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The widening gender gap in marijuana use prevalence in the U.S. during a period of economic change, 2002–2014



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ABSTRACT

Aim: Concurrently with increasingly permissive attitudes towards marijuana use and its legalization, the prevalence of marijuana use has increased in recent years in the U.S. Substance use is generally more prevalent in men than women, although for alcohol, the gender gap is narrowing. However, information is lacking on whether time trends in marijuana use differ by gender, or whether socioeconomic status in the context of the Great Recession may affect these changes.

Methods: Using repeated cross-sectional data from the National Survey on Drug Use and Health (2002–2014), we examined changes over time in prevalence of past-year marijuana use by gender, and whether gender differences varied across income levels. After empirically determining a change point in use in 2007, we used logistic regression to test interaction terms including time, gender, and income level.

Results: Prevalence of marijuana use increased for both men (+4.0%) and women (+2.7%) from 2002 to 2014, with all of the increase occurring from 2007 to 2014. Increases were greater for men, leading to a widening of the gender gap over time ($p < 0.001$). This divergence occurred primarily due to increased prevalence among men in the lowest income level (+6.2%) from 2007 to 2014.

Conclusion: Our findings are consistent with other studies documenting increased substance use during times of economic insecurity, especially among men. Corresponding with the Great Recession and lower employment rate beginning in 2007, low-income men showed the greatest increases in marijuana use during this period, leading to a widening of the gender gap in prevalence of marijuana use over time.

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1. Introduction

Among individuals aged 12 and older in the U.S. in 2014, 8.4% reported past-month and 12.5% reported past-year marijuana use (CBHSQ, 2015; SAMHSA, 2014). Attitudes about the risks of marijuana use are changing (Pacek et al., 2015), and prevalence of use has increased since 2001 (Gruza et al., 2016; Hasin et al., 2015; SAMHSA, 2003, 2014). With marijuana currently legalized for medical use in 28 states, and recreational use in eight of these, permissive attitudes towards marijuana use are becoming more

prevalent, with further increases in use anticipated (Pew Research Center, 2014). As the social and legal environment surrounding marijuana use changes, a more nuanced understanding of adult trends in marijuana use by population subgroups is an important public health issue.

Increased marijuana use among adults could have adverse consequences, e.g., marijuana use disorders (Hall and Degenhardt, 2009; Hasin et al., 2015; Volkow et al., 2014), respiratory diseases (Hall, 2009; Tashkin et al., 2002), lower educational and career achievement (Fergusson and Boden, 2008; Henkel, 2011), and vehicular crashes (Hall and Degenhardt, 2009; Li et al., 2012; Volkow et al., 2014). Potentially beneficial consequences, e.g., decreased opioid use and mortality (Bachhuber et al., 2014; Kim et al., 2016, 2015; Powell et al., 2015), and decreased traffic fatalities (Anderson et al., 2013) could also occur. Thus, assessing

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population-level change in marijuana use over time, particularly by sociodemographic characteristics, may help identify population subgroups most likely to increase marijuana use, enabling public health practitioners to plan targeted interventions for these changes.

While the prevalence of substance use consistently varies between men and women (SAMHSA, 2003, 2014), the gender gap in prevalence of use of a given substance is not necessarily stable over time. At the population level, gender-specific changes in use could translate into millions of people at increased risk for marijuana-related outcomes over time. Identifying trends in use by gender is therefore valuable for public health planning and targeting interventions. While men historically report higher prevalence of drinking than women, this gender gap has narrowed in recent years (Keyes et al., 2008, 2011; McHugh et al., 2014; White et al., 2015), a change attributed to increasing gender equality in social roles, and to changes in social norms regarding acceptability of drinking by women. In contrast, a review found that the gender gap in cigarette smoking remained largely unchanged between 2004 and 2014, with a stable male to female prevalence ratio of about 1.3:1 (Higgins et al., 2015). Studies of past-year marijuana use have also documented that temporal changes in prevalence vary by gender. For example, between 1984 and 2000, prevalence among young men decreased from 33% to 22% yet increased among young women from 12% to 19%, resulting in a substantial narrowing of the gender gap in marijuana use (Kerr et al., 2007). Other studies have suggested a slight increase in the gender gap in marijuana use since 2002, but did not formally test for gender differences in trends using the most recent annual prevalence estimates (Pacek et al., 2015). In sum, no current information exists specifically testing whether time trends in the prevalence of marijuana use differ by gender.

