

Personality Disorders and the 3-Year Course of Alcohol, Drug, and Nicotine Use Disorders

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Context: Little is known about the role of a broad range of personality disorders in the course of substance use disorder (SUD) and whether these differ by substance. The existing literature focuses mostly on antisocial personality disorder and does not come to clear conclusions.

Objective: To determine the association between the 10 DSM-IV personality disorders and the persistence of common SUDs in a 3-year prospective study of a national sample.

Design: Data were drawn from participants in the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) who had alcohol dependence (n=1172), cannabis use disorder (n=454), or nicotine dependence (n=4017) at baseline and who were reinterviewed 3 years later. Control variables included demographic characteristics, family history of substance disorders, baseline Axis I disorders and treatment status, and prior SUD duration.

Main Outcome Measure: Persistent SUD, defined as meeting full criteria for the relevant SUD throughout the 3-year follow-up period.

Results: Persistent SUD was found among 30.1% of participants with alcohol dependence, 30.8% with cannabis use disorder, and 56.6% with nicotine dependence at baseline. Axis I disorders did not have strong or consistent associations with persistent SUD. In contrast, antisocial personality disorder was significantly associated with persistent alcohol, cannabis, and nicotine use disorders (adjusted odds ratios, 2.46-3.51), as was borderline personality disorder (adjusted odds ratios, 2.04-2.78) and schizotypal personality disorder (adjusted odds ratios, 1.65-5.90). Narcissistic, schizoid, and obsessive-compulsive personality disorders were less consistently associated with SUD persistence.

Conclusions: The consistent findings on the association of antisocial, borderline, and schizotypal personality disorders with persistent SUD indicates the importance of these personality disorders in understanding the course of SUD. Future studies should examine dimensional representations of personality disorders and the role of specific components of these disorders, biological and environmental contributors to these relationships, and potential applications of these findings to treatment development.

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ALCOHOL, NICOTINE, AND drug use disorders are highly prevalent,¹⁻³ comorbid with other mental disorders,^{1,2,4,5} and associated with considerable health, economic, and social burdens. The chronic nature of substance use disorders (SUDs) seen in alcohol and drug treatment settings^{6,7} continues to present challenges to clinicians and researchers. Identifying consistent predictors of chronic SUDs in prospective studies has been difficult. Some factors suggested in the literature include family history of SUDs^{8,9} and Axis I disorders, such as major depression¹⁰⁻¹⁵ and anxiety disorders.^{11,12,16,17} However, not all studies have had consistent findings on these relationships.^{5,17-19}

The association of antisocial personality disorder and its childhood antecedent, conduct disorder, with the risk for occurrence of SUDs is well known. However, regarding course, in clinical and school samples, antisocial personality disorder predicts poor outcome of SUD in some studies²⁰⁻²³ but not in others.^{17,24,25} The inconsistencies could have been due to methodologic variation, different substance disorder profiles among participants, and nonrepresentative samples, suggesting a need to investigate this issue in a substance-specific manner using standardized methods in representative samples.

In cross-sectional general population research, all 10 DSM-IV personality disorders were shown to have strong associations with alcohol and nicotine dependence

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and with drug disorders (abuse and dependence).^{1,2,4,26-29} Further, personality disorders, by definition characterized by extended duration, are associated with considerable additional impairment in functioning among those with alcohol and nicotine dependence compared with those without personality disorders.³⁰ However, the relationship of personality disorders other than antisocial to the persistence of SUDs has been studied far less, despite a suggestion made several years ago to expand the scope of substance abuse research to include a broader range of personality disorders.³¹ Recent prospective studies³²⁻³⁴ have suggested a worse course of SUDs among patients with borderline personality disorder, supporting the need for expanded investigation of this area.

Practical considerations may have limited research on the full range of personality disorders and the course of substance use disorders, since structured diagnostic interviews for Axis I disorders ordinarily include only one Axis II disorder, antisocial personality disorder.³¹ However, symptoms and impaired functioning across multiple life domains characterize not only antisocial personality disorder but also the other personality disorders. Given these considerations, the association of a broader range of personality disorders with the persistence of the most common SUDs appeared to represent a relatively unexplored area of high potential importance. Our aim was therefore to investigate the relationship between the 10 *DSM-IV* personality disorders and the persistence of alcohol, cannabis, and nicotine use disorders. For this, we used data from a large, nationally representative sample that included measurement of all 10 *DSM-IV* personality disorders and a 3-year follow-up with an excellent response rate. These data present a unique opportunity to investigate our research question. In conducting the analyses, we used statistical methods that enabled us to control for a wide variety of potential demographic and clinical confounders, including other psychiatric disorders.

