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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.

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Contributors:

Blanco C. designed the study, Flórez-Salamanca L. managed the literature searches and summaries of previous related work, and wrote the first draft of the manuscript. Wang S. conducted the statistical analyses. All authors contributed to and have approved the final manuscript.

Conflict of interest:

Dr. Budney has been a consultant for GW pharmaceuticals. The remaining authors report no competing interests. 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, agencies or the US government.

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 remission of individuals with CUD and conduct disorder or major depressive disorder.

Keywords

cannabis; relapse; remission; abuse; dependence; NESARC; cannabis use disorder; CUD; marijuana

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 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, psychopathological 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 2,350 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 4 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 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). Test-retest reliabilities for mood, anxiety and personality disorder diagnoses in the general population and clinical settings are fair to good ($\kappa=0.40-0.77$; Canino et al., 1999; Grant et al., 2003a; Ruan et al., 2008). Convergent validity was good to excellent for all affective, anxiety, and personality disorder diagnoses (Grant et al., 2004a; Hasin et al., 2005), and selected diagnoses showed good agreement ($\kappa=0.64-0.68$) with psychiatrist reappraisals (Canino et al., 1999).

2.3 Analyses

To provide nationally representative estimates, weighted percentages, using the sampling weights were computed to derive prevalence, sociodemographic correlates, and clinical correlates of individuals with CUD remission. To obtain a thorough understanding of the relative importance of each variable and group of variables, we conducted our analysis in progressive hierarchical stages. To identify predictors of CUD relapse we first compared data from respondents with CUD relapse versus those who maintained remission after Wave 1. We used odds ratios (ORs) to examine the bivariate relationships between each predictor and cannabis relapse after Wave 1 (Table 1). To test our hypothesis we then constructed two models. Model 1 contains all the significant variables at the univariate level in the cannabis use domain adjusted for sociodemographic characteristics. Model 2 added to Model 1 the variables from the psychopathology domain significant at the univariate level (Table 2). All analyses, including ORs and 95% confidence intervals were estimated using the statistical software SUDAAN to adjust for the design effects of the NESARC (Research Triangle Institute, 2004).

We focused our analyses on individuals who met DSM-IV criteria for abuse or dependence when they relapse. Including respondents who achieved partial remission (meeting one or two criteria for cannabis dependence) at some point after Wave 1 ($n=12$) resulted in similar findings to when they were excluded. Therefore, respondents who achieved partial remission were not included in the analysis but are available on request.

Furthermore, to minimize the risk that the effect of recall bias on our estimates, we repeated the analyses restricting the sample to those who had been in remission for only one year at the time of Wave 1 ($n=180$). Because the results were similar to our main analyses and only involved small changes in the level of significance due to the smaller sample size (but never change in direction), they are not presented but are available on request.

3. RESULTS

3.1 Odds of CUD relapse

Among individuals in remission of CUD in Wave 1, 6.63% ($n=147$) fulfilled criteria for CUD during the time period between Wave 1 and Wave 2 assessments. The odds of relapse

were smaller (OR=0.87, 95% CI=0.82–0.92) for individuals with longer time in remission (Table 2). Of those who relapsed, 50% relapsed within 1.86 years after Wave 1.

3.2 Bivariate predictors of CUD relapse

Individuals younger than 30 years, with high school or lower educational attainment, income below \$35,000 or unemployed were at greater risk of relapse to CUD (Table 1).

Respondents with more stressful events in 12 months prior to the Wave 1 assessment or had a poor to fair self reported health status at Wave 1 were more likely to relapse. Individuals with a diagnosis of major depressive disorder or dysthymia, bipolar disorder or any anxiety disorder between Waves 1 and 2 were more likely to relapse. Having a past history of conduct disorder, a cluster A or B personality disorder or a current SUD in addition to CUD also increased the risk to relapse. Individuals who used greater amounts of cannabis during their heaviest period of use, had a longer duration of CUD, were older at time of remission or respondents who had received treatment for drug problems at Wave 1, were more likely to relapse, whereas time in remission in Wave 1 was inversely associated to the risk of relapse.

