Antisocial Behavioral Syndromes and DSM-IV Drug Use Disorders in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions

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Abstract

Background—Antisocial behavioral syndromes, including antisocial personality disorder (ASPD), syndromal adult antisocial behavior (AABS) without conduct disorder (CD) before age 15, and CD without progression to ASPD ("CD only") are highly comorbid with drug use disorders (DUDs). Among patients in DUD treatment, antisocial syndromes are associated with greater severity and poorer outcomes. Comparative data concerning associations of antisocial syndromes with clinical characteristics of DUDs among general population adults have not previously been available. This study describes associations of antisocial syndromes with clinical characteristics of lifetime *Diagnostic and Statistical Manual – Version IV* DUDs in the general U.S. adult population.

Methods—This report is based on the 2001–2002 National Epidemiologic Survey on Alcohol and Related Conditions (n=43,093, response rate=81%). Respondents (n=4,068) with lifetime DUDs were classified according to whether they met criteria for ASPD, AABS, "CD only," or no antisocial syndrome. Associations of antisocial syndromes with clinical characteristics of DUDs were examined using logistic regression.

Results—Antisocial syndromes were significantly associated with the phenomenology of DUDs, particularly ASPD with the most severe clinical presentations. Associations with AABS were similar to those with ASPD; those with "CD only" were weak, inconsistent, and not statistically significant. Patterns of associations differed little between men and women.

Conclusions—Both ASPD and AABS, but not "CD only," appear to identify greater clinical severity of DUDs among adults in the general U.S. population.

Keywords

Antisocial personality disorder; conduct disorder; drug use disorders

1. Introduction

Antisocial personality disorder (ASPD) is highly comorbid with drug use disorders (DUDs) among adults in both DUD treatment settings and the general population. In the Epidemiologic Catchment Area survey, the prevalence of ASPD according to *Diagnostic and Statistical Manual – Version III* (DSM-III; American Psychiatric Association, 1980) criteria among adults in the U.S. general population with any lifetime DSM-III DUD was 17.2% (Anthony and Helzer, 1991). Comparable data have not been published from other major epidemiologic surveys conducted in the U.S. However, among National Comorbidity Survey respondents with lifetime cannabis dependence, the prevalence of ASPD was 21.4% (Agosti et al., 2002). Prevalences in DUD treatment samples range from 8.9% to 68.0%, depending in part upon the diagnostic criteria and assessment instruments utilized to identify the disorder (Broome et al., 1999; Brooner et al., 1992; Cacciola et al., 1996; Compton et al., 2000a; Grella et al., 2003; Hasin et al., 2006; Kidorf et al., 2004; King et al., 2001; Ladd and Petry, 2003; McKay et al., 2000; Messina et al., 2002; H.E. Ross et al., 1988; Westermeyer and Thuras, 2005).

Patients in drug treatment settings with ASPD demonstrate more severe DUDs than those without ASPD, including more extensive drug use histories and greater impairment across multiple domains of functioning at intake (Cacciola et al., 1996; Darke et al., 2004; Ladd and Petry, 2003; McKay et al., 2000; Westermeyer and Thuras, 2005). ASPD has been associated with poorer treatment outcomes, including worse psychosocial functioning, more legal problems, and more problematic substance use in many (Basu et al., 2004; Cacciola et al., 1996; Compton et al., 2003; Fridell et al., 2006; Grella et al., 2003; King et al., 2001; Leal et al., 1994) but not all (Brooner et al., 1998; Crits-Cristoph et al., 1999; McKay et al., 2000; Messina et al., 2002, 2003) studies. Among patients with DUDs, comorbid ASPD is associated with higher levels of drug and sexual HIV risk behaviors (Compton et al., 1995; Disney et al., 2006; Fals-Stewart et al., 2003; Kelley and Petry, 2000; Ladd and Petry, 2003; Woody et al., 1997). However, ASPD has been an inconsistent predictor of response to HIV risk reduction interventions (Compton et al., 1998, 2000b; McCusker et al., 1995; Woody et al., 2003).

DSM-III, *Diagnostic and Statistical Manual – Version III-Revised* (DSM-III-R; American Psychiatric Association, 1987), and *Diagnostic and Statistical Manual – Version IV* (DSM-IV; American Psychiatric Association, 2000) criteria for ASPD require both syndromal levels of antisocial behavior since age 15, and evidence of conduct disorder (CD) with onset before age 15. However, it has now been well documented in both clinical (Black and Braun, 1998; Brooner et al., 1992; Cacciola et al., 1994, 1995; Cottler et al., 1995; Goldstein et al., 1998, 2001) and epidemiologic (Compton et al., 2005; Galbaud du Fort et al., 2002; Marmorstein, 2006; Tweed et al., 1994) samples that individuals with syndromal levels of antisocial behavior in adulthood frequently do not report symptomatic behaviors sufficient to meet criteria for CD with onset before age 15 (AABS, not a codable disorder in DSM-IV). Regardless of ascertainment source, individuals with AABS differ little from those with ASPD on adult antisocial behavior and psychiatric comorbidity (Black and Braun, 1998; Cottler et al., 1995; Goldstein et al., 1998; Langbehn and Cadoret, 2001; Tweed et al., 1994). In addictions treatment settings, clients with AABS also differ little from clients with ASPD on lifetime drug and alcohol histories and substance-related problems at intake (Cecero et al., 1999; Cacciola et al., 1995; Goldstein et al., 1998). Further, the limited available evidence suggests that

treatment outcomes may not differ importantly between clients with DUDs who have comorbid ASPD and those with AABS (Cacciola et al., 1995; Cecero et al., 1999; Goldstein et al., 2001).

These findings raise increasing concern that categorizing individuals with AABS as "without ASPD" may obscure important differences in clinical characteristics and treatment outcomes of DUDs, between individuals with ASPD and individuals with no adult antisocial syndrome, and between those with ASPD and those with no lifetime history of antisociality (Black and Braun, 1998; Cottler et al., 1995). Further, the lack of a dedicated DSM diagnostic category for AABS leaves affected individuals' antisociality to be recorded in clinical settings under the V-code of "adult antisocial behavior" (Langbehn and Cadoret, 2001; Tweed et al., 1994) or the diagnosis of "Personality Disorder Not Otherwise Specified" (Black and Braun, 1998). Both options raise nosologic concerns. The former may downplay the severity of the antisociality by implying that symptomatic behavior is not maladaptive, or characterized by the inflexibility, persistence, and impairment or distress that would define ASPD, while both may obscure the need for clinical attention to behaviors that would meet criteria for ASPD but for the requirement of CD onset before age 15 (Black and Braun, 1998; Marmorstein, 2006). Recent research has raised similar issues regarding the diagnosis of attention-deficit/ hyperactivity disorder (ADHD; Faraone et al., 2006a, 2006b). Strong similarity in clinical and neuropsychological characteristics, as well as patterns of familial transmission, between "full" ADHD, in which all DSM-IV criteria are met including onset before age 7 years, and "late-onset" ADHD, in which all criteria are met except for age at onset, suggests that the age-at-onset requirement in ADHD may be too stringent, at least for diagnosing adults (Faraone et al., 2006a, 2006b).

CD is a well-documented risk factor for substance use disorders (Marmorstein and Iacono, 2005; Nock et al., 2006; Robins and McEvoy, 1990; Robins and Price, 1991; Sung et al., 2004). However, associations of CD that does not progress to ASPD (hereinafter, "CD only") with clinical characteristics and outcomes of DUDs have received little attention in adults. Nock et al. (2006) showed DSM-IV CD to be associated with persistence of substance use disorders (alcohol and drug combined) from the lifetime to the 12-month time frame, but found less elevation in risk of persistence with "remitted" than with "active" CD.

Comparative data concerning associations of DSM-IV ASPD, "CD only," and AABS with clinical characteristics of DUDs have not previously been available from adult general population samples. There are also no comparative data concerning the sociodemographic and clinical correlates of these syndromes among general population adults with DUDs. Accordingly, this report has 2 purposes. First, we examine the prevalences of ASPD, AABS, and "CD only," among adults diagnosed with DUDs in Wave 1, conducted in 2001–2002, of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC; Grant et al., 2003b, 2004c). We compare the sociodemographic and clinical characteristics, including family histories and psychiatric comorbidity, of U.S. adults in the general population with DUDs who are affected with each syndrome and with no antisocial syndrome. We then examine associations of ASPD, AABS, and "CD only" with clinical characteristics of DUDs, including ages at drug use milestones, treatment seeking, lifetime symptom counts, number of lifetime episodes, duration of longest or only episode of DUD, and patterns of drug consumption during respondents' periods of heaviest lifetime drug use.