METHODS

SAMPLE AND PROCEDURES

The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)^{35,36} was the source of data. The NESARC target population at Wave 1 was the civilian noninstitutionalized population 18 years and older residing in households and group quarters. Blacks, Hispanics, and adults 18 to 24 years were oversampled, with data adjusted for oversampling and household- and person-level nonresponse. Interviews were conducted with 43 093 participants by experienced lay interviewers with extensive training and supervision.^{35,36} All procedures, including informed consent, received full ethical review and approval from the US Census Bureau and the US Office of Management and Budget. The Wave 2 interview was conducted approximately 3 years later (mean [SE] interval, 36.6 [2.6] months). Excluding ineligible respondents (eg, deceased), the Wave 2 response rate was 86.7%, reflecting 34 653 completed interviews.³⁶ Wave 2 NESARC weights include a component that adjusts for nonresponse, 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 2 waves. As described previously,³⁶ adjustment for nonresponse was successful, as the Wave

2 respondents and the original target population did not differ on age, race/ethnicity, gender, socioeconomic status, or the presence of any substance, mood, anxiety, or personality disorder.³⁶ Participants included in this analysis were those with Wave 1 diagnoses of current (ie, past 12 months) *DSM-IV* alcohol dependence (*n* = 1172), cannabis abuse or dependence (*n* = 454), and nicotine dependence (*n* = 4017). Demographic and clinical characteristics of the 3 groups (including the prevalence of other disorders) are shown in **Table 1**.

MEASURES

The National Institute on Alcohol Abuse and Alcoholism (NIAAA) Alcohol Use Disorder and Associated Disabilities Interview Schedule–*DSM-IV* Version (AUDADIS-IV),³⁷⁻³⁹ a structured diagnostic interview, was developed to advance measurement of substance use and mental disorders in large-scale surveys. Computer algorithms produced *DSM-IV* diagnoses based on AUDADIS-IV data.

SUBSTANCE DISORDER OUTCOMES

We investigated the course of SUD using 3 substance-specific variables. We assessed alcohol and nicotine dependence as outcomes without a corresponding abuse diagnosis; for alcohol, abuse has little relationship with personality disorders,^{1,27,29} and for nicotine, no abuse diagnosis exists in the *DSM-IV*. We assessed cannabis use disorders because cannabis is the most widely used illicit drug and because drug abuse and dependence are both associated with personality disorders in the NESARC.^{4,28-30} We focused on these 3 substances because they are the most common in the general population.

In the AUDADIS, all users of alcohol, cannabis, and nicotine are assessed for the *DSM-IV* criteria for these substance use disorders. Alcohol and nicotine dependence were assessed using multiple items covering all 7 *DSM-IV* criteria, with 3 or more required within a 12-month period for a diagnosis. In the *DSM-IV*, cannabis dependence criteria do not include withdrawal. However, cannabis withdrawal has been demonstrated in clinical and laboratory studies^{40,41} and in the NESARC⁴² and will be included in the *DSM-5*.⁴³ We therefore based the cannabis dependence diagnosis on all 7 dependence criteria in this analysis. Cannabis abuse was assessed with items covering the 4 *DSM-IV* abuse criteria, of which at least 1 is required to meet criteria. A cannabis abuse diagnosis was given to respondents who met criteria for cannabis abuse but never for cannabis dependence. The good to excellent (κ = 0.70-0.91) test-retest reliability of AUDADIS-IV SUD diagnoses is documented in clinical and general population samples.^{37-39,44-46} Convergent, discriminant, and construct validity of AUDADIS-IV SUD criteria and diagnoses were good to excellent,⁴⁷⁻⁵¹ including in international studies,⁵²⁻⁵⁷ and agreed with clinical reappraisals.^{44,52}

