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Antisocial Behavioral Syndromes and Past-Year Physical Health Among Adults in the United States: Results from the National Epidemiologic Survey on Alcohol and Related Conditions

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Abstract

Objective—To describe associations of DSM-IV antisocial personality disorder (ASPD), conduct disorder without progression to ASPD (“CD only”), and syndromal antisocial behavior in adulthood without CD before age 15 (AABS, not a DSM-IV diagnosis) with past-year physical health status and hospital care utilization 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 were classified according to whether they met criteria for ASPD, AABS, “CD only,” or no antisocial syndrome. Associations of antisocial syndromes with physical health status and care utilization were examined using normal-theory and logistic regression.

Results—ASPD and AABS were significantly but modestly associated with total past-year medical conditions, coronary heart and gastrointestinal diseases, and numbers of inpatient hospitalizations, inpatient days, emergency department visits, and clinically significant injuries. ASPD was also associated with liver disease, arthritis, and lower scores on the Short Form-12 version 2 (SF-12v2) Physical Component, Role Physical, and Bodily Pain Scales. AABS was associated with noncoronary heart disease, lower scores on the SF-12v2 General Health and Vitality Scales, and, among men, arthritis. “CD only” was associated with single but not multiple inpatient hospitalizations, emergency department visits, and clinically significant injuries.

Conclusions—Estimates of burden related to antisocial behavioral syndromes need to consider associated physical health problems. Prevention and treatment guidelines for injuries and common chronic diseases may need to address comorbid antisociality, and interventions targeting antisociality may need to consider general health status, including prevention and management of injuries and chronic diseases.

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Keywords

Antisocial personality disorder; conduct disorder; coronary heart disease; liver disease; arthritis; gastrointestinal disease; injury; health care utilization

Introduction

Antisocial personality disorder (ASPD) affects 3 to 5 percent of adults in the United States.¹⁻⁴ Diagnostic criteria for ASPD specified in the Diagnostic and Statistical Manual of Mental Disorders – Third Edition (DSM-III),⁵ the Diagnostic and Statistical Manual of Mental Disorders – Third Edition, Revised (DSM-III-R),⁶ and the Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition (DSM-IV),⁷ require both conduct disorder (CD) with onset before age 15 years, and a persistent pattern of aggressive, irresponsible, impulsive, and remorseless behaviors thereafter. ASPD is associated with substantial burden on affected individuals, their families, and society in general, both in its own right and because of its high comorbidity with mood,^{2,4,8,9} anxiety,^{2,4,8,9} substance use,^{1,2,4} and other personality¹⁰ disorders (PDs).

Due in part to its comorbidity with other mental disorders, ASPD is also a risk factor for increased morbidity and mortality related to injuries,¹¹⁻¹⁴ sexually transmitted diseases (STDs) including HIV/AIDS,¹⁵⁻¹⁷ and chronic diseases such as diabetes mellitus and liver disease.^{18,19} Of note, however, many of these associations were observed in samples of patients ascertained from psychiatric settings,^{12,18} STD clinics,^{15,16} and transplant clinics,¹⁹ or based on criteria that predated DSM-IV.^{12-14,18,19} Associations of DSM-IV ASPD with common medical conditions other than STDs, and with medical care utilization, have not been examined in nonclinical samples.

In both clinical and epidemiologic samples, CD, even without progression to ASPD (hereinafter, “CD only”), is also highly comorbid with mood,^{4,20-24} anxiety,²¹⁻²³ and substance use.^{1,21-23,25} disorders. It has been identified as a risk factor for STDs^{25,26} and, among young women, early pregnancy and greater numbers of physical health problems in late adolescence.^{25,27} Conduct problems were associated with cardiovascular risk factors including elevated blood pressure, overweight, and family history of hypertension among younger brothers (ages 6 to 10 years) of adjudicated juvenile delinquents.²⁸ Moreover, among men in the Dunedin, New Zealand, birth cohort at age 32 years, CD symptoms, particularly those consistent with the “life course-persistent” trajectory characterized by childhood onset, predicted poorer current self-reported health status, higher C-reactive protein level, and greater past-year prevalences of chronic bronchitis symptoms, herpesvirus type 2, dental decay, gum disease, serious injuries, and inpatient hospitalization, as well as increased numbers of past-year primary care visits.²⁹ Among a cohort of United States women of low socioeconomic status studied cross-sectionally at a similar average age, DSM-III CD symptoms were associated with increases in self-reported long-term disability and chronic health problems,³⁰ but specific conditions were not examined. Data concerning associations of fully diagnosable DSM-IV CD with common chronic medical conditions, injuries, and medical care utilization are not available from a representative sample of the general adult population.