3.3. Multivariable logistic regression models

In Model 1, after adjusting the cannabis use related variable was time in remission at Wave 1 was inversely related to risk of relapse (Table 2). In Model 2, after controlling for the effect of sociodemographic variables, a diagnosis of major depressive disorder after Wave 1 and a history of any conduct disorder were associated with a higher risk of relapse. Time in remission at Wave 1 remained inversely related to risk of relapse.

4. DISCUSSION

To our knowledge, this is the first study to investigate odds and predictors of relapse of CUD in a nationally representative sample. We found that only 6.63% of individuals in remission of CUD at Wave 1 had relapsed at the three-year follow-up. The odds of relapse were inversely related to time in remission. Several sociodemographic variables, indicators of substance use severity and psychopathology predicted relapse in the univariate analyses. In the multivariable models, only having a history of conduct disorder or a diagnosis of new onset major depressive disorder or dysthymia after Wave 1 increased the risk of relapse, indicating that other variables previously identified as risk factors for relapse in clinical samples of CUD (Stephens et al., 1994b) and other SUD (Bolt et al., 2009; Catalano et al., 1990; Ramo et al., 2005) no longer increased the risk of relapse after adjusting for the effect of other covariates. This pattern of results remained unchanged when individuals in partial remission were included or the analyses were restricted to participants who had been in remission for one year at the baseline assessment.

Our findings are consistent with previous data from the NESARC documenting that among individuals who had recovered from alcohol dependence only 5.1% relapsed to dependence in the same follow-up period, indicating that maintenance of remission was the most common outcome (Dawson et al., 2007). However, the odds of CUD relapse found in our study are much lower than those reported in studies of clinical samples (Catalano et al.,

1990; Haney et al., 2010; Perkonig et al., 2008; Price et al., 2001; Stephens et al., 1994a, 1994b; Witkiewitz and Marlatt, 2004), possibly due to lower average severity of CUD, less psychiatric comorbidity and health issues (Arendt et al., 2007a; Chen et al., 2011), and less exposure to high-risk environments (Benowitz, 2008; Lopez-Quintero et al., 2011; Piasecki, 2006), among community rather than clinical samples. However, exact comparisons with previous findings are difficult because of the different definitions of relapse, follow-up periods and specific characteristics of the samples included across studies (Okuda et al., 2010). Overall, our data suggest that individuals in the community who achieve remission have a high likelihood of remaining in remission. Of note however, in a previous study we found that the median time to remission after onset of cannabis dependence is six years, and that over one third of individuals continue to meet criteria for cannabis dependence one decade after the onset of the disorder, indicating that individuals who meet criteria for cannabis dependence are likely to suffer its negative consequences for a long period of time (Lopez-Quintero et al., 2011). These findings emphasize the need to develop more effective interventions and to increase enrollment rates into existing treatments to accelerate rates of remission and decrease the burden of CUD on individuals and communities.

In accord with studies in clinical samples of individuals with CUD (Arendt et al., 2007b; Bonn-Miller and Moos, 2009; Cornelius et al., 2008; Godley et al., 2005; Ramo et al., 2005; White et al., 2004), and other SUD (Dennis et al., 2007; Scott et al. 2011), as well as in community samples with alcohol dependence (Dawson et al., 2007), time in remission was inversely associated with risk of relapse. The period with highest risk for relapse was the first year after remission, with a steep decrease in subsequent years. Increased self-efficacy, desensitization to cues, extinction of learned behaviors and lower frequency of cravings may help explain the protective effect of longer time in remission (Dawson et al., 2007; Piasecki, 2006; Witkiewitz and Marlatt, 2004). Nevertheless, although the likelihood of relapse decreases with time, even individuals in remission for several years were at risk of relapse, suggesting that learned behaviors associated with addictions may be difficult to fully reverse in some individuals. Although treatment programs for CUD might emphasize the importance of remission during the first year, they should consider periodic booster sessions or check-ups to enhance the probability of prolonged remission (Scott and Dennis, 2009).

