the NESARC (2001 – 2013) and the NSDUH (2002–2016), and in so doing increase the convergent validity of our findings. We pay particular attention to the analysis of differences between key sociodemographic subgroups (e.g., age, gender). Additionally, among immigrants, we will

assess trends among those who immigrated as children versus later in their development, and examine trends in use by region of origin to assess the stability of trends across major world regions.

The scientific premise for this study is that, despite prior research suggesting lower rates of cannabis use among immigrants, we do not have a solid understanding of rates of cannabis use among immigrants over time. Such an analysis is critical given the rapidly changing cannabis use landscape and the possibility that rates of cannabis use among immigrants may increase as it becomes easier to access and use without risk of contact with the criminal justice system.

## 2. Method

### 2.1. NESARC waves I and III

**2.1.1. Data and sample—**We examine data from two nationally representative NESARC surveys, the NESARC Wave I (collected in 2001–2002,  $N = 43,093$ ) and NESARC-III (collected in 2012–2013,  $N = 36,309$ ) (Grant et al., 2014; Hasin & Grant, 2015). The NESARC Wave I and NESARC-III are independent samples, such that individuals interviewed as part of the earlier study were not eligible to participate in the latter. The NESARC surveys utilize a multistage cluster sampling design to interview civilian, non-institutionalized adults ages 18 and older living in all 50 states and the District of Columbia. In both surveys, data were collected through face-to-face structured psychiatric interviews in which interviewers administered the National Institute on Alcohol Abuse and Alcoholism (NIAAA) Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS) (Hasin et al., 2015). Participants had the option of completing the NESARC interviews in English, Spanish, Korean, Vietnamese, Mandarin, or Cantonese (NIAAA, 2019). Detailed information on the demographic characteristics of immigrants in the NESARC surveys is available elsewhere (see Salas-Wright et al., 2014).

#### 2.1.2. Measures

**2.1.2.1. Cannabis use.:** Participants were asked about past year (no, yes) use of marijuana or products including tetrahydrocannabinol (THC) such as “weed, pot, dope, hashish, Mary Jane, joints, or blunts.” We also examined cannabis use disorder in supplemental analyses. The NESARC surveys assess cannabis use disorder (meets criteria, does not meet criteria) on the basis of DSM criteria using the AUDADIS.

**2.1.2.2. Immigrant status.:** Immigrant status was based on the following question: “Were you born in the US?” Consistent with prior research (see Salas-Wright, Vaughn, Goings, Córdova, & Schwartz, 2018), those responding affirmatively were classified as US-born and those reporting they were not born in the US—including individuals born in US territories—were classified as immigrants or foreign born. Immigrants were asked to report their age of arrival which, in turn, allowed researchers to create arrival subgroups (under age 12, age 12 or older). We also categorized foreign born individuals by major world region, including Africa, Asia, Europe, and Latin America.

**2.1.2.3. Sociodemographic factors.:** Sociodemographic variables included age, gender, education level, marital status, household income, and region of the US (see Table 1 for specific categories).

## 2.2. NSDUH restricted-use data analysis system (RDAS)

**2.2.1. Data and sample—**We also examine data from the Substance Abuse & Mental Health Data Archive’s Restricted-Use Data Analysis System (RDAS) which allows users to conduct crosstab analyses on NSDUH public and restricted data collected between 2002 and 2017. The RDAS was utilized because information on foreign versus US birth is not available in the public NSDUH data files. The RDAS utilizes multistage area probability sampling methods to select a representative sample of the US civilian, non-institutionalized population, ages 12 years or older. Data were available for all years between 2002 and 2017 in two-year blocks. However, information on US/foreign born status was not available in 2014. As such, we excluded data from the 2014–2015 block and examine data from 2015 to 2016 and 2016 to 2017 blocks, which we averaged to create mean values for 2015–2017 as displayed in figures. While the RDAS does not provide a specific total or year-by-year sample size, it is based on NSDUH data which includes an annual sample of roughly 60,000–70,000 participants annually. A more detailed description of the NSDUH and RDAS (see <https://rdas.samhsa.gov/>) design and procedures is available elsewhere. Details on the demographic characteristics of immigrants in the NSDUH are provided in the results section.

### 2.2.2. Measures

**2.2.2.1. Cannabis use.:** Participants were asked if they smoked or consumed “marijuana or hashish” within the previous 12 months (no, yes). The NSDUH also provides information of cannabis use disorder (either abuse or dependence) based on DSM-IV diagnostic criteria (American Psychiatric Association, 1994).

**2.2.2.2. Immigrant status.:** Consistent with the NESARC, immigrant status was based on the following question: “Were you born in the US?” Those responding affirmatively were coded as US-born and those responding “no” were classified as immigrants. It should be noted that two different modes of administration were used for the immigrant status question: interviewer-asked (2002–2014) and self-administered via a computer (2015–2017).

**2.2.2.3. Sociodemographic factors.:** Sociodemographic variables included age and gender. The RDAS system will suppress results of analyses if it is deemed that a participant’s identity may be potentially revealed as a result of the granularity of results. It is challenging to examine a wide variety of demographic subgroups among immigrants given the relatively small number of foreign born individuals in the sample and the relatively low prevalence of cannabis use.