At Wave 1, the substance disorder criteria were assessed in 2 time frames: (a) current (ie, past 12 months [1 year]) and (b) past (ie, any time prior to the past 12 months). At Wave 2, three years later, the criteria were also assessed in 2 time frames: (a) current (ie, past 12 months [1 year]); and (b) past (ie, any time prior to the past 12 months but since Wave 1 [2 years], covering the three years between Waves 1 and 2). Persistent alcohol or nicotine dependence was defined as meeting full criteria for current dependence at Wave 1 and evidencing at least 3 criteria for dependence in both Wave 2 time frames (ie, continuing to meet full criteria for the disorder throughout the entire 3-year follow-up). Persistent cannabis disorder was defined as meeting current abuse or dependence criteria at Wave 1 and evidencing at least 3 dependence criteria or 1 abuse criterion in both Wave 2 time frames (ie, continuing to

Table 1. Demographic and Clinical Characteristics at Wave 1

Characteristic	Mean (SE), %		
	Alcohol Dependence (n=1172)	Cannabis Abuse or Dependence (n=454)	Nicotine Dependence (n=4017)
Demographic characteristics			
Male sex	68.02 (1.6)	71.19 (2.4)	52.88 (0.9)
Age group, y			
18-29	53.52 (1.8)	66.40 (3.0)	28.43 (1.0)
30-39	21.64 (1.5)	17.00 (2.2)	23.00 (0.8)
40-49	17.52 (1.2)	12.66 (1.9)	24.87 (0.9)
≥50	7.32 (0.8)	3.94 (1.2)	23.71 (0.8)
Completed high school	83.43 (1.4)	80.54 (2.4)	85.35 (0.5)
Race/ethnicity			
White, non-Latino	69.92 (2.4)	68.70 (2.9)	79.58 (1.0)
Black, non-Latino	10.84 (1.2)	11.61 (1.9)	8.27 (0.7)
Native American	3.26 (0.8)	4.83 (1.3)	4.06 (0.5)
Asian/Pacific Islander	2.33 (0.6)	3.70 (1.5)	2.02 (0.4)
Hispanic	13.64 (2.0)	11.16 (1.9)	6.07 (0.6)
Axis I categories			
Affective/anxiety			
Unipolar affective	11.91 (1.2)	11.21 (1.6)	11.10 (0.6)
Bipolar affective	10.64 (1.2)	13.16 (2.1)	5.90 (0.5)
Anxiety disorder	20.79 (1.5)	20.17 (2.4)	19.31 (0.8)
Substance use disorders			
Alcohol dependence	NA	41.99 (3.0)	13.15 (0.7)
Cannabis abuse/dependence	16.95 (1.5)	NA	6.44 (0.5)
Nicotine dependence	44.70 (2.1)	54.26 (2.6)	NA
Other <i>DSM-IV</i> substance abuse/dependence ^a	21.76 (1.7)	23.67 (2.5)	8.14 (0.5)
Personality disorders			
Narcissistic	15.99 (1.2)	20.89 (2.6)	9.78 (0.6)
Schizotypal	9.27 (1.0)	12.96 (1.9)	8.51 (0.6)
Borderline	19.31 (1.5)	22.04 (2.4)	14.12 (0.7)
Histrionic	10.75 (1.1)	13.07 (2.1)	5.55 (0.5)
Schizoid	8.41 (1.0)	10.70 (1.7)	7.40 (0.5)
Paranoid	15.98 (1.3)	18.92 (2.3)	11.05 (0.7)
Obsessive-compulsive disorder	15.59 (1.2)	19.59 (2.2)	14.62 (0.8)
Avoidant/dependent	8.95 (1.0)	10.75 (1.7)	6.11 (0.5)
Antisocial	4.95 (0.8)	11.60 (2.0)	2.55 (0.4)
Other clinical characteristics			
Family history of alcohol/drug abuse	53.31 (2.0)	61.42 (2.6)	54.11 (1.0)
Current substance treatment	12.63 (1.1)	14.32 (2.1)	5.76 (0.4)
Alcohol dependence duration ^b	34.62 (1.9)	NA	NA
Cannabis abuse or dependence duration ^b	NA	51.61 (4.8)	NA
Nicotine dependence duration ^b	NA	NA	25.55 (1.3)

Abbreviation: NA, not applicable.