As has been documented in both clinical³¹⁻³⁷ and epidemiologic^{1,38-40} samples, individuals with syndromal antisocial behavior in adulthood frequently do not report symptomatic behaviors sufficient to meet criteria for CD before age 15 (adulthood antisocial behavioral syndrome, or AABS; not a codable disorder in DSM-IV). Individuals with AABS differ little from those with ASPD on antisocial symptomatology in adulthood and psychiatric comorbidity.^{31,35,36,40-43} However, to our knowledge, associations between AABS or

antisocial traits specifically with onset after age 15, and general health characteristics or patterns of care utilization, have not yet been examined.

Because comparative data concerning associations of DSM-IV ASPD, CD, and AABS with general medical status are not available from nationally representative epidemiologic samples, it remains unclear whether antisocial syndromes occurring at different points over the life course bear differential associations with physical health status or service utilization in the general population. Differential associations with antisociality based on developmental phases of onset and persistence could indicate a need to tailor prevention and treatment approaches to address antisocial syndromes as well as chronic diseases and injuries, and to facilitate appropriate medical care utilization. In addition, the prevalences of antisocial behavioral syndromes^{1,22} and many general medical conditions, including cardiovascular disease,⁴⁴ nonalcoholic fatty liver disease,⁴⁵ many types of injuries,⁴⁶ and peptic ulcer disease⁴⁷ show male preponderances. Conversely, the prevalences of rheumatoid arthritis⁴⁸⁻⁵¹ and most forms of medical care utilization⁵² show female preponderances. Specifically with regard to antisocial syndromes, the observed sex differentials in prevalences could reflect real male-female differences in rates of antisocial phenomena. However, questions have been raised about the diagnostic validity of both CD and ASPD among females. DSM criteria for these conditions rely heavily on “overt,” notably physically aggressive, behaviors that are far more prevalent in males, while giving much more limited attention to “covert” behaviors, and “relational aggression,” that are asserted to be much more “typical” manifestations of antisociality in women.⁵³⁻⁵⁵ If the diagnostic criteria for CD and ASPD are biased with respect to sex, then the associations between these syndromes as they are now defined and physical health status, and the implications of these associations for prevention and treatment planning, may also differ importantly by sex. Accordingly, this report examines associations of antisocial syndromes with respondent-reported common chronic medical conditions diagnosed by a health care provider during the past year, as well as clinically significant injuries, physical health-related impairment and disability, and hospital inpatient and emergency department (ED) utilization, and compares patterns of associations between men and women, using data from Wave 1, conducted in 2001-2002, of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC).^{3,56} The NESARC is the first major psychiatric epidemiology survey to employ DSM-IV criteria. With a nationally representative sample of 43,093 adult respondents, the NESARC allows precise estimates of measures of general medical status, hospital care utilization, and relevant sociodemographic and clinical correlates including health insurance coverage, tobacco, alcohol, and drug use and associated disorders, lifetime psychiatric comorbidity, and body mass index (BMI) by antisocial syndrome. In addition, the large number of respondents both with and without antisocial syndromes allows examination of sex by antisocial syndrome interactions in associations between antisocial syndromes and general health characteristics.

Methods

Sample

The entire research protocol, including informed consent procedures, was approved by the institutional review board of the U.S. Bureau of the Census and the U.S. Office of Management and Budget. As described in detail elsewhere,^{57,58} the 2001-2002 NESARC was conducted by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) and based on a representative sample of the general U.S. population. The NESARC's target population was non-institutionalized adults, 18 years and older, residing in households and group quarters. All potential respondents consenting to participate after being 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 strict confidentiality of

identifiable survey information were interviewed. Face-to-face interviews were conducted with 43,093 respondents, yielding a response rate of 81%. The NESARC oversampled Blacks, Hispanics, and young adults 18 to 24 years old; data were adjusted for oversampling and household- and person-level nonresponse. The weighted data were then further adjusted to represent the civilian United States population based on the 2000 Census.

