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Psychiatric comorbidity and the persistence of drug use disorders in the United States

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Abstract

Context—DSM-IV drug use disorders, a major public health problem, are highly comorbid with other psychiatric disorders, but little is known about the role of this comorbidity when studied prospectively in the general population.

Aims—Determine the role of comorbid psychopathology in the three-year persistence of drug use disorders.

Design—Secondary data analysis using Waves 1 (2001-2) and 2 (2004-5) of the National Epidemiologic Survey on Alcohol and Related Conditions.

Participants—Respondents with current DSM-IV drug use disorder at Wave 1 who participated in Wave 2 (N=613).

Measurements—AUDADIS-IV obtained DSM-IV Axis I and II diagnoses. Persistent drug use disorder was defined as meeting full criteria for any drug use disorder between Waves 1 and 2.

Findings—Drug use disorders persisted in 30.9% of respondents. No Axis I disorders predicted persistence. Antisocial (OR=2.75; 95% CI=1.27–5.99), borderline (OR=1.91; 95% CI=1.06–3.45) and schizotypal (OR=2.77; 95% CI=1.42–5.39) personality disorders were significant predictors of persistent drug use disorders, controlling for demographics, psychiatric comorbidity, family history, treatment and number of drug use disorders. Deceitfulness and lack of remorse were the strongest antisocial criteria predictors of drug use disorder persistence, identity disturbance and

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Conflict of Interest

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self-damaging impulsivity were the strongest borderline criteria predictors, and ideas of reference and social anxiety were the strongest schizotypal criteria predictors.

Conclusions—Antisocial, borderline and schizotypal personality disorders are specific predictors of drug use disorder persistence over a three-year period.

Keywords

Drug Dependence; Drug Abuse; Axis I disorders; Axis II disorders; Personality Disorders; Drug Persistence; Chronic Drug Use Disorder

INTRODUCTION

Drug use disorders are prevalent in the United States (1), representing a significant personal, societal and economic burden (2–4). A disproportionate part of this burden is accounted for by chronic drug use disorders (5,6). Thus, information on factors associated with persistent drug use disorders is important.

Clinicians often conceptualize drug use disorders as chronic (7,8). However, only a small proportion of individuals with drug use disorders receive treatment, and treatment-seeking is associated with disorder severity (9–12), so patient samples may over-represent those with a more chronic course. More complete information requires prospective, population-based studies. To date, these only addressed marijuana use disorders in small samples, using varied selection methods, follow-up periods and measures (13–15). Subsequently, the wide range of persistence estimates from these studies is difficult to interpret (6.6%–70.1%) (13–15). Research in a large, representative sample with standardized measures would offer clearer information.

Drug use disorders are highly comorbid with mood, anxiety and personality disorders (1,16–18), and this comorbidity is associated with many harmful consequences (19). For example, major depression, generalized anxiety disorder, and borderline and antisocial personality disorders predict poor drug treatment outcome in clinical studies (20–26), suggesting that comorbidity may predict drug use disorder persistence in the population. However no prospective epidemiology studies have considered psychiatric comorbidity and the persistence of drug abuse and dependence.

The relationship between drug use disorders and personality disorders is particularly strong (1), and such comorbidity is associated with considerable additional impairment (27). In community studies, personality disorder symptoms increase the risk for onset of drug problems (28,29). However, little is known about the effects of a broad range of personality disorders on the persistence of drug use disorders.

To address these gaps in the literature, we studied the role of comorbid psychopathology in the three-year persistence of drug use disorders using prospective, nationally representative data.

Our aims were to determine:

1. The prevalence of three-year persistence of drug use disorders;
2. Whether persistence is predicted by:
 - a. Mood, anxiety, alcohol and nicotine disorders
 - b. All ten DSM-IV personality disorders.

To suggest more specific information for use in treatment development, we also conducted analyses to identify personality disorder symptoms as predictors of persistence

METHODS

Sample and procedures

Data came from Waves 1 and 2 of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) (18,30). The target population was the civilian non-institutionalized population 18 years and older residing in households and group quarters. Blacks, Hispanics, and ages 18–24 were oversampled, with data adjusted for oversampling, household- and person-level non-response (30). Interviews were conducted by extensively trained and supervised experienced lay interviewers (18,30). All procedures, including informed consent, received full ethical review and approval from the U.S. Census Bureau and U.S. Office of Management and Budget. Of the 43,093 Wave 1 respondents, 34,653 were re-interviewed at Wave 2. Excluding ineligible (e.g., deceased) respondents, the overall Wave 2 response rate was 86.7%.