^aFor the alcohol and nicotine dependence groups, these variables include *DSM-IV* stimulant, hallucinogen, inhalant or solvent, opioid, sedative/tranquilizer, and cannabis or cocaine dependence or abuse. For the cannabis abuse or dependence group, this variable includes all these disorders except cannabis abuse or dependence.

^bNumber of months of the current or longest episode.

meet full criteria for the disorder throughout the entire 3-year follow-up).

PERSONALITY DISORDERS

Antisocial, avoidant, borderline, dependent, histrionic, narcissistic, obsessive-compulsive, paranoid, schizoid, and schizotypal personality disorders were all assessed. As defined in the *DSM-IV*, these diagnoses require evidence of long-term maladaptive patterns of cognition, emotion, and functioning. The AUDADIS-IV was designed to diagnose the disorders accordingly.^{27-29,58,59} Except for antisocial, all personality disorders were assessed with an introduction and repeated reminders asking respondents to answer how they felt or acted “most of the time, throughout your life, regardless of the situation or whom you

were with,” excluding symptoms occurring only when depressed, manic, anxious, drinking heavily, using drugs, recovering from the effects of alcohol or drugs, or physically ill. All positive responses were followed by a question on distress or social or occupational dysfunction. Diagnoses were made if the required number of *DSM-IV* personality symptoms were positive and at least 1 of them caused distress or social or occupational dysfunction. Antisocial personality disorder was assessed with questions about conduct disorder before age 15 and adult antisocial symptoms at or after age 15, similar to other standardized interviews.⁶⁰⁻⁶⁴ Consistent with the *DSM-IV*, we required conduct disorder before age 15 and at least 3 adult antisocial symptoms for a diagnosis of antisocial personality disorder. Because antisocial was the only personality disorder in the NESARC with adult symptoms assessed at both waves, we

also required that adult antisocial symptoms be reported at both waves to be considered positive.

The symptom items, worded in nontechnical language to avoid the need for insight or judgment, were adapted to be fully structured from items in the Structured Clinical Interview for DSM-IV Personality Disorders,⁶⁵ the International Personality Disorder Examination,⁶⁶ and the Diagnostic Interview for DSM-IV Personality Disorders.⁶² The reliability of the AUDADIS-IV, assessed in test-retest studies of NESARC participants,^{37,38} ranged from fair (paranoid, histrionic, avoidant $\kappa=0.40-0.45$) to very good (schizotypal, antisocial, narcissistic, borderline $\kappa=0.67-0.71$),^{37,38} comparing favorably with that of semistructured interviews in clinical samples.⁶⁷ Convergent validity ranges from good to excellent.^{27-29,58,59,68} Analysis of the personality disorders in the NESARC⁶⁹ indicated that avoidant and dependent personality disorders were so highly associated that they could be considered alternative representations of the same disorder. Accordingly, we analyzed variables indicating 9 DSM-IV personality disorders; each disorder was defined by the DSM-IV except for a variable representing avoidant and dependent personality disorders that was positive if 1 or both disorders were diagnosed.

CONTROL COVARIATES

Demographic covariates included gender, race/ethnicity (white, Hispanic, black, Asian/Pacific Islander, or Native American), Wave 1 age (18-29, 30-39, 40-49, or ≥ 50 years), and educational level (any college vs others). Family history of alcohol or drug problems was defined as positive if experienced by parents or siblings; NESARC family history methods are described in detail elsewhere.⁷⁰ Since treatment in naturalistic, nonrandomized studies may indicate more severe or persistent disorders,⁷ we also controlled for treatment status at baseline for alcohol or drug problems (treatment for nicotine dependence was not ascertained). As detailed elsewhere,¹ the binary treatment variable was defined as positive if respondents participated in any of 12 types of inpatient or outpatient treatment or a 12-step program group. Duration of the alcohol, cannabis, or nicotine disorder was defined as the number of months of the current or longest episode, with a minimum of 12 months (required to meet diagnostic criteria). Axis I disorders were also controlled, including DSM-IV primary affective and anxiety disorders, and substance disorders other than the disorder that was the outcome in a particular analysis. The DSM-IV-defined mood disorders included bipolar I, bipolar II, major depressive, and dysthymic disorders. Anxiety disorders included panic, social anxiety, specific phobia, and generalized anxiety disorders. In addition to alcohol and nicotine dependence and cannabis use disorders, substance disorders included stimulant, hallucinogen, inhalant/solvent, opioid, sedative/tranquilizer, or cocaine dependence or abuse. The time frame for all Axis I disorder control variables was current (past 12 months) at baseline. The AUDADIS-IV methods used to diagnose these DSM-IV disorders are described elsewhere,^{71,72} including the methods of differentiating primary and substance-induced disorders. As previously reported,^{37,72} test-retest reliability was good for major depression and fair to good for other mood and anxiety disorders. Validity of mood and anxiety disorders was supported via highly significant associations with impairment using the 12-Item Short-Form Health Survey, version 2 (SF-12v2),⁷³ a reliable, valid measure of current impaired functioning used in large population surveys. The prevalence of these control covariates is given in Table 1.

