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# Probability and predictors of cannabis use disorders relapse: Results of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)

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### ABSTRACT

**Background:** This study aims to estimate the odds and predictors of Cannabis Use Disorders (CUD) relapse among individuals in remission.

**Methods:** Analyses were done on the subsample of individuals with lifetime history of a CUD (abuse or dependence) who were in full remission at baseline (Wave 1) of the National Epidemiological Survey of Alcohol and Related Conditions (NESARC) ( $n=2350$ ). Univariate logistic regression models and hierarchical logistic regression model were implemented to estimate odds of relapse and identify predictors of relapse at 3 years follow up (Wave 2).

**Results:** The relapse rate of CUD was 6.63% over an average of 3.6 year follow-up period. In the multivariable model, the odds of relapse were inversely related to time in remission, whereas having a history of conduct disorder or a major depressive disorder after Wave 1 increased the risk of relapse.

**Conclusions:** Our findings suggest that maintenance of remission is the most common outcome for individuals in remission from a CUD. Treatment approaches may improve rates of sustained remission of individuals with CUD and conduct disorder or major depressive disorder.

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## 1. Introduction

Cannabis is the most widely used illicit substance in the world, and the illicit drug with the highest prevalence rate of abuse or dependence worldwide (United Nations Office on Drugs and Crime, 2010). Previous studies in community samples suggest that most individuals who develop a cannabis use disorder (CUD) achieve remission at some point in their lives (Calabria et al., 2010; Lopez-Quintero et al., 2011). Unfortunately, some individuals who achieve remission eventually relapse (Bonn-Miller and Moos, 2009; Moore and Budney, 2003). An important clinical question is to estimate the odds and identify predictors of relapse among individuals who achieve remission.

Existing studies of relapse have been based on treatment samples and varied widely in relation to the length of follow-up interval

and definition of relapse (Bonn-Miller and Moos, 2009; Godley et al., 2005; Hides et al., 2006; Moore and Budney, 2003; Ramo et al., 2005; White et al., 2004). However, to date, no study has examined odds and predictors of relapse from CUD in the general population.

Prior research has suggested that depression (White et al., 2004), anxiety (Bonn-Miller and Moos, 2009), use of other substances (Ramo et al., 2005), and frequency of cannabis use (Moore and Budney, 2003) may increase the risk of CUD relapse. These studies have been constrained by their focus on a restricted range of ages (Ramo et al., 2005; White et al., 2004) or geographical locations (Bonn-Miller and Moos, 2009), and exclusion of individuals with other substance use disorder (SUD; Moore and Budney, 2003) or psychiatric comorbidity (Ramo et al., 2005). Furthermore, no study evaluating CUD relapse has had a follow-up period longer than a year (Bonn-Miller and Moos, 2009; Godley et al., 2005; Hides et al., 2006; Moore and Budney, 2003; Ramo et al., 2005; White et al., 2004).

In a previous study, we evaluated the probability and predictors of remission from dependence in several substances, including cannabis (Lopez-Quintero et al., 2011). We found that other SUD and personality disorders were associated with decreased

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probability of CUD remission (Lopez-Quintero et al., 2011). To have a better understanding of remission and its progression, it is also necessary to evaluate stability of remission among individuals in the community. Thus, we designed the present study using the DSM-IV definition of remission and drawing on data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), a large nationally representative study of the United States adult population that carefully assessed CUD and had a three-year follow-up with an excellent response rate (Grant and Kaplan, 2005).

The goals of this study were to: (1) estimate the odds of CUD relapse among individuals in remission and (2) identify sociodemographic, psychopathology and cannabis use – and other substance use-related predictors of CUD relapse among individuals in remission. Consistent with the conceptual framework used in previous studies reporting correlates of progression from cannabis use to CUD, as well as remission and relapse to CUD and other SUD (Bonn-Miller and Moos, 2009; Hides et al., 2006; Lopez-Quintero et al., 2011), we classified our predictors of CUD relapse into sociodemographic, psychopathology and substance use-related characteristics. Additionally, based on prior studies on relapse of cannabis and other drug disorders (Dawson et al., 2007; Godley et al., 2005; Moore and Budney, 2003), we also included several indicators of CUD severity as predictors of relapse. Based on prior findings (Bonn-Miller and Moos, 2009; Lopez-Quintero et al., 2011; Moore and Budney, 2003), we hypothesized that co-occurring psychopathology and severity of cannabis use would predict CUD relapse, whereas time in remission would be inversely associated with risk of relapse.