At Wave 1, 779 respondents met criteria for past year DSM-IV abuse or dependence on any drug. Of these, 613 (78.7%) participated at Wave 2 and constitute the sample for the present report (see Table 1 for sample characteristics).

Measures

All psychiatric diagnoses were obtained using the NIAAA Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version IV (AUDADIS-IV) (31), a structured interview specifically designed to measure psychiatric disorders in large-scale surveys.

Outcome: Persistence—Detailed AUDADIS-IV items operationalize DSM-IV abuse and dependence criteria for ten drug classes (cannabis, cocaine, inhalants, hallucinogens, heroin, stimulants, opioids, tranquilizers, sedatives, other) (32). DSM-IV criteria for drug dependence require 3 of 7 criteria within 12-months, except hallucinogen and cannabis, which does not include withdrawal. Since DSM-5 will include a cannabis withdrawal criterion (33), we included this criterion to make cannabis dependence consistent with the other substances. DSM-IV criteria for drug abuse require 1 of 4 criteria within 12-months, and no drug dependence. Reliability and validity of AUDADIS-IV drug dependence diagnoses are good to excellent (34–40), with test-retest reliability ranging from $K=0.66$ – 0.91 (36). The concurrent, convergent, and construct validity of these diagnoses have been shown in U.S. and international studies (34,36–40), including clinician re-appraisals (35). At Wave 1, the timeframes in which drug use disorders were assessed included: (a) last 12 months, and (b) prior to last 12 months. At Wave 2, the timeframes in which drug use disorders were assessed included: (a) last 12 months, and (b) prior to last 12 months, but since Wave 1, covering the entire follow-up period. Individuals who met full criteria for any drug use disorder in three of the following time periods were classified as persistent: past 12 months at Wave 1; since Wave 1 but prior to the past 12 months at Wave 2; past 12 months at Wave 2.

Of note, the outcome variable was defined in terms of persistence rather than remission since there is a lack of consensus on how to conceptualize and measure remission from drug use disorders, and respondents manifesting active symptoms of drug use disorders throughout the three year follow-up period likely represent the greatest priority in terms of public health and clinical need.

Axis I Predictors—AUDADIS-obtained alcohol and nicotine dependence, mood (major depression, bipolar I and II, dysthymia) and anxiety (panic, social anxiety, specific phobia, generalized anxiety) disorders were diagnosed according to DSM-IV criteria, and are described in detail elsewhere (1,32,41–47). Axis I disorders were considered positive if they were current (last 12 months) at baseline. Fair to excellent reliability and good validity of all Axis I disorders has been documented (34–43,46–54). Given that mood and anxiety disorders commonly co-occur (55), we created three combined categories to avoid collinearity: unipolar affective (major depression, dysthymia); bipolar (bipolar I, bipolar II); and anxiety (panic, social anxiety, specific phobia, generalized anxiety).

Axis II Predictors—The AUDADIS-IV included ten DSM-IV personality disorders (antisocial, avoidant, borderline, dependent, histrionic, narcissistic, obsessive-compulsive, paranoid, schizoid, schizotypal), obtained according to DSM-IV criteria requiring evidence of long-term maladaptive patterns of cognition, emotion and functioning (16,17,44,56,57). Except for antisocial, personality disorders were assessed with an introduction and repeated reminders asking respondents to answer about how they felt or acted “most of the time, throughout your life, regardless of the situation or whom you were with”, not including symptoms occurring only when depressed, manic, anxious, using or recovering from substances, or physically ill. For all symptoms coded positive, respondents were asked if the symptom caused distress, social or occupational dysfunction. Diagnoses were made if the required number of DSM-IV personality symptoms was positive, and at least one caused distress, social or occupational dysfunction.