STATISTICAL ANALYSIS

Separate analyses were conducted for each of the 3 substance disorder outcomes using multiple logistic regression models to pro-

duce adjusted odds ratios (AORs) and 95% CIs. Standard errors and CIs were estimated with SUDAAN software, version 10 (RTI International, Research Triangle Park, North Carolina) to adjust for nonresponse and the sample design. All models included the demographic covariates listed herein. For each substance disorder outcome, we first tested individual effects of Wave 1 current (past 12 months) Axis I disorders, controlling for the demographic covariates. Then, to determine the impact of personality disorders, we tested individual models for each personality disorder, controlling for Axis I disorders, family history, treatment status, the duration of the substance disorder at the baseline interview, and the variables representing other personality disorder comorbidity. In these models, to guard against collinearity, we created combined-disorder variables. This included a variable coded positive for affective or anxiety disorders, including unipolar affective disorders (major depressive disorder and dysthymia), bipolar disorders (bipolar I or bipolar II disorders), and anxiety disorders (panic, generalized anxiety, social anxiety, and/or specific phobia disorder). In analysis of the persistence of each separate substance disorder, we also controlled for other substance disorders. For each of the 3 substance outcomes, we controlled for the other 2 and for any other SUDs with a combined variable. For alcohol and nicotine dependence, this variable included all substance disorders listed herein. For cannabis abuse/dependence, the control variable included all substance disorders listed herein except cannabis abuse/dependence. To determine the specific effect of each personality disorder controlling for other personality disorder comorbidity^{27-29,69} while minimizing collinearity, we created variables coded positive if any personality disorder other than the one of focus in the model was present.

RESULTS

ALCOHOL DEPENDENCE

Among the 1172 respondents with 12-month alcohol dependence at Wave 1, 30.1% evidenced persistent alcohol dependence throughout the 3-year follow-up. No baseline Axis I disorder was significantly associated with persistent alcohol dependence. As shown in **Table 2**, 4 personality disorders were associated with persistent alcohol dependence: antisocial (AOR, 3.51), borderline (AOR, 2.52), narcissistic (AOR, 1.96), and schizotypal (AOR, 3.36).

CANNABIS USE DISORDER

Among the 454 respondents with 12-month cannabis use disorders at Wave 1, 30.8% evidenced persistent cannabis use disorders throughout the 3-year follow-up. Adjusting for demographic characteristics, the only Axis I variable significantly associated with persistent cannabis use disorder was the combined "other DSM-IV substance abuse/dependence" variable defined in Table 1 footnote a (AOR, 1.45; 95% CI, 1.01-2.08). Three personality disorders predicted persistent cannabis use disorder: antisocial (AOR, 2.46), borderline (AOR, 2.78), and schizotypal (AOR, 5.90) (Table 2).

NICOTINE DEPENDENCE

Among the 4017 respondents with 12-month nicotine dependence at Wave 1, 56.6% evidenced persistent nicotine dependence throughout the 3-year follow-up. Ad-

Table 2. Relationship of Axis II Disorders to 3-Year Persistence of Substance Use Disorders^a

