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Stressful Events and Other Predictors of Remission from Drug Dependence in the United States: Longitudinal Results from a National Survey

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Abstract

This study examined stressful life events and other predictors associated with remission from DSM-IV drug dependence involving cannabis, cocaine, hallucinogens, heroin, inhalants, non-heroin opioids, sedatives, stimulants, tranquilizers, or other drugs. Waves 1 and 2 of the National Epidemiologic Survey on Alcohol and Related Conditions were used to examine the prevalence and predictors of past-year remission status. Among U.S. adults with previous (i.e., prior-to-past-year) drug dependence ($n = 921$) at baseline (Wave 1), the prevalence of past-year remission status at Wave 1 was: abstinence (60.5%), asymptomatic drug use (18.8%), partial remission (7.1%), and still drug dependent (13.5%). Similarly, the prevalence of past-year remission status three years after baseline at Wave 2 was: abstinence (69.1%), asymptomatic drug use (15.5%), partial remission (8.4%), and still drug dependent (7.0%). Remission three years after baseline at Wave 2 was much more likely among formerly drug dependent U.S. adults who abstained from drug use at baseline (Wave 1) relative to those who reported asymptomatic drug use, partial remission, or remained drug dependent. Design-based weighted multinomial logistic regression analysis showed that relative to abstinence, past-year stressful events at baseline (Wave 1) predicted higher odds of partial remission and drug dependence at both Waves 1 and 2. This is the first national study to examine the potential role of stressful life events associated with remission from drug dependence. Although the majority of those who reported previous drug dependence transitioned to full remission, a sizeable percentage were either still drug dependent or in partial remission. Higher levels of stressful life events appear to create barriers for remission and should remain a focus for relapse prevention programs.

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Keywords

Epidemiology; Longitudinal; Substance Use Disorders; Drug Dependence; Remission

1. Introduction

Approximately one in every ten U.S. adults develop drug use disorders (DUDs) involving psychoactive substances other than alcohol (i.e., cannabis, cocaine, hallucinogens, heroin, inhalants, non-heroin opioids, sedatives, stimulants, tranquilizers, and other drugs) in their lifetime (Grant et al., 2016). Recent evidence also indicates the prevalence of cannabis use disorders have increased among U.S. adults over the past decade (Hasin et al., 2015). Approximately three in every ten U.S. adults who develop DSM-IV DUDs will continue to meet criteria for DUDs over a three-year period (Fenton et al., 2012). The estimated percentage of U.S. adults in the general population in remission from substance use disorders ranges from 5.3% to 15.3% (White, 2012). While the course of alcohol dependence and remission from alcohol dependence has been well-investigated in the U.S. general population (Dawson et al., 2005a; Dawson, Goldstein, & Grant, 2007; Moss, Chen, & Yi, 2010; White, 2012), very few national longitudinal studies have examined the course and predictors associated with remission from drug dependence among U.S. adults over time (Calabria et al., 2010; Compton, Dawson, Conway, Brodsky, & Grant, 2013; Fenton et al., 2012; Sarvet & Hasin, 2016).

There is evidence that drugs other than alcohol are increasingly becoming primary drugs of misuse among those entering drug treatment programs in the U.S. over the past two decades (SAMHSA, 2006, 2012, 2015). For instance, the percentage of drug treatment admissions reporting alcohol as the primary drug decreased from 57% in 1993 to 38% in 2013, while the percentage of drug treatment admissions for marijuana, opiates, and stimulants increased from approximately 22% in 1993 to 53% in 2013 (SAMHSA, 2006, 2012, 2015). These trends suggest the importance of improving our understanding of remission from drug dependence, including predictors of relapse and stability of abstinence from drug use over time based on national studies in the U.S. (Blanco et al., 2007; Compton et al., 2007; Lopez-Quintero et al., 2011). While a shift has occurred in presenting substance use profiles for those entering drug treatment programs, the research on the course and correlates associated with remission from drug (non-alcohol) dependence has lagged behind relative to alcohol.

There is robust cross-sectional evidence that stressful life events are associated with heavy drinking, alcohol use disorders, marijuana use disorders, other DUDs, and other mental health disorders (Blanco et al., 2014; Dawson, Grant & Ruan, 2005b; Keyes et al., 2012; McLaughlin Conron, Koenen, & Gilman, 2010; Myers, McLaughlin, Wang, Blanco, & Stein, 2014; Sarvet & Hasin, 2016; Young-Wolff, Kendler, & Prescott, 2012). To date, no national longitudinal studies have tested whether higher levels of stressful life events predict remission among U.S. adults with drug dependence over time. Other factors associated with transitioning from DUDs and/or problematic drug use to abstinence and sustained remission in clinical and epidemiological studies include age, sex, race/ethnicity, educational attainment, income, marital status, comorbid substance use disorders (SUDs), and drug

treatment utilization (Compton et al., 2013; McKay et al., 2013; Mertens, Kline-Simon, Delucchi, Moore, & Weisner, 2012). Clearly, a more comprehensive understanding of the role such factors play in remission from drug dependence is paramount for enhancing drug treatment and relapse prevention efforts.