The NESARC is the first major psychiatric epidemiology survey to employ DSM-IV criteria. With a nationally representative sample of 43,093 respondents, including 4,068 who met lifetime criteria for DUDs, the NESARC allows precise estimates of sociodemographic correlates, family histories of drug problems and antisociality, lifetime psychiatric comorbidity, and clinical characteristics of DUDs by antisocial syndrome. In addition, the large

number of cases of DUDs both with and without antisocial syndromes allows examination of whether patterns of association between antisocial syndromes and DUD phenomenology vary by sex.

2. Method

2.1. Sample

The research protocol, including informed consent procedures, was approved by the Census Bureau's institutional review board and the U.S. Office of Management and Budget. As described in detail elsewhere (Grant et al., 2003a, 2004a), the 2001–2002 NESARC was conducted by NIAAA and based on a representative sample of the general U.S. population. The NESARC's target population was the non-institutionalized civilian population, 18 years and older, residing in households and group quarters. All potential respondents were informed in writing about the nature of the NESARC, the statistical uses of the survey data, the voluntary nature of their participation, and the federal laws that rigorously provide for the strict confidentiality of identifiable survey information. Respondents consenting to participate after receiving this information were interviewed. Face-to-face interviews were conducted with 43,093 respondents, yielding a survey response rate of 81%. Blacks, Hispanics, and young adults 18 to 24 years of age were oversampled, with data adjusted for oversampling and household- and person-level nonresponse. The weighted data were then further adjusted to represent the U.S. civilian population based on the 2000 Census.

2.2. Interviewers and training

Interviews were conducted by 1800 professional lay interviewers from the U.S. Bureau of the Census with, on average, 5 years experience administering health-related surveys. All interviewers completed a 5-day self-study course followed by a 5-day in-person training session at one 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% sample 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 interviews. 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 a further test-retest reliability study (Grant et al., 2003b).

2.3. Assessments

All diagnoses were made using the NIAAA Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version (AUDADIS-IV; Grant et al., 2001). Developed to advance measurement of substance use and mental disorders in large-scale surveys, the AUDADIS-IV is a fully structured diagnostic interview designed for nonclinician interviewers.

2.3.1. Antisocial behavioral syndromes—An AUDADIS-IV diagnosis of ASPD required the specified number of DSM-IV symptoms of CD before age 15 and adult antisocial behaviors since age 15. Consistent with DSM-IV (American Psychiatric Association, 2000), at least 1 CD symptom before age 15 must have caused social, academic, or occupational dysfunction. Respondents were classified as having "CD only" if they met DSM-IV criteria for CD but not ASPD. AABS was operationalized as meeting all criteria for ASPD except CD before age 15. Respondents who did not meet criteria for ASPD, AABS, or "CD only" were considered to have no antisocial syndrome.

2.3.2. Drug and alcohol use disorder diagnoses—AUDADIS-IV questions operationalize DSM-IV criteria for drug-specific abuse and dependence for 10 drug classes (aggregated in this report), as well as alcohol use disorders (AUDs) and nicotine dependence. Consistent with DSM-IV, lifetime AUDADIS-IV diagnoses of drug abuse required ≥ 1 of the 4 criteria for abuse either in the 12-month period preceding the interview or previously. AUDADIS-IV drug dependence diagnoses required ≥ 3 of the 7 DSM-IV dependence criteria to be met for the same specific drug class during the past year or prior. For prior diagnoses of drug dependence, ≥ 3 criteria must have occurred in association with the same drug class within a 1-year period, following DSM-IV. Alcohol abuse and dependence and nicotine dependence diagnoses followed the same algorithms.

2.3.3. Clinical characteristics of DUDs and drug use patterns—DUDs were characterized with respect to age at onset of first episode, total lifetime DUD symptom counts, number of lifetime episodes, duration of longest or only episode, and treatment seeking for DUDs. In addition, ages at first drug use, onset of heaviest drug use, and first treatment for DUD, as well as drug consumption patterns during the period of heaviest lifetime use were examined.

2.3.4. Mood and anxiety disorders—As described in detail elsewhere (Grant et al., 2004b), anxiety (panic disorder with and without agoraphobia, social phobia, specific phobia, and generalized anxiety disorder) and mood (major depressive disorder, dysthymia, bipolar I, and bipolar II) diagnoses in this report are DSM-IV primary, or independent, diagnoses. In DSM-IV (p. 192), "primary" excludes mental disorders that are substance induced or due to a general medical condition (American Psychiatric Association, 2000). All mood and anxiety disorders met the DSM-IV criterion for clinical significance; major depressive disorder diagnoses also ruled out bereavement.

2.3.5. Other personality disorders—AUDADIS-IV assessments of DSM-IV personality disorders (PDs) have been presented previously (Grant et al., 2004c, 2005a,b). In addition to ASPD, these include avoidant, dependent, obsessive-compulsive, paranoid, schizoid, and histrionic PDs. DSM-IV PD diagnoses require evaluating long-term patterns of functioning. AUDADIS-IV PD diagnoses were made accordingly. Respondents were asked a series of 64 PD symptom questions about how they felt or acted *most* of the time, *throughout* their lives, *regardless* of the situation or whom they were with. Respondents were instructed not to include symptoms occurring only when they were depressed, manic, anxious, drinking heavily, using medicines or drugs, experiencing withdrawal symptoms, or physically ill. For each reported symptom, respondents were queried to ascertain whether they experienced distress or social or occupational dysfunction resulting from the symptom.

To receive a DSM-IV PD diagnosis, respondents needed to endorse the required number of DSM-IV symptoms for the specific PD, with ≥ 1 symptom causing distress or social or occupational impairment. Administration time was minimized by the concise explanation, repeated throughout, of the criteria common across PDs (pervasiveness, inflexibility, stability over the lifetime) and by assessing only a subset of PDs. Borderline, schizotypal, and narcissistic PDs were included in Wave 2.

2.3.6. Reliability and validity of AUDADIS-IV diagnoses and drug consumption measures—As reported in detail elsewhere (Grant et al., 2003b, 2004b), reliability and validity were good to excellent for all substance use disorders (Canino et al., 1999; Compton et al., 2004, 2005; Grant et al., 1995, 2003a; Hasin et al., 1997a,b, 2003; Hasin and Paykin, 1999; Vrasti et al., 1998), and fair to good for mood, anxiety, and personality disorders, including ASPD (Canino et al., 1999; Compton et al., 2004, 2005; Conway et al., 2005; Grant et al., 2003a, 2004a,b,c, 2005a,b,c). Measures of drug use, including prevalences and ages at

onset of use of specific drug classes, displayed fair to excellent reliability (Grant, 1996; Grant and Dawson, 1998; Grant et al., 1995; Hasin et al., 1997a,b).

2.4. Statistical analyses

The analysis sample for this report consists of the 4,068 respondents, 2,428 men and 1,640 women, with lifetime DSM-IV drug abuse or drug dependence. In analyses restricted to respondents with lifetime drug dependence (n=1,045), estimates were less precise due to diminutions in sample sizes, particularly in the "CD only" group. Nevertheless, the patterns of results were generally similar to those obtained when all respondents with lifetime DUDs were combined. Therefore, we included respondents with either lifetime drug abuse or lifetime drug dependence, with and without comorbid lifetime AUDs, in order to maximize the available sample size and statistical power.

Categorical variables were compared by antisocial syndrome using standard contingency table approaches, both in the total sample and stratified by sex (Agresti, 1990). Where appropriate, continuous variables were compared by antisocial syndrome, and assessed for sex by antisocial syndrome interactions, using normal theory analyses of variance. Continuous variables with highly skewed distributions that could not be rendered approximately normal with transformations were converted into categorical variables based on their observed distributions. Unless more than 1 quartile for a variable had the same value, quartiles were used to define categories. When more than 1 quartile had the same value, other cutpoints were chosen based on a balance between variability of values within and between categories, as well as adequate sample sizes within categories to permit meaningful analyses.

Multivariable binary and multinomial logistic regression analyses were used, as appropriate to the number of levels of the response variables, to examine associations of antisocial syndromes with clinical characteristics of DUDs, adjusted for the potentially confounding effects of age, sex, marital status, education, past-year income, region, urbanicity, family history of drug problems, and comorbid Axis I and II psychiatric diagnoses (Hosmer and Lemeshow, 2000). The referent category of antisocial syndrome was the group with no antisocial syndrome in either childhood or adulthood. For polytomous response variables, the referent categories were always the lowest or least severe levels. Because no Native American respondents of either sex, and no Asian/Pacific Islander males, met criteria for inclusion in the "CD only" group, race/ethnicity could not be included in the models as a covariate without excluding all Native American and Asian/Pacific Islander respondents. In ancillary analyses considering only White, Black, and Hispanic respondents, results were identical whether or not race/ethnicity was included as a covariate. Therefore, in the interests of maximizing the available sample size, we report results from the full sample without adjustment for race/ethnicity. Similarly, no male respondents in the "CD only" group met lifetime criteria for pathological gambling; therefore, this disorder could not be included as a covariate.