In our study, having a history of conduct disorder increased the risk of relapse. These findings are in line with its role as risk factor for the onset and persistence of SUD (Disney et al., 1999; Morcillo et al., 2012; Torok et al., 2012). Impulsivity and poor behavioral control, which are common among individuals with conduct disorder are important risk factors for SUD (Castellanos-Ryan and Conrod, 2011; Moeller et al., 2001a), and predict lower treatment retention, poorer course (Chambers et al., 2003; Moeller et al., 2001a, 2001b; VanderVeen et al., 2008a, 2008b; Verdejo-Garcia et al., 2008) and increased risk of relapse to other substances (Doran et al., 2004; Economidou et al., 2009; Vanderveen et al., 2008b). Treatment approaches that include modified behavioral therapies or treatment with antipsychotics, mood stabilizers or antidepressants tailored to well-defined symptoms such as anger, anxiety or impulsivity (Fleischhaker et al., 2011; Ingenhoven et al., 2010) may improve rates of maintained remission of individuals with CUD and conduct disorder.

In line with previous findings in clinical samples (White et al., 2004), individuals with a depressive disorder after Wave 1 were at higher risk to relapse at Wave 2. Previous studies have shown that depressive disorders increase the risk of CUD (Compton et al., 2007; Pacek et al., 2012; Swendsen et al., 2010). Our findings document that major depressive disorder also increases the risk of relapse to a CUD. Several mechanisms may contribute to these associations, including shared genetic predisposition, correlated liabilities, unidirectional relationships in which one condition influences the other, or bidirectional relationships (Pacek et al., 2012; Swendsen et al., 2010). Early treatment or prevention of these comorbid disorders could contribute to reducing the risk of relapse (Swendsen et al., 2010).

In contrast with findings in other clinical samples (Bonn-Miller and Moos, 2009; Hides et al., 2006; Ramo et al., 2005), but consistent with previous findings on predictors of remission from cannabis dependence (Lopez-Quintero et al., 2011), and relapse of individuals in remission from alcohol dependence in general population samples (Dawson et al., 2007), this study did not find relationship between cannabis relapse and other axis I diagnosis different from major depressive disorder after adjusting for other covariates. Although the presence of other axis I disorders may constitute an important risk factor for relapse in certain clinical subgroups (Arendt et al., 2007a; Chen et al., 2011; Okuda et al., 2010) their role in the remission and relapse of individuals with CUD in the community appears more limited in comparison to the effect of conduct disorder or major depressive disorder. Lower rates of co-occurring psychiatric disorders in community samples compared to clinical ones may also explain part of the difference (Rush et al., 2008; Shane et al., 2003).

Univariate analyses found that several sociodemographic variables (e.g., younger age at Wave 1 interview, poorer educational level, lower income), indicators of substance use severity (e.g., greater length of CUD, history of treatment-seeking for CUD, number of joints used per day when used the most) and co-occurring psychopathology (e.g., personality disorders, history of another SUD in the year prior to Wave 1 interview, bipolar or anxiety disorder after Wave 1) predicted relapse. However these variables were not associated with a higher risk to relapse after controlling for the effect of other covariates, suggesting that the higher risk of CUD relapse among those who had the variables was mostly explained by the other covariates.

