Patterns of marijuana and tobacco use associated with suboptimal self-rated health among US adult ever users of marijuana

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ABSTRACT

The purpose of this study was to examine the patterns of marijuana and tobacco use and their associations with suboptimal self-rated health (SRH) among US adults who reported "ever, even once, using marijuana or hashish." Data came from the 2009–2012 National Health and Nutrition Examination Survey, restricting to respondents aged 20 years and older who reported using marijuana at least once in their lifetime (n = 3,210). We assessed the age-adjusted prevalence of mutually exclusive groups of regular (at least once a month for more than one year) and non-regular marijuana smoking by current (serum cotinine ≥3.08 ng/mL) and not current use of tobacco. Suboptimal SRH status was defined as "fair" or "poor" in response to the question "Would you say that in general your health is excellent, very good, good, fair, or poor?" We produced prevalence ratios with multivariable log-linear regression models.

Among ever users of marijuana, the age-adjusted prevalence of regular marijuana smoking with current tobacco use, non-regular marijuana smoking with current tobacco use, and regular marijuana smoking without current tobacco use was 24.7%, 15.2%, and 21.1%, respectively. When compared to non-regular marijuana smokers without current tobacco use, the adjusted prevalence ratio for reporting suboptimal SRH was 1.98 (95% CI: 1.50–2.61), 1.82 (95% CI: 1.40–2.37), and 1.34 (95% CI: 1.05–1.69), respectively.

In conclusion, among adult ever users of marijuana, current tobacco use is high and strongly associated with suboptimal SRH; regular marijuana smoking with or without current tobacco use is significantly associated with suboptimal SRH.

1. Introduction

Tobacco use is the leading cause of preventable morbidity and mortality in the US (DHHS, 2016). Cannabis (hereinafter referred to as marijuana) is the most prevalent and increasingly used illicit drug in the United States (SAMHSA, 2014). Accumulating evidence consistently demonstrates that heavy or habitual marijuana use is associated with numerous short- and long-term deleterious health consequences (NIDA, 2015; Volkow et al., 2014), including but not limited to addiction (Lopez-Quintero et al., 2011), altered brain structure and connectivity (Batalla et al., 2013; Zalesky et al., 2012), impaired memory and neuropsychological decline (Meier et al., 2012; Riba et al., 2015), psychosis (Di Forti et al., 2015; Radhakrishnan et al., 2014), poor educational attainment (Chatterji, 2006; Stiby et al., 2015), symptoms of chronic bronchitis (Joshi et al., 2014; Tashkin, 2013), impaired motor coordination and traffic collisions (Asbridge et al., 2014; Hartman and Huestis, 2013), and diminished life satisfaction (Fergusson and Boden, 2008).

Marijuana and tobacco use share potential common environmental influences (e.g., peer influences), common mode of use (e.g., smoked), and are frequently used together (e.g., blunts and spliffs) (Agrawal et al., 2012; Agrawal et al., 2010; Rabin and George, 2015). One study suggested that, during a lifetime period, 57.9% of those who ever used tobacco reported ever using marijuana and 90% of those who ever used marijuana reported ever using tobacco (Agrawal et al., 2012). Another study showed that, during the past month, the prevalence of marijuana use was 17.8% among past-month tobacco users and the prevalence of tobacco use was 69.6% among past-month marijuana users (Schauer et al., 2015). Across the lifespan, either concurrently or at different times, prior use of either tobacco or marijuana substantially elevates the risk of subsequent initiation of the other and is associated with the progression to tobacco and marijuana dependence (Agrawal et al., 2011; Patton et al., 2005; Patton et al., 2006; Ream et al., 2008; Timberlake et al., 2007). Heightened susceptibility has been linked to

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genetic predispositions and putative neurobiological mechanisms that may facilitate increased urge and intensity of using each substance (Ramo et al., 2013b), promote progression to other types of illicit drugs (Fergusson et al., 2006; Secades-Villa et al., 2015), and precipitate relapse or hamper the success of quitting use of either substance (Ford et al., 2002; Haney et al., 2013; Ramo et al., 2013a).

Self-rated health (SRH) is a brief, validated proxy measure of overall health status (DeSalvo et al., 2006; Idler and Benyamini, 1997; Jylha, 2009). Among a variety of populations, SRH is strongly predictive of future morbidity and mortality, even after extensive adjustment for many covariates such as illness, depression status, functional and cognitive decline, and health care utilization (Cesari et al., 2008; DeSalvo et al., 2006; DeSalvo et al., 2005; Idler and Benyamini, 1997; Idler et al., 2000; Jylha, 2009; Kawada, 2003; Lee, 2000; Molarius and Janson, 2002). Although SRH is generated through a subjective, contextual, and non-arbitrary process, research shows that individuals with "poor" SRH have a two-fold higher mortality risk than that of those with "excellent" SRH (DeSalvo et al., 2006). SRH has been adopted as a chronic disease indicator for overarching conditions and as a Foundation Health Measure for the *Healthy People 2020* objectives that monitor progress toward promoting health, preventing disease and disability, eliminating disparities, and improving quality of life (CDC, 2015a; DHHS, 2015).

