Prevalence, Correlates, and Comorbidity of DSM-IV Antisocial Personality Syndromes and Alcohol and Specific Drug Use Disorders in the United States: Results From the National Epidemiologic Survey on Alcohol and Related Conditions

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Objective: The purpose of this study was to provide nationally representative data on the prevalence, sociodemographic correlates, and comorbidity of antisocial syndromes across alcohol and 8 specific drug use disorders, including sedative, tranquilizer, opiate, stimulant, hallucinogen, cannabis, cocaine, and inhalant/solvent abuse and dependence.

Method: This study is based on a nationally representative sample of adults. Lifetime prevalences of antisocial syndromes were estimated and logistic regression analyses were used to examine associations between antisocial syndromes and sociodemographic characteristics and substance use disorders. Diagnoses were made according to the criteria of the DSM-IV using the National Institute on Alcohol Abuse and Alcoholism Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version.

Results: The lifetime prevalences of antisocial personality disorder (APD), conduct disorder, and adult antisocial behavior were 3.6%, 1.1%, and 12.3%, respectively. Prevalences of alcohol use disorders and drug use disorders were 30.3% and 10.3%, respectively. In general, men and individuals who were younger, widowed/separated/divorced, of lower socioeconomic status, and living in urban areas or in the West were more likely to have antisocial syndromes. Native Americans were more likely and Asians and Hispanics were less likely to have APD and adult antisocial behavior. Virtually all of the associations between APD and adult antisocial behavior and specific substance use disorders were positive and statistically significant (p < .05). Significant associations between conduct disorder and substance use disorders were concentrated among women.

Conclusion: Comorbidity of specific substance disorders with antisocial syndromes is very common in the U.S. population. Further work in many directions is indicated by the results of this study, including the factors that give rise to the associations and the treatment and prevention implications of these conditions when comorbid.

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Among the personality disorders, antisocial personality disorder (APD), a psychiatric disorder characterized by a pattern of irresponsible, impulsive, and remorseless behaviors beginning in childhood or early adolescence and continuing into adulthood,[1] has been consistently demonstrated to be one of the most common psychiatric disorders among substance abusers. Findings from 3 large epidemiologic surveys, the Epidemiologic Catchment Area (ECA) survey, the National Comorbidity Survey (NCS), and the International Consortium in Psychiatric Epidemiology, show substantial comorbidity of APD with substance use disorders (i.e., alcohol and drug use disorders).[2–4] Most recently, Grant and colleagues[5] have shown that APD has markedly strong associations with alcohol and drug abuse and dependence in the general population. In that study, the associations of APD with alcohol and drug use disorders were higher than those for other personality disorders. Further, in clinical studies of substance abusers, APD has been shown to be common and associated with poor outcomes among substance abuse patients.[6–11]

Despite these consistent findings of a general association between APD and substance abuse and dependence in these general population samples, much less research has been conducted on the comorbidity between APD and alcohol and specific drug use disorders in general population samples.[2,12] In fact, most previous studies were limited to examining APD and associations with combined abuse and dependence categories or aggregate measures of any alcohol and/or any drug use disorder, and none have used diagnoses based on the most up-to-date criteria, the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition (DSM-IV).[1] Further, no comparative data exist on the relationships between antisocial syndromes, including APD (which requires evidence of conduct disorder in childhood), child conduct disorder (without adult antisocial behaviors) and adult antisocial behaviors (without evidence of conduct disorder), and alcohol and specific drug use disorders in large surveys of the general population. Moreover, there are no comparable data that have examined the sociodemographic characteristics of these antisocial syndromes.

Accordingly, the purpose of this article is to provide nationally representative data on the prevalence, sociodemographic correlates, and comorbidity of antisocial syndromes and alcohol and specific drug use disorders. This report from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)[5,13] advances prior research on several fronts. First, the NESARC is the first of the major psychiatric epidemiologic surveys to use DSM-IV criteria. Second, it is the first nationally representative sample to assess specific antisocial syndromes and specific drug abuse and dependence, in addition to alcohol use disorders. Third, the NESARC sample size (N = 43,093) is large enough to accurately estimate the prevalence, sociodemographic characteristics, and comorbidity of antisocial syndromes and alcohol and specific drug use disorders, including those disorders that are relatively rare in the general population.

METHOD

Sample

The 2001–2002 NESARC is a nationally representative sample of the adult population of the United States. As described in detail elsewhere,[5,13] the target population was the civilian, noninstitutionalized population, 18 years and older, residing in the 50 states and the District of Columbia. The sample included persons living in households, the military living off base, and the following group quarters: boarding houses, rooming houses, nontransient hotels and motels, shelters, facilities for housing workers, college quarters, and group homes. In the final selection phase, 1 individual was selected at random from each housing unit. The overall survey response rate was 81%. The NESARC oversampled blacks and Hispanics to ensure 20% each in the total sample. Young adults (ages 18–24) were also oversampled at a rate of 2.25:1.00.

The complex sampling design necessitated weighting the data to reflect the probability of selection of a primary sampling unit (PSU) within stratum, selection of housing units within the sample PSU, oversampling of young adults, and nonresponse at the household and person levels. The weighted data were then adjusted to be representative of the population of the United States for a variety of socioeconomic variables including geographical region, age, sex, and race-ethnicity using the 2000 Decennial Census.

Interviewers and Training

Interviews were conducted by 1800 professional lay interviewers from the U.S. Bureau of the Census who had, on average, 5 years of experience administering health-related surveys. All interviewers completed a 5-day self-study course followed by a 5-day in-person training session at 1 of the Bureau's 12 regional offices. The survey instrument was completely computerized with software that included built-in skip, logic, and consistency checks. Quality of interviewing was assured by regional supervisors who recontacted a random 10% of all respondents by telephone and re-asked a set of questions from different parts of the interview to verify answers. In addition, 2657 respondents were randomly selected for reinterview after completion of their NESARC interview. Each respondent was readministered 1 to 3 complete sections of the NESARC survey interview. This served as an additional check on data quality and formed the basis of an additional test-retest study.[14]

Diagnostic Assessment

Diagnoses were made according to the criteria of the DSM-IV using the National Institute on Alcohol Abuse and Alcoholism Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version (AUDADIS-IV), a fully structured diagnostic interview designed for use by interviewers who are not clinicians.[15] The AUDADIS-IV included an extensive list of symptom questions that separately operationalized DSM-IV criteria for alcohol and drug abuse and dependence including 10 classes of drugs: sedatives, tranquilizers, opiates (other than heroin or methadone), stimulants, hallucinogens, cannabis, cocaine (including crack cocaine), inhalants/solvents, heroin, and other drugs. Consistent with the DSM-IV, lifetime dependence diagnoses of alcohol and specific drugs required the respondent to satisfy at least 3 of the 7 DSM-IV criteria for dependence for any 12-month period of their lives. The withdrawal criterion of the dependence diagnoses also was measured as a syndrome, requiring the requisite number of positive symptoms as defined in the respective DSM-IV withdrawal categories. Substances that do not have specified DSM-IV

withdrawal categories (e.g., marijuana and hallucinogens) exclude withdrawal from the diagnosis of dependence and require 3 of the remaining 6 criteria to be met. The AUDADIS-IV alcohol and drug-specific diagnoses of abuse required a respondent to meet at least 1 of the 4 criteria defined for abuse in any 12-month period and to never meet criteria for dependence. Similar to other general population surveys, the prevalences of heroin and other drugs were too small to yield reliable estimates and are not included in the analyses presented here.

The diagnosis of antisocial personality disorder requires an evaluation of the individual's long-term patterns of functioning.[1] Diagnoses of antisocial personality disorders using the AUDADIS-IV were made accordingly. To receive a DSM-IV diagnosis of APD, respondents needed to endorse the requisite number of DSM-IV symptom items for both childhood conduct disorder prior to age 15 and adult antisocial syndrome at and since the age of 15. Furthermore, at least 1 positive symptom item prior to the age of 15 must have caused social or occupational dysfunction. In the present study, adult antisocial behavior was operationalized as meeting all criteria for APD except for the criterion that required evidence of childhood conduct disorder.

Test-retest reliability[14,16–19] and validity[20–31] of the AUDADIS-IV alcohol and drug diagnoses are well documented in psychiatric studies conducted in clinical and especially general populations samples, the population for which the NESARC was designed. The psychometric properties of these modules also were shown to be excellent in several countries that participated in the World Health Organization/National Institutes of Health International Study on Reliability and Validity.[32–37]

The reliability of AUDADIS-IV APD diagnoses was assessed in a test-retest study conducted as part of the NESARC survey proper.[14] A random subsample of 282 respondents was reinterviewed with the antisocial module. These reinterviews were conducted approximately 10 weeks after the NESARC interviews. The reliability of APD in this community sample was good ($\kappa = 0.67$), results that are as good as or better than those found for semistructured personality interviews in short-term test-retest studies conducted in treated samples of patients.[38] Further, using the NESARC data, the convergent validity of AUDADIS-IV APD was assessed in a series of linear regression analyses that examined the associations between APD and 3 Short Form-12 Health Survey, version 2 (Short Form-12)[39] disability scores, controlling for age, all other personality disorders, and DSM-IV Axis I disorders assessed in the NESARC (i.e., major depressive episode, manic episode, dysthymic disorder, hypomanic episode, panic disorder with and without agoraphobia, social phobia, specific phobia, generalized anxiety disorders, and substance use disorders).[40] The Short Form-12 yields 3 component summary and profile scores assessing various

Table 1. Lifetime Prevalence of Antisocial Syndromes and Specific Substance Use Disorders by Sex

Disorder	Men %	Men SE	Women %	Women SE	Total %	Total SE
Antisocial personality disorder	5.5	(0.25)	1.9	(0.11)	3.6	(0.15)
Conduct disorder (without adult antisocial behavior)	1.5	(0.12)	0.7	(0.06)	1.1	(0.07)
Adult antisocial behavior (without conduct disorder)	16.5	(0.53)	8.5	(0.32)	12.3	(0.38)
Any alcohol use disorder	42.0	(1.00)	19.5	(0.64)	30.3	(0.77)
Alcohol abuse	24.6	(0.70)	11.5	(0.44)	17.8	(0.52)
Alcohol dependence	17.4	(0.50)	8.0	(0.31)	12.5	(0.35)
Any drug use disorder	13.8	(0.46)	7.1	(0.29)	10.3	(0.32)
Any drug abuse	10.6	(0.36)	5.1	(0.24)	7.7	(0.24)
Any drug dependence	3.3	(0.19)	2.0	(0.12)	2.6	(0.13)
Sedative use disorder	1.6	(0.12)	0.6	(0.06)	1.1	(0.07)
Sedative abuse	1.3	(0.11)	0.4	(0.05)	0.8	(0.06)
Sedative dependence	0.3	(0.05)	0.2	(0.03)	0.3	(0.03)
Tranquilizer use disorder	1.4	(0.12)	0.6	(0.06)	1.0	(0.07)
Tranquilizer abuse	1.2	(0.11)	0.4	(0.05)	0.8	(0.06)
Tranquilizer dependence	0.3	(0.05)	0.2	(0.03)	0.2	(0.03)
Opioid use disorder	2.0	(0.16)	0.9	(0.09)	1.4	(0.10)
Opioid abuse	1.6	(0.13)	0.6	(0.08)	1.1	(0.08)
Opioid dependence	0.4	(0.07)	0.3	(0.04)	0.3	(0.04)
Amphetamine use disorder	2.5	(0.18)	1.5	(0.13)	2.0	(0.13)
Amphetamine abuse	1.9	(0.15)	0.9	(0.09)	1.4	(0.10)
Amphetamine dependence	0.6	(0.08)	0.6	(0.07)	0.6	(0.06)
Hallucinogen use disorder	2.5	(0.17)	1.0	(0.09)	1.7	(0.10)
Hallucinogen abuse	2.1	(0.14)	0.9	(0.08)	1.5	(0.09)
Hallucinogen dependence	0.4	(0.07)	0.1	(0.03)	0.2	(0.03)
Marijuana use disorder	11.8	(0.40)	5.4	(0.25)	8.5	(0.27)
Marijuana abuse	10.0	(0.34)	4.5	(0.22)	7.2	(0.23)
Marijuana dependence	1.7	(0.14)	0.9	(0.08)	1.3	(0.08)
Cocaine use disorder	3.9	(0.20)	1.8	(0.11)	2.8	(0.12)
Cocaine abuse	2.7	(0.17)	1.0	(0.08)	1.8	(0.10)
Cocaine dependence	1.2	(0.10)	0.7	(0.07)	1.0	(0.06)
Inhalant abuse[a]	0.5	(0.07)	0.1	(0.03)	0.3	(0.04)

[a]The base rate of inhalant dependence was virtually 0.0% in the sample.

dimensions of mental disability and impairment: the mental component summary score, the social functioning score, and the role emotional function score. APD was shown to be a highly significant predictor ($p < .0167$ to .0002) of each of these scores. Respondents with APD had significantly greater disability and social/occupational dysfunction than respondents who did not have the disorder.

Statistical Methods

Cross-tabulations produced lifetime prevalence estimates of antisocial syndromes and alcohol and specific drug use disorders. Multivariate logistic regression analyses were used to examine associations between antisocial syndromes and sociodemographic characteristics. In these 3 analyses, all sociodemographic factors were input into the same logistic model simultaneously for conduct disorder, APD, and adult antisocial syndromes. A series of logistic regression analyses was also used to study associations between antisocial syndromes and alcohol and drug use disorders. The β coefficients from

Table 2. Associations Between Sociodemographic Characteristics and Antisocial Syndromes[a]

Sociodemographic Characteristic	Conduct Disorder		Adult Antisocial Behavior		Antisocial Personality Disorder	
	OR	95% CI	OR	95% CI	OR	95% CI
Sex						
Men	2.2	(1.70 to 2.91)	2.3	(2.11 to 2.48)	3.3	(2.84 to 3.80)
Women	1.0		1.0		1.0	
Race-ethnicity						
White	1.0		1.0		1.0	
Black	1.0	(0.73 to 1.48)	0.9	(0.79 to 1.00)	0.9	(0.70 to 1.04)
Native American	2.1	(0.84 to 5.08)	1.4	(1.12 to 1.84)	2.3	(1.67 to 3.25)
Asian	0.7	(0.32 to 1.49)	0.2	(0.17 to 0.29)	0.4	(0.22 to 0.60)
Hispanic	0.8	(0.53 to 1.26)	0.5	(0.41 to 0.56)	0.5	(0.35 to 0.58)
Age, y						
18–29	3.8	(2.35 to 6.02)	7.0	(5.76 to 8.39)	14.6	(9.40 to 22.71)
30–44	2.9	(1.86 to 4.61)	6.1	(5.06 to 7.24)	10.1	(6.52 to 15.72)
45–64	2.6	(1.60 to 4.18)	3.9	(3.34 to 4.59)	6.3	(4.03 to 9.81)
65+	1.0		1.0		1.0	
Marital status						
Married/living with someone	1.0		1.0		1.0	
Widowed/separated/divorced	0.7	(0.47 to 1.01)	1.7	(1.54 to 1.85)	1.7	(1.41 to 2.05)
Never married	1.0	(0.65 to 1.39)	1.0	(0.88 to 1.09)	1.0	(0.85 to 1.25)
Education						
Less than high school	2.0	(1.37 to 2.79)	1.0	(0.90 to 1.18)	2.2	(1.74 to 2.69)
High school graduate	1.0	(0.77 to 1.35)	1.0	(0.90 to 1.07)	1.3	(1.14 to 1.56)
Some college or higher	1.0		1.0		1.0	
Income						
$1–$19,999	1.1	(0.66 to 1.79)	1.4	(1.14 to 1.62)	1.6	(1.17 to 2.28)
$20,000–$34,999	1.0	(0.62 to 1.52)	1.3	(1.10 to 1.52)	1.5	(1.08 to 2.03)
$35,000–$69,999	0.9	(0.58 to 1.48)	1.2	(1.01 to 1.41)	1.1	(0.83 to 1.55)
$70,000 or more	1.0		1.0		1.0	
Place of residence						
Urban	1.8	(1.19 to 2.63)	0.9	(0.78 to 1.01)	1.3	(1.14 to 1.56)
Rural	1.0		1.0		1.0	
Region						
Northeast	0.8	(0.51 to 1.10)	0.6	(0.52 to 0.76)	0.6	(0.46 to 0.75)
Midwest	1.1	(0.74 to 1.56)	0.8	(0.69 to 1.02)	0.7	(0.55 to 0.89)
South	0.5	(0.37 to 0.78)	0.7	(0.61 to 0.84)	0.6	(0.46 to 0.73)
West	1.0		1.0		1.0	

[a]All 3 multivariate models include sex, race-ethnicity, age, marital status, education, income, place of residence, and region entered simultaneously.

these analyses were transformed into odds ratios (ORs) for ease of interpretation and reflect the strength of associations between the disorders. These models were estimated separately for men and women, and the significance of sex differences (p < .05) was evaluated in pooled models. To take into account the NESARC sampling design, all standard errors of the prevalence estimates and the confidence intervals (CIs) of the ORs were generated using SUDAAN, a software program that uses Taylor series linearization to make adjustments for complex sample designs.[41]

RESULTS

Lifetime Prevalence of Antisocial Syndromes and Substance Use Disorders

The lifetime prevalence of DSM-IV APD in the general population was 3.6%, adult antisocial behavior was 12.3%, and conduct disorder without adult antisocial behavior was 1.1% (Table 1). Overall, the prevalence of any alcohol use disorders (30.3%) substantially exceeded the rate of any drug use disorder (10.3%). For all substances, abuse was more common than dependence, and all substance disorders were more common among men than women. The rank order of the prevalence of the specific drug use disorders was nearly identical across the sexes. That is, the most common illicit drug disorders were for marijuana, followed by cocaine, amphetamines, hallucinogens, opioids, sedatives, tranquilizers, and inhalants. For the combined male and female sample, the lifetime prevalence of specific drug disorders varied from 0.30% for inhalant abuse to 8.45% for marijuana use disorder.

Associations Between Sociodemographic Characteristics and Antisocial Syndromes

Men were significantly more likely to have all 3 antisocial syndromes than women (Table 2). Native Americans (ORs = 2.3 and 1.4) were significantly more likely and Asians (ORs = 0.4 and 0.2) and Hispanics (ORs = 0.5 and 0.5) were significantly less likely to have APD and adult antisocial behavior, respectively, compared to whites, whereas no race-ethnicity differences were observed for

Table 3. Odds Ratios (ORs) of Antisocial Personality Disorder (APD) and Specific Substance Use Disorders by Sex[a]

Disorder	Men		Women		Total	
	OR	95% CI	OR	95% CI	OR	95% CI
Any alcohol use disorder	5.7	(4.73 to 6.92)	9.3[b]	(7.25 to 12.02)	8.0	(6.89 to 9.22)
Alcohol abuse	1.1	(0.95 to 1.37)	2.9[b]	(2.14 to 3.88)	1.7	(1.48 to 2.04)
Alcohol dependence	6.0	(5.11 to 7.07)	8.9[b]	(6.94 to 11.35)	7.8	(6.83 to 8.80)
Any drug use disorder	8.1	(6.81 to 9.74)	17.1[b]	(13.31 to 21.88)	11.3	(9.77 to 13.11)
Any drug abuse	4.2	(3.47 to 5.14)	6.2[b]	(4.64 to 8.37)	5.4	(4.52 to 6.39)
Any drug dependence	11.9	(9.40 to 15.15)	28.3[b]	(20.99 to 38.09)	16.7	(13.81 to 20.08)
Sedative use disorder	9.1	(6.48 to 12.67)	17.6[b]	(11.19 to 27.51)	12.5	(9.58 to 16.30)
Sedative abuse	7.3	(4.97 to 10.68)	12.2	(6.52 to 22.72)	9.9	(7.21 to 13.72)
Sedative dependence	17.7	(9.15 to 34.35)	27.8	(14.63 to 52.70)	20.9	(13.24 to 32.95)
Tranquilizer use disorder	11.2	(8.04 to 15.58)	20.3[b]	(12.68 to 32.48)	15.1	(11.57 to 19.67)
Tranquilizer abuse	9.8	(6.80 to 14.15)	12.3	(6.33 to 23.75)	12.5	(9.25 to 16.97)
Tranquilizer dependence	16.5	(7.45 to 36.40)	39.5	(19.72 to 79.11)	23.0	(13.39 to 39.55)
Opioid use disorder	9.9	(7.20 to 13.53)	16.1[b]	(11.09 to 23.24)	12.8	(9.95 to 16.46)
Opioid abuse	8.4	(5.98 to 11.72)	11.3	(6.83 to 18.83)	10.6	(8.04 to 14.08)
Opioid dependence	14.5	(7.66 to 27.47)	25.5	(14.58 to 44.42)	18.0	(11.56 to 27.91)
Amphetamine use disorder	9.2	(7.19 to 11.82)	16.9[b]	(12.28 to 23.33)	11.9	(9.78 to 14.48)
Amphetamine abuse	7.7	(5.60 to 10.69)	7.9	(4.91 to 12.57)	8.9	(6.86 to 11.48)
Amphetamine dependence	12.1	(7.23 to 20.05)	31.8[b]	(20.72 to 48.82)	17.1	(12.40 to 23.68)
Hallucinogen use disorder	10.8	(8.44 to 13.80)	16.9	(11.08 to 25.87)	14.0	(11.34 to 17.27)
Hallucinogen abuse	9.9	(7.49 to 13.06)	15.0	(9.44 to 23.82)	12.7	(9.94 to 16.15)
Hallucinogen dependence	12.8	(7.18 to 22.77)	27.9	(11.22 to 69.10)	18.3	(11.14 to 29.96)
Marijuana use disorder	7.5	(6.27 to 8.94)	14.0[b]	(10.92 to 18.04)	10.2	(8.77 to 11.88)
Marijuana abuse	5.0	(4.09 to 5.97)	8.0[b]	(6.07 to 10.45)	6.5	(5.53 to 7.62)
Marijuana dependence	13.3	(9.73 to 18.09)	30.4[b]	(20.25 to 45.72)	18.7	(14.79 to 23.54)
Cocaine use disorder	7.5	(6.08 to 9.34)	18.0[b]	(12.97 to 25.06)	10.9	(9.22 to 12.84)
Cocaine abuse	5.6	(4.27 to 7.35)	9.4	(6.03 to 14.50)	7.5	(5.94 to 9.39)
Cocaine dependence	10.2	(7.44 to 13.85)	28.2[b]	(18.12 to 43.79)	15.1	(11.81 to 19.34)
Inhalant abuse[c]	14.8	(9.07 to 24.22)	15.2	(6.24 to 37.10)	18.7	(12.16 to 28.65)

[a]The OR is the odds of having APD among respondents with the respective substance use disorder compared to the odds of having APD among respondents who do not have that substance use disorder.
[b]ORs significantly greater (p < .05) among women than men.
[c]The base rate of inhalant dependence was virtually 0.0% in the sample.

conduct disorder (only). The 3 youngest age groups were significantly more likely to have all 3 antisocial syndromes compared with the oldest age group (65 years or older), with associations being stronger for the youngest age group (18- to 29-year-olds) and for APD compared to adult antisocial behavior and conduct disorder.

With respect to marital status, widowed/separated/divorced respondents were significantly more likely to have APD and adult antisocial behavior relative to those who were married. Respondents with less than a high school education were more likely to have APD and adult antisocial behavior, as were high school graduates more likely to have APD compared with respondents with some college education. Further, respondents in the lower income brackets were significantly more likely to have APD and adult antisocial behavior compared to those in the highest income bracket, a result not found for conduct disorder. The odds of APD and conduct disorder among respondents living in urban areas (ORs = 1.3 and 1.8) were significantly greater than the odds among respondents living in rural areas, respectively. With regard to region, the odds of APD and adult antisocial behavior were significantly lower among respondents living in the Northeast, Midwest, and South compared with those living in the West. Further, respondents living in the North-

east and South were significantly less likely to have antisocial behavior, and those respondents living in the South were less likely to have conduct disorder relative to those living in the West.

ORs of Antisocial Syndromes and Specific Substance Use Disorders

Tables 3, 4, and 5 show the associations between alcohol and specific drug use disorders and APD (Table 3), conduct disorder without adult antisocial behavior (Table 4), and adult antisocial behavior without conduct disorder (Table 5) in the entire sample. These ORs represent associations between antisocial syndromes and specific substance use disorders.

In Tables 3 and 5, all except 1 of the ORs for APD and adult antisocial behavior were positive and statistically significant. That is, the 95% CIs do not contain 1.0. For conduct disorder without adult antisocial behavior (Table 4), none of the ORs for men were statistically significant but several of the ORs among women were. For women, alcohol use disorders (OR = 2.6), drug use disorders (OR = 3.8), amphetamine use disorders (OR = 4.1), marijuana use disorders (OR = 4.6), and cocaine use disorders (OR = 3.5) were significantly associated with conduct disorder. For each of these substance use disorders,

Table 4. Odds Ratios (ORs) of Conduct Disorder and Specific Substance Use Disorders by Sex[a]

Disorder	Men		Women		Total	
	OR	95% CI	OR	95% CI	OR	95% CI
Any alcohol use disorder	1.2	(0.89 to 1.61)	2.6[b]	(1.80 to 3.86)	1.8	(1.44 to 2.28)
Alcohol abuse	1.2	(0.88 to 1.57)	2.0	(1.24 to 3.31)	1.6	(1.24 to 2.03)
Alcohol dependence	1.1	(0.71 to 1.65)	2.6[b]	(1.55 to 4.20)	1.6	(1.15 to 2.19)
Any drug use disorder	1.4	(0.93 to 1.98)	3.8[b]	(2.34 to 6.17)	2.1	(1.57 to 2.79)
Any drug abuse	1.5	(0.97 to 2.19)	3.4[b]	(1.93 to 5.82)	2.1	(1.50 to 2.92)
Any drug dependence	1.0	(0.45 to 2.13)	3.9[b]	(1.60 to 9.33)	1.8	(1.00 to 3.15)
Sedative use disorder	1.3	(0.53 to 3.24)	1.7	(0.27 to 11.03)	1.6	(0.73 to 3.68)
Sedative abuse	1.6	(0.65 to 4.03)	2.7	(0.42 to 17.30)	2.2	(0.95 to 4.86)
Sedative dependence	…	…	…	…	…	…
Tranquilizer use disorder	1.2	(0.32 to 4.17)	…	…	1.2	(0.32 to 4.05)
Tranquilizer abuse	1.4	(0.39 to 5.14)	…	…	1.5	(0.42 to 5.29)
Tranquilizer dependence	…	…	…	…	…	…
Opioid use disorder	0.7	(0.23 to 1.97)	1.2	(0.15 to 8.84)	0.9	(0.34 to 2.30)
Opioid abuse	0.8	(0.24 to 2.50)	1.7	(0.23 to 13.15)	1.1	(0.40 to 3.04)
Opioid dependence	0.2	(0.03 to 1.83)	…	…	0.2	(0.03 to 1.46)
Amphetamine use disorder	0.5	(0.14 to 1.82)	4.1[b]	(1.40 to 11.77)	1.4	(0.62 to 3.07)
Amphetamine abuse	0.3	(0.07 to 1.16)	3.1[b]	(0.65 to 14.33)	0.9	(0.29 to 2.82)
Amphetamine dependence	1.2	(0.15 to 9.03)	5.4	(1.23 to 23.65)	2.5	(0.79 to 7.90)
Hallucinogen use disorder	0.5	(0.15 to 1.65)	2.3	(0.35 to 14.83)	0.9	(0.32 to 2.58)
Hallucinogen abuse	0.6	(0.17 to 1.95)	2.6	(0.40 to 16.92)	1.1	(0.37 to 3.03)
Hallucinogen dependence	…	…	…	…	…	…
Marijuana use disorder	1.4	(0.90 to 2.03)	4.6[b]	(2.78 to 7.72)	2.2	(1.65 to 3.03)
Marijuana abuse	1.4	(0.91 to 2.11)	3.5[b]	(1.98 to 6.27)	2.1	(1.46 to 2.90)
Marijuana dependence	1.1	(0.43 to 2.74)	8.1[b]	(3.07 to 21.45)	2.7	(1.38 to 5.31)
Cocaine use disorder	1.1	(0.60 to 2.18)	3.5	(1.43 to 8.59)	1.8	(1.08 to 3.00)
Cocaine abuse	1.5	(0.76 to 2.97)	4.8	(1.66 to 13.65)	2.4	(1.36 to 4.14)
Cocaine dependence	0.4	(0.05 to 2.86)	1.7	(0.39 to 7.38)	0.8	(0.22 to 2.51)
Inhalant abuse[c]	0.5	(0.07 to 3.89)	3.1	(0.38 to 24.35)	1.0	(0.23 to 4.25)

[a]Ellipses identify table cells where the base rate was too low to be reliable. The OR is the odds of having conduct disorder among respondents with the respective substance use disorder compared to the odds of having conduct disorder among respondents who do not have that substance use disorder.
[b]ORs significantly greater (p < .05) among women than men.
[c]The base rate of inhalant dependence was virtually 0.0% in the sample.

except for cocaine use disorders, associations were significantly greater among women than men. Strikingly, for APD (Table 3) and adult antisocial behavior syndrome (Table 5), the associations for women were stronger than those for men, and most of these comparisons were statistically significant. Further, for APD and adult antisocial behavior, the associations for alcohol and specific drug dependence were generally greater than the corresponding associations for abuse. Regarding associations of the antisocial syndromes with particular substances, no discernible pattern was observed, except that the ORs for alcohol use disorders were generally lower than for specific drug use disorders.

In considering the relative magnitude of the associations of different drug use disorders with the particular antisocial syndromes, lower-prevalence drug use disorders generally had higher ORs. The dependence disorders, which were less prevalent than their respective abuse disorders, were nearly universally more strongly related to each antisocial syndrome compared with abuse. Further, the rank order of prevalence of the combined abuse and dependence disorders was inversely related to OR for both men and women with the full antisocial personality disorder and for women with adult antisocial behavior. The rank order of the prevalence of drug use disor-

ders and the ORs for antisocial personality disorder were associated with Pearson correlations of –0.75 for men and –0.51 for women. Thus, the less common the drug use disorder, the stronger the association. A similar but less robust correlation was found for women with adult antisocial behavior (r = –0.21), but the result was in the opposite direction for men with adult antisocial behavior (r = 0.61). For conduct disorder, too few ORs were significant, precluding correlational analyses between prevalence and ORs.

DISCUSSION

The lifetime prevalences of DSM-IV APD and conduct disorder were 3.6% and 1.1%, respectively, in this general population sample. The rate of adult antisocial behavior was substantially greater—12.3%. In general, men and individuals who were younger, widowed/separated/divorced, of lower socioeconomic status, and residing in urban areas and the West were significantly more likely to have APD and adult antisocial behavior. Further, Native Americans were more likely and Asians and Hispanics were less likely to have APD and adult antisocial behavior. The picture was somewhat different for individuals with conduct disorder, who were significantly

Table 5. Odds Ratios (ORs) of Adult Antisocial Behavior and Specific Substance Use Disorders by Sex[a]

Disorder	Men OR	Men 95% CI	Women OR	Women 95% CI	Total OR	Total 95% CI
Any alcohol use disorder	6.3	(5.55 to 7.09)	8.3[b]	(7.40 to 9.34)	7.6	(7.02 to 8.32)
Alcohol abuse	1.9	(1.68 to 2.12)	3.1[b]	(2.66 to 3.54)	2.5	(2.27 to 2.76)
Alcohol dependence	5.0	(4.51 to 5.58)	9.2[b]	(7.98 to 10.67)	6.8	(6.23 to 7.43)
Any drug use disorder	5.7	(5.12 to 6.41)	10.0[b]	(8.66 to 11.50)	7.6	(6.91 to 8.27)
Any drug abuse	4.9	(4.33 to 5.54)	8.2[b]	(6.98 to 9.68)	6.4	(5.78 to 7.06)
Any drug dependence	4.9	(3.96 to 6.07)	9.1[b]	(7.20 to 11.59)	6.5	(5.57 to 7.69)
Sedative use disorder	5.4	(3.97 to 7.32)	11.5[b]	(7.76 to 16.96)	7.6	(5.98 to 9.61)
Sedative abuse	6.1	(4.31 to 8.64)	14.5[b]	(8.59 to 24.58)	8.8	(6.60 to 11.74)
Sedative dependence	2.9	(1.60 to 5.36)	7.1[b]	(3.93 to 12.80)	4.4	(2.82 to 6.70)
Tranquilizer use disorder	3.8	(2.74 to 5.38)	11.4[b]	(7.53 to 17.22)	6.0	(4.65 to 7.65)
Tranquilizer abuse	4.0	(2.76 to 5.87)	12.2[b]	(7.28 to 20.53)	6.2	(4.61 to 8.33)
Tranquilizer dependence	3.0	(1.46 to 6.10)	9.5[b]	(4.73 to 19.21)	5.0	(3.06 to 8.21)
Opioid use disorder	4.4	(3.30 to 5.80)	8.7[b]	(6.21 to 12.10)	6.0	(4.87 to 7.42)
Opioid abuse	4.4	(3.22 to 5.94)	7.5[b]	(4.97 to 11.26)	5.8	(4.52 to 7.39)
Opioid dependence	4.1	(2.21 to 7.49)	11.1[b]	(6.68 to 18.55)	6.4	(4.20 to 9.62)
Amphetamine use disorder	5.0	(4.08 to 6.23)	11.1[b]	(8.57 to 14.35)	7.2	(6.17 to 8.35)
Amphetamine abuse	5.6	(4.38 to 7.27)	12.4[b]	(8.87 to 17.38)	8.0	(6.59 to 9.78)
Amphetamine dependence	3.2	(2.00 to 5.25)	8.4[b]	(5.68 to 12.45)	5.0	(3.69 to 6.85)
Hallucinogen use disorder	5.1	(4.04 to 6.38)	11.6[b]	(8.24 to 16.42)	7.3	(5.98 to 8.92)
Hallucinogen abuse	5.1	(3.93 to 6.58)	11.4[b]	(7.76 to 16.74)	7.3	(5.83 to 9.06)
Hallucinogen dependence	4.6	(2.57 to 8.05)	12.2	(5.17 to 28.62)	6.8	(4.13 to 11.12)
Marijuana use disorder	5.5	(4.86 to 6.14)	9.2[b]	(7.80 to 10.74)	7.1	(6.47 to 7.88)
Marijuana abuse	5.2	(4.52 to 5.88)	9.0[b]	(7.54 to 10.69)	6.8	(6.14 to 7.59)
Marijuana dependence	4.3	(3.22 to 5.64)	6.5	(4.60 to 9.11)	5.3	(4.31 to 6.60)
Cocaine use disorder	5.3	(4.45 to 6.39)	10.5[b]	(8.02 to 13.64)	7.3	(6.34 to 8.44)
Cocaine abuse	4.8	(3.79 to 6.13)	10.0[b]	(7.32 to 13.59)	6.7	(5.56 to 8.13)
Cocaine dependence	5.8	(4.19 to 7.91)	10.0[b]	(6.71 to 14.85)	7.5	(5.86 to 9.48)
Inhalant abuse[c]	3.3	(2.02 to 5.23)	5.6	(2.02 to 15.68)	4.4	(2.87 to 6.65)

[a]The OR is the odds of having adult antisocial behavior among respondents with the respective substance use disorder compared to the odds of having adult antisocial behavior among respondents who do not have that substance use disorder.
[b]ORs significantly greater (p < .05) among women than men.
[c]The base rate of inhalant dependence was virtually 0.0% in the sample.

more likely to be men, younger, with less than a high school education, and living in urban areas of the country, and significantly less likely to reside in the South.

Taken together, these results underscore the need for prevention and intervention programs for antisocial syndromes, keeping the sociodemographic differentials found in this study in mind. Further research is also critically needed to determine why race-ethnicity disparities exist in adult antisocial syndromes, and not conduct disorder, with a view toward their elimination. Moreover, the higher rate of antisocial behavior among more recently born cohorts found in this study highlights the need for longitudinal studies or repeated cross-sectional studies that will unconfound the effects of birth year and age. Whether the 3 antisocial syndromes constitute distinct nosologic entities is an important question that extends beyond the scope of this study, but is an issue currently being addressed in further analyses of the rich NESARC database.

Antisocial syndromes are common among persons with substance use disorders. That is, substance use disorders frequently overlap with the full antisocial personality disorder, with conduct disorder in the absence of adult antisocial behaviors, and with adult antisocial behaviors in the absence of conduct disorder, although the relationship is less consistent for men with conduct disorder in the absence of adult antisocial behaviors. Further, comorbidity of specific substance disorders with antisocial disorders is very common and is consistent with a general comorbidity factor, rather than specific associations with certain substances. Perhaps serving as an indicator of overall severity, the degree of comorbidity is more pronounced among women than men and for specific dependence disorders compared to abuse disorders. For APD, the relationship was stronger for the less common specific drug use disorders, but this inverse relationship with prevalence was not seen for conduct disorder or among men with adult antisocial behavior. The exceptionally strong associations found for APD (and possibly for adult antisocial behavior) may indicate significant phenotypic overlap in terms of a common etiology between these antisocial syndromes and substance use disorders. However, the less pronounced associations for the group of individuals with conduct disorder limited to childhood suggests that alcohol and drug use disorders may be associated with chronicity of antisocial behavior. The clearest implication of these results is that prevention and intervention efforts of both antisocial syndromes and substance use disorders can benefit from an

integrated approach. Programs that focus on antisocial syndromes, particularly those that are persistent over time or develop in adolescence, are particularly indicated as a way to reduce later substance use disorders. In fact, several programs support the utility of just such an approach to substance abuse prevention.[42,43]

Consistent across all 3 subtypes of antisocial behavior, the patterns of associations appear to indicate a continuum of severity. The strength of the associations was generally inversely related to prevalence of the underlying condition.[2,44] That is, associations of the antisocial syndromes with specific substance use disorders were higher among women compared to men, among those with dependence compared to abuse and, at least for APD, for those specific drug use disorders with lower overall prevalence of abuse or dependence. In this regard, drug dependence appears to be a more severe condition than abuse, and this finding is reflected in the increased association of the dependence disorders with antisocial syndromes. Further, the less common specific drug disorders tended to have stronger associations with antisocial syndromes. Thus, the lower rates of substance use disorders and antisocial syndromes among women belie the closer links between the 2 conditions. Certainly, this finding argues for increased targeting of interventions to address substance use disorders and antisocial behaviors among women for whom these are particularly intertwined conditions in the general population as well as in criminal justice populations.[45]

What explains the markedly strong associations of nearly all specific substance use disorders with antisocial personality syndromes, especially the adult syndromes? One possibility is a shared etiology. Such an association has been proposed by several researchers.[46–51] In fact, recent work by Tarter and colleagues[50] supports a common neurobehavioral disinhibition factor underlying the risk for substance abuse and dependence, which includes a prominent component of impaired executive decision making in youth at risk for substance abuse. This impaired executive decision making is based on reduced frontal lobe development and functioning (hypofrontality) and may be an underlying common feature of both substance use disorders and antisocial syndromes. Underlying the hypofrontality in substance abuse and antisocial personality may be genetic risk. Future work will need to focus on disentangling the likely gene-environment interactions in the etiology of these conditions. For example, adoption and twin studies demonstrate a strong family environmental interaction with genetic risk for antisocial behaviors.[52–54] How these interactions may relate to onset of specific substance disorders remains to be determined, but animal models are already providing support for interactions of social environment with risk for substance use disorders.[55] These findings regarding gene-environment interactions for substance abuse and antisocial behaviors, taken together, support the current research emphasis on gene-environment interactions as a key element in the etiology of substance use disorders.

Another implication of this study is that the current approach to diagnosing APD in DSM-IV may not adequately reflect the nature of the condition. Individuals with adult antisocial behavior without childhood-onset conduct disorder seem to have nearly the same patterns of comorbidity with specific substance disorders as those with the full APD. Thus, the data are consistent with a continuous approach to severity found in other studies,[56,57] rather than the current nosology in which conduct disorder and APD are defined categorically. Of course, important distinctions in outcomes for the 2 groups may yet be seen in follow-up studies, and it is also possible that adult antisocial behaviors may be related to the initiation of substance abuse and thus may be a less independent or heritable condition than the full antisocial personality disorder syndrome.[58] However, this cross-sectional study is most consistent with a continuous model for antisocial personality, at least as far as comorbidity with substance use disorders is concerned.

In light of the extensive comorbidity between antisocial syndromes, especially APD and adult antisocial behavior, there would appear to be great value in assessing these syndromes among substance abuse patients. Further work in many directions also is indicated by the results of this study, including the factors, both genetic and environmental, that give rise to the associations and the treatment and prevention implications of these conditions when comorbid.

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