β coefficients from the logistic models were exponentiated to yield odds ratios (ORs). In addition to ORs, 95% confidence intervals (CIs) were estimated. Sex by antisocial syndrome interactions were tested for each model with an α to stay of 0.05. All analyses were conducted using SUDAAN (Research Triangle Institute, 2002), a software program that uses Taylor series linearization to make adjustments for the NESARC's complex sampling design.

3. Results

3.1. Prevalences and sociodemographic correlates of antisocial syndromes among respondents with DUDs

The overall prevalence±standard error of ASPD among respondents with lifetime DUDs was 18.3%±0.78, 20.7%±1.00 among men and 14.1%±1.07 among women. AABS occurred in 42.4%±0.96 of the sample, 44.0%±1.21 among men, and 39.4%±1.50 among women; "CD only," in 2.0%±0.26 in the total sample, 1.9%±0.34 among men, and 2.1%±0.45 among women. With the exclusion of respondents who reported symptomatic behaviors only under the influence of substances, the prevalences±standard errors of ASPD, AABS, and "CD only" in the total sample were nearly the same: 17.8%±0.80, 40.4%±1.01, and 1.9%±0.26, respectively. Similarly, with the exclusion of respondents who reported symptomatic behaviors only when they were manic, the prevalences±standard errors were 17.8%±0.77, 41.7%±0.96, and 1.9%±0.26, respectively. Sex-specific results also remained nearly unchanged under both exclusions (data available upon request). Therefore, we report results based on antisocial syndrome categories derived without the exclusions. Respondents with ASPD were most likely to be male (72.3%±1.86, versus 66.6%±1.32 with AABS, 62.6%±6.79 with "CD only," and 57.3%±1.84 with no antisocial syndrome). As shown in Table 1, all sociodemographic characteristics except region of residence and urbanicity were significantly associated with antisocial syndrome. Respondents with ASPD were youngest, least likely to be non-Hispanic White and most likely to be Native American, and least likely to be currently married or cohabiting. In addition, they were least likely to have finished high school, and reported the lowest past-year income. Significant sex by antisocial syndrome interactions were observed, indicating differences in patterns of associations with antisocial syndromes between men and women, for age, race/ethnicity, and past-year personal income. Women with ASPD, AABS, and no antisocial syndrome were younger, while those with "CD only" were older, than their male counterparts. Women with ASPD and "CD only" were less likely than men with the respective antisocial syndromes to be White, and women with ASPD were more likely than men with ASPD to be Black. No men with "CD only" were Asian or Pacific Islander; additionally, women with "CD only" were more likely than men with "CD only" to be Hispanic. Conversely, women with AABS and with no antisocial syndrome were more likely than their male counterparts to report higher levels of education. Women in all groups were strikingly overrepresented in the lowest past-year personal income categories; no woman in the "CD only" group reported $70,000 or more.

3.2. Antisocial symptomatology in adulthood among respondents with ASPD versus AABS

As shown in Table 2, with the exception of recklessness and, among women, repeated unlawful behaviors and consistent irresponsibility, respondents with ASPD met all criteria in adulthood significantly more frequently than did respondents with AABS, though the differences were modest to moderate in size. The total numbers of adulthood ASPD criteria and lifetime violent antisocial symptoms endorsed by respondents with ASPD were significantly (all *p*-values < 0.0001) higher than the numbers endorsed by respondents with AABS. Identical patterns were observed in men and women.

Clinical and Family History Characteristics of Respondents with DUDs by Antisocial Syndrome—Clinical characteristics of DUDs and drug use patterns during heaviest period of lifetime consumption, as well as lifetime prevalences of comorbid Axis I and II disorders, are given in Table 3. All these variables were significantly associated with antisocial syndrome. Further, gradients of associations with antisocial syndromes were observed for family histories of drug problems and antisocial behavior, ages at first drug use and onset of heaviest use, number of categories of drugs ever used and number associated with DUDs, duration and frequency of heaviest use of most frequently used drug (cannabis for

72.1% and cocaine for 9.6% of the sample), total lifetime DUD symptoms, age at first onset of DUD, duration of longest or only episode of DUD, and most comorbid lifetime disorders. Whether pairwise group differences were statistically significant or not, respondents with ASPD demonstrated the highest prevalence or severity, those with AABS and "CD only" appeared intermediate, and respondents with no antisocial syndrome demonstrated the lowest prevalence or severity. Of note, however, respondents with "CD only" exhibited shorter duration of longest or only episode and lower lifetime prevalence of treatment for DUDs than respondents with no antisocial syndrome, though differences were modest.

Statistically significant sex by antisocial syndrome interactions were observed for family history of drug problems, age at first drug use, age at first onset of DUD, and total number of categories of drugs associated with DUDs. In addition, the interaction was nearly significant (p=0.06) for family history of antisocial behavior. Women with "CD only" were most likely to report family histories of drug problems and antisocial behavior, while men with "CD only" were least likely to report them. Women with ASPD and AABS reported ages at first drug use very similar to their male counterparts, while women with "CD only" reported onset of drug use on average 2.3 years earlier, and those with no antisocial syndrome reported onset on average 0.9 year later, than their respective male counterparts. Similar patterns of results were observed for age at first onset of DUDs. The number of categories of drugs associated with lifetime DUDs decreased monotonically for men from the group with ASPD to the group with no antisocial syndrome. Among women, the picture was more complex. Women with AABS and "CD only" were similar, and intermediate between those with ASPD and those with no antisocial syndrome, in percentages reporting only one drug associated with a lifetime DUD. Women with ASPD and "CD only" were similar in their reporting of 3 to 4 categories, and more likely to report these numbers than women with AABS or no antisocial syndrome. Patterns of associations between antisocial syndromes and other clinical characteristics did not differ by sex. However, women in each group reported slightly fewer categories of drugs ever used, as well as shorter durations of heaviest use and of longest or only episode of DUD, but higher prevalences of comorbid lifetime mood, anxiety, nicotine dependence, and additional personality disorders, than their respective male counterparts.

3.3. Adjusted associations of antisocial syndromes with clinical characteristics of DUDs

Adjusted associations of antisocial syndromes with clinical characteristics of DUDs are shown in Table 4. For total categories of drugs associated with lifetime DUDs, the only response variable for which the sex by antisocial syndrome interaction met the α-to-stay criterion of 0.05, sex-specific results from the model incorporating the interaction term are reported. Otherwise, results from main effect models that adjust for sex are reported for the total sample. While many of the pairwise differences in ORs were not statistically significant (i.e., the 95% CIs overlapped), numerical gradients of associations of many characteristics with antisocial syndromes were observed, from the strongest with ASPD to the weakest with "CD only." Within the groups with ASPD and, to a more modest and less consistent extent, AABS, whether or not the differences in ORs were statistically significant, the strongest associations were generally found with the most severe levels of the response variables.

The adjusted analyses of total categories of drugs associated with lifetime DUDs yielded similar ORs for men and women in the groups with ASPD and AABS except for the most severe level (largest number of drug categories), where the ORs for women were strikingly higher than those for men, though the CIs for women and men substantially overlapped within the groups. In the "CD only" group, none of the ORs, nor any of the differences between the ORs, were statistically significant for either women or men; an OR for women associated with the highest number of drug categories could not be computed because no women with "CD only" reported > 4 categories of drugs associated with lifetime DUDs.

4. Discussion

4.1. Prevalence and correlates of antisocial behavioral syndromes

Consistent with findings from previous epidemiologic and clinical studies (Anthony and Helzer, 1991; Agosti et al., 2002; Broome et al., 1999; Brooner et al., 1992; Cacciola et al., 1996; Cottler et al., 1995; Goldstein et al., 1998), the prevalences of ASPD and AABS among NESARC respondents with lifetime DUDs are strikingly higher, while the prevalence of "CD only" was modestly higher, than in the NESARC sample as a whole (Compton et al., 2005). ASPD and AABS were also considerably more prevalent, though "CD only" was not, among the present subsample of NESARC respondents with lifetime DUDs (with or without comorbid AUDs) than among the subsample of respondents with AUDs (with or without comorbid DUDs; Goldstein et al., in press). The higher prevalence of ASPD and AABS among individuals selected for DUDs than among those selected for AUDs is compatible with findings of greater severity of DUDs relative to AUDs along the spectrum of externalizing conditions that includes substance dependence as well as antisocial syndromes (Compton et al., 2005; Kendler et al., 2003; Kirisci et al., 2002; Krueger et al., 2005; Markon and Krueger, 2005).