Although abstinence represents the most stable form of full remission from alcohol dependence in treatment and non-treatment samples, there is limited knowledge on the stability of abstinence from drug use over time among formerly drug dependent individuals (Calabria et al., 2010; Compton et al., 2007, 2013; Dawson et al., 2007; Mertens et al., 2012). A review concluded the extant literature on remission from drug dependence suffers from notable methodological limitations, including a lack of national studies, imprecise definitions of full remission, and homogeneous and/or small clinical or community studies (Calabria et al., 2010). In addition, most studies examining the stability of full remission have focused on alcohol, neglecting the potential differences and similarities between remission from alcohol dependence and other drug dependence. Thus, it remains unknown whether long-term outcomes are similar between formerly drug dependent individuals reducing drug use to asymptomatic levels and those attaining complete abstinence from drug use. In order to fill these gaps in knowledge, the present study assesses the prevalence associated with remission from drug dependence among U.S. adults and examines the potential role stressful life events and other factors play in predicting remission from drug dependence over time.

2. Materials and methods

Data collected from Waves 1 and 2 of the 2001–2002 and 2004–2005 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC-I and NESARC-II) were used as the primary sources of information regarding substance use and remission from drug dependence among the general noninstitutionalized adult population in the United States. The target population for the NESARC was the civilian noninstitutionalized population residing in the United States aged 18 years or older. The NESARC sample included persons living in households, military personnel living off base, and persons residing in the following group quarters: boarding or rooming houses, non-transient hotels, shelters, facilities for housing workers, college quarters, and group homes.

At Wave 1, the NESARC achieved a sampling frame response rate of 99%, a household response rate of 89%, and a person response rate of 93%, for an overall response rate of 81% (Grant et al., 2005). A total of 43,093 respondents completed face-to-face personal interviews at Wave 1. Three years after Wave 1 was completed, an attempt was made to re-interview all 43,093 Wave 1 respondents via face-to-face personal interviews. A response rate of 87% was achieved at Wave 2 for a total $n=34,653$, resulting in an overall response rate of 70% (Ruan et al., 2008).

2.1. Sample

The weighted Wave 1 sample ($N = 43,093$) represented a population that was 52% female; 71% White, 12% Hispanic, 11% African-American, 4% Asian, and 2% Native American or other racial category. Approximately 12% of the sample were 18 to 24 years of age and 88%

were adults 25 years of age or older. Considering weighted estimates, the final Wave 2 sample (N = 34,653) represented a population that has the same sex and race/ethnic distributions as the Wave 1 sample. In addition, more than one-half of the participants reported educational levels beyond high school (59%), while about one-fourth completed high school (27%) and one in every seven completed less than high school (14%).

2.2. Measures

The NESARC included the NIAAA Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version (AUDADIS-IV), which is a fully structured diagnostic interview (Grant et al., 2004). The AUDADIS-IV was computerized and responses were entered directly into laptop computers. The measures in the NESARC survey assessed demographic characteristics, alcohol dependence, other drug dependence, remission status, stressful life events, and drug treatment utilization.

Demographic characteristics were measured with several items including sex, age, race, personal income level, educational attainment, marital status.

Substance use disorders were assessed according to the criteria of the DSM-IV using the AUDADIS-IV, which contains symptom questions that separately operationalize DSM-IV criteria for abuse and dependence for alcohol, cannabis, cocaine, hallucinogens, heroin, inhalants, non-heroin opioids, sedatives, stimulants, tranquilizers, and other drugs. The present study focused on the sub-sample of 921 drug dependent persons at Wave 1 and did not include individuals dependent solely on alcohol. Consistent with the DSM-IV, a diagnosis of abuse required the absence of a dependence diagnosis and at least one positive response to four criteria defined for abuse in a 12-month period: (1) recurrent use resulting in failure to fulfill major role obligations; (2) recurrent use in hazardous situations; (3) recurrent substance-related legal problems; and (4) continued use despite recurrent social or interpersonal problems caused or exacerbated by drinking. A dependence diagnosis was defined as a positive response to at least three of the seven dependence criteria in a 12-month period: (1) tolerance; (2) withdrawal; (3) using larger amounts or for a longer period than intended; (4) persistent desire or unsuccessful efforts to quit; (5) spending much time obtaining or recovering from its effects; (6) giving up or reducing occupational, social or recreational activities; and (7) and continuing to use despite a physical or psychological problem caused or exacerbated by use. Reliability and validity of the DSM-IV, AUDADIS-IV diagnoses of substance use disorders have been established in numerous national and international psychometric studies, with test-retest reliability ranging from good to excellent (0.70 to 0.91) (e.g., Grant, 1996; Grant, Dawson, Stinson, Chou, Kay, & Pickering, 2003; Grant, Harford, Dawson, Chou, & Pickering, 1995; Hasin, Carpenter, McCloud, Smith, & Grant, 1997; Hasin, Li, McCloud, & Endicott, 1996; Muthen, Grant, & Hasin, 1993; Nelson, Rehm, Usten, Grant, & Chatterji, 1999; Pull et al., 1997).