## 2.3. Statistical analyses for NESARC and NSDUH

Data analysis differed for the NESARC and NSDUH. For the NESARC, we used weighted cross tabulations to estimate the prevalence of cannabis use among immigrants and US-born individuals for each of the NESARC waves (see Table 1). We also generated prevalence

estimates for immigrants only based on age of arrival and region of origin (see Table 2). Consistent with prior research, we tested for differences in the prevalence of cannabis use between the NESARC Wave I and NESARC-III using independent samples *t*-tests (Dawson, Goldstein, Saha, & Grant, 2015; Hasin et al., 2015). For all statistical analyses, weighted prevalence estimates and standard errors were computed separately for each survey using Stata 15.1 software.

For the NSDUH data, we used the RDAS online system to generate prevalence estimates for cannabis use among US-born and foreign born respondents in general (see Table 3) as well as by age group (see Fig. 1) and by age and gender (see Fig. 2). The RDAS online data analytic software—the only software that can be used for RDAS analyses—produces results for contingency table analyses and allows for sample stratification, but does not allow for regression-based or multivariate approaches. Although we were not able to conduct formal statistical tests of trend, we note instances in which the prevalence of cannabis use is distinct from that of 2002–2003 data based on non-overlapping 95% confidence intervals. The examination of confidence interval overlap is a frequent, albeit conservative, approach for examining the differences in the magnitude of effects across categorical variables in large epidemiologic data files (Cumming & Finch, 2005; Knol, Pestman, & Grobbee, 2011). All NSDUH prevalence estimates and confidence intervals were weighted for the complex sampling design using the RDAS system.

### 3. Results

#### 3.1. NESARC: trends in prevalence from 2001 to 2013

As shown in Table 1, significant increases in prevalence—representing a two-fold or greater change—were observed both among US-born (2001–2002: 4.53%, 2012–2013: 10.74%) and immigrant participants (2001–2002: 1.67%, 2012–2013: 3.32%). Among US-born participants, significant trend increases were observed for all demographic subgroups across age, gender, education, marital status, household income, and region of the US. Particularly large proportional increases were observed for US-born individuals ages 50 and older with a more than six fold increase observed between 2001 and 2002 (0.60%) and 2012–2013 (4.28%). The largest percentage point increases were observed among young adults ages 18–25, participants who were never married, and participants in households earning less than \$20,000 per year as all increased by > 11 percentage points.

Among immigrants, significant increases were observed for nearly all demographic subgroups, with the exception of immigrants residing in households earning more than \$35,000 per year and immigrants residing in the Southern US. The largest proportional increases were observed among female immigrants (a 239% increase), those residing in low income households (also a 239% increase), and those residing in the Midwestern US (a 576% increase). The largest percentage point change was observed for immigrants between the ages of 18 and 25 with the rate increasing by > 8 percentage points (from 4.8% in 2001–2002 to 12.9% in 2012–2013). The prevalence of cannabis use did not change significantly between 2001 and 2013 among immigrants arriving after childhood (i.e. age 12 or older) or among immigrants from Africa and Asia.

With respect to cannabis use disorder, in 2001–2002 the rate was 0.60% (95% CI = 0.5–0.7) among immigrants and 1.60% (95% CI = 1.5–1.7) among US-born individuals. As of 2012–2013, the rate had not changed among immigrants (0.86%, 95% CI = 0.6–1.2), but a marginally significant ( $t = 1.87$ ,  $p = .062$ ) increase was observed among US-born adults (2.86%, 95% CI = 2.62–3.13).

### 3.2. NSDUH: trends in prevalence from 2002 to 2017

**3.2.1. Demographic factors**—In the NSDUH, 16% of study participants reported foreign birth. With respect to demographic characteristics, several differences can be noted. In terms of age, roughly half of the immigrant sample was comprised of adults ages 26 to 49 (49.1% as compared to 34.5% of US-born). Compared to US-born individuals, a smaller proportion of the immigrant sample was comprised of adolescents (ages 12–17: 4% versus 10%), young adults (ages 18–25: 10% versus 13%), and middle age or older adults (age 50+: 38% versus 42%). A larger proportion of immigrants were without a high school education (24% versus 9% for US-born), but a larger proportion of immigrants were college graduates (33% versus 28%). A greater proportion of US-born individuals (39%) resided in households earning \$75,000 or more per years as compared to immigrants (33%). A greater proportion of immigrants resided in the Western US (34% versus 22% for US-born) and in the Northeast (22% versus 17%), and a smaller proportion resided in the South (34% versus 38%) and Midwest (10% versus 23%). The US-born and immigrant samples had similar gender distributions (both were 48% male).

**3.2.2. Cannabis use trends**—Data from the NSDUH show that the prevalence of past year cannabis use among US-born and foreign-born individuals increased from 2002 to 2017. As shown in Table 3, among US-born individuals, the confidence intervals for the prevalence estimate for past year use ceased to overlap with the 2002–2003 estimate (11.8%, 95% CI = 11.5–12.1) beginning in 2010–2011 as rates increased steadily to reach their pinnacle in 2016–2017 (17.4%, 95% CI = 16.9–17.9). Among immigrants, we see also significant differences from the 2002–2003 rate, but only beginning in the most recent surveys (2015–2016: 5.4%, 95% CI = 5.0–5.9; 2016–2017: 6.3%, 95% CI = 5.8–6.8). Table 1 also shows that the rate of cannabis use disorder did not change significantly among US-born or foreign born participants.

Beyond the full sample of US residents ages 12 and older, we also examined trends among adolescents and adults. As shown in Fig. 1, among adolescents ages 12–17, we see that the prevalence of cannabis use declined from a peak of 16.0% in 2002–2003 to a low of 12.6% in 2015–2017. During the same time period, the prevalence of cannabis use consistently remained lower among immigrants than among US-born youth, but did not significantly change. As shown in Fig. 2, the same basic pattern was observed among both male and female adolescents.