Personality Disorder	Odds Ratio (95% CI)		
	Alcohol Dependence (n=1172)	Cannabis Abuse or Dependence (n=454)	Nicotine Dependence (n=4017)
Antisocial	3.51 (1.74-7.08) ^b	2.46 (1.05-5.73) ^c	3.19 (1.64-6.18) ^b
Avoidant or dependent	0.92 (0.49-1.74)	0.73 (0.29-1.83)	1.02 (0.69-1.51)
Borderline	2.52 (1.64-3.85) ^b	2.78 (1.40-5.50) ^d	2.04 (1.56-2.68) ^b
Histrionic	0.96 (0.57-1.60)	1.10 (0.46-2.65)	1.10 (0.76-1.59)
Narcissistic	1.96 (1.32-2.91) ^d	1.32 (0.63-2.74)	1.22 (0.92-1.61)
Obsessive-compulsive disorder	0.89 (0.57-1.38)	0.91 (0.44-1.87)	1.40 (1.06-1.85) ^c
Paranoid	1.18 (0.72-1.95)	0.83 (0.40-1.73)	0.99 (0.73-1.35)
Schizoid	1.10 (0.59-2.06)	0.80 (0.33-1.97)	1.47 (1.08-2.01) ^c
Schizotypal	3.36 (1.98-5.72) ^b	5.90 (2.68-13.00) ^b	1.65 (1.19-2.28) ^d

^aControlling for demographics, Axis I categories listed in Table 1 and the other personality disorders, family history of alcohol or drug problems, current alcohol or drug treatment at baseline, and baseline duration (months) of longest or only use disorder.

^b $P < .001$.

^c $P < .05$.

^d $P < .01$.

justing for demographic characteristics, Axis I categories significantly associated with persistent nicotine dependence included unipolar affective disorders (AOR, 1.30; 95% CI, 1.03-1.64), anxiety disorders (AOR, 1.44; 95% CI, 1.15-1.79), alcohol dependence (AOR, 1.29; 95% CI, 1.01-1.66), and drug abuse/dependence (AOR, 1.47; 95% CI, 1.11-1.95). Personality disorders associated with persistent nicotine dependence included antisocial (AOR, 3.19), borderline (AOR, 2.04), obsessive-compulsive (AOR, 1.40), schizoid (AOR, 1.47), and schizotypal (AOR, 1.65) (Table 2).

COMMENT

This study provides a rigorous test of the impact of personality disorder on the course of substance-specific substance use disorders in a nationally representative sample assessed with a well-established instrument. A large number of participants with substance use disorders were ascertained independently of treatment status and were re-evaluated 3 years later with excellent retention. This study tested the prognostic significance of personality disorders while controlling for demographic factors, Axis I disorders, other personality disorder comorbidity, duration of the substance use disorders, family history, and treatment status at baseline. The sample sizes and covariates controlled allowed for multivariate tests of the association of the DSM-IV personality disorders with the persistence of substance use disorders in a manner not possible in previous studies. Our primary finding was that 3 personality disorders—antisocial, borderline, and schizotypal—significantly and robustly predicted the persistence of the substance use disorders, even after controlling for many other potentially negative prognostic indicators. Other personality disorders were also significantly associated with persistent SUD but in a less consistent manner.

The likelihood of persistent SUD across the 3 years was similar for alcohol dependence and cannabis use disorders (approximately 30%). The likelihood of persistent nicotine dependence was higher (56.6%), highlight-

ing the difficulty of achieving a good outcome for this substance. We defined our outcome variables in terms of persistence rather than remission for 2 reasons. First, the field lacks consensus on the conceptualization and measurement of remission from SUD. Second, we wished to focus this study on the respondents who manifested active symptoms of their disorders throughout the follow-up period, arguably the most important in terms of need, public health, and clinical significance.

While some of the earlier studies did not find an association between antisocial personality disorder and poor course of SUD, our findings on the association between antisocial personality disorder and the persistence of alcohol, cannabis, and nicotine disorders are consistent with those of most previous studies of patients and students,²⁰⁻²³ suggesting that the relationship is generalizable. These results are also consistent with those of studies^{74,75} suggesting that SUDs and antisocial personality disorder form part of a unidimensional domain of psychopathology often referred to as the externalizing domain. While the externalizing domain is usually conceptualized in terms of risk for the disorders (ie, as different manifestations of a single underlying condition explaining comorbidity risk), our results suggest that this framework could be broadened to include examination of persistence as well. In addition, while extensive literature focuses on the relationship between alcohol and drug disorders and antisocial personality disorder, far less attention has been paid to the relationship between antisocial personality disorder and the course of nicotine dependence or smoking cessation. The strength of the finding, even after controlling for multiple other potential confounders, suggests further investigation of this relationship (eg, identification of mechanisms).