Interviewers and Training

Interviews were conducted by 1800 professional lay interviewers from the U.S. Bureau of the Census with, 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 one of the Bureau's 12 regional offices. The survey instrument was fully 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 interview. This served as an additional check on data quality and formed the basis of a further test-retest reliability study.⁵⁶

Assessments

The diagnostic interview utilized in the NESARC was the NIAAA Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version (AUDADIS-IV).⁵⁹ Developed to advance measurement of substance use and mental disorders in large-scale surveys, the AUDADIS-IV is a fully structured instrument designed for nonclinician interviewers.

Antisocial Behavioral Syndromes—Antisocial behavioral syndromes were assessed on a lifetime basis. A diagnosis of ASPD required respondents to endorse the specified number of DSM-IV CD symptoms with onset before, as well as antisocial behaviors since, age 15 years, on the AUDADIS-IV. Consistent with DSM-IV,⁷ at least 1 CD symptom before age 15 years must have caused social, academic, or occupational role impairment. Respondents were classified as having “CD only” if they met DSM-IV criteria for CD but not ASPD. AABS was operationalized as meeting all ASPD criteria except CD before age 15. Respondents who did not meet criteria for ASPD, AABS, or “CD only” were considered to have no antisocial syndrome.

General Medical Conditions, Hospital Care Utilization, and Clinically Significant Injuries—Respondents were asked whether a physician or other health professional had told them during the past year that they had any of 11 general medical conditions, spanning coronary heart disease (arteriosclerosis, myocardial infarction, or angina pectoris), “other” heart disease (tachycardia or “any other form of heart disease”), hypertension, and liver (cirrhosis or “any other form of liver disease”), other gastrointestinal (stomach ulcer or gastritis), and arthritic diseases. They were also asked to report, concerning the past year, the number of times they were hospitalized and the number of days they stayed in the hospital as inpatients, excluding admissions for normal childbirth, as well as the number of times they obtained medical care from a hospital ED. In addition, they were queried about the number of injuries they experienced during the past year that were of sufficient severity to cause them to seek medical help or restrict their usual activities for more than half a day.

Physical Health-Related Disability and Impairment—Past-month physical health-related disability and impairment were assessed using the Physical Component Summary (PCS), Physical Functioning, Role Physical, Bodily Pain, General Health, and Vitality Scales

of the SF-12, version 2 (SF-12v2), a reliable and valid measure of disability and impairment used in general population surveys.⁶⁰ Lower scores indicate higher impairment in each domain.

Covariates

Mood and anxiety disorders: As described in detail elsewhere,⁶¹ lifetime anxiety (panic disorder with and without agoraphobia, social and specific phobias, 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.⁷ All mood and anxiety disorders met the DSM-IV clinical significance criterion; major depressive disorder diagnoses also ruled out bereavement.

Drug and alcohol use disorder diagnoses: AUDADIS-IV questions operationalize DSM-IV criteria for drug-specific abuse and dependence for 10 drug classes that are aggregated in this report, as well as alcohol use disorders and nicotine dependence. Consistent with DSM-IV, lifetime AUDADIS-IV diagnoses of drug abuse required ≥ 1 of the 4 abuse criteria either in the 12 months 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.