Past-year remission was based on DSM-IV definitions and broken into the following four sub-categories: 1) Past-Year Abstinence: No drug use in the past 12 months; 2) Past-Year Asymptomatic Drug Use: Used at least one drug at least once but did not experience any DSM-IV drug use disorder criteria in the past 12 months; 3) Past-Year Partial Remission: Past-year recurrence of DSM-IV DUD criteria but did not meet full criteria for DSM-IV

drug dependence in the past 12 months; and 4) Past-Year Still Drug Dependent: Continued to meet criteria for DSM-IV drug dependence for at least one drug class in the past 12 months.

Stressful life events were assessed by asking respondents if they had experienced each of the following stressful life events: “In the last 12 months... 1) Did any of your family members or close friends die? 2) Did any of your family members or close friends have a serious illness or injury? 3) Did you move or have anyone new come to live with you? 4) Were you fired or laid off from a job? 5) Were you unemployed and looking for a job for more than a month? 6) Have you had trouble with your boss or a coworker? 7) Did you change jobs, job responsibilities or work hours? 8) Did you get separated or divorced or break off a steady relationship? 9) Have you had serious problems with a neighbor, friend or relative? 10) Have you experienced a major financial crisis, declared bankruptcy or more than once been unable to pay your bills on time? 11) Did you or a family member have trouble with the police, get arrested or get sent to jail?; and 12) Were you or a family member the victim of any type of crime? The 12 items were summed to create an index of the number of stressful life events (range 0–12) experienced during the last 12 months (see Dawson, Grant and Ruan, 2005b). Test–retest reliabilities of the stressful life events scale was excellent (ICC = 0.94; Ruan et al., 2008).

Drug treatment utilization was assessed by asking respondents with PPY drug dependence about lifetime treatment or help-seeking behavior specifically for their drug use in the following settings: self-help groups (which include Narcotics or Cocaine Anonymous, Alcoholics Anonymous, or other 12-step or religious-based groups); family services or another social service agency; drug detoxification ward or clinic; inpatient ward of a psychiatric or general hospital or community mental health program; outpatient clinic, including outreach programs and day or partial patient programs; drug rehabilitation program; emergency room; halfway house or therapeutic community; crisis center; employee assistance program; clergyman, priest, rabbi, or any type of religious counselor; private physician, psychiatrist, psychologist, social worker, or any other professional; and methadone maintenance. Several studies have examined the psychometric properties of similar self-reported measures of drug treatment utilization and found such measures to be reliable and valid (Adair, Craddock, Miller, & Turner, 1996; Cacciola et al., 2008; Edwards, Fisher, Johnson, Reynolds, & Redpath, 2007; Killeen Brady, Gold, Tyson, & Simpson, 2004; McLellan, Alterman, Cacciola, Metzger, & O’Brien, 1992).

2.3. Data Analysis

All analyses were design-based, using the sampling weights provided in the NESARC data set to compute unbiased population estimates of the descriptive parameters of interest, and the available codes describing the sampling strata and sampling clusters from the multi-stage stratified cluster sampling design to compute linearized variance estimates for the weighted estimates. Initial analyses focused on estimation of the past-year prevalence of remission in U.S. adults with prior-to-past-year drug dependence. Next, the past-year prevalence of remission was compared for subgroups defined by sex (female, male), race (Black, White, and Other), age (18–24 years and 25 years and older), educational attainment (more than

high school, high school, and less than high school), income (less than \$20,000, \$20,000 – \$39,999, and \$40,000 and above), marital status (married/cohabiting, never married, divorced/separated/widowed), stressful life events, prior-to-past-year alcohol use disorder (yes/no), drug treatment utilization (yes/no), and prior-to-past-year comorbid drug use disorder status (yes/no), using similar methods. Correlates and predictors of past-year remission were examined in design-based weighted bivariate analyses and using multinomial logistic regression models. All parameters, 95% confidence intervals (CIs) and standard errors were estimated using SAS/STAT 14.1 (SAS Institute Inc., 2015), a statistical software program that includes SURVEY procedures with the Taylor series linearization variance estimation method to adjust for complex survey sample design effects. Because our hypotheses focused on subgroups defined by drug dependence, we used domain analysis (see Heeringa, West, & Berglund., 2010).