Borderline personality disorder is recognized as a serious form of psychopathology associated with distress, suicide, impaired functioning, and health care costs.⁷⁶⁻⁷⁹ When studied, this personality disorder is also shown to be associated with SUDs in clinical^{33,80} and general population^{29,79} samples. Using structural modeling techniques, we recently showed that borderline personality

disorder is located on both the internalizing and externalizing domains of psychopathology.⁷⁹ In prospective research, we have also shown that borderline personality disorder is a robust predictor of poor course of major depression in both clinical^{81,82} and general population⁸³ samples. While borderline personality disorder has received less attention than antisocial personality disorder in its relationship to SUDs, several criteria for borderline personality disorder (eg, unstable interpersonal relationships, impulsivity, and anger) are common problems among substance abusers. Therefore, borderline personality disorder was of particular interest as we undertook this study. Recent clinical studies³²⁻³⁴ also suggest poor substance outcomes among patients with comorbid borderline personality disorder. Our finding that borderline personality disorder is a robust predictor of the persistence of alcohol, cannabis, and nicotine use disorders even after controlling for many other potential confounders suggests the need for greater research and clinical focus on the conjunction of these disorders, such as work on dialectical behavioral therapy for patients with comorbid substance abuse and borderline personality disorder.⁸⁴⁻⁸⁶

Schizotypal personality disorder was present in about 10% of the participants in our study. In a Norwegian study⁸⁷ of substance abuse treatment retention conducted several years ago, schizotypal traits predicted treatment dropout, but we have not found more recent studies of schizotypal personality disorder and SUD treatment outcome. However, the strong cross-sectional relationship between schizotypal personality disorder and SUDs^{22,27,88} is drawing increased attention.⁸⁸ Given the interest in cannabis use as a risk factor for schizophrenia and the connection of schizotypal personality disorder to schizophrenia in the schizophrenia-spectrum domain, several cross-sectional studies⁸⁹⁻⁹⁵ examined the association between cannabis use and schizotypal symptoms, finding positive associations. The only study⁹¹ among these to address time order found that the schizotypal symptoms preceded cannabis use, suggesting that this association is not an artifact of cannabis effects. We were unable to find studies on schizotypal personality disorder as a predictor of the course of cannabis use disorder, so in this regard, the strong present study findings are novel and invite further investigation.

The relationship between schizotypal personality disorder and nicotine is also receiving increasing attention given the high prevalence of smoking among individuals with schizophrenia and the hypothesized links between schizotypal personality disorder and schizophrenia. Several studies⁹⁵⁻⁹⁹ have found a positive relationship between levels of schizotypal symptoms and levels of smoking. A prior study⁹⁵ that examined the relationship between subfactors within schizotypal symptoms found associations between smoking and eccentric behavior and odd speech but not other domains. The present results suggest the need for further fine-grained investigation of the specific symptoms of schizotypal personality disorder that predict persistent nicotine dependence. This type of symptom-based research has recently begun, focusing on a SUD persistence outcome consisting of a global category of drug

use disorders.⁸⁸ More work of this type may be informative in terms of phenotypes for etiologic study and in identifying targets of new treatments. Substance abuse treatment specialists may not necessarily be attuned to schizotypal symptoms in their patients. Greater awareness of the potential for odd or eccentric thoughts or behavior to signal poor substance abuse outcomes could lead to greater treatment attention to these symptoms and to better substance abuse outcomes.

Persistent alcohol dependence was also predicted by narcissistic personality disorder. The only related prospective study¹⁰⁰ we found suggested that narcissistic personality traits predicted problem drinking during medical training. These findings suggest merit in replication and further investigation of this relationship.

Baseline unipolar affective disorders, anxiety disorders, and other substance disorders predicted persistent nicotine dependence, although the low ORs (1.29-1.47) are consistent with results in previously mixed literature.^{5,101-103} Speaking generally, a set of weak or inconsistent relationships can sometimes be explained by identifying previously undetected moderators of the associations. Improving smoking cessation treatment for patients with comorbid disorders is an active, important area of study.¹⁰⁴⁻¹⁰⁶ Research that can identify moderators of the relationship between comorbid disorders and smoking outcomes may offer information that would help in developing more targeted and therefore more effective smoking cessation treatments.