Fig. 1 also shows that the prevalence of cannabis use increased among some groups of adults, but not among all. More specifically, we observed significant increases—beginning in 2010–2011 and continuing through to 2015–2017—among young adults ages 18–25.



Rates were consistently between 11% and 12% among young adult immigrants between 2002 and 2007 before steadily climbing to a high of 18.7% in 2015–2017.

## 4. Discussion

### 4.1. Lower rates of cannabis use among immigrants

Drawing from two large, nationally representative samples, findings from the present study provide compelling evidence that immigrants use cannabis at far lower rates than individuals born in the US. Indeed, we see in the NSDUH that the prevalence of past-year cannabis use among immigrant youth ages 12–17 was 7.8% versus 12.6% among US-born youth in 2015–2017. We see even more marked differences among adults ages 18 and older in both the NESARC (Immigrants: 3.2%, US-born: 10.7% in 2012–2013) and NSDUH (Immigrants: 5.7%, US-born: 16.5% in 2016–2017).

Scholars have advanced several hypotheses related to this pattern of findings (see Alarcón et al., 2016, Alegría, Álvarez, & DiMarzio, 2017). For one, it has been argued that *self-selection* may be an important factor as it is reasonable to surmise that those who immigrate are, in fact, uniquely healthy and resilient individuals (Kennedy, McDonald, & Biddle, 2006). It may be that those who migrate are also less inclined than non-migrants—in their home and receiving countries—to misuse psychoactive drugs and take part in other unhealthy activities. Second, it has also been noted that *deterrence* may be an important factor. As foreigners who may be involved in the immigration process, there is a strong incentive to avoid criminal behaviors, including illicit drug use, that may compromise their ability to stay in the US. Also, scholars have noted that *cultural stress* and *acculturation* may be important factors that could contribute to increased drug use risk as immigrants are exposed to discrimination (Salas-Wright & Schwartz, 2019) and adopt US customs and practices (Blanco et al., 2013).

### 4.2. Trends in cannabis use among immigrants and US-born populations

Beyond the most up-to-date prevalence estimates, we also report important findings related to trends in the prevalence of cannabis use. Among adolescents, we see that cannabis use among immigrant youth remained relatively flat between 2002 and 2017; however, during the same period, modest but noteworthy declines in cannabis use were observed among US-born male and female youth. Prior research has shown that rates of cannabis use and risky behavior among youth in general have been on a downward trajectory since the early 2000's (Goings et al., 2019; Salas-Wright & Vaughn, 2016; Vaughn et al., 2018). And yet, it seems that this broader trend may not extend to foreign born youth. That said, it is possible that rates among immigrant youth may have reached a “floor” (very low rates since the early 2000s) such that further declines are less of a possibility than among US-born youth (who have higher overall rates).

A distinct pattern was observed among foreign and US-born adults. In general, both national surveys suggest that important increases in the prevalence of cannabis use have taken place since the early 2000s. This is entirely consistent with prior research on trends in cannabis use among the general population of adults in the US (see Compton et al., 2016; Hasin &

Grant, 2015), but novel in that it provides new evidence on trends *among immigrant adults*. Several points in particular stand out. First, we see particularly marked increases in use among immigrant young adults ages 18 to 25 in both data sources. Second, we observed large increases among both immigrant and US-born adults ages 50 and older. In the NSDUH, the proportional increase was roughly 275% among both immigrant and US-born adults between 2002 and 2017. In the NESARC, proportional increases were smaller among immigrants (roughly 150%) and very large among US-born adults (> 600%). While it is difficult to determine precisely why rates are increasing among immigrant adults, it is plausible that such increases are similar to those of US-born adults who have begun to use cannabis at higher rates as the drug becomes easier to obtain via legal purchase and the stigma of use decreases (Volkow, Baler, Compton, & Weiss, 2014).

We also examined trends in cannabis use among immigrants by region of origin. This revealed that, while no increases could be observed among immigrants from Africa or Asia, the prevalence of past year cannabis use did increase significantly among immigrants from Latin America and Europe. The identification of European immigrants as demonstrating elevated risk for cannabis use is consistent with prior research on substance use disorders (Salas-Wright, Vaughn, Goings, Córdova, and Schwartz, 2018). Notably, it is also in keeping with research focused on other impulse-related and health-risk behaviors such as crime (Vaughn et al., 2014), gambling (Wilson, Salas-Wright, Vaughn, & Maynard, 2015), and even recurrent overeating (Salas-Wright et al., 2019).

### 4.3. Study limitations

Findings from the present study should be interpreted in light of several limitations. First, all data were derived from respondent self-report. It is possible that secular trends may be influenced by changes in willingness to report cannabis use. Notably, different methodologies were used for data collection (the NESARC uses a psychiatric interview, the NSDUH uses computer assisted self-interviewing) and scholars have debated potential bias related to social desirability regarding the reporting of cannabis use (see Hasin & Grant, 2016 and reply from Grucza and colleagues). Second, the NSDUH does not make available information on immigration status via its public data file. As such, we utilized the RDAS system which, although clearly beneficial, is limited as it does not allow for multivariate regression analyses and the use of other advanced statistical techniques. Similarly, it is not possible to merge the NESARC surveys to conduct multivariate tests of trend and produce adjusted odds ratios. As such, consistent with prior R-DAS and NESARC trend studies (Hasin, Saha, et al., 2015; Salas-Wright, Vaughn, Schwartz, & Córdova, 2016), we used alternative methods (*t*-tests, examination of confidence intervals) to assess the degree to which point estimates changed over time.