Results

The prevalence of any prior-to-past-year (PPY) drug dependence was 2.3% (n = 921). As illustrated in Table 1, among U.S. adults with PPY drug dependence at baseline (Wave 1), the prevalence of past-year remission was as follows: abstinence (60.5%), asymptomatic drug use (18.8%), partial remission (7.1%), and still drug dependent (13.5%).

As illustrated in Table 2, among those with PPY drug dependence at baseline (Wave 1), the mean number of stressful life events increased in a stepwise fashion as a function of past-year remission as follows: abstinence (2.7), asymptomatic drug use (3.9), partial remission (4.0), and still drug dependent (4.7). Design-based weighted multinomial logistic regression analysis showed that higher levels of past-year stressful events at baseline (Wave 1) were associated with greater odds of past-year asymptomatic drug use (AOR = 1.2, 95% CI = 1.1, 1.4), past-year partial remission (AOR = 1.3, 95% CI = 1.1, 1.5), and past-year still drug dependent (AOR = 1.4, 95% CI = 1.3, 1.8) relative to abstinence at baseline (Wave 1) among U.S. adults with PPY drug dependence. In addition, other baseline (Wave 1) correlates of being still drug dependent relative to abstinence at baseline (Wave 1) included being male, young adulthood (18–24 years of age), having low income (less than \$20,000 per year), being divorced/separated/widowed or never married, and drug treatment utilization.

The prevalence of past-year remission at Wave 2 was: abstinence (69.1%), asymptomatic drug use (15.5%), partial remission (8.4%), and still drug dependent (7.0%). As illustrated in Table 3, past-year abstinence or asymptomatic drug use at Wave 2 was most prevalent among those who reported past-year abstinence at baseline (Wave 1) (94.8%), followed by past-year asymptomatic drug use at Wave 1 (72.9%), past-year partial remission at Wave 1 (58.9%), and past-year still drug dependent at Wave 1 (65.9%). In contrast, past-year still drug dependent at Wave 2 was most prevalent among those who reported past-year still drug dependent at Wave 1 (23.4%) followed by past-year partial remission at Wave 1 (11.1%), past-year asymptomatic drug use at Wave 1 (11.0%), and past-year abstinence at Wave 1 (2.1%).

As illustrated in Table 4, among prior-to-past-year drug dependence at Wave 2, the mean number of stressful life events increased in a stepwise fashion as a function of past-year

remission as follows: abstinence (3.0), asymptomatic drug use (3.7), partial remission (4.2), and still drug dependent (4.4). Design-based multinomial logistic regression analysis revealed that higher levels of past-year stressful life events at baseline (Wave 1) predicted greater odds of past-year partial remission (AOR = 1.2, 95% CI = 1.0, 1.5) and past-year still dependent (AOR = 1.2, 95% CI = 1.0, 1.5) three years later at Wave 2. Other baseline (Wave 1) predictors of past-year still drug dependent relative to abstinence at Wave 2 included having less than a high school education (AOR = 3.3, 95% CI = 1.3, 8.5) or a high school education (AOR = 3.6, 95% CI = 1.8, 7.4) relative to having more than a high school education.

Discussion

Approximately one in every ten U.S. adults will develop a drug use disorder involving cannabis, cocaine, hallucinogens, heroin, inhalants, non-heroin opioids, sedatives, stimulants, tranquilizers, or other drugs in their lifetime (Grant et al., 2016). The present study makes a unique contribution because it represents the first large-scale longitudinal national investigation to assess the prevalence of remission from drug dependence among U.S. adults and examine the potential role that stressful life events and other predictors play in persistence and remission from drug dependence over time. We found that nearly 80% of U.S. adults who reported previous (i.e., prior-to-past-year) drug dependence transitioned to abstinence or asymptomatic drug use in the past 12 months at baseline (Wave 1) and three years later (Wave 2). At least one national study found that nearly half (49.0%) of illicit drug users with at least one DSM-IV drug abuse or dependence symptom had stopped using illicit drugs over three years later while 10.9% of illicit drug users had transitioned to asymptomatic use and 40.1% continued symptomatic illicit drug use (Compton et al., 2013). The differences in the three-year developmental course and remission rates between the present study focused on drug dependence and the above-mentioned study focused on transitions involving symptomatic drug use reinforce the importance of considering severity of drug use.