The sociodemographic correlates of antisocial syndromes among respondents with DUDs were broadly consistent with those in the total NESARC sample, and with results from prior epidemiologic and clinical studies (Brooner et al., 1992; Compton et al., 2005; Cottler et al., 1995; Goldstein et al., 1998; Kessler et al., 1994; Nock et al., 2006; Robins et al., 1991; Tweed et al., 1994). Also consistent with prior findings related to comorbidity of DUDs with antisocial syndromes (e.g., Anthony and Helzer, 1991; Cottler et al., 1995; Goldstein et al., 1998), sex differences in prevalences of antisocial syndromes, particularly ASPD, were smaller than those observed in the general population (Robins et al., 1991; Compton et al., 2005). This finding, along with the lower population prevalences of both DUDs and antisociality among women, as well as substantially higher prevalences of comorbid Axis I and II disorders, add to the data suggesting that women with DUDs exhibit higher loading and greater severity of psychopathology than men. Further evidence of increased loading for psychopathology is found in the strikingly higher prevalences of family histories of drug problems and antisocial behavior, particularly in our "CD only" group, among women compared with men (Galen et al., 2000; Grella et al., 2003; Kidorf et al., 2004; Kirisci et al., 2002; Markon and Krueger, 2005; cf. Goldstein et al., 1998, Cottler et al., 1995).

Of note, our results did not suggest antisocial symptom patterns in adulthood that were unique to either ASPD or AABS, nor sex-specific patterns of group differences in total numbers of criteria, violent symptoms, or individual adulthood criteria endorsed. However, like our other results concerning the clinical characteristics of antisocial syndromes among respondents with DUDs, the globally more polysymptomatic and, in particular, more violent antisociality in adulthood in the group with ASPD than in the group with AABS is broadly compatible with previously published findings (e.g., Brooner et al., 1992; Cottler et al., 1995; Goldstein et al., 1998; Tweed et al., 1994) derived from both addictions treatment settings and epidemiologic samples.

4.2. Associations of antisocial syndromes with clinical presentation of DUDs

This is the first study to examine associations between antisocial syndromes and clinical characteristics of lifetime DSM-IV DUDs among general population adults. In a pattern strikingly similar to that which we observed for AUDs (Goldstein et al., in press), our findings indicate that, in addition to being characterized by the most severe antisociality, ASPD is associated with the most severe DUD phenomenology. Associations between AABS and clinical characteristics of DUDs, including total categories of drugs ever used, total categories of drugs associated with DUDs and total lifetime DUD symptom counts, were similar in

direction though more modest in magnitude. Within the groups with ASPD and AABS, whether differences between individual odds ratios were statistically significant or not, associations with clinical characteristics of DUDs were generally strongest at the most severe levels of the response variables, including the largest number of categories of drugs used, the largest number of categories of drugs associated with DUDs, the highest symptom counts, and the highest frequency of use of respondents' most frequently used drug during the period of maximum use. For most of the characteristics we examined, we observed similar patterns of associations between men and women.

These results converge with findings from many, though not all, clinically ascertained samples concerning both the associations of ASPD with more severe lifetime clinical presentations of DUDs (Cacciola et al., 1996; Ladd and Petry, 2003; McKay et al., 2000; Westermeyer and Thuras, 2005), and the similarity between patients admitted to DUD treatment with ASPD and those with AABS (Cottler et al., 1995; Goldstein et al., 1998; cf. Brooner et al., 1992). Thus, they add to the evidence that AABS is clinically important. Furthermore, paralleling recent findings that call into question the DSM-IV requirement of onset before age 7 years for the ADHD diagnosis (Faraone et al., 2006a, 2006b), they contribute to the evidence supporting a modification of current diagnostic nomenclature that would either eliminate the requirement of evidence of CD before age 15 for the ASPD diagnosis, or include a separate diagnostic category for AABS. Alternatively, since our findings, like those of Compton et al. (2005) regarding lifetime prevalence of AUDs and specific DUDs associated with antisocial syndromes, appear to identify gradients of severity from ASPD to AABS to "CD only," antisocial syndromes across the lifespan might be conceptualized within a continuous model (Black and Braun, 1998; Compton et al., 2005; Cottler et al., 1995; Langbehn and Cadoret, 2001). This approach is also consistent with recent evidence indicating that both ASPD (Marcus et al., 2006) and the broader category of externalizing disorders (Markon and Krueger, 2005; Krueger et al., 2005) have dimensional latent structures. Nevertheless, further work is needed to examine whether data concerning psychosocial correlates and outcomes of antisocial syndromes in samples not selected for substance use disorders would yield similar conclusions.

The overall lack of significant associations between "CD only" and clinical characteristics of DUDs appear consistent with the lower severity of CD relative to ASPD or AABS along the externalizing spectrum (Krueger et al., 2005; Markon and Krueger, 2005; Marmorstein, 2006). These results also appear consistent with findings reported by Marmorstein and Iacono (2005) of less elevation in risk for onsets of subsequent mental disorders including DUDs, and those of Nock et al. (2006) showing less elevated risk of persistence of disorders from the lifetime to the 12-month time frame, associated with "remitted" compared with "active" CD. Desistance or nonprogression of CD may not eliminate CD-associated risk for onset, but also may not carry adverse impact with respect to DUD phenomenology. Given the mean ages at onset of first and heaviest drug use and DUDs in our sample, from the middle teens to the early 20s, our findings also appear compatible with those of Hussong et al. (2004) that more problematic substance use in adolescence may act as a "snare" hindering desistance from antisocial behavior. Nevertheless, we advance these assertions cautiously for three reasons. First, our data are cross-sectional, precluding inferences about causality of the associations we observed. Second, our respondent subsample with "CD only" was small (n=77). This may have constrained our power to detect modest but clinically important associations as statistically significant. Moreover, we did not ask respondents whether they completely ceased their CD behaviors, but instead asked if the symptomatic behaviors occurred since age 15. Some who reported CD behaviors since age 15 may have desisted long before they were interviewed; others, while not progressing to ASPD, may have remained symptomatic. However, if the "CD only" group contained both remitted and nonremitted cases, this would make both our estimates of associations between "CD only" and clinical characteristics of DUDs, and our comparisons of associations across antisocial syndromes, conservative.

4.3. Limitations

As previously noted, the study's limitations include the cross-sectional nature of our data. Longitudinal data are needed to characterize the temporality and causality of associations between onsets and remissions of antisocial behavioral syndromes and DUD-related milestones, and to identify underlying mechanisms. Wave 2 of the NESARC, which was recently completed, will yield data bearing importantly on these questions in adults. In addition, ongoing birth cohort studies of children followed into adulthood, including the Dunedin (Silva and Stanton, 1996) and Christchurch (Fergusson et al., 2005) studies, will yield important information concerning several decades of the developmental trajectory.

The NESARC was specifically designed to examine the epidemiology of alcohol use, drug use, and mental disorders in the general adult population; the target population did not include incarcerated individuals. This approach eliminates selection biases that could result from ascertainment of respondents in correctional settings, where prevalences and severity of antisocial syndromes and DUDs, and comparative associations between antisocial syndromes and DUD phenomenology, may differ substantially from those observed in the general population (Berkson, 1946). However, the extent to which findings obtained in incarcerated samples would resemble or differ from those we have reported herein is unclear.

Similarly, lifetime treatment rates for DUDs below 30% in all groups yielded sample sizes too small to allow comparisons of results between treated and untreated respondents. Further, while we observed similar patterns of results whether or not we restricted our analysis sample to respondents with lifetime drug dependence, nearly 75% of NESARC respondents with lifetime DUDs were diagnosed with abuse but not dependence. This stands in contrast to the preponderance of drug dependence in clinical samples (Dinwiddie et al., 1996; Ladd and Petry, 2003; S. Ross et al., 2003). Given these considerations, and the generally greater symptomatic severity of DUDs observed in treatment than in epidemiologic samples, it remains unclear whether analyses of treated versus untreated cases would yield similar or different associations to antisociality. Therefore, some caution is appropriate regarding the application of our results to clinical samples. Finally, previous work based on the NESARC data (Compton et al., 2005) identified patterns of comorbidity between antisocial syndromes and specific lifetime DUDs that are consistent with a general comorbidity factor rather than differential associations with specific drugs. Based on these findings, and the low population prevalences of several specific DUDs (Compton et al., 2005), we considered all DUDs together in the present study. Nevertheless, it remains possible that there are drug-specific associations between antisocial syndromes and clinical characteristics of DUDs.

4.4. Implications

Combined with findings from previous studies (e.g., Kendler et al., 2003; Krueger et al., 2002, 2005) indicating robust relationships between antisocial behavior problems and DUDs, our findings re-emphasize the need for continued attention to expanding the range of effective, culturally appropriate prevention and intervention approaches targeting both antisocial syndromes and DUDs, as well as their co-occurrences, in childhood, adolescence, and adulthood. Several prevention curricula have demonstrated effectiveness against CD, substance use, or both, among children and adolescents (e.g., Bierman et al., 2002; Botvin and Kantor, 2000; Brotman et al., 2005; Conduct Problems Prevention Research Group, 2002; Farmer et al., 2002; Hawkins et al., 1999; Webster-Stratton et al., 2001). To our knowledge, however, their effects on fully diagnosable substance use *disorders* have not been evaluated. Further, these approaches often require substantial resources to implement and sustained, active participation on the part of targeted youth and their families. Increasing evidence suggests that prevention programs targeting CD need to be delivered before targeted children reach the age of 8 years for maximum effectiveness (Webster-Stratton and Taylor, 2001). Many treatments

for CD have demonstrated limited effectiveness and even iatrogenic effects (Frick, 2001). Others, however, particularly those that address multiple facets of targeted children's lives, have yielded more encouraging results (Farmer et al., 2002).