Tobacco, alcohol, and drug consumption: Because the vast majority of nicotine in the United States is consumed as cigarettes,⁶² tobacco use was estimated as the number of cigarettes per day during the past year for current smokers, and for ex-smokers' most recent year of smoking. Alcohol consumption during the period of heaviest lifetime drinking was assessed as the average daily volume (ADV) of ethanol ingested during that period. For respondents who never drank more heavily than in the past year, past-year consumption measures reflected their heaviest drinking. For both the past year and the period of heaviest drinking, respondents were asked to indicate their overall frequency of drinking, their typical and largest numbers of drinks per day, the frequency with which they drank their largest number of drinks and the frequency of drinking five or more drinks in a day, considering all beverage types together. For the past year, comparable series of questions, with the inclusion of drink size and main brand consumed, were asked for each individual beverage type (coolers, beer, wine or spirits); for period of heaviest drinking, respondents were asked an additional question on the main type of beverage they drank during that period. ADV of ethanol intake was estimated on the basis of quantity, frequency and drink size for all beverages combined, incorporating information for atypically heavy drinking days. For individuals whose heaviest consumption was in the past year, drink size (ounces of beverage times the ethanol content by volume of the main brand consumed) was estimated as a weighted function of the drink sizes for the individual beverage types. For those whose heaviest consumption was not in the past year, the drink size for their main beverage type was used if available from past-year information, or otherwise assuming a standard drink size. Drug use was quantified as the frequency in days per year of use of the drug respondents reported they used most frequently, during the period of heaviest lifetime consumption.

Other PDs: AUDADIS-IV assessments of DSM-IV PDs have been presented previously.^{3,8,10} In addition to ASPD, these include avoidant, dependent, obsessive-compulsive, paranoid, schizoid, and histrionic PDs. DSM-IV PD diagnoses require evaluation of 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, and 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. Respondents were also queried to ascertain whether they experienced distress or social or occupational dysfunction resulting from each reported 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. Borderline, schizotypal, and narcissistic PDs were included in Wave 2.

Health insurance coverage: Respondents were classified as having public, private, or no insurance, based on whether they reported being currently covered by 4 categories of health insurance: Medicare; Medicaid; CHAMPUS, CHAMPVA, the Veterans Affairs system, or other military health care; and health insurance obtained by the respondent, a spouse, or a family member privately or through a current or former employer or union. Respondents reporting both public (Medicare, Medicaid, or military sources) and private coverage were coded as privately insured.

BMI: Respondents were asked to report their current height and weight. The propensity of individuals to underestimate their weight by self-report has been well documented, with clear trends toward greater underestimation with increasing weight. However, the extent of underestimation is unrelated to height in both men and women. Self-reported weight is robustly correlated with measured weight ($r \geq 0.9$) in general population samples.^{63,64} Conversely, individuals tend to overestimate their height, to a greater extent among shorter than among taller men, among heavier than among lighter women, and among older than among younger respondents of both sexes.⁶³ Nevertheless, recent evidence has documented that self-reported BMI data are valid for identifying associations in epidemiologic studies.⁶³⁻⁶⁷

Reliability and Validity of AUDADIS-IV Diagnoses and Tobacco, Alcohol, and Drug Consumption Measures—As reported in detail elsewhere,^{56,61} reliability and validity were good to excellent for all substance use disorders,^{1,57,68-75} and fair to good for mood, anxiety, and personality disorders, including ASPD.^{1,3,8,10,57,58,61,68,69,76,77} Measures of tobacco, alcohol, and drug use utilized in this study also displayed good to excellent reliability.^{57,70-72,78,79}

Statistical Analyses

Standard contingency table approaches were used to examine bivariate associations of antisocial syndromes with categorical health status measures in the total sample and stratified by sex.⁸⁰ Associations of antisocial syndromes with continuous measures were examined and sex by antisocial syndrome interactions tested using normal-theory analyses of variance. Counts of hospitalizations, inpatient days, ED visits, and clinically significant injuries were converted into categorical variables based on their observed distributions, with categories defined according to cutpoints chosen to balance variability with subgroup sizes adequate to permit meaningful analyses.

Multivariable regression analyses were used to examine associations of antisocial syndromes with measures of physical health status, adjusted for the potentially confounding effects of age, sex, race/ethnicity, marital status, education, past-year income, current health insurance coverage, region and urbanicity of residence, comorbid Axis I and II psychiatric diagnoses, and tobacco, alcohol, and drug consumption.⁸¹ Normal-theory models were used for continuous measures and binary or multinomial logistic models were used, as appropriate to

the number of levels of the response variables, for categorical measures. The referent category of antisocial syndrome was the group with no lifetime antisocial syndrome and the referent groups for polytomous response variables were always the lowest levels. β coefficients from the logistic models were exponentiated to yield odds ratios (ORs) and 95% confidence intervals (CIs) were estimated. Sex by antisocial syndrome interactions were tested in the regression models by incorporating a product term that crossclassified the 3 antisocial syndrome categories against sex. The odds ratios or regression coefficients obtained from these interaction models compared women with each antisocial syndrome with the referent group of women with no lifetime history of syndrome antisociality, and compared men with each antisocial syndrome with the referent group of men with none.⁸¹ The α to stay for the interaction term was 0.05. All analyses were conducted using SUDAAN,⁸² a software program that uses Taylor series linearization to make adjustments for the NESARC's complex sampling design.