To date, abstinence is one of the most supported goals to achieving meaningful recovery for treatment-seeking patients, especially for those with more severe SUDs (Dennis, Foss, & Scott, 2007; DuPont, Compton, & McLellan, 2015; Garner, Scott, Dennis, & Funk, 2014; Scott, Dennis, Laudet, Funk, & Simeone, 2011). Medication-assisted treatment is currently regarded as separate from abstinent recovery but is common for treating several types of substance use disorders, including opioid use disorders (Connery, 2015; Jones, Campopiano, Baldwin, & McCance-Katz, 2015; Rieckmann et al., 2016). Among U.S. adults who were prior-to-past-year drug dependent at baseline (Wave 1), the most prevalent drug use status at Wave 1 and Wave 2 was complete abstinence. However, these results differ from earlier work that examined remission from DSM-IV alcohol dependence and found most U.S. adults with previous alcohol dependence were still classified as dependent or in partial remission in the past 12 months (Dawson et al., 2005a). Indeed, among U.S. adults who were previously alcohol dependent, only 18.2% reported abstinence in the past 12 months at Wave 1 (Dawson et al., 2005a).

We found that stressful life events appeared to play an important role in the remission from drug dependence because higher levels of stressful life events were the only correlates/predictors associated with lower likelihood of remission both cross-sectionally and longitudinally. Past research has been primarily cross-sectional and found that stressful life events are significantly associated with heavy drinking, alcohol use disorders, marijuana use disorders, other DUDs, and other mental health disorders (Blanco et al., 2014; Dawson et al., 2005b; Keyes et al., 2012; McLaughlin et al., 2010; Myers et al., 2014; Sarvet & Hasin, 2016; Young-Wolff et al., 2012). While stress-reducing activities play an integral role in relapse prevention efforts for addictive behaviors (Hendershot, Witkiewitz, George, & Marlatt, 2011; Witkiewitz, Lustyk & Bowen, 2013), the present study offers a significant contribution by testing whether stressful life events predict remission among U.S. adults with drug dependence over time. One clinical study examined the role of stressful life events as potential predictors of role functioning in four life domains (i.e., friends, family, home duties, and work/school) among 65 patients with bipolar disorder and found the presence of stressful life events predicted longer time to functional recovery (Yan-Meier et al., 2011). The findings of the present study offer evidence that higher levels of stressful life events appear to be barriers to sustained remission resulting in greater likelihood of partial remission and persistent drug dependence. Taken together, these findings suggest an important role of coping with stress and negative affect plays in relapse prevention for addictive behaviors such as mindfulness-based relapse prevention might be useful, especially in early remission and withdrawal as these periods may leave individuals particularly susceptible to relapse due to an inability to cope with stressful life events and negative affect (Baker, Japuntich, Hogle, McCarthy, & Curtin, 2006; Hendershot et al., 2011; Witkiewitz et al., 2013).

The present study identified several other Wave 1 correlates associated with past-year partial remission and/or drug dependence relative to past-year abstinence at Wave 1 including male sex, young adulthood (18–24 years of age), low personal income, low educational attainment, divorced/separated/widowed or never married, and prior drug treatment utilization. Notably, most of the Wave 1 correlates associated with increased odds of past-year partial remission and drug dependence at Wave 1 did not predict these outcomes three years later at Wave 2 suggesting the importance of distinguishing between cross-sectional correlates and predictors of remission over time. For example, having a high school education or less at Wave 1 predicted past-year drug dependence relative to past-year abstinence at Wave 2 while young adulthood at Wave 1 was associated with partial remission at Wave 2. A prior cross-sectional study of U.S. adults also found that males and young adults (18–29 years of age) were correlates associated with lower likelihood of remission from cannabis or cocaine dependence (Lopez-Quintero et al., 2011). Taken together, these findings suggest future research is needed to examine whether predictors associated with remission differ among subpopulations such as young adults and those with less educational attainment based on their higher levels of SUDs and lower levels of abstinence found in the present study and recent studies (Grant et al., 2016; Hasin et al., 2016).

The positive association between drug treatment utilization and drug dependence at Wave 1 should be considered in a larger context rather than used as evidence that drug treatment is ineffective in achieving abstinence. First, the finding that drug treatment utilization was

associated with increased odds of drug dependence relative to abstinence was no longer present three years later at Wave 2. Second, drug treatment is typically utilized by individuals who experience the most severe drug-related consequences, have higher rates of relapse, and/or have difficulty achieving abstinence or asymptomatic drug use (Dawson, Grant, Stinson, & Chou, 2006). Third, it should be noted that most individuals in the U.S. general population with drug dependence never utilize drug treatment services despite substantial disability and psychiatric comorbidity associated with these disorders (Blanco et al., 2007; Compton et al., 2007; Grant et al., 2016; McCabe, Cranford, & West, 2008; SAMHSA, 2013). Finally, drug treatment utilization and subsequent abstinence have been shown to significantly increase health-related quality of life and reduce risk of mortality (Dennis et al., 2007; Garner et al., 2014; Scott et al., 2011). The findings that prior alcohol dependence or comorbid drug dependence were not associated with partial remission or drug dependence at baseline (Wave 1) or three years later at Wave 2 were somewhat unexpected. Previous studies have found extremely high rates of comorbidity between non-alcohol drug use disorders and other substance use disorders (Blanco et al., 2014; Compton et al., 2007, 2013; Fenton et al., 2012; McCabe et al., 2008).