Though AABS is more prevalent than ASPD and "CD only" among adults in the general U.S. population (Compton et al., 2005; Kessler et al., 1997), including those with DUDs, prevention and treatment approaches targeting AABS have not been described, perhaps because AABS is not currently a diagnosable DSM disorder. ASPD has responded poorly to treatment (Reid and Gacono, 2000), though the possibility that specific features of the disorder, such as violent behaviors, might be amenable to more narrowly targeted interventions such as anger management, warrants further investigation.

In addition to evaluating overall effectiveness and developmental and cultural appropriateness, it will be important to assess variations in the effectiveness of prevention and treatment interventions addressing antisociality and DUDs over targeted subgroups. In addition to those defined by demographic characteristics, other potentially relevant subgroups might involve length of persistence of DUDs, the specific drugs associated with abuse or dependence, specific medical concerns related to DUDs including HIV/AIDS, the time course of other co-occurring psychiatric disorders, and family histories of both antisocial syndromes and DUDs. Appropriate prioritization and sequencing of interventions targeting DUDs and comorbid antisociality in subgroups of adult clients, among whom both sets of conditions may be long entrenched by the time they are identified, should also be examined.

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Table 1

Demographic Characteristics of NESARC Respondents with Any Lifetime DSM-IV Drug Use Disorder by Antisocial Behavioral Syndrome

Characteristic, % (SE)	Males (n=2,428)				Females (n=1,640)				Total (n=4,068)				p-values	
	ASPD[a] (n=498)	AABS[b] (n=1,046)	"CD Only,"[c] (n=47)	No Antisocial Behavioral Syndrome (n=837)	ASPD[a] (n=231)	AABS[b] (n=675)	"CD Only,"[c] (n=30)	No Antisocial Behavioral Syndrome (n=704)	ASPD[a] (n=729)	AABS[b] (n=1721)	"CD Only,"[c] (n=77)	No Antisocial Behavioral Syndrome (n=1541)	Antisocial Syndrome	Sex * Antisocial Syndrome Interaction
Male									72.3% (1.86)	66.6% (1.32)	62.6% (6.79)	57.3% (1.84)	<0.0001	
Age, years													<0.0001	<0.0001
18–29	40.3% (2.76)	26.8% (1.54)	25.1% (6.48)	23.8% (1.86)	41.4% (3.86)	34.5% (2.31)	35.3% (9.95)	27.5% (2.14)	40.6% (2.17)	29.4% (1.39)	28.9% (5.50)	25.4% (1.40)		
30–44	33.7% (2.92)	44.8% (1.86)	54.1% (7.73)	42.2% (1.85)	46.3% (4.02)	44.5% (2.30)	39.4% (10.48)	44.0% (2.19)	37.2% (2.19)	44.7% (1.44)	48.6% (6.48)	43.0% (1.45)		
45–64	25.6% (2.30)	27.7% (1.54)	19.3% (7.31)	32.4% (2.11)	12.3% (2.15)	20.2% (1.67)	25.3% (11.25)	27.1% (2.20)	21.9% (1.72)	25.2% (1.17)	21.5% (6.17)	30.1% (1.51)		
65+	0.4% (0.22)	0.7% (0.26)	1.5% (1.52)	1.6% (0.39)	0.0% (0.00)	0.9% (0.56)	0.0% (0.00)	1.4% (0.51)	0.3% (0.16)	0.8% (0.24)	1.0% (0.95)	1.5% (0.31)		
Race/ethnicity													0.001	<0.0001
White, non-Hispanic	73.1% (2.70)	76.5% (1.74)	83.6% (6.20)	78.4% (2.00)	68.2% (3.94)	78.4% (2.21)	65.6% (9.64)	82.2% (1.81)	71.8% (2.33)	77.2% (1.51)	76.9% (5.67)	80.0% (1.58)		
Black, non-Hispanic	7.9% (1.29)	10.2% (1.08)	7.5% (3.83)	10.0% (1.23)	13.8% (2.86)	9.4% (1.26)	8.0% (4.65)	6.8% (0.93)	9.6% (1.24)	9.9% (0.91)	7.7% (2.96)	8.7% (0.83)		
Native American	6.2% (1.37)	3.6% (0.82)	0.0% (0.00)	2.2% (0.57)	8.9% (2.75)	3.8% (0.90)	0.0% (0.00)	3.2% (0.84)	7.0% (1.32)	3.7% (0.62)	0.0% (0.00)	2.6% (0.52)		
Asian	2.3% (0.79)	1.6% (0.56)	0.0% (0.00)	2.1% (0.72)	0.9% (0.62)	1.0% (0.40)	6.7% (5.17)	1.1% (0.48)	1.9% (0.59)	1.4% (0.39)	2.5% (1.98)	1.7% (0.45)		
Hispanic	10.4% (1.98)	8.1% (1.19)	8.9% (5.06)	7.4% (1.18)	8.3% (1.69)	7.4% (1.30)	19.7% (7.63)	6.8% (1.27)	9.8% (1.58)	7.9% (1.02)	12.9% (4.70)	7.1% (1.07)		
Marital status													0.03	0.89
Married/cohabiting	48.6% (2.87)	56.7% (1.62)	55.9% (8.73)	58.0% (2.07)	45.3% (4.28)	52.1% (2.57)	59.1% (10.39)	57.1% (2.13)	47.7% (2.18)	55.2% (1.44)	57.1% (6.67)	57.6% (1.53)		
Separated/divorced/Widowed	15.5% (1.80)	14.5% (1.18)	10.3% (4.44)	13.8% (1.34)	24.7% (3.66)	22.8% (1.78)	8.6% (4.21)	18.1% (1.51)	18.0% (1.78)	17.3% (1.01)	9.7% (3.19)	15.6% (0.99)		
Never married	35.9% (2.74)	28.8% (1.52)	33.8% (8.66)	28.2% (1.94)	30.1% (3.68)	25.2% (1.95)	32.3% (9.95)	24.8% (1.97)	34.3% (2.23)	27.6% (1.27)	33.2% (6.43)	26.8% (1.34)		
Education													<0.0001	0.50
Less than high school	22.2% (2.30)	15.2% (1.41)	9.9% (3.96)	8.7% (1.17)	23.4% (3.70)	10.7% (1.35)	16.7% (7.08)	8.0% (1.21)	22.5% (2.09)	13.7% (1.04)	12.4% (3.57)	8.4% (0.88)		
High school diploma	35.4% (2.62)	30.4% (1.74)	36.0% (8.21)	27.4% (2.21)	32.2% (3.55)	27.1% (2.19)	44.5% (11.11)	24.0% (1.95)	34.6% (2.08)	29.3% (1.39)	39.2% (6.65)	26.0% (1.55)		
Postsecondary education	42.4% (2.84)	54.4% (1.96)	54.1% (8.66)	63.8% (2.44)	44.4% (4.17)	62.3% (2.24)	38.9% (10.31)	68.0% (2.24)	42.9% (2.41)	57.0% (1.52)	48.4% (6.93)	65.6% (1.75)		
Past-year personal income													0.0002	<0.0001
Less than $19,999	47.3% (2.75)	36.7% (1.86)	34.4% (9.25)	30.4% (2.04)	69.1% (4.16)	64.0% (2.36)	60.1% (10.9)	52.5% (2.53)	53.3% (2.33)	45.8% (1.58)	44.0% (6.95)	39.8% (1.68)		
$20,000–34,999	26.2% (2.28)	24.5% (1.71)	30.6% (7.65)	21.2% (1.83)	20.7% (3.63)	21.6% (1.90)	27.7% (11.08)	22.1% (2.00)	24.7% (1.97)	23.5% (1.30)	29.5% (6.20)	21.6% (1.42)		
$35,000–69,999	19.8% (1.92)	28.5% (1.61)	27.1% (7.72)	33.0% (2.02)	7.0% (2.05)	12.8% (1.38)	12.2% (5.94)	18.6% (1.87)	16.3% (1.51)	23.2% (1.21)	21.6% (5.54)	26.8% (1.46)		
$70,000+	6.7% (1.37)	10.3% (1.14)	7.9% (4.06)	15.5% (1.81)	3.2% (2.03)	1.7% (0.56)	0.0% (0.00)	6.9% (1.38)	5.8% (1.10)	7.4% (0.79)	5.0% (2.58)	11.8% (1.25)		
Region of residence													0.09	0.62
Northeast	14.5% (2.77)	15.8% (2.78)	11.8% (5.05)	22.6% (4.09)	15.7% (3.79)	15.8% (2.89)	18.9% (9.64)	18.4% (3.65)	14.8% (2.67)	15.8% (2.57)	14.5% (5.04)	20.8% (3.68)		