Obsessive-compulsive and schizoid personality disorders were not associated with persistent alcohol or cannabis disorders but did predict persistent nicotine dependence. Given the public health importance of smoking cessation, further investigation in this and other data sets of whether particular elements of these 2 personality disorders predict persistent nicotine dependence could identify potential targets for more effective smoking cessation interventions.

Many treated substance abusers with antisocial personality disorder have other personality disorders, and aspects of substance outcomes may differ between antisocial substance abuse patients with and without other personality disorders.¹⁰⁷ Accordingly, we explored whether borderline or schizotypal personality disorders modified the effects of antisocial personality disorder on substance outcomes by adding interaction terms to the logistic regression models. None of these interactions were statistically significant, suggesting that the influence of antisocial personality did not differ by the co-occurrence of these other 2 personality disorders. Note that, as was previously shown for the full sample,^{27-29,69} comorbidity among personality disorders within the alcohol, cannabis, and nicotine subsamples was common. Among those with alcohol dependence, cannabis use disorder, and nicotine dependence, 27.6%, 32.4%, and 20.3%, respectively, had more than 1 personality disorder. Further, within these 3 subgroups, more than 95% of pairwise associations between personality disorders were significant, as indicated by AORs. This comorbidity was the reason we controlled for potential confounding by other personality disorders when analyzing the effects of each one.

Study limitations are noted. Information on SUDs was based on self-report. Future studies should include biomarkers when these are sufficiently developed to be practical and valid. The sample did not include individuals permanently institutionalized or younger than 18, so results cannot be generalized to these groups. Lower reliability of some personality disorders (eg, paranoid, histrionic, and avoidant) may limit the ability to detect associations with persistent SUDs. This study assessed psychiatric disorders categorically, consistent with the *DSM-IV*. Dimensional approaches could also be undertaken in future studies (eg, number [count] of personality disorders or their criteria or use of the Five-Factor Model of Personality as measured by the NEO Personality Inventory or other such instruments).¹⁰⁸⁻¹¹⁰ Disorders were assessed with structured interviews by lay interviewers, not trained clinicians. When done reliably, clinician assessment is desirable but is generally not possible in studies the size of the NESARC. Information on personality disorder symptoms during periods of heavy substance use and other periods would be better ascertained by many repeated assessments across the life course, which would also be desirable when feasible. Finally, diagnostic interviews covering antisocial personality disorder, including the AUDADIS, do not include instructions to report only symptoms persisting across different situations and time periods. This may be because diagnostic assessment of antisocial personality disorder was standardized many years ago¹¹¹ in longitudinal studies of delinquents and prisoners or because the requirement of childhood as well as adult symptoms made instructions on symptom persistence appear unnecessary. Future studies could investigate whether such instructions improve the validity of the antisocial personality diagnosis in clinical and general population settings. These limitations are considered relative to the fact that the test-retest reliability of the personality disorder assessments compared favorably with that of semistructured interviews in clinical samples, that the personality disorder diagnoses have been shown to be associated with significant functional impairment in this sample, and that the use of lay interviewers enabled ascertainment of a large sample and a breadth of covariates that enabled us to control for confounding in a manner not possible in smaller studies that relied on clinician evaluation. Additional study strengths include a representative, general population sample, a good follow-up response rate, and an analytic strategy allowing control for multiple factors.

Previously, the NESARC has shown that alcohol, cannabis, and nicotine use disorders are prevalent among US adults. These disorders are largely untreated and associated with considerable comorbidity and disability. Our results showed that a substantial minority of those with alcohol dependence and cannabis use disorders manifested symptoms throughout a 3-year period and, in addition, that a majority of those with nicotine dependence remained fully symptomatic throughout this period. Three personality disorders were associated with persistent course of the substance disorders—antisocial, borderline, and schizotypal. Other personality disorders were associated with poor course but less consistently across the SUDs. While the findings for antisocial personality

disorder may not be surprising, far less attention in the substance abuse field has been paid to borderline and schizotypal personality disorders. The findings suggest the importance of extending research and clinical attention to a broader range of personality psychopathology when investigating and treating substance use disorders and of gaining a better understanding of the environmental and biological causes of these relationships.

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