There was evidence in the present study that abstinence three years after baseline was more prevalent among formerly drug dependent U.S. adults who abstained from drug use at baseline (Wave 1) relative to those who reported asymptomatic drug use, partial remission, or remained drug dependent. Indeed, baseline abstinence was most stable drug use status over time, with 85.3% of U.S. adults in this category at Wave 1 still reporting abstinence at Wave 2. These findings are consistent with past research indicating abstinence from alcohol and other substance use at baseline was associated with much lower risk of subsequent partial remission or substance dependence than asymptomatic substance use among U.S. adults with a history of alcohol dependence (Dawson et al., 2007) and adults who attended a regional drug treatment (Mertens et al., 2012). The present study found that the 3-year persistence rate of past-year DSM-IV drug dependence occurred among 23.4% of individuals with baseline past-year drug dependence which is lower than a prior study that found the 3-year persistence rate of DUDs was 30.9% (Fenton et al., 2012).

4.2 Strengths and Limitations

The present study has several strengths that build upon past epidemiological research on remission from alcohol and other drug dependence. First, this investigation allowed us to generalize our findings to the civilian noninstitutionalized population aged 18 years and older residing in the United States. Second, the sample was large enough to include several key variables as correlates/predictors (e.g., age, sex, race, income, educational attainment, marital status, stressful events, alcohol use disorders, drug treatment history). Finally, the present study focused on remission from drug dependence based on different levels of substance use and DSM-IV symptomology. Most importantly, inclusion of stressful life events and DSM-IV criteria allowed for examination of a key variable presumed to be associated with remission from drug dependence.

In addition to its strengths, the current study has some limitations that should be taken into account when considering implications of the findings. First, the exclusion of currently

institutionalized adults with higher rates of DUDs such as incarcerated adults is a limitation that may lead to underestimates (Compton, Dawson, Duffy, & Grant, 2010). Second, the first two waves of the NESARC included DSM-IV criteria and future research is needed to further examine the associations found in the present study based on DSM-5 criteria. Third, the present study considered remission from several drug classes and stress could play a different role in remission from different substances. Fourth, despite a large national sample, the sizes of some subgroups (e.g., still drug dependent) were small and should be replicated in future research using larger national samples. Finally, the present study examined past-year remission over a three-year period and experts have proposed a new model for care management of SUDs to resemble a chronic disease management paradigm with a longer-term outcome goal for abstinence among patients with severe SUDs (DuPont et al., 2015).

In conclusion, the present study offers multiple notable contributions to the existing literature. First, we found that while the majority of those who reported prior drug dependence transitioned to full remission, between 15–20% were either still drug dependent or in partial remission at baseline or three years later. These findings differed from past work indicating considerably lower rates of full remission among U.S. adults who reported prior-to-past-year alcohol dependence. Abstinence was the most stable form of remission over time, with more than 4 in every 5 U.S. adults in this category at Wave 1 still reporting abstinence at Wave 2. Second, the present study demonstrated a significant relationship between higher levels of stressful life events and lower levels of remission from drug dependence over time and more work is needed to examine the role of stressful life events over longer periods of time. The findings of the present study provide evidence that treatment for drug use disorders and relapse prevention programs should include assessment of stressful life events. More research is needed to examine different drug treatment and relapse prevention modalities that can help mitigate the effects of stress at various stages of remission from drug use disorders.

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Table 1

Prevalence of Past-Year Remission from Prior-to-Past-Year Drug Dependence at Wave 1

Past-Year Remission Status	Frequency	Percentage
Abstinence	560	60.53
Asymptomatic Drug Use	170	18.81
Partial Remission	66	7.12
Still Drug Dependent	125	13.54
Total	921	100.0

Correlates of Past-Year Remission from Prior-to-Past-Year Drug Dependence at Wave 1 ($N = 921$)