Although epidemiologic studies have evaluated effects of marijuana and tobacco use on many health outcomes, combined patterns of marijuana and tobacco use and their impact on overall health are uncertain. To our knowledge, no study has assessed regular marijuana smoking, with and without current tobacco use, in relation to suboptimal SRH among US adult ever users of marijuana. Ever users of marijuana are an important population of concern. Given that habitual marijuana use may affect health outcomes, and that tobacco use is a serious public health problem (Jamal et al., 2014; Ramo et al., 2013a), such a study may provide observational evidence to inform prevention efforts. Therefore, we sought to examine patterns of regular marijuana smoking and current tobacco use and their associations with suboptimal SRH among a nationally representative household-based survey sample of US adult ever users of marijuana by analyzing data from the 2009–2012 National Health and Nutrition Examination Survey (NHANES).

2. Methods

2.1. Participants

The NHANES is a program of studies designed to assess the health and nutritional status of adults and children in the US. NHANES participants were recruited using a household-based, multistage, stratified sampling designed to represent the noninstitutionalized civilian US population. The response rates for 2009–2012 ranged from 69.5% to 77.2% (CDC, 2013). We limited this analysis to men and nonpregnant women aged 20–59 years who attended the medical examination and provided information on their lifetime marijuana use in the Mobile Examination Center (MEC) interview (n = 6342). Of the participants who attended the MEC and reported marijuana use at least once during their lifetime (n = 3370), 3253 adults (96.5%) provided blood by venipuncture for measurement of serum cotinine. After excluding participants with missing covariate values, 3210 participants remained as ever users of marijuana for our analyses. All procedures involving human participants and confidentiality were reviewed and approved by the Research Ethics Review Board of the National Center for Health Statistics (CDC, 2015b).

2.2. Measures

2.2.1. Marijuana use

We defined ever users of marijuana as those participants who said yes to the question "Have you ever, even once, used marijuana or hashish?" We further classified ever users of marijuana into subgroups of regular and non-regular marijuana smokers based on their responses to the question "Have you ever smoked marijuana or hashish at least once a month for more than one year?" Respondents who reported "yes" were considered regular marijuana smokers.

2.2.2. Current tobacco use

Cotinine is a metabolite of nicotine and a biomarker for both active and passive tobacco exposure (Benowitz et al., 2009b; CDC, 2015c). Previous studies have identified a nearly identical optimal cutpoint of using serum cotinine (≥ 3.08 ng/mL) to distinguish tobacco users from non-tobacco users (Agaku and King, 2014; Benowitz et al., 2009a; Flouris et al., 2013). Because recent use of other tobacco products (e.g., cigars, pipes, smokeless tobacco, nicotine patch, nicotine gum, e-cigarette, and any products containing nicotine) would be reflected in the measure of serum cotinine, and because non-tobacco users with exposures to secondhand smoking typically have serum cotinine below the cutpoint (Baltar et al., 2011; Chiu et al., 2011; Matsunaga et al., 2014), we defined current tobacco use as having serum cotinine values ≥ 3.08 ng/mL in this study.

2.2.3. Patterns of regular marijuana smoking with and without current tobacco use

Based on the status of regular marijuana smoking (yes/no) and current tobacco use (serum cotinine ≥ 3.08 ng/mL), we created four mutually exclusive groups: (1) non-regular marijuana smoking without current tobacco use; (2) regular marijuana smoking without current tobacco use; (3) non-regular marijuana smoking with current tobacco use; and (4) regular marijuana smoking with current tobacco use. Based on the response to the question, "How long has it been since you last smoked marijuana or hashish at least once a month for one year?", we considered those who reported ≤ 30 days and ≤ 60 days as recent regular marijuana smokers for the periods of past 30-day and 60-day, respectively.

2.2.4. Suboptimal self-rated health

SRH is validated measure across various population and subgroups, although there are many different biological, physiological, psychological, behavioral (e.g., cigarette smoking, alcohol use, and physical activity), and health underpinnings for SRH (Emmelin et al., 2003; Jylha, 2009; Jylha et al., 2006; Tsai et al., 2010a; Tsai et al., 2010b; Tsai et al., 2010c). The NHANES survey asked participants to rate their overall health by answering the question: "Would you say that in general your health is excellent, very good, good, fair, or poor?" We dichotomized these responses into the categories of optimal (excellent, very good, or good) and suboptimal (fair or poor) SRH.

2.2.5. Behavioral and health-related risk factors

In addition to sociodemographic variables such as age, sex, race or ethnicity, education, and marital status, we also assessed behavioral and health-related risk factors. Specifically, we included alcohol use, physical activity, body mass index (BMI), health care access, and a self-reported history of cardiovascular diseases (CVD), diabetes, arthritis, and cancer. For alcohol use, we classified participants into: (1) lifetime abstainers—<12 drinks ever; (2) former drinkers—12 or more drinks during their lifetime but none during the past year; (3) non-excessive current drinkers—an average of up to 14 drinks per week for men or up to 7 drinks per week for women and never 5 drinks (men)/4 drinks (women) or more in a single day during the past year; and (4) excessive current drinkers—an average of >14 drinks per week for men or >7 drinks per week for women, or ≥ 5 (men)/≥ 4 (women) drinks in a single day once or more during the past year. BMI was calculated as measured weight in kg divided by the square of height in m and categorized as: (1) normal or underweight (<25 kg/m^2); (2) overweight (25–29.9 kg/m^2); and (3) obese (≥ 30 kg/m^2). We summed and classified weekly hours of Metabolic Equivalent of Task (MET) for