## 5. Conclusions

Findings from two of the nation's premier drug use surveillance surveys make clear that cannabis use among US-born individuals has consistently been higher than that of immigrants in the US since the early 2000s. However, we also see that, while rates of cannabis use have declined slightly among US-born adolescents in recent years, the



prevalence of cannabis use has remained stable among their immigrant counterparts. We also found that rates of cannabis use among individuals who immigrated during childhood have increased markedly to the point that they were comparable to those of US-born individuals in 2012–2013. Among immigrant adults, we see particularly noteworthy increases in the prevalence of cannabis use among young adults ages 18 to 25 and among middle-aged/older adults ages 50 and older. In all, these findings provide new evidence on the trends in cannabis use among immigrants in the US and make clear that, while still lower than that of US-born individuals, the upward trend in cannabis use among immigrants should by no means escape our attention. Future research should examine the specific factors related to increased cannabis use risk among immigrants to inform the design of evidence-based interventions.

## References

- Alarcón RD, Parekh A, Wainberg ML, Duarte CS, Araya R, & Oquendo MA (2016). Hispanic immigrants in the USA: Social and mental health perspectives. *The Lancet Psychiatry*, 3(9), 860–870. [PubMed: 27568273]
- Alegría M, Álvarez K, & DiMarzio K (2017). Immigration and mental health. *Current Epidemiology Reports*, 4(2), 145–155. [PubMed: 29805955]
- Alegría M, Canino G, Shrout PE, Woo M, Duan N, Vila D, ... Meng XL (2008). Prevalence of mental illness in immigrant and non-immigrant US Latino groups. *American Journal of Psychiatry*, 165(3), 359–369. [PubMed: 18245178]
- Almeida J, Johnson RM, Matsumoto A, & Godette DC (2012). Substance use, generation and time in the United States: The modifying role of gender for immigrant urban adolescents. *Social Science & Medicine*, 75(12), 2069–2075. [PubMed: 22727651]
- American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: American Psychiatric Association.
- Blanco C, Morcillo C, Alegría M, Dedios MC, Fernández-Navarro P, Regincos R, & Wang S (2013). Acculturation and drug use disorders among Hispanics in the US. *Journal of Psychiatric Research*, 47(2), 226–232. [PubMed: 23128062]
- Compton WM, Han B, Jones CM, Blanco C, & Hughes A (2016). The use and use disorders in adults in the USA, 2002–14: Analysis of annual cross-sectional surveys. *The Lancet Psychiatry*, 3(10), 954–964. [PubMed: 27592339]
- Cumming G, & Finch S (2005). Inference by eye: Confidence intervals and how to read pictures of data. *American Psychologist*, 60(2), 170–180. [PubMed: 15740449]
- Dawson DA, Goldstein RB, Saha TD, & Grant BF (2015). Changes in alcohol consumption: United States, 2001–2002 to 2012–2013. *Drug and Alcohol Dependence*, 148, 56–61. [PubMed: 25620731]
- Drug Policy Alliance (2019). Marijuana legalization and regulation. Retrieved from: <http://www.drugpolicy.org/issues/marijuana-legalization-and-regulation>.
- Ewing WA, Martínez DE, & Rumbaut RG (2015). *The criminalization of immigration in the United States*. Washington, DC: American Immigration Council.
- Geiger A (2019). In June (Ed.). Key findings about US immigrants. Retrieved from: <https://www.pewresearch.org/fact-tank/2019/06/03/key-findings-about-u-s-immigrants/>.
- Goings TT, Salas-Wright CP, Belgrave F, Nelson E, Harezlak J, & Vaughn MG (2019). Trends in binge drinking and alcohol abstinence among adolescents in the US, 2002–2016. *Drug and Alcohol Dependence*, 200, 115–123. [PubMed: 31121494]
- Grant BF, Amsbary M, Chu A, Sigman R, Kali J, Sugawana Y, ... Chou PS. (2014). *Source and accuracy statement: National epidemiologic survey on alcohol and related conditions-III (NESARC-III)*. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism.