Table 2

OVERALL ¹	Abstinence (n=560)	Drug Use (n=170)	Partial Remission (n=66)	Still Drug Dependent (n=125)	Drug Use vs. Abstinence	Partial Remission vs. Abstinence	Still Drug Dependent vs. Abstinence
	60.5%	18.8%	7.1%	13.5%	AOR ² [95% CI]	AOR ² [95% CI]	AOR ² [95% CI]
Sex							
Female	60.9%	21.2%	5.9%	12.0%	—	—	—
Male	60.2%	17.1%	8.0%	14.6%	0.9 [0.6, 1.5]	2.0 [0.9, 4.3]	2.0* [1.1, 3.7]
Race							
Black	68.3%	6.4%	7.0%	18.3%	0.3* [0.1, 0.6]	0.8 [0.4, 1.9]	1.4 [0.7, 2.7]
White	60.3%	19.5%	7.9%	12.2%	—	—	—
Other	56.5%	23.1%	3.0%	17.4%	1.1 [0.6, 1.9]	0.4* [0.1, 0.9]	1.2 [0.6, 2.6]
Age							
18–24 years	38.8%	19.2%	15.4%	26.6%	1.1 [0.6, 2.0]	3.7* [1.7, 8.0]	2.4* [1.3, 4.5]
25 and older	65.9%	18.7%	5.1%	10.3%	—	—	—
Education							
Less than HS	53.6%	20.3%	5.26%	20.9%	0.9 [0.5, 1.8]	0.8 [0.3, 2.1]	1.4 [0.6, 3.0]
High School	59.0%	13.5%	11.3%	16.3%	0.7 [0.4, 1.2]	2.2* [1.2, 4.2]	1.7 [0.9, 3.2]
More than HS	63.3%	21.3%	5.4%	9.9%	—	—	—
Income							
\$0 to \$19k	53.6%	20.1%	8.0%	18.3%	1.6 [0.9, 3.1]	1.6 [0.6, 4.2]	2.6* [1.1, 5.9]
\$20k to 39k	60.0%	20.1%	7.8%	12.0%	1.5 [0.8, 2.8]	1.8 [0.6, 5.5]	2.3 [0.9, 5.8]
\$40k and higher	78.9%	13.7%	3.8%	3.6%	—	—	—
Marital Status							
Never Married	45.1%	21.5%	10.7%	22.7%	1.7 [0.9, 2.9]	1.9 [0.9, 4.1]	3.3* [1.8, 6.2]
Divorced/separated/widowed	52.8%	19.8%	7.6%	19.7%	1.4 [0.8, 2.2]	3.0* [1.4, 6.4]	4.6* [2.3, 9.3]
Married/cohabiting	71.7%	17.0%	5.0%	6.3%	—	—	—

	Abstinence (n=560)	Drug Use (n=170)	Partial Remission (n=66)	Still Drug Dependent (n=125)	Drug Use vs. Abstinence	Partial Remission vs. Abstinence	Still Drug Dependent vs. Abstinence
OVERALL ¹	60.5%	18.8%	7.1%	13.5%	AOR ² [95% CI]	AOR ² [95% CI]	AOR ² [95% CI]
Stressful Events ¹	2.7 ^a	3.9 ^b	4.0 ^{b,c}	4.7 ^c	1.2 * [1.1, 1.4]	1.3 * [1.1, 1.5]	1.4 * [1.3, 1.6]
Prior-to-Past Year Alcohol Dependence							
Yes	58.6	30.0	6.7	13.7	3.2 * [1.7, 8.7]	2.2 [0.3, 15.3]	1.4 [0.5, 4.0]
No	64.7	14.1	8.0	13.2	—	—	—
Drug Treatment Utilization							
Yes	56.5%	17.2%	7.4%	19.0%	1.0 [0.6, 1.5]	1.1 [0.6, 2.0]	2.1 * [1.2, 3.4]
No	63.6%	19.8%	7.0%	9.2%	—	—	—
Prior-to-Past-Year Comorbid Drug Dependence							
Yes	59.4	20.1	6.5	14.0	0.4 [0.1, 1.1]	0.3 [0.1, 2.4]	0.6 [0.2, 2.0]
No	63.8	15.1	8.8	12.3	—	—	—

¹Based on domain analysis (SAS, 2014) of past-year remission status at W1.

²AOR=adjusted odds ratio from weighted design-based multiple multinomial regression analyses predicting past-year remission at W1.

95% CI = confidence interval. — = reference group.

* $p < .05$.

¹Means that have no superscript in common are significantly different from each other ($p < .05$).

Table 3

Transitions in Past-Year Remission from Prior-to-Past-Year Drug Dependence between Wave 1 and Wave 2

Wave 1 Past-Year Remission Status	Wave 2 Past-Year Remission Status	Frequency	Row Percentage
Abstinence	Abstinence	400	85.3
	Asymptomatic Drug Use	44	9.5
	Partial Remission	15	3.1
	Still Drug Dependent	12	2.1
Asymptomatic Drug Use	Total	471	100.0
	Abstinence	66	47.6
	Asymptomatic Drug Use	41	25.2
	Partial Remission	17	16.2
Partial Remission	Still Drug Dependent	11	11.0
	Total	135	100.0
	Abstinence	20	32.5
	Asymptomatic Drug Use	14	26.4
Still Drug Dependent	Partial Remission	14	30.0
	Still Drug Dependent	8	11.1
	Total	56	100.0
	Abstinence	39	41.1
Still Drug Dependent	Asymptomatic Drug Use	20	24.9
	Partial Remission	15	10.7
	Still Drug Dependent	22	23.4
	Total	96	100.0