Characteristic, % (SE)	Males (n=2,428)				Females (n=1,640)				Total (n=4,068)				p-values	
	ASPD[a] (n=498)	AABS[b] (n=1,046)	"CD Only"[c] (n=47)	No Antisocial Behavioral Syndrome (n=837)	ASPD[a] (n=231)	AABS[b] (n=675)	"CD Only"[c] (n=30)	No Antisocial Behavioral Syndrome (n=704)	ASPD[a] (n=729)	AABS[b] (n=1721)	"CD Only"[c] (n=77)	No Antisocial Behavioral Syndrome (n=1541)	Antisocial Syndrome	Sex * Antisocial Syndrome Interaction
Midwest	23.0% (3.77)	25.1% (3.39)	26.3% (9.10)	21.5% (3.43)	28.4% (4.83)	24.2% (3.49)	40.5% (11.64)	25.0% (3.87)	24.5% (3.66)	24.8% (3.21)	31.6% (7.49)	23.0% (3.31)		
South	28.9% (3.63)	30.9% (3.22)	27.5% (7.93)	30.8% (3.71)	23.5% (4.19)	29.3% (3.37)	18.7% (7.30)	28.7% (3.75)	27.4% (3.24)	30.4% (3.03)	24.2% (6.06)	29.9% (3.34)		
West	33.7% (4.48)	28.2% (3.76)	34.5% (9.52)	25.1% (4.58)	32.3% (5.01)	30.7% (4.15)	21.9% (9.87)	27.9% (4.11)	33.3% (4.27)	29.0% (3.68)	29.8% (7.34)	26.3% (3.95)		
Urban (vs. rural) residence	77.2% (3.17)	80.3% (2.03)	91.2% (4.21)	82.3% (2.38)	82.8% (3.41)	75.7% (3.02)	81.3% (9.29)	84.4% (2.24)	78.7% (2.68)	78.8% (2.06)	87.5% (4.99)	83.2% (1.91)	0.06	0.06

[a] ASPD: antisocial personality disorder.

[b] AABS: adult antisocial behavior without conduct disorder before age 15 years.

[c] "CD Only": conduct disorder without adult antisocial behavior.

Table 2

ASPD[a] Criteria in Adulthood and Lifetime Violent Symptomatology among NESARC Respondents with Lifetime DSM-IV Drug Use Disorders and ASPD[a] versus AABS[b]

Characteristic, % or mean	Males (n=1544)			Females (n=906)			Total Sample (n=2450)		
(SE)	ASPD[a] (n=498)	AABS[b] (n=1046)	p-value	ASPD[a] (n=231)	AABS[b] (n=675)	p-value	ASPD[a] (n=729)	AABS[b] (n=1721)	p-value
Repeated unlawful behaviors	93.0% (1.19)	84.8% (1.42)	0.0001	88.1% (3.10)	83.4% (1.81)	0.18	91.6% (1.21)	84.3% (1.10)	0.0001
Deceitfulness	51.9% (2.92)	26.7% (1.76)	<0.0001	63.2% (3.98)	34.7% (2.08)	<0.0001	55.0% (2.47)	29.4% (1.42)	<0.0001
Impulsivity/failure to plan ahead	61.8% (2.82)	48.3% (1.98)	0.0004	61.4% (4.21)	49.4% (2.47)	0.02	61.7% (2.44)	48.6% (1.43)	0.0001
Irritability/aggressiveness	73.1% (2.68)	57.4% (1.89)	0.0001	72.3% (3.99)	55.0% (2.31)	0.001	72.9% (2.33)	56.6% (1.60)	<0.0001
Recklessness	84.9% (2.02)	82.1% (1.57)	0.27	65.5% (3.74)	66.5% (2.15)	0.79	79.5% (1.83)	76.9% (1.26)	0.23
Consistent irresponsibility	90.8% (1.42)	81.3% (1.48)	0.0001	90.6% (3.02)	86.0% (1.42)	0.16	90.8% (1.30)	82.9% (1.08)	0.0001
Lack of remorse	51.1% (2.67)	44.9% (1.90)	0.05	52.2% (4.20)	41.0% (2.11)	0.03	51.4% (2.19)	43.6% (1.42)	0.003
Total ASPD criteria endorsed since age 15	5.1 (0.07)	4.3 (0.04)	<0.0001	4.9 (0.12)	4.2 (0.05)	<0.0001	5.0 (0.06)	4.2 (0.04)	<0.0001
Lifetime violent symptoms[c]	3.5 (0.12)	1.5 (0.06)	<0.0001	3.0 (0.15)	1.3 (0.07)	<0.0001	3.3 (0.09)	1.4 (0.05)	<0.0001

[a] ASPD: antisocial personality disorder.

[b] AABS: adult antisocial behavior without conduct disorder before age 15 years.

[c] Includes : bullying, pushing around, or intimidating other people; vandalism; firesetting; robbing, mugging, or snatching someone's purse; forcing someone into sexual activity; repeatedly starting fights; swapping blows with intimates; using a dangerous weapon; hitting someone and causing injury; hurting another person on purpose; and hurting an animal on purpose.

Table 3

Clinical Characteristics of NESARC Respondents with Lifetime DSM-IV Drug Use Disorders by Antisocial Behavioral Syndrome (n=4,068)