Personality disorder symptom items were adapted to be fully structured from items in the Structured Clinical Interview for DSM-IV Disorders–II (58), International Personality Disorder Examination (59), and Diagnostic Interview for DSM-IV Personality Disorders (60). Avoidant, dependent, histrionic, obsessive-compulsive, paranoid, and schizoid PDs were assessed at Wave 1; borderline, narcissistic and schizotypal PDs were assessed at Wave 2. Consistent with DSM-IV and other standardized interviews (60–65), antisocial personality disorder was assessed with questions about conduct disorder before age 15 and adult antisocial symptoms after age 14. Because antisocial was the only personality disorder in the NESARC with adult symptoms assessed at both waves, diagnoses required that adult antisocial symptoms be reported at both waves. AUDADIS-IV personality disorder reliability, assessed in test-retest studies (34,66), ranged from fair (paranoid, histrionic, avoidant $K=0.40\text{--}0.45$) to very good (schizotypal, antisocial, narcissistic, borderline $K=0.67\text{--}0.71$) (34,66), comparing favorably with semi-structured interviews in clinical samples (67). Convergent personality disorder validity, including association with impairment, has ranged from good to excellent (16,17,44,45,56,57).

Control covariates—Demographic covariates included gender, race/ethnicity (white, Hispanic, black, Asian, Native American), Wave 1 age (18–29, 30–39, 40–49, 50+), and education (high school or less, >high school). Family history (parents or siblings) of alcohol or drug problems was included as it is predictive of poor course (68,69). Treatment in naturalistic studies may indicate more severe or persistent disorders (9), and treatment during the follow-up period could decrease the risk of persistence, thus use of any substance-related services (either at Wave 1 or between Waves 1 and 2, referred to below as “treatment”) was controlled. In addition, we controlled for the number of past year Wave 1 drug use disorder diagnoses.

Statistical Analyses

Logistic regression models tested relationships, producing adjusted odds ratios and 95% confidence intervals. To adjust for the sample design, all analyses were conducted in SUDAAN (70).

We tested the effects of individual Axis I disorders, and then additionally controlling for all Axis I disorders simultaneously, as was done previously (1,47). To determine the effect the Axis II disorders on drug use disorder persistence, three models were generated for each personality disorder adjusting for: 1) demographics; 2) demographics and Axis I comorbidity; 3) demographics, Axis I and II comorbidity, family history, treatment, and number of drug use disorders.

Since Axis I and II disorders are highly comorbid (17,44,57,71), Model 3 was designed to detect the unique effect of each personality disorder, after adjusting for the effects of co-occurring Axis I and II disorders. To avoid collinearity due correlations of the Axis I and II disorders within and between categories, Axis I comorbidity was controlled for with one binary “any Axis I disorder” variable, and for each personality disorder, Axis II comorbidity was controlled for with one “any other Axis II disorder” variable (yes if any Axis II disorders other than the one under investigation were present).

Given the results, we then explored whether specific criteria of the personality disorders that emerged as significant predicted drug use disorder persistence. To do this, we generated logistic regression models with each symptom of the significant personality disorders as a predictor, controlling for demographics, Axis I and II comorbidity.

RESULTS

Three-year persistence of any drug use disorder occurred among 30.9% (s.e.=2.2) of respondents. Most persistent cases (85.7%; s.e.=2.9) reported the same drug use disorder at baseline and throughout the three-year follow-up, while 14.3% (s.e.=2.9) reported different drug use disorders at baseline and follow-up.

Axis I disorders (Table 2)

No Axis I disorder was associated with drug use disorder persistence, controlling for demographics ($p>0.05$).

Axis II disorders (Table 3)

Antisocial, borderline, narcissistic and schizotypal personality disorders were significant predictors of persistent drug use disorders, controlling for demographics and Axis I comorbidity. When additionally controlling for Axis II comorbidity, family history, treatment and number of baseline drug use disorders, only antisocial (OR=2.75; 95% CI=1.27–5.99), borderline (OR=1.91; 95% CI=1.06–3.45) and schizotypal (OR=2.77; 95% CI=1.42–5.39) remained significant.

Specific personality disorder criteria (Table 4)

Four antisocial (unlawful behavior, deceitfulness, irresponsibility, lack of remorse), four schizotypal (ideas of reference, constricted affect, odd behavior, social anxiety) and five borderline (identity disturbance, self-damaging impulsivity, suicidal behavior, feelings of emptiness, paranoid ideation) criteria significantly predicted persistence, controlling for demographics and Axis I and II disorders ($p<0.05$).