- Hartig H, & Geiger A (10, 2018). About six-in-ten Americans support marijuana legalization. Retrieved from: <http://www.pewresearch.org/fact-tank/2018/10/08/americans-support-marijuana-legalization/>.
- Hasin DS, & Grant B (2016). NESARC findings on increased prevalence of marijuana use disorders—Consistent with other sources of information. *JAMA Psychiatry*, 73(5), 532.
- Hasin DS, & Grant BF (2015). The National Epidemiologic Survey on alcohol and related conditions (NESARC) waves 1 and 2: Review and summary of findings. *Social Psychiatry and Psychiatric Epidemiology*, 50(11), 1609–1640. [PubMed: 26210739]
- Hasin DS, Greenstein E, Aivadyan C, Stohl M, Aharonovich E, Saha T, ... Grant BF. (2015). 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 and Alcohol Dependence*, 148, 40–46. [PubMed: 25604321]
- Hasin DS, Saha TD, Kerridge BT, Goldstein RB, Chou SP, Zhang H, ... Huang B. (2015). Prevalence of marijuana use disorders in the United States between 2001–2002 and 2012–2013. *JAMA Psychiatry*, 72(12), 1235–1242. [PubMed: 26502112]
- Kennedy S, McDonald JT, & Biddle N (2006). The healthy immigrant effect and immigrant selection: Evidence from four countries *Social and Economic Dimensions of an Aging Population Research Papers* (pp. 164). McMaster University.
- Knol MJ, Pestman WR, & Grobbee DE (2011). The (mis) use of overlap of confidence intervals to assess effect modification. *European Journal of Epidemiology*, 26(4), 253–254. [PubMed: 21424218]
- McCarthy J (2018). October. Two in three Americans now support legalizing marijuana. Retrieved from: <https://news.gallup.com/poll/243908/two-three-americans-support-legalizing-marijuana.aspx>.
- NIAAA. National Epidemiologic Survey on alcohol and related conditions-III (NESARC-III). (2019). Retrieved from: <https://www.niaaa.nih.gov/research/nesarc-iii> (n.d.).
- Salas-Wright CP, & Schwartz SJ (2019). The study and prevention of alcohol and other drug misuse among migrants: Toward a transnational theory of cultural stress. *International Journal of Mental Health and Addiction*, 10.1007/s11469-018-0023-5. Advance online publication
- Salas-Wright CP, & Vaughn MG (2016). The changing landscape of adolescent marijuana use risk. *Journal of Adolescent Health*, 59(3), 246–247. [PubMed: 27562365]
- Salas-Wright CP, Vaughn MG, Clark TT, Terzis LD, & Córdova D (2014). Substance use disorders among first-and second-generation immigrant adults in the United States: Evidence of an immigrant paradox? *Journal of Studies on Alcohol and Drugs*, 75(6), 958–967. [PubMed: 25343653]
- Salas-Wright CP, Vaughn MG, Cummings-Vaughn LA, Holzer KJ, Nelson EJ, AbiNader M, & Oh S (2017). Trends and correlates of marijuana use among late middle-aged and older adults in the United States, 2002–2014. *Drug and Alcohol Dependence*, 171, 97–106. [PubMed: 28063338]
- Salas-Wright CP, Vaughn MG, Goings TC, Córdova D, & Schwartz SJ (2018). Substance use disorders among immigrants in the United States: A research update. *Addictive Behaviors*, 76, 169–173. [PubMed: 28843730]
- Salas-Wright CP, Vaughn MG, Goings TC, Miller DP, Chang J, & Schwartz SJ (2018). Alcohol-related problem behavior among Latino immigrants in the US: Evidence from a national sample. *Addictive Behaviors*, 87, 206–213. [PubMed: 30055450]
- Salas-Wright CP, Vaughn MG, Miller DP, Hahm HC, Scaramutti C, Cohen M, ... Schwartz SJ (2019). Overeating and binge eating among immigrants in the United States: New terrain for the healthy immigrant hypothesis. *Social Psychiatry and Psychiatric Epidemiology* 10.1007/s00127-019-01677-y Advance online publication.
- Salas-Wright CP, Vaughn MG, Schwartz SJ, & Córdova D (2016). An “immigrant paradox” for adolescent externalizing behavior? Evidence from a national sample. *Social Psychiatry and Psychiatric Epidemiology*, 52(1), 27–37. [PubMed: 27815623]
- Vaughn MG, Nelson EJ, Oh S, Salas-Wright CP, DeLisi M, & Holzer K (2018). Abstinence from drug use and delinquency increasing among youth in the United States, 2002–2014. *Substance Use and Misuse*, 53(9), 1468–1481. [PubMed: 29313738]