Table 4Predictors at Wave 1 of Past-Year Remission from Drug Dependence at Wave 2 (*N* = 758)

	Abstinence (n=525)	Drug Use (n=119)	Partial Remission (n=61)	Still Drug Dependent (n=53)	Drug Use vs. Abstinence	Partial Remission vs. Abstinence	Still Drug Dependent vs. Abstinence
OVERALL	69.1%	15.5%	8.4%	7.0%	AOR [95% CI]	AOR [95% CI]	AOR [95% CI]
Sex							
Female	69.1%	14.4%	7.3%	9.2%	—	—	—
Male	69.0%	16.2%	9.1%	5.6%	1.2 [0.7, 2.1]	1.3 [0.6, 3.1]	0.7 [0.4, 1.3]
Race							
Black	81.6%	6.1%	6.1%	6.2%	0.3* [0.1, 0.7]	0.7 [0.2, 2.2]	0.8 [0.3, 2.0]
White	67.2%	16.9%	9.1%	16.8%	—	—	—
Other	70.7%	14.0%	6.3%	9.0%	0.8 [0.4, 1.5]	0.8 [0.3, 1.8]	1.2 [0.4, 3.0]
Age							
18–24	47.5%	24.2%	15.0%	13.2%	2.3* [1.2, 4.5]	2.6* [1.1, 6.0]	2.3 [0.9, 5.5]
25+	74.4%	13.3%	6.8%	5.5%	—	—	—
Education							
Less than HS	59.8%	16.3%	11.5%	12.4%	1.1 [0.5, 2.3]	2.0 [0.6, 5.9]	3.3* [1.3, 8.5]
High School	65.2%	13.1%	10.4%	11.2%	0.9 [0.5, 1.6]	1.7 [0.8, 3.6]	3.6* [1.8, 7.4]
More than HS	73.6%	16.6%	6.4%	3.4%	—	—	—
Income							
\$0 to \$19k	65.2%	16.4%	9.4%	9.0%	0.7 [0.3, 1.6]	1.5 [0.5, 4.6]	1.3 [0.4, 3.6]
\$20k to 39k	71.0%	12.8%	9.3%	6.9%	0.6 [0.3, 1.2]	1.7 [0.6, 5.1]	1.7 [0.5, 5.5]
\$40k and higher	75.8%	17.0%	4.8%	2.4%	—	—	—
Marital Status							
Never Married	58.9%	21.4%	9.4%	11.2%	1.7 [0.9, 3.3]	0.6 [0.3, 1.3]	1.5 [0.6, 4.3]
Divorced/separated/widowed	69.2%	18.7%	4.0%	8.7%	2.1* [1.1, 4.30]	0.4 [0.2, 1.2]	1.5 [0.6, 3.6]
Married/cohabiting	74.2%	11.4%	9.4%	5.0%	—	—	—

	Abstinence (n=525)	Drug Use (n=119)	Partial Remission (n=61)	Still Drug Dependent (n=53)	Drug Use vs. Abstinence	Partial Remission vs. Abstinence	Still Drug Dependent vs. Abstinence
OVERALL	69.1%	15.5%	8.4%	7.0%	AOR [95% CI] 1.1 [0.9, 1.1]	AOR [95% CI] 1.2* [1.01, 1.5]	AOR [95% CI] 1.2* [1.02, 1.5]
Stressful Events ¹	3.0 ^a	3.7 ^b	4.2 ^b	4.4 ^b			
Prior-to-Past Year Alcohol Dependence							
Yes	68.5%	12.7%	8.8%	7.0%	1.5 [0.5, 5.1]	3.1 [0.6, 15.7]	1.6 [0.3, 9.4]
No	70.2%	15.1%	7.4%	7.2%	—	—	—
Drug Treatment Utilization							
Yes	66.9%	14.9%	9.7%	8.4%	1.0 [0.6, 1.7]	1.2 [0.7, 2.4]	1.4 [0.7, 2.7]
No	70.5%	16.0%	7.6%	5.9%	—	—	—
Prior-to-Past Year Comorbid Drug Dependence							
Yes	69.1%	15.4%	8.5%	7.0%	0.5 [0.2, 1.7]	0.3 [0.1, 1.5]	0.6 [0.1, 3.6]
No	68.9%	15.8%	8.2%	7.2%	—	—	—

¹Based on domain analysis (SAS, 2014) of W2 remission status.

²AOR=adjusted odds ratio from weighted design-based multiple multinomial regression analyses predicting W2 remission status.

95% CI = confidence interval. — = reference group.

* $p < .05$.

¹Means that have no superscript in common are significantly different from each other ($p < .05$).