DISCUSSION

In a prospective, nationally representative sample, three-year persistence of drug use disorders occurred among 30.9% of individuals with baseline drug use disorders, which is within the range (32%–39.6%) reported in older studies with similar characteristics (13,14). Identifying and treating these individuals could represent an important strategy to reduce the burden of drug use disorders in the United States. Antisocial, borderline and schizotypal personality disorders were robust predictors of persistence, suggesting the need to consider a broad range of personality psychopathology in the investigation and treatment of drug use disorders.

We considered Axis I disorders as predictors of drug abuse and dependence since they are associated with these disorders in cross-sectional population-based and prospective treatment studies (1,20). However, no Axis I disorders predicted drug use disorder persistence in the present study. One possible explanation is that Axis I disorders typically wax and wane, cycling between symptomatic episodes and periods of normal functioning (65). If their role in the etiology of drug use disorders is limited to symptomatic episodes, then we would expect baseline Axis I disorders to be associated with baseline drug use disorders in cross-sectional studies, but not with drug use disorders which occur during a three-year follow-up period when studied prospectively. Furthermore, previous findings implicating Axis I disorders in drug treatment outcome could be due to the more severe and chronic nature of Axis I disorders in clinical samples (9). Future work could consider whether persistent Axis I disorders are associated with persistent substance use disorders in the general population, as has been done in clinical samples (72). Nevertheless, the present results underscore the importance of understanding psychiatric disorders in the general population and not just in clinical samples, which may not be entirely generalizable.

In contrast to the acute nature of Axis I disorders, Axis II disorders are characterized as long-term patterns of affective, cognitive and behavioral dysfunction (65). Given this definition, in conjunction with the strong associations of personality disorders with drug use disorders in cross-sectional general population samples (1,16,17,57), and with drug outcome in prospective clinical studies (20,22–26,73), we predicted that personality disorders would be important in understanding chronic drug use disorders. Results support this- antisocial, borderline and schizotypal predicted drug use disorder persistence after controlling for many relevant covariates. Thus, a unique role of antisocial, borderline and schizotypal personality disorders in the course of drug use disorders is suggested.

The strong association between antisocial personality disorder and drug use disorders is well established (45,74), and our population-based findings (i.e. results not conditional on respondents receiving treatment) are consistent with reports from clinical settings (20,21) that comorbid antisocial personality drug use disorder predicts chronicity of drug use disorders.. Borderline personality disorder is also acknowledged for its association with substance use disorders in clinical (25,29) and general population samples (57,75). Less recognized is the fact that individuals with schizotypal personality disorder are almost 5 times as likely to have a drug use disorder as the rest of the population based on analyses in these data (16). However, little else is known about this relationship. Taken together, these results suggest a need to address comorbid antisocial, borderline and schizotypal personality disorders in drug disorders.

Unfortunately, these personality disorders are difficult to treat, possibly because individuals experiencing antisocial, borderline and schizotypal psychopathology may not recognize their disorders or consider that their symptoms are behaviors warranting change. Indeed, individuals rarely seek treatment for Axis II disorders, instead presenting for comorbid

conditions including drug use or anxiety disorders (76). Therefore, treatment aimed at the full syndrome of a personality disorder may be less effective in reducing substance abuse than identifying and targeting specific symptoms that the patient can view as problematic and in need of intervention. Such symptoms could be used as “hooks”, or aids, to assist in keeping the patients engaged in treatment. Within such an intervention, better-aligned provider-patient goals may foster a more positive outcome. To this end, we provided information on the antisocial and schizotypal criteria associated with drug use disorder chronicity, information previously unavailable. Of note, these analyses are exploratory and require additional research on these symptoms in other samples.

Four antisocial criteria had significant effects on drug use disorder chronicity. Among these, “unlawful behavior” may be most amenable to intervention. Individuals with a disorder characterized by the disregard and violation of others (65), may be more motivated to work on symptoms if change will reduce likely and impending personal negative consequences. Indeed, evidence that this criterion may be amenable to treatment is suggested by findings that cognitive behavioral therapy can reduce criminal and delinquent behavior among youths (77). The short-term and thus most immediate costs of engaging in unlawful behavior (e.g., drug-buying) can be made clear in interventions. These could be particularly salient in subpopulations such as those already within the criminal justice system for whom additional unlawful behavior may result in substantial undesirable consequences. Furthermore, the salience of proximal (over distal) consequences to substance abusers (78), suggests the need to focus treatment on short-term consequences. The efficacy of using “unlawful behavior” as a treatment-amenable target among adult antisocial substance abusers could be investigated in clinical research.