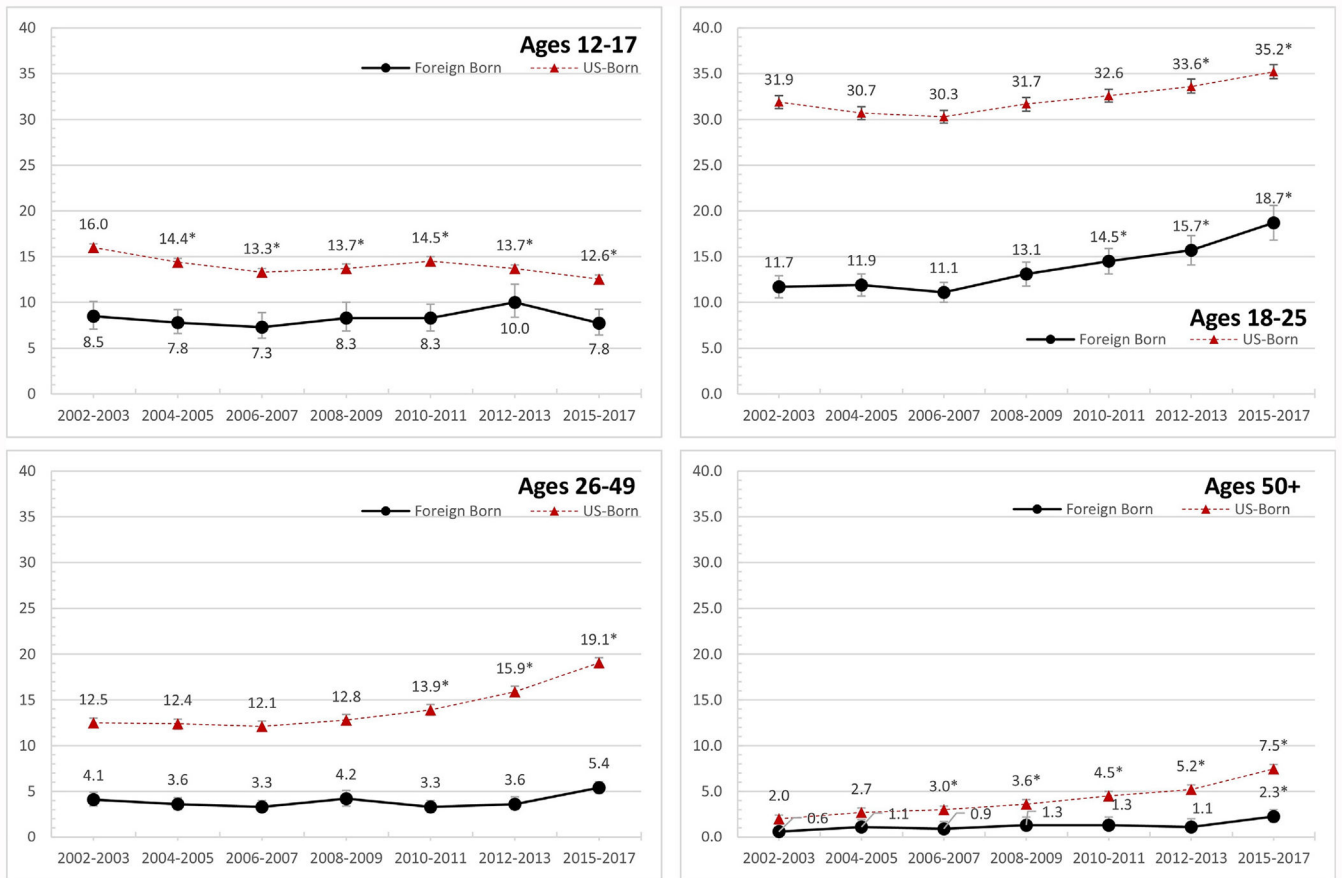
- Vaughn MG, Salas-Wright CP, DeLisi M, & Maynard BR (2014). The immigrant paradox: Immigrants are less antisocial than native-born Americans. *Social Psychiatry and Psychiatric Epidemiology*, 49(7), 1129–1137. [PubMed: 24292669]
- Volkow ND, Baler RD, Compton WM, & Weiss SR (2014). Adverse health effects of marijuana use. *New England Journal of Medicine*, 370(23), 2219–2227. [PubMed: 24897085]
- Wilson AN, Salas-Wright CP, Vaughn MG, & Maynard BR (2015). Gambling prevalence rates among immigrants: A multigenerational examination. *Addictive Behaviors*, 42, 79–85. [PubMed: 25462658]