In addition, whether patterns in marijuana use by gender are consistent across income levels is unknown, which is particularly relevant during economic downturns. Unlike some sociodemographic characteristics, individual income can vary over time. As a potentially modifiable risk factor, identifying a role for income in marijuana use trends could inform public health policy and prevention and also provide insight into drivers of change in marijuana use. Studies show that socioeconomic status can modify the association between gender and alcohol use among adults (Arcaya et al., 2014; Vijayasiri et al., 2012) and between gender and marijuana use among adolescents and young adults (Hanson and Chen, 2007; Miller and Miller, 1997; Pitel et al., 2013). Other studies report that socioeconomic changes, e.g., unemployment, are associated with increased use of marijuana (Arkes, 2007; Merline et al., 2004). Substantial changes in the U.S. economy occurred in recent years, beginning with the Great Recession (Business Cycle Dating Committee of the National Bureau of Economic Research, 2008) and increased unemployment rate (U.S. Bureau of Labor Statistics, 2016); and continuing with high income inequality, low labor force participation, and continued declines in median real earnings (Acs, 2011; Greenstone and Looney, 2011a, 2013; Kearney et al., 2015). These macroeconomic changes are associated with changes in substance use among both men and women (Arcaya et al., 2014; Bor et al., 2013; Case and Deaton, 2015; Catalano et al., 2011; Tekin et al., 2013). However, the joint effect of gender and socioeconomic status on marijuana use among adults over time has not been examined, even though marijuana is one of the most widely used psychoactive substances (SAMHSA, 2014).

We therefore examined gender differences in the prevalence of marijuana use and whether such differences are changing over time, using data from the 2002–2014 U.S. National Survey on Drug Use and Health (NSDUH) adult sample. We further assessed whether any differences varied by income level. First, we assessed whether national estimates of prevalence of past-year marijuana

use were linear over time, or whether any distinct change point in trends occurred. Second, we tested whether time trends in marijuana use were the same for men and women. Third, we assessed whether gender differences in changes in prevalence of marijuana use over time were modified by household income level.

2. Methods

2.1. Sample and procedures

The NSDUH provides annual cross-sectional national survey data on substance use in a sample of the U.S. population over age 12, living in households and non-institutional group quarters. Sponsored by the Substance Abuse and Mental Health Services Administration (SAMHSA), the survey uses a multistage area probability sample for all 50 states and the District of Columbia. Younger individuals, Blacks, and Hispanics were oversampled. Response rates range from 71 to 79% over the years studied (CBHSQ, 2015; SAMHSA, 2003). The NSDUH surveys were methodologically consistent between 2002 and 2014, and therefore these were the years we examined.

Trained interviewers administered the survey using computer-assisted personal interviewing (CAPI), supplemented by audio computer-assisted self-interviewing (ACASI), in order to provide participants with privacy and confidentiality when responding to questions about illicit drug use and other sensitive behaviors (CBHSQ, 2015; SAMHSA, 2003). Participants gave informed consent prior to being interviewed. Additional details on data confidentiality maintenance are provided elsewhere (CBHSQ, 2015; SAMHSA, 2003). Our analyses utilized de-identified publicly available data, exempt from Institutional Review Board approval. Datasets from each year were concatenated, adding a variable for survey year. Adults (ages 18+) were included (N=492,831). NSDUH sampling weights were used to adjust for non-response and oversampling, to correspond to population estimates from the U.S. Census Bureau.

2.2. Measures

Past-year marijuana users were defined as participants who reported most recent marijuana use “within the past 30 days” or “more than 30 days ago but within the past 12 months.” Adjusted models included these covariates: race/ethnicity (Hispanic, non-Hispanic Black, non-Hispanic Other, non-Hispanic White), age (18–25, 26–34, 35+), education level (less than high school, high school, at least some college), household income (\$0–19,999, \$20,000–49,999, \$50,000–74,999, \$75,000+), and marital status (married, previously married, never married).

2.3. Statistical analysis

2.3.1. Trends in use over time. To test trends in past-year marijuana use over time, the outcome was regressed on a variable indicating interview year (2002–2014, continuous), using logistic regression. The regression coefficient for the year variable indicates the slope (change over time) on the multiplicative (log-odds) scale. To evaluate change over time in prevalence of use, we back-transformed model-predicted marginal log-odds of past-year marijuana use to the prevalence scale (Bieler et al., 2010); the difference in the prevalence for the last year as compared to the first year (risk difference) indicates the change over time for the entire time period.

To determine if the change over time differed by gender, an interaction term between year and gender was included in the regression model, and an interaction contrast (IC) was evaluated (Rothman et al., 2008). The IC estimates a “difference in differences” or the difference in the prevalence differences (from the last

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