Borderline is the most thoroughly investigated personality disorder, and evidence-based therapies designed to target specific borderline symptoms have already been developed. For example, dialectical behavior therapy (DBT) uses cognitive and behavioral strategies to target borderline-related suicidal behavior (79), a criterion that predicted persistence in this study. DBT is effective at treating suicidal behavior (80), and substance-related problems (81) among borderline patients, suggesting potential benefits of targeting borderline-related suicidal behavior among substance disorder patients to reduce drug use disorder persistence. Future research should investigate this approach.

One schizotypal criterion that predicted persistence, ideas of reference, is a cognitive-perceptual symptom. Cognitive-perceptual symptoms can be the most distressing aspects of schizotypal personality disorder for some, inducing considerable anxiety. Positively, cognitive-perceptual symptoms may respond to anti-psychotic medication (82), so individuals with persistent drug use disorders and this type of symptomatology may benefit from such treatment. A promising therapeutic agent specifically designed to treat cognitive symptoms among schizotypal patients was withdrawn due to safety concerns, but development of safer formulations (83) may represent a future therapeutically promising targeted treatment for drug use disorder patients with cognitive perceptual symptoms. Social anxiety, another schizotypal criterion that predicted persistence, responds to evidence-based interventions such as cognitive behavioral and schema-focused therapy. Future research is necessary to see whether these findings extend to the relevant schizotypal symptomatology among individuals with comorbid chronic drug use disorders.

Several limitations of the present study deserve mention. (1) Data are subject to self-report biases. (2) Generalizability is limited to groups included in the NESARC. (3) In accordance with the DSM-IV, we used binary psychiatric disorder variables. Future studies could also consider dimensional diagnoses. (4) Personality disorder prevalence is higher in NESARC than other surveys (84), and, as expected, even higher in this sub-sample with drug use

disorders. Other, more restrictive methods for scoring NESARC personality data can be explored (85), as well as use of latent variables representing different constellations of personality disorder symptoms. Using a continuous outcome may increase the power of the model and help to detect additional significant associations. (5) We focused on drug use disorders rather than persistent drug use. To determine the specificity of our findings to drug use disorders, we replicated analyses for drug use, defined as use ≥ 1 time/month throughout the follow-up period. Results were similar: Axis I disorders were not associated with persistent use ($p > 0.05$), while antisocial, borderline and schizotypal personality disorders predicted persistent use ($p < 0.05$). Future studies should examine in more detail the relationship of personality disorders to different indicators of the course of drug use disorders. (6) All three significant personality disorders were measured at Wave 2, which may have affected the results. However, this is unlikely since a) other personality disorders were significant predictors of other outcomes in the same dataset (e.g. major depression (86) and alcohol and nicotine dependence (87)), and b) Axis II disorders were diagnosed based on symptoms that were defined in the interview as being stable and enduring. (7) Trends in persistence may vary over time. To determine the specificity of our results to three-year persistence, analyses were repeated for two-year persistence (any drug use disorder in the past year at Wave 1 and since Wave 1 but prior to the past year at Wave 2). Results were almost identical- among the 613 respondents, prevalence of persistence was 33.4% at 2 years and 30.9% at 3 years. Furthermore, predictors of two-year and three-year were the same. For example, of all the predictors considered, antisocial and schizotypal and borderline personality disorders were the only significant predictors of two-year and three-year of any drug use disorder, controlling for demographics and Axis I and II comorbidity ($p < 0.05$). These results suggest temporal stability for the prevalence and predictors of persistent drug use disorders. (8) Since AUDADIS alcohol dependence diagnoses are more robust than abuse diagnoses, only alcohol dependence was considered as a predictor of persistence. However, results were largely unchanged for alcohol disorders as predictors of persistent drug use disorder persistence when we considered a combined alcohol abuse/dependence variable ($p > 0.05$). (9) The multiple analyses of symptom-specific predictors of persistence were exploratory in nature. These results may signal a novel, clinically useful direction to study the course of drug use disorders, but their replication in other samples is warranted.