Characteristic, % or mean (SE)	Males (n=2,428)				Females (n=1,640)				Total (n=4,068)				p-values	
	ASPD[a] (n=498)	AABS[b] (n=1,046)	"CD Only"[c] (n=47)	No Antisocial Behavioral Syndrome (n=837)	ASPD[a] (n=231)	AABS[b] (n=675)	"CD Only"[c] (n=30)	No Antisocial Behavioral Syndrome (n=704)	ASPD[a] (n=729)	AABS[b] (n=1721)	"CD Only"[c] (n=77)	No Antisocial Behavioral Syndrome (n=1541)	Antisocial Syndrome	Sex* Antisocial Syndrome Interaction
Family history of drug problems	55.2% (2.84)	42.3% (1.76)	20.4% (6.00)	29.5% (1.95)	71.7% (3.46)	58.1% (2.43)	77.1% (7.48)	41.0% (2.39)	59.8% (2.40)	47.6% (1.44)	41.6% (6.54)	34.4% (1.57)	<0.0001	0.005
Family history of antisocial behavior	57.8% (3.00)	46.6% (1.77)	29.7% (7.24)	23.3% (1.85)	76.9% (3.55)	63.3% (2.18)	79.3% (7.55)	37.4% (2.32)	63.1% (2.39)	52.2% (1.43)	48.3% (6.68)	29.3% (1.59)	<0.0001	0.06
Age at first drug use	14.9 (0.21)	17.0 (0.18)	17.5 (1.18)	17.7 (0.18)	14.8 (0.29)	17.0 (0.22)	15.2 (0.51)	18.6 (0.34)	14.8 (0.18)	17.0 (0.15)	16.6 (0.77)	18.1 (0.19)	<0.0001	0.03
Total categories of drugs ever used													<0.0001	0.28
1	16.6% (1.99)	26.5% (1.86)	36.3% (8.01)	40.4% (2.12)	17.9% (3.38)	26.7% (1.95)	41.9% (11.56)	44.0% (2.30)	16.9% (1.70)	26.6% (1.38)	38.4% (6.64)	42.0% (1.58)		
2	14.8% (1.85)	16.7% (1.49)	15.3% (5.82)	25.4% (1.63)	20.3% (3.30)	20.2% (2.19)	15.7% (6.70)	25.1% (1.97)	16.3% (1.56)	17.8% (1.20)	15.5% (4.36)	25.2% (1.21)		
3–4	26.2% (2.55)	26.6% (1.64)	24.8% (7.65)	20.6% (1.77)	27.5% (3.58)	24.8% (1.89)	41.3% (11.57)	20.2% (1.89)	26.5% (1.99)	26.0% (1.26)	30.9% (6.75)	20.4% (1.32)		
>4	42.5% (2.71)	30.2% (1.86)	23.6% (7.12)	13.6% (1.47)	34.3% (3.87)	28.3% (2.35)	1.2% (1.19)	10.7% (1.37)	40.2% (2.29)	29.6% (1.50)	15.2% (4.83)	12.4% (1.04)		
Total categories of drugs associated with lifetime drug use disorders													<0.0001	<0.0001
1	44.0% (2.54)	58.5% (1.98)	72.8% (7.35)	78.1% (1.90)	48.2% (3.91)	61.5% (2.10)	60.8% (11.69)	79.9% (1.64)	45.1% (1.96)	59.5% (1.51)	68.3% (6.63)	78.9% (1.31)		
2	22.0% (2.41)	19.2% (1.37)	15.6% (6.64)	12.9% (1.25)	21.0% (3.22)	20.6% (1.92)	22.7% (10.33)	13.8% (1.44)	21.7% (1.78)	19.7% (1.12)	18.2% (5.59)	13.3% (0.94)		
3–4	16.3% (1.93)	12.4% (1.36)	10.2% (4.65)	5.4% (1.21)	19.8% (2.95)	9.2% (1.26)	16.5% (9.11)	5.0% (0.98)	17.3% (1.58)	11.3% (1.00)	12.6% (4.45)	5.2% (0.86)		
>4	17.7% (1.91)	9.8% (1.27)	1.5% (1.46)	3.7% (0.79)	10.9% (2.25)	8.7% (1.41)	0.0% (0.00)	1.2% (0.42)	15.9% (1.51)	9.5% (0.92)	0.9% (0.91)	2.6% (0.49)		
Age at onset of heaviest use of most frequently used drug[d]	18.9 (0.35)	20.7 (0.23)	20.2 (1.36)	20.5 (0.22)	18.9 (0.50)	20.1 (0.26)	18.3 (2.10)	21.2 (0.38)	18.9 (0.30)	20.5 (0.17)	19.5 (1.13)	20.8 (0.22)	<0.0001	0.11
Duration of heaviest use of most frequently used drug[d], weeks													0.02	0.43
≤52	36.3% (2.40)	35.7% (1.85)	34.1% (7.39)	40.6% (2.05)	42.0% (4.09)	42.9% (2.16)	38.2% (10.56)	49.1% (2.39)	37.9% (2.18)	38.1% (1.41)	35.6% (5.97)	44.2% (1.53)		
>52–104	15.9% (2.13)	17.6% (1.41)	18.4% (6.40)	14.1% (1.44)	13.0% (3.16)	14.8% (1.57)	24.0% (9.12)	16.4% (1.78)	15.1% (1.85)	16.6% (1.13)	20.5% (5.24)	15.1% (1.10)		
>104–261	19.6% (2.08)	22.5% (1.49)	28.6% (6.74)	24.9% (1.84)	27.0% (3.70)	24.3% (1.91)	23.2% (9.60)	22.1% (2.06)	21.7% (1.92)	23.1% (1.16)	26.6% (5.62)	23.7% (1.33)		
>261	28.2% (2.45)	24.2% (1.71)	18.9% (6.56)	20.4% (1.48)	17.9% (3.67)	18.0% (1.86)	14.6% (8.52)	12.4% (1.33)	25.4% (2.16)	22.2% (1.33)	17.3% (5.01)	17.0% (0.99)		
Frequency of heaviest use of most frequently used drug[d], days per year													<0.0001	0.72
≤12	5.7% (1.20)	8.8% (0.99)	1.8% (1.82)	12.8% (1.76)	4.9% (1.60)	11.3% (1.42)	16.9% (7.57)	16.2% (1.69)	5.4% (1.01)	9.6% (0.77)	7.5% (3.10)	14.2% (1.22)		
>12–104	15.8% (1.89)	26.0% (1.62)	43.8% (8.36)	35.3% (2.10)	15.0% (3.31)	24.6% (1.86)	24.5% (9.54)	35.0% (2.21)	15.6% (1.82)	25.5% (1.33)	36.6% (6.57)	35.2% (1.48)		
>104–312	23.0% (2.47)	21.7% (1.58)	23.1% (9.09)	24.4% (1.80)	20.8% (3.36)	21.5% (1.77)	29.1% (9.87)	23.3% (1.97)	22.4% (2.02)	21.6% (1.15)	25.4% (6.53)	23.9% (1.31)		
>312	55.6% (2.84)	43.5% (1.76)	31.2% (7.62)	27.6% (1.86)	59.3% (3.88)	42.7% (2.24)	29.4% (10.60)	25.5% (1.77)	56.6% (2.27)	43.3% (1.43)	30.5% (6.03)	26.7% (1.36)		
Total lifetime drug use disorder symptoms													<0.0001	0.87

Characteristic, % or mean (SE)	Males (n=2,428)				Females (n=1,640)				Total (n=4,068)				p-values	
	ASPD[a] (n=498)	AABS[b] (n=1,046)	"CD Only"[c] (n=47)	No Antisocial Behavioral Syndrome (n=837)	ASPD[a] (n=231)	AABS[b] (n=675)	"CD Only"[c] (n=30)	No Antisocial Behavioral Syndrome (n=704)	ASPD[a] (n=729)	AABS[b] (n=1721)	"CD Only"[c] (n=77)	No Antisocial Behavioral Syndrome (n=1541)	Antisocial Syndrome	Sex[*] Antisocial Syndrome Interaction
≤ 3	12.9% (1.95)	22.2% (1.59)	28.2% (6.78)	42.1% (2.11)	6.7% (2.12)	17.2% (1.66)	26.0% (10.31)	37.2% (2.15)	11.1% (1.53)	20.6% (1.22)	27.4% (5.80)	40.0% (1.60)		
4–8	22.5% (2.30)	30.5% (1.68)	38.4% (7.61)	30.7% (1.69)	18.5% (3.15)	29.7% (2.02)	27.6% (10.19)	31.7% (2.31)	21.4% (1.90)	30.3% (1.27)	34.4% (6.47)	31.1% (1.41)		
9–16	26.0% (2.72)	23.6% (1.57)	22.8% (6.92)	16.4% (1.60)	26.9% (4.03)	24.3% (2.17)	25.2% (10.03)	20.0% (1.74)	26.2% (2.28)	23.8% (1.25)	23.7% (5.70)	17.9% (1.26)		
>16	38.7% (2.49)	23.6% (1.42)	10.6% (5.44)	10.8% (1.45)	48.0% (4.16)	28.8% (2.01)	21.2% (9.86)	11.2% (1.45)	41.3% (2.15)	25.3% (1.18)	14.6% (5.07)	11.0% (1.07)		
Age at first onset of drug use disorder	18.2 (0.27)	19.9 (0.22)	21.9 (1.62)	20.2 (0.22)	17.9 (0.52)	19.9 (0.27)	16.5 (0.66)	21.1 (0.39)	18.1 (0.24)	19.9 (0.17)	20.0 (1.11)	20.6 (0.22)	<0.0001	0.003
Number of lifetime episodes of drug use disorder													0.0001	0.25
1	60.9% (2.73)	67.4% (1.90)	73.9% (6.92)	75.1% (2.00)	61.2% (3.80)	69.6% (2.11)	65.9% (10.76)	78.8% (2.08)	61.0% (2.39)	68.1% (1.47)	71.0% (5.99)	76.7% (1.42)		
2	13.3% (2.03)	15.3% (1.44)	11.7% (5.16)	10.1% (1.35)	14.1% (2.74)	13.0% (1.59)	5.8% (4.87)	12.0% (1.54)	13.5% (1.64)	14.5% (1.15)	9.6% (3.81)	10.9% (1.06)		
3–4	12.0% (1.70)	7.8% (1.06)	11.4% (6.04)	7.4% (1.20)	12.2% (2.37)	9.4% (1.43)	18.2% (10.05)	4.9% (1.17)	12.0% (1.52)	8.3% (0.88)	13.8% (5.39)	6.4% (0.81)		
>4	13.9% (1.83)	9.6% (1.12)	3.0% (2.80)	7.4% (1.13)	12.5% (3.07)	8.0% (1.18)	10.1% (5.67)	4.3% (0.93)	13.5% (1.68)	9.0% (0.83)	5.5% (2.65)	6.1% (0.73)		
Duration of longest or only episode of drug use disorder, months													0.0001	0.25
1–5	19.1% (2.13)	23.6% (1.85)	24.0% (7.08)	27.2% (1.86)	23.7% (3.33)	21.6% (1.99)	30.2% (11.45)	33.2% (2.34)	20.4% (1.72)	22.9% (1.43)	26.4% (6.55)	29.8% (1.52)		
>5–12	23.6% (2.65)	23.4% (1.72)	36.2% (8.95)	26.5% (2.08)	25.0% (3.90)	28.4% (2.34)	43.3% (10.88)	30.8% (2.31)	24.0% (2.05)	25.1% (1.40)	38.9% (7.02)	28.3% (1.54)		
>12–48	28.4% (2.73)	25.9% (1.70)	20.8% (6.76)	28.2% (1.83)	25.5% (3.79)	28.3% (2.17)	24.2% (8.12)	22.0% (1.79)	27.5% (2.11)	26.7% (1.30)	22.1% (5.40)	25.6% (1.25)		
>48	29.0% (2.58)	27.1% (1.79)	19.1% (6.31)	18.1% (1.60)	25.8% (3.46)	21.7% (2.02)	2.3% (2.28)	14.0% (1.59)	28.1% (1.97)	25.3% (1.47)	12.7% (4.11)	16.4% (1.17)		
Ever treated for drug use disorder	26.2% (2.39)	16.7% (1.39)	2.3% (1.82)	8.7% (1.16)	30.8% (3.40)	18.1% (1.79)	4.8% (3.79)	8.3% (1.19)	27.5% (1.97)	17.2% (1.04)	3.2% (1.83)	8.6% (0.84)	<0.0001	0.77
Age at first treatment for drug use disorder	22.9 (0.83)	26.7 (0.70)	25.2 (4.46)	27.6 (1.08)	22.0 (1.23)	24.7 (0.86)	14.2 (1.31)	27.6 (1.41)	22.6 (0.70)	26.0 (0.54)	19.1 (3.35)	27.6 (0.85)	<0.0001	0.14
Any lifetime mood disorder	53.3% (2.59)	37.3% (1.88)	32.9% (7.42)	18.5% (1.65)	76.9% (3.34)	56.6% (2.36)	58.7% (11.29)	41.5% (2.13)	59.9% (2.11)	43.8% (1.54)	42.6% (6.06)	28.3% (1.50)	<0.0001	0.25
Any lifetime anxiety disorder	38.7% (2.77)	27.0% (1.66)	29.1% (8.46)	16.2% (1.43)	56.9% (4.13)	42.6% (2.19)	58.8% (10.76)	34.6% (2.32)	43.7% (2.33)	32.2% (1.40)	40.2% (6.65)	24.0% (1.29)	<0.0001	0.38
Any lifetime alcohol use disorder	89.5% (1.88)	88.0% (1.24)	73.1% (9.17)	77.8% (1.68)	85.3% (2.89)	78.8% (1.93)	62.1% (11.54)	61.9% (2.29)	88.3% (1.52)	85.0% (1.08)	69.0% (7.31)	71.0% (1.48)	<0.0001	0.74
Lifetime nicotine dependence	64.0% (2.67)	54.8% (1.87)	31.8% (7.21)	37.5% (2.13)	71.8% (3.62)	57.9% (2.35)	54.5% (10.65)	40.1% (2.28)	66.2% (2.21)	55.8% (1.54)	40.3% (6.56)	38.6% (1.70)	<0.0001	0.38
Lifetime pathological gambling	3.9% (1.18)	1.6% (0.47)	0.0% (0.00)	0.5% (0.25)	1.7% (0.69)	1.5% (0.43)	2.3% (2.29)	1.0% (0.58)	3.3% (0.87)	1.6% (0.35)	0.9% (0.86)	0.7% (0.29)	0.03	e
Any additional personality disorder	44.5% (3.05)	27.8% (1.65)	14.9% (6.98)	10.1% (1.26)	51.8% (4.42)	36.8% (2.19)	39.6% (10.80)	17.3% (1.56)	46.5% (2.33)	30.8% (1.37)	24.1% (6.23)	13.1% (1.02)	<0.0001	0.40