## 2. Methods

### 2.1. Sample and procedures

The NESARC target population at baseline (Wave 1: 2001–2002) was the civilian non-institutionalized population 18 years and older residing in households and group quarters (Grant et al., 2009, 2004b). The final sample included 43,093 respondents drawn from individual households and group quarters. Blacks, Hispanics, and adults 18–24 were oversampled, with data adjusted for oversampling, household – and person-level non-response. The overall survey response rate was 81%. Data were adjusted using the 2000 Decennial Census, to be representative of the U.S. civilian population for a variety of sociodemographic variables. Experienced lay interviewers were trained and conducted interviews under close supervision (Grant et al., 2009, 2004b). All procedures, including informed consent, received full human subjects review and approval from the U.S. Census Bureau and U.S. Office of Management and Budget.

The Wave 2 interview was conducted approximately 3 years later. The mean time interval between Wave 1 and Wave 2 interviews was 36.6 months. Excluding ineligible respondents (e.g., deceased), the Wave 2 response rate was 86.7% ( $n = 34,653$ ; Grant et al., 2009). Wave 2 NESARC weights include a component that adjusts for non-response, demographic factors and psychiatric diagnoses, to ensure that the Wave 2 sample approximated the target population, that is, the original sample minus attrition between the two Waves. Adjustment for non-response was successful, as the Wave 2 respondents and the original target population did not differ on age, race-ethnicity, sex, socioeconomic status or the presence of any substance, mood, anxiety or personality disorder (Grant et al., 2009). There were 2350 respondents (5.45% of the total Wave 1 sample) with a lifetime history of a CUD (i.e., abuse or dependence) who were in full remission at Wave 1 and also participated at Wave 2, constituting the present sample.

### 2.2. Measures

All diagnoses were made according to the DSM-IV criteria using AUDADIS-IV (Grant et al., 2001, 2008, 2004b). Computer algorithms produced DSM-IV diagnoses based on AUDADIS-IV data. For substance dependence (except for cannabis) 3 or more of 7 criteria within a 12-month period are required. The diagnosis of cannabis dependence required that at least 3 criteria from a list of six during a 12-month period be met. Because DSM-IV does not describe a withdrawal syndrome for cannabis, the AUDADIS-IV withdrawal criterion was not included in the diagnosis of cannabis dependence. For substance abuse, participants had to meet 1 or more of 4 criteria within a 12-month period and not meet the criteria for dependence (American Psychiatric Association, 1994). The good to excellent test-retest reliability and validity of AUDADIS-IV SUD diagnoses is well documented in clinical and general population samples (Grant et al., 2003a; Hasin et al., 1997, 2003; Ruan et al., 2008). CUD relapse was defined as fulfillment of the DSM-IV criteria for cannabis abuse or dependence after Wave 1. To better identify the predictors of CUD relapse we divided the potential risk factors in 3 tiers: sociodemographic, cannabis use-related and psychopathology.

**2.2.1. Sociodemographic variables.** Sociodemographic factors included race/ethnicity, gender, urbanicity (urban vs. rural), nativity (U.S.-born vs. foreign-born), educational attainment, individual income, marital status and employment status. Because CUD has higher prevalence among individuals younger than 30 years, age was dichotomized as younger vs. older than 30 respondents. Family history of SUD was defined as any alcohol or drug use disorder among first degree relatives (Heiman et al., 2008). Number of stressful life events during the previous 12 months was assessed using the Social Readjustment Rating Scale (Holmes and Rahe, 1967). A 4-point Self-perceived Health Status assessment was collapsed into two categories, good to excellent or fair or poor.

**2.2.2. Cannabis use-related variables.** Information on age at first cannabis use as well as other variables regarding cannabis use and use disorder was collected as part of the AUDADIS-IV. Age of onset of abuse or dependence was defined as the age at which the respondent first met abuse or dependence diagnostic criteria. Daily cannabis use was defined as the usual number of joints smoked per day during the period of heaviest use. Duration of CUD was defined as the time interval between the age of onset of the disorder and the age at remission. Remission and age at remission were determined using the DSM-IV definition and by asking individuals with a lifetime diagnosis of abuse or dependence: “about how old were you when you finally stopped having any of these experiences (dependence or abuse criteria) with marijuana? By finally stopped, I mean they never started happening again.” Time since remission was defined as the time interval between age of remission and current age, and was measured in years (Lopez-Quintero et al., 2011). Treatment-seeking was coded as positive if respondents reported ever having sought professional help for problems related to their substance use.

**2.2.3. Other psychiatric variables.** Past-year mood disorders included DSM-IV major depressive disorder, dysthymia, and bipolar disorder. Past year anxiety disorders included panic disorder, social anxiety disorder, specific phobia and generalized anxiety disorder (Grant et al., 2005a, 2005b, 2005c; Stinson et al., 2007). The presence of new onset of major depressive disorder or dysthymia, bipolar disorder or any anxiety disorder after Wave 1 was also assessed. Avoidant, dependent, obsessive-compulsive, paranoid, schizoid, histrionic and antisocial personality disorders were assessed on a lifetime basis at Wave 1 (Grant et al., 2004a).

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