Strengths of the study include that it is the first to address drug use disorder persistence using a prospective, large, nationally representative sample assessed with standardized methods. Furthermore, we provide novel information with potential clinical utility on the unique role of comorbid personality diagnoses and symptoms in the course of chronic drug use disorders. Results raise a potentially useful new line of inquiry regarding differential roles of Axis I and II disorders and symptomatology in the etiology of drug use disorders. For example, although drug use disorders are associated with both Axis I and Axis II disorders in cross sectional data, information comparing these disorders with regards to the strength of association with drug use disorders and degree of impairment is lacking and warrants investigation. In summary, among adults with a drug use disorder, nearly one-third persist throughout a three-year interval. We identified specific antisocial, borderline and schizotypal criteria associated with drug use disorder persistence that can be considered as potential targets for evidence-based psychotherapeutic or pharmacotherapeutic approaches.

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Table 1

Sample characteristics: NESARC participants with any current drug use disorder at baseline who participated in a 3-year follow-up interview (N=613)

CHARACTERISTIC		Weighted Prevalence (%)	Standard Error
Demographics and Substance-Related Variables.			
<u>Sex:</u>	Male	67.50	2.24
	Female	32.50	2.24
<u>Race:</u>	White	69.28	2.56
	Black	11.80	1.56
	Native American	5.02	1.24
	Asian	3.37	1.17
	Hispanic	10.53	1.54
<u>Age, years:</u>	18–29	57.71	2.44
	30–39	20.05	1.86
	40–49	16.26	1.83
	50+	5.99	1.11
<u>Education:</u>	High school or less	52.82	2.46
	>High School	47.18	2.46
Family History ^a		61.33	2.35
Treatment ^b		18.01	1.92
<u>Number of drug use disorder diagnoses:</u>	1	78.68	2.08
	2	13.21	1.54
	3+	8.11	1.48
<u>Type of drug use disorder at Wave 1</u>	Cannabis	74.46	2.08
	Cocaine	12.43	1.18
	Opioids	17.08	2.02
	Sedatives	7.81	1.23
	Hallucinogens	7.73	1.35
	Stimulants	7.46	1.24
	Tranquillizers	5.68	1.15
	Inhalants	1.34	0.64
	Heroin	1.23	0.70
	Other	0.15	0.11
Psychiatric Disorder Diagnoses			
<u>Past Year Axis I disorders:</u>	Unipolar affective	12.62	1.41
	Bipolar affective	12.47	1.72
	Anxiety disorder	21.61	2.06
	Alcohol Dependence	39.71	2.68
	Nicotine Dependence	52.08	2.52
<u>Lifetime Axis II disorders:</u>	Antisocial	9.31	1.54

CHARACTERISTIC		Weighted Prevalence (%)	Standard Error
	Avoidant/Dependent	11.62	1.65
	Borderline	22.49	2.11
	Histrionic	12.15	1.64
	Narcissistic	18.26	1.96
	Obsessive/Compulsive	18.91	1.95
	Paranoid	19.49	2.10
	Schizoid	11.86	1.55
	Schizotypal	13.67	1.59

^aFamily History (1st degree relatives) of alcohol or drug problems

^bAny alcohol or drug use disorder treatment between Waves 1 and 2

TABLE 2
Axis I disorders at baseline: Relationship to 3-year persistence of drug use disorders (N=613)

Past Year Axis I predictors (N)	Weighted prevalence of persistence among those with predictor		Associations Controlling for			
			Demographics ^a		Demographics + Axis I comorbidity ^b	
	%	s.e.	OR	95% CI	OR	95% CI
Unipolar affective ^c (98)	35.05	5.8	1.43	0.83–2.49	1.44	0.83–2.49
Bipolar affective (82)	38.92	6.4	1.55	0.80–3.00	1.56	0.81–3.03
Anxiety disorder (126)	38.64	5.0	1.61	0.98–2.66	1.50	0.94–2.42
Alcohol Dependence (222)	32.12	3.5	1.07	0.67–1.73	0.94	0.58–1.51
Nicotine Dependence (310)	32.60	3.2	1.08	0.71–1.66	1.01	0.65–1.57

Abbreviations: s.e., standard error; OR, Odds Ratio; CI, Confidence Interval

^a ORs derived from individual logistic regression models, adjusted for age, race/ethnicity, sex and education.

^b ORs adjusted for age, race/ethnicity, sex and education and additionally for all Axis I disorders in Table 1.

Table 3

Axis II Disorders: Relationship to 3-year persistence of drug use disorders (N=613)

Lifetime Axis II predictors (N)	Weighted prevalence of persistence among those with predictor		Associations Controlling for					
			Model 1 Demographics ^a		Model 2 Demographics and Axis I comorbidity ^b		Model 3 Demographics, Axis I and II comorbidity ^c	
	%	s.e.	OR	95% CI	OR	95% CI	OR	95% CI
Antisocial (53)	57.53	8.7	3.30**	1.53–7.11	3.11**	1.46–6.63	2.75*	1.27–5.99
Avoidant/Dependent (75)	33.07	7.3	1.05	0.52–2.14	0.97	0.47–1.98	0.75	0.37–1.52
Borderline (145)	44.67	5.3	2.32**	1.34–4.01	2.19**	1.28–3.76	1.91*	1.06–3.45
Histrionic (73)	38.91	7.1	1.47	0.79–2.72	1.36	0.74–2.51	1.10	0.58–2.07
Narcissistic (124)	44.22	6.5	2.08*	1.16–3.70	1.94*	1.09–3.43	1.55	0.84–2.84
Obsessive/Compulsive (110)	35.88	6.5	1.35	0.74–2.47	1.25	0.69–2.27	1.05	0.54–2.03
Paranoid (132)	33.47	5.6	1.23	0.71–2.14	1.13	0.65–1.96	0.86	0.48–1.56
Schizoid (77)	28.18	7.2	0.82	0.40–1.70	0.77	0.37–1.60	0.60	0.28–1.29
Schizotypal (87)	54.43	6.9	3.20**	1.69–6.08	3.03**	1.60–5.73	2.77**	1.42–5.39

Abbreviations: s.e., standard error; OR, Odds Ratio; CI, Confidence Interval

* p<0.05,

** p<0.01

^a Odds ratios derived from individual logistic regression models adjusted for demographics: age, race/ethnicity, sex and education.

^b Odds ratios adjusted for demographics and all Axis I disorders in Table 2.

^c Odds ratios adjusted for demographics, Axis I disorders in Table 2, all other Axis II disorders, family history of alcohol or drug problems, treatment, and number of baseline drug use disorders.

Table 4

Antisocial and Schizotypal Criteria: Relationship to drug use disorder persistence (N=613)

Lifetime Personality	Disorder Criteria (N)	Odds Ratio	(95% CI)
ANTISOCIAL CRITERIA	Unlawful behavior (141)	2.23 [*]	1.32–3.74
	Deceitfulness (42)	3.30 [*]	1.49–7.28
	Impulsivity (66)	1.04	0.51–2.11
	Irritability/aggressiveness (60)	1.37	0.73–2.58
	Recklessness (145)	1.53	0.96–2.44
	Consistent irresponsibility (132)	2.38 [*]	1.44–3.92
	Lack of remorse (53)	3.31 ^{**}	1.69–6.47
SCHIZOTYPAL CRITERIA	Ideas of reference (119)	1.74 [*]	1.01–2.98
	Odd beliefs (197)	1.45	0.92–2.29
	Unusual perceptions (216)	1.50	0.92–2.44
	Odd thinking (188)	1.56	1.00–2.46
	Paranoid ideation (192)	1.56	0.94–2.58
	Constricted affect (222)	1.58 [*]	1.00–2.48
	Odd behavior (215)	1.63 [*]	1.04–2.54
	Lack of close friends (306)	1.26	0.77–2.06
BORDERLINE CRITERIA	Social Anxiety (92)	2.13 [*]	1.16–3.92
	Avoid abandonment (196)	1.23	0.73–2.06
	Unstable relationships (229)	1.59	0.94–2.69
	Identity disturbance (222)	2.27 ^{**}	1.48–3.48
	Self-damaging Impulsivity (403)	2.55 ^{**}	1.52–4.28
	Suicidal behavior (118)	2.15 [*]	1.25–3.68
	Affective Instability (134)	1.20	0.68–2.12
	Feelings of emptiness (149)	2.08 [*]	1.22–3.54
	Inappropriate anger (222)	1.34	0.86–2.10
	Paranoid ideation (142)	1.81 [*]	1.08–3.02

Abbreviations: OR, Odds Ratio; CI, Confidence Interval

^{*} p<0.05,^{**} p<0.01^a Odds ratios adjusted for demographics, any Axis I disorder and any Axis II disorder