Results

Antisocial Syndromes, Sociodemographic Correlates, and Lifetime Psychiatric Comorbidity

As reported in detail by Compton et al.,¹ the overall prevalence $\pm$ standard error in the NESARC sample of ASPD was $3.6\% \pm 0.15$, $5.5\% \pm 0.25$ among men and $1.9\% \pm 0.11$ among women. For AABS, prevalences were $12.3\% \pm 0.38$ overall, $16.5\% \pm 0.53$ among men and $8.5\% \pm 0.32$ among women. "CD only" was diagnosed in $1.1\% \pm 0.07$ of the total sample, $1.5\% \pm 0.12$ of men and $0.7\% \pm 0.06$ of women. As described in detail elsewhere,¹ significant associations were observed between antisocial syndromes and all examined sociodemographic variables, including sex, age, race/ethnicity, marital status, education, past-year employment status and income, and region and urbanicity of residence. In brief, respondents with ASPD were most likely and those with no antisocial syndrome least likely to be male, in the 3 youngest age groups (18-29, 30-44, and 45-64 years), of Native American race/ethnicity, with a high school education or less, and with past-year income less than \$35,000. Conversely, respondents with no antisocial syndrome were most likely to be female, at least 65 years old, married or cohabiting or widowed, separated, or divorced, and residing in the Northeast or South. Consistent with their older age and female preponderance, respondents without any antisocial syndrome were also least likely to have been employed in the past year. Respondents with "CD only" were least likely to be non-Hispanic White but most likely to be Hispanic, and reported the highest past-year personal income; they were most likely to live in the Midwest and in urban areas.

Antisocial syndromes were also significantly ($p < 0.0001$) associated with medical insurance coverage. Respondents with ASPD were least likely to be privately insured ($53.8\% \pm 1.71$) and most likely to report either public ($17.5\% \pm 1.27$) or no ($28.8\% \pm 1.59$) coverage. Conversely, respondents with no antisocial syndrome were most likely to report private medical insurance ($69.3\% \pm 0.84$, with $12.7\% \pm 0.35$ publicly insured and $18.0\% \pm 0.67$ uninsured), and those with "CD only" were least likely to report public insurance coverage ($12.0\% \pm 1.71$, with $63.7\% \pm 3.07$ reporting private and $24.3\% \pm 2.79$ reporting no insurance).

Associations between antisocial syndromes and comorbid lifetime psychiatric disorders were statistically significant ($p < 0.0001$ in all instances) and striking, with the lowest prevalences of each disorder observed among respondents with no antisocial syndrome and the highest observed among respondents with ASPD. In the total sample, lifetime prevalences of any mood disorder ranged from $15.0\% \pm 0.34$ to $52.3\% \pm 1.63$. Lifetime prevalences of any anxiety disorder ranged from $14.2\% \pm 0.40$ to $40.4\% \pm 1.53$. For alcohol use disorders, the corresponding range was from $22.0\% \pm 0.62$ to $76.1\% \pm 1.40$; for lifetime drug use disorders, from $4.7\% \pm 0.16$ to $52.1\% \pm 1.88$. Nicotine dependence was diagnosed in $12.3\% \pm 0.38$ to $54.7\% \pm 1.82$; pathological gambling, in $0.2\% \pm 0.03$ to $2.17\% \pm 0.54$; and at least one additional personality disorder, in $8.8\% \pm 0.24$ to $44.7\% \pm 1.66$ of the respondent sample. Women in all 4 antisocial syndrome-

defined groups demonstrated markedly higher prevalences of lifetime mood, anxiety, and, to a lesser extent, additional personality disorders than their respective male counterparts, while men, particularly those with no antisocial syndrome, were diagnosed more often than their respective female