This study has limitations common to most large-scale surveys. First, information on substance use and SUD was based on self-report and not confirmed by urine toxicology. Second, because ADHD was assessed in Wave 2 of NESARC, it could not be included as a prospective predictor in our analysis. Third, consistent with DSM-IV, the withdrawal criterion was not included in the diagnosis of cannabis dependence. Fourth, diagnoses of CUD may be subject to recall bias (Grant et al., 2003b; Hasin and Liu, 2003); however, the prospective design of this study minimized that bias. The narrow 3-year time span should have also contributed to minimize the recall error compared to surveys with a longer period of retrospective recall (Dawson et al., 2007). Furthermore, when analyses were restricted to individuals who were in remission for only one year in Wave 1, the pattern of results was identical, suggesting that our analyses are robust to the analytic timeframe. At the same time, because the follow-up period was only three years, our results only provide a lower

bound for the risk of relapse. Longer follow up periods would likely result in higher cumulative estimates of risk of relapse. Finally, because the NESARC sampled populations 18 years and older, information for adolescents, an important, large proportion of cannabis users, was unavailable.

Despite limitations, these data represent the largest and only nationally representative longitudinal study to date of individuals in remission from CUD, and provide new and valuable information on the course of remission and predictors of relapse. In the community, most individuals who achieve remission from CUD do not relapse within a three-year period, although having a cluster B personality disorder or a history of conduct disorder significantly increase the risk of relapse. We hope these findings indicate the high clinical value and public health impact of achieving remission, emphasize the importance of developing interventions that accelerate time to remission, and help in tailoring treatments to the personalized needs of individuals achieving remission.

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Table 1

Prevalence of covariates by CUD status at Wave 2 of individuals in remission from cannabis use disorders (CUD) at Wave 1 (n=2,350) and unadjusted logistic regression model.

Characteristic	% among relapsed	S.E.	% among did not relapse	S.E.	Unadjusted odds ratios			
					OR	95% CI	p-value	
SOCIODEMOGRAPHIC								
Gender								
Male	69.73	4.72	65.25	1.29	1.23	0.77	1.95	0.3842
Female	30.27	4.72	34.75	1.29	-	-	-	-
Age group								
18-29	41.89	5.13	23.27	1.23	-	-	-	-
>30	58.11	5.13	76.73	1.23	0.42	0.27	0.67	0.0003
Race/ethnicity								
Whites	76.31	4.77	79.12	1.20	-	-	-	-
Non-Whites	23.69	4.77	20.88	1.20	1.18	0.70	1.99	0.5399
Urbanicity								
Rural	15.93	3.74	20.87	2.01	0.72	0.41	1.24	0.2337
Urban	84.07	3.74	79.13	2.01	-	-	-	-
US Born								
Yes	96.35	1.64	96.82	0.56	-	-	-	-
No	3.65	1.64	3.18	0.56	1.15	0.44	3.02	0.7688
Education								
High school or less	62.61	4.77	36.38	1.29	2.93	1.91	4.49	<0.0001
College	37.39	4.77	63.62	1.29	-	-	-	-
Individual income								
\$0-\$34,999	79.11	3.79	60.83	1.38	-	-	-	-
35,000	20.89	3.79	39.17	1.38	0.41	0.26	0.66	0.0004
Marital Status								
Married	51.66	5.40	61.49	1.11	-	-	-	-