Author Manuscript

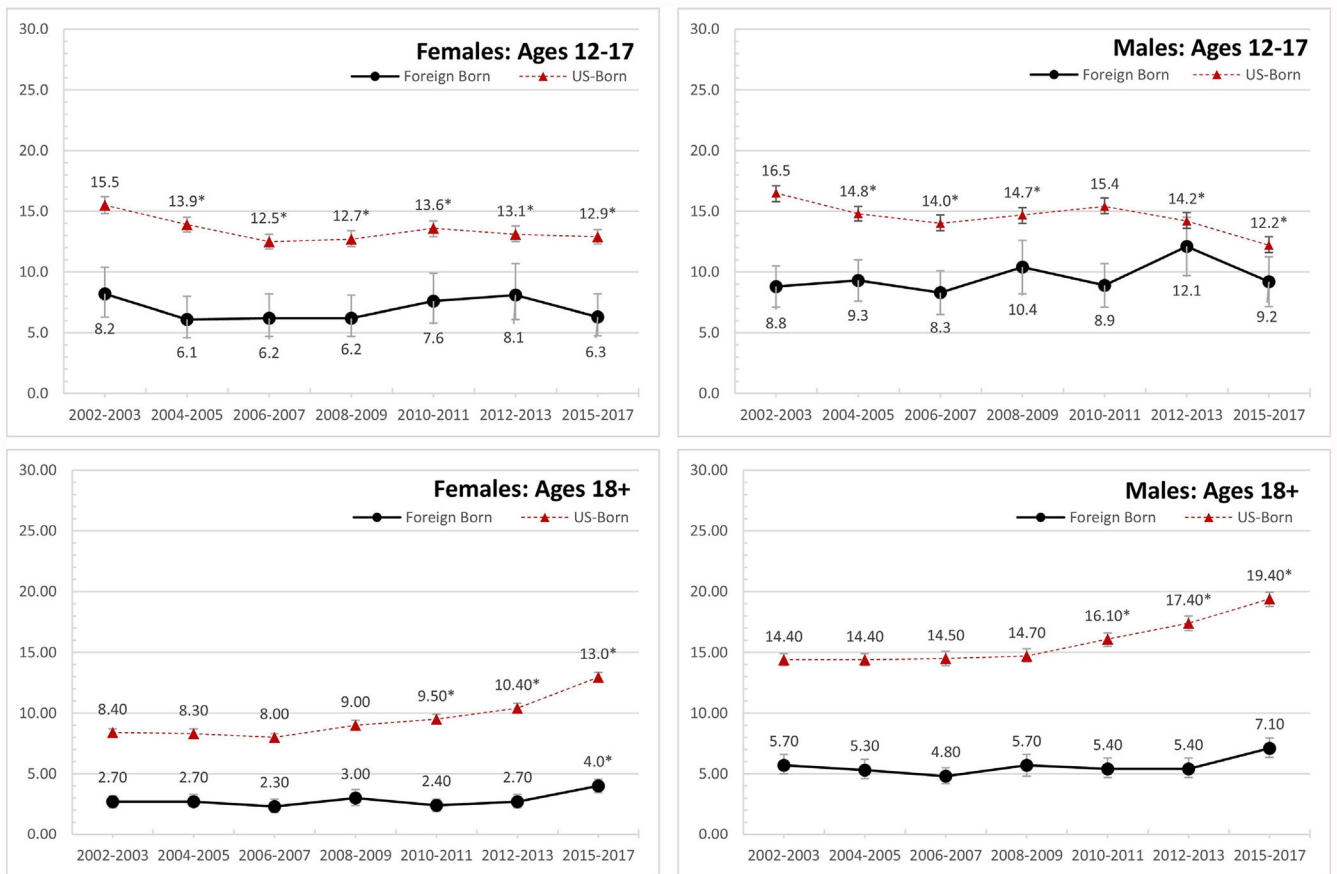
Author Manuscript

Author Manuscript

Author Manuscript



**Fig. 1.** Trends in Prevalence of Past-Year Cannabis Use from 2002 to 2016, by Age Category. Asterisk signifies that the 95% confidence interval for prevalence estimate does not overlap with 95% confidence interval corresponding to the 2002–2003 prevalence estimate. Different modes of administration were used for the immigrant status question: interviewer-asked (2002–2014) and self-administered via a computer (2015–2017).



**Fig. 2.** Trends in Prevalence of Past-Year Cannabis Use from 2002 to 2016, by Age Category. Asterisk signifies that the 95% confidence interval for prevalence estimate does not overlap with 95% confidence interval corresponding to the 2002–2003 prevalence estimate. Different modes of administration were used for the immigrant status question: interviewer-asked (2002–2014) and self-administered via a computer (2015–2017).

**Table 1**  
 Past year prevalence of cannabis use among immigrants and US-Born by sociodemographic characteristics, 2001–2013 (NESARC).

	US-Born				Foreign Born					
	2001–2002 ( <i>n</i> = 35,622)	2012–2013 ( <i>n</i> = 29,896)	<i>pp</i> (% change)		2001–2002 ( <i>n</i> = 7320)	2012–2013 ( <i>n</i> = 6404)	<i>pp</i> (% change)			
	%	95% CI	%	95% CI	%	95% CI	%	95% CI		
Total	4.53	(4.4–4.7)	10.74	(10.2–11.4)	6.21 (137)	1.67	(1.4–1.9)	3.32	(2.8–3.9)	1.65 (99)
Subgroups										
Age										
18–25	14.03	(13.4–15.7)	25.17	(23.3–27.1)	11.14 (79)	4.80	(4.4–5.2)	12.88	(10.0–16.4)	8.08 (168)
26–49	4.84	(4.7–5.0)	12.42	(11.62–13.3)	7.58 (157)	1.37	(1.0–1.9)	2.77	(2.2–3.5)	1.4 (102)
50 and older	0.60	(0.5–0.6)	4.28	(3.8–4.8)	3.68 (613)	0.50	(0.5–0.6)	1.24	(0.8–1.8)	0.74 (148) <sup>a</sup>
Gender										
Female	2.98	(2.8–3.1)	7.78	(7.1–8.5)	4.80 (161)	0.71	(0.7–0.8)	2.41	(1.8–3.2)	1.7 (239)
Male	6.24	(6.0–6.5)	13.97	(13.1–14.9)	7.73 (124)	2.64	(2.1–3.1)	4.26	(3.6–5.1)	1.62 (61)
Education										
< High School	6.12	(5.7–6.6)	13.61	(12.3–15.0)	7.49 (122)	0.75	(0.7–0.8)	1.90	(1.3–2.8)	1.15 (153)
High School	4.34	(4.1–4.6)	10.46	(9.5–11.5)	6.12 (141)	1.83	(1.7–2.0)	3.02	(2.1–4.3)	1.19 (65) <sup>b</sup>
Some College	4.27	(4.1–4.4)	10.39	(9.7–11.1)	6.12 (143)	2.20	(1.7–2.8)	4.10	(3.4–5.0)	1.90 (86)
Marital Status										
Married	2.38	(2.3–2.5)	6.38	(5.8–7.0)	4.00 (168)	0.63	(0.6–0.7)	1.53	(1.2–2.0)	0.90 (143)
Formerly Married	3.62	(3.4–3.8)	9.02	(8.2–10.0)	5.40 (149)	1.41	(1.0–2.1)	2.78	(1.9–4.1)	1.37 (97) <sup>b</sup>
Never married	11.66	(11.3–12.1)	22.75	(21.4–24.2)	11.09 (95)	5.36	(4.3–6.7)	10.33	(8.4–12.7)	4.97 (93)
Household Income										
Less than \$20,000	6.56	(6.1–7.0)	17.91	(16.5–19.4)	11.35 (173)	1.28	(1.1–1.5)	4.34	(3.3–5.7)	3.06 (239)
\$20,000–\$34,999	5.06	(4.7–5.4)	11.56	(10.4–12.8)	6.50 (128)	1.39	(1.1–1.7)	2.55	(1.8–3.6)	1.16 (83) <sup>b</sup>
\$35,000–\$69,999	4.01	(3.8–4.2)	9.39	(8.7–10.2)	5.38 (134)	1.86	(1.2–2.8)	3.06	(2.2–4.2)	1.20 (65)
\$70,000 or higher	3.21	(3.1–3.3)	6.34	(5.7–7.1)	3.13 (98)	2.18	(2.1–2.3)	3.34	(2.3–4.8)	1.16 (53)
Region										
Northeast	4.98	(4.8–5.1)	12.30	(11.1–13.6)	7.32 (147)	1.59	(1.6–1.7)	3.49	(2.4–5.1)	1.90 (119)
Midwest	4.42	(4.2–4.7)	9.44	(8.2–10.9)	5.02 (114)	0.66	(0.4–1.0)	4.46	(2.6–7.6)	3.80 (576)



	US-Born			Foreign Born			<i>pp</i> (% change)
	2001-2002 ( <i>n</i> = 35,622)	2012-2013 ( <i>n</i> = 29,896)	<i>pp</i> (% change)	2001-2002 ( <i>n</i> = 7320)	2012-2013 ( <i>n</i> = 6404)	<i>pp</i> (% change)	
	%	95% CI	%	95% CI	%	95% CI	
South	3.16 (2.9-3.4)	8.70 (7.8-9.7)	<b>5.54 (175)</b>	1.60 (1.3-2.0)	2.42 (1.7-3.5)	0.82 (51)	
West	6.76 (6.5-7.1)	14.51 (13.3-15.8)	<b>7.75 (115)</b>	2.07 (1.5-2.8)	3.76 (3.2-4.5)	<b>1.69 (82)</b>	

Note. Prevalence estimates adjusted for survey design effects. *pp* = percentage point change from 2001 to 2002 to 2012-2013. % change determined by dividing the *pp* change by the 2001-2002 value and multiplying by 100. *pp* and % change values in bold indicate  $p < .001$  or  $p < .01$  (superscript<sup>a</sup> signifies  $p < .01$  superscript<sup>b</sup> signifies  $p < .05$ ), 2001-2002 compared with 2012-2013.

**Table 2**

Past year prevalence of cannabis use among immigrants by migration-related characteristics, 2001–2013 (NESARC).

	<b>Foreign Born</b>				
	<b>2001–2002 (n = 7320)</b>		<b>2012–2013 (n = 6404)</b>		<b>pp (% change)</b>
	<b>%</b>	<b>95% CI</b>	<b>%</b>	<b>95% CI</b>	
<b>Age of Arrival</b>					
< 12	5.17	(4.10–6.50)	11.39	(9.20–14.00)	<b>6.22 (120)</b>
12 or older	0.88	(0.80–1.00)	1.48	(1.20–1.80)	0.60 (68)
<b>Region of Origin</b>					
Africa	2.19	(2.10–2.30)	3.02	(1.30–6.60)	0.83 (38)
Latin America	0.93	(0.90–1.00)	3.01	(2.40–3.70)	<b>2.08 (224)</b>
Europe	2.67	(2.30–3.10)	8.01	(5.90–10.70)	<b>5.34 (200)</b>
Asia	1.61	(1.40–1.90)	1.40	(2.40–3.70)	–0.21 (13)

Note. Prevalence estimates adjusted for survey design effects. *pp* = percentage point change from 2001 to 2002 to 2012–2013. % change determined by dividing the *pp* change by the 2001–2002 value. *pp* and % change values in bold indicate  $p < .001$ , 2001–2002 compared with 2012–2013. No differences were significant at  $p < .05$  or  $p < .01$ .

**Table 3**

Past Year Prevalence of Cannabis Use and Cannabis Use Disorder, 2002–2017 (NSDUH).

	Past Year Use		Cannabis Use Disorder					
	US-Born		Foreign Born		Foreign Born			
	%	95% CI	%	95% CI	%	95% CI		
2002–2003	11.8	(11.5–12.1)	4.4	(4.0–4.9)	2.00	(1.90–2.10)	0.60	(0.50–0.80)
2004–2005	11.6	(11.3–11.9)	4.2	(3.8–4.7)	2.00	(1.90–2.10)	0.60	(0.50–0.80)
2006–2007	11.3	(11.0–11.7)	3.7	(3.3–4.2)	1.80	(1.70–1.90)	0.60	(0.50–0.80)
2008–2009	12.0	(11.6–12.3)	4.5	(4.0–5.1)	1.90	(1.80–2.00)	0.60	(0.50–0.70)
2010–2011	<b>12.9</b>	<b>(12.5–13.2)</b>	4.1	(3.7–4.5)	1.90	(1.80–2.00)	0.70	(0.50–0.80)
2012–2013	<b>13.8</b>	<b>(13.4–14.1)</b>	4.3	(3.8–4.8)	1.80	(1.70–2.00)	0.40	(0.30–0.50)
2015–2016	<b>15.3</b>	<b>(14.9–15.6)</b>	<b>5.4</b>	<b>(5.0–5.9)</b>	1.70	(1.60–1.70)	0.70	(0.50–0.80)
2016–2017	<b>17.4</b>	<b>(16.9–17.9)</b>	<b>6.3</b>	<b>(5.8–6.8)</b>	1.70	(1.60–1.80)	0.60	(0.50–0.80)

Note. Prevalence estimates adjusted for survey design effects. Prevalence estimates in bold signify that the corresponding 95% confidence intervals (CI) do not overlap with the CI for 2002–2003. No data on immigrants was available for the 2014 survey year. As such, this year is omitted and information is included on both the 2015–2016 and 2016–2017 gears. The Restricted Data Analysis System does not provide information for 2015–2017. It should be noted that two different modes of administration were used for the immigrant status question: interviewer-asked (2002–2014) and self-administered via a computer (2015–2017).