[a] ASPD: antisocial personality disorder.

[b] AABS: adult antisocial behavior without conduct disorder before age 15.

[c] "CD Only": conduct disorder without adult antisocial behavior.

[d] Most frequently used drug (lifetime): cannabis (72.1% ± 1.00), cocaine (9.6% ± 0.64), stimulants (4.8% ± 0.48), opiates other than heroin (4.1% ± 0.40), hallucinogens (3.00% ± 0.32), sedatives (1.7% ± 0.23), inhalants or solvents (1.4% ± 0.23), tranquilizers or heroin (1.1% ± 0.19 each), and any other drug (1.1% ± 0.23).

e Significance of sex

* antisocial syndrome interaction could not be tested due to small cell sizes.

Table 4

Adjusted Associations of Antisocial Behavioral Syndromes with Selected Variables Describing Clinical Characteristics of Illness among NESARC Respondents with Lifetime DSM-IV Drug Use Disorders (n=4,068)

Characteristic	ASPD[d] (n=729)	AABS[e] (n=1721)	"CD Only"[f] (n=77)	No Antisocial Behavioral Syndrome (n=1541)
Odds Ratios (95% Confidence Intervals)[a,b,c]				
Total categories of drugs ever used				
1	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)
2	1.4 (0.99–2.04)	1.0 (0.81–1.31)	0.7 (0.30–1.39)	1.0 (referent)
3–4	2.4 (1.65–3.49)	1.7 (1.36–2.13)	1.6 (0.74–3.40)	1.0 (referent)
>4	4.9 (3.40–7.06)	2.8 (2.12–3.64)	1.3 (0.53–3.35)	1.0 (referent)
Total categories of drugs associated with lifetime drug use disorders	*Men / Women*	*Men / Women*	*Men / Women*	
1	1.0 (referent) / 1.0 (referent)	1.0 (referent) / 1.0 (referent)	1.0 (referent) / 1.0 (referent)	1.0 (referent)
2	2.6 (1.81–3.81) / 2.0 (1.21–3.27)	1.8 (1.37–2.44) / 1.7 (1.19–2.40)	1.3 (0.45–3.89) / 2.1 (0.56–8.12)	1.0 (referent)
3–4	3.7 (2.08–6.51) / 4.0 (2.17–7.23)	2.4 (1.42–4.10) / 1.7 (0.99–3.00)	2.1 (0.70–6.41) / 3.7 (0.80–17.07)	1.0 (referent)
>4	6.0 (3.42–10.55) / 9.3 (3.68–23.53)	2.7 (1.61–4.60) / 7.1 (3.16–15.76)	0.5 (0.06–3.72) / [g]	1.0 (referent)
Total lifetime drug use disorder symptoms				
<=3	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)
4–8	1.8 (1.21–2.78)	1.6 (1.28–2.00)	1.4 (0.67–3.00)	1.0 (referent)
9–16	2.9 (1.92–4.37)	1.9 (1.39–2.51)	1.5 (0.65–3.57)	1.0 (referent)
>16	5.1 (3.40–7.72)	2.7 (1.98–3.62)	1.3 (0.47–3.82)	1.0 (referent)
Number of lifetime episodes of drug use disorder				
1	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)
2	1.3 (0.87–1.97)	1.4 (1.02–1.89)	0.9 (0.35–2.18)	1.0 (referent)
3–4	1.8 (1.18–2.75)	1.2 (0.90–1.72)	2.3 (0.89–6.12)	1.0 (referent)
>4	2.2 (1.45–3.40)	1.5 (1.06–2.10)	1.0 (0.32–2.90)	1.0 (referent)
Duration of longest or only episode in months				

Odds Ratios (95% Confidence Intervals)^{a,b,c}

Characteristic	ASPD^d (n=729)	AABS^e (n=1721)	"CD Only"^{f} (n=77)	No Antisocial Behavioral Syndrome (n=1541)
1–5	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)
>5–12	0.9 (0.66–1.32)	1.0 (0.76–1.30)	1.5 (0.65–3.27)	1.0 (referent)
>12–48	1.3 (0.93–1.89)	1.2 (0.93–1.54)	1.0 (0.42–2.32)	1.0 (referent)
>48	2.1 (1.46–2.89)	1.7 (1.31–2.18)	0.9 (0.33–2.24)	1.0 (referent)
Ever treated for drug use disorder Yes (vs. no)	2.6 (1.88–3.70)	1.8 (1.35–2.27)	0.3 (0.08–1.03)	1.0 (referent)
Frequency of use (days/year) of most frequently used drug during period of maximum use				
<=12	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)
>12–104	1.0 (0.60–1.71)	1.0 (0.73–1.41)	1.8 (0.70–4.83)	1.0 (referent)
>104–312	1.8 (1.12–2.87)	1.2 (0.81–1.63)	1.8 (0.58–5.44)	1.0 (referent)
>312	3.2 (2.02–5.22)	1.8 (1.33–2.53)	1.8 (0.58–5.44)	1.0 (referent)
Duration of period of maximum use, most frequently used drug (weeks)				
≤52	1.0 (referent)	1.0 (referent)	1.0 (referent)	1.0 (referent)
>52–104	1.2 (0.79–1.70)	1.2 (0.95–1.63)	1.8 (0.87–3.73)	1.0 (referent)
>104–261	1.3 (0.93–1.76)	1.2 (0.96–1.55)	1.6 (0.80–3.29)	1.0 (referent)
>261	1.7 (1.19–2.29)	1.4 (1.13–1.82)	1.3 (0.55–3.24)	1.0 (referent)

^{a}Odds ratios are based on binary logistic regression models for dichotomous, and multinomial logistic regression models for polytomous, response variables.

^{b}All models control for age, sex, marital status, education, past-year personal income, region and urbanicity of respondent residence, family history of drug problems, and comorbid lifetime diagnoses of nicotine dependence and any mood, any anxiety, any alcohol use, and any additional personality disorders.

^{c}Race/ethnicity and lifetime pathological gambling could not be included as covariates because of zero cells in some subgroups of interest.

^{d}ASPD: antisocial personality disorder.

^{e}AABS: adult antisocial behavior without conduct disorder before age 15

^{f}"CD Only": conduct disorder without adult antisocial behavior.

^{g}Odds ratio could not be computed because no woman with "CD only" reported >4 categories of drugs associated with lifetime drug use disorders.