Characteristic	% among relapsed	S.E.	% among did not relapse	S.E.	Unadjusted odds ratios			
					OR	95% CI	p-value	
Never married/Divorced/Separated/Widowed	48.34	5.40	38.51	1.11	1.49	0.95	2.34	0.0795
Employment status								
Employed	72.51	4.55	81.11	0.92	-	-	-	
Unemployed	27.49	4.55	18.89	0.92	1.63	1.02	2.61	0.0429
Family history of SUD	70.38	4.37	60.79	1.26	1.53	0.97	2.41	0.0649
Number of stressful life events in the last 12 months	3.07	0.23	2.49	0.05	1.15	1.04	1.26	0.0074
Self perceived health status								
Good to Excellent	76.64	4.84	87.26	0.77	-	-	-	
Poor, Fair	23.36	4.84	12.74	0.77	2.09	1.21	3.60	0.0088
CANNABIS USE RELATED								
Age of onset of cannabis first use	16.06	0.46	16.97	0.09	0.93	0.86	1.02	0.1095
Age of onset of cannabis use disorder	19.00	0.75	19.12	0.11	1.00	0.94	1.06	0.8750
Number of joints used per day during heaviest use period	3.92	0.53	2.63	0.09	1.08	1.04	1.12	0.0002
Duration of cannabis use disorder (years)	7.61	1.14	5.12	0.18	1.05	1.01	1.09	0.0060
Age at remission	26.92	0.99	24.25	0.18	1.04	1.01	1.07	0.0021
Time since remission, yr	5.30	0.60	13.99	0.24	0.86	0.83	0.90	<0.0001
Number of different episodes of cannabis use disorder	2.61	0.95	2.19	0.25	1.01	0.98	1.03	0.6090
Lifetime history of having obtained help for drug problems	22.49	4.22	12.14	0.97	2.10	1.24	3.56	0.0067
PSYCHOPATHOLOGY								
Major depressive disorder or dysthymia (past year)	7.81	2.59	9.09	0.86	0.85	0.39	1.82	0.6656
New onset major depressive disorder or dysthymia between Waves 1 and 2	17.00	3.94	8.01	0.70	2.35	1.29	4.31	0.0062
Bipolar disorder (past year)	9.29	2.44	6.74	0.61	1.42	0.77	2.62	0.2602
New onset bipolar disorder between Waves 1 and 2	14.96	3.40	8.63	0.78	1.86	1.07	3.25	0.0292
Any past year anxiety disorder	19.00	3.66	20.15	1.03	0.93	0.56	1.53	0.7720
Any new onset anxiety disorder (excluding PTSD) between Waves 1 and 2	30.89	4.83	20.43	1.05	1.74	1.09	2.78	0.0207
Any past year psychotic disorder	1.55	0.87	0.81	0.27	1.94	0.52	7.23	0.3185
Any conduct disorder	5.84	2.53	1.94	0.35	3.13	1.13	8.66	0.0281
Cluster A personality disorder	21.46	3.87	12.16	0.84	1.97	1.20	3.24	0.0077

Characteristic	% among relapsed	S.E.	% among did not relapse	S.E.	Unadjusted odds ratios			
					OR	95% CI	p-value	
Cluster B personality disorder	35.26	4.35	18.43	1.03	2.41	1.62	3.59	<0.0001
Cluster C personality disorder	18.10	3.68	17.83	1.04	1.02	0.60	1.71	0.9453
Any other SUD in past year ^a	61.32	4.83	44.88	1.41	1.95	1.28	2.96	0.0023

^aSubstances assessed include nicotine, alcohol, cocaine, sedatives, tranquilizers, painkillers, stimulants, hallucinogens, inhalants/solvents and heroin. Significant results (p<0.05) are bolded.

Table 2

Predictors of relapse to CUD at NESARC Wave 2 among individuals in remission at Wave 1. Results from logistic regression analyses Models 1 and 2.

Characteristic	Model 1		Model 2	
	OR	95% CI	OR	95% CI
CANNABIS USE RELATED				
Number of joints used per day during heaviest use period	0.99	0.95	0.98	0.93
Duration of cannabis use disorder (years)	0.99	0.94	0.99	0.94
Age at remission	1.01	0.96	1.02	0.98
Time since remission, yr	0.86	0.82	0.87	0.82
Lifetime history of having obtained help for drug problems	1.43	0.74	1.38	0.69
PSYCHOPATHOLOGY				
New onset major depressive disorder or dysthymia between Waves 1 and 2			2.29	1.14
New onset bipolar disorder between Waves 1 and 2			1.24	0.61
Any new onset anxiety disorder (excluding PTSD) between Waves 1 and 2			1.42	0.77
Any conduct disorder			5.80	2.08
Cluster A personality disorder			1.08	0.58
Cluster B personality disorder			1.67	0.98
Any other SUD in past year ^a			1.30	0.83

^aSubstances assessed include nicotine, alcohol, cocaine, sedatives, tranquilizers, painkillers, stimulants, hallucinogens, inhalants/solvents and heroin. Significant results (p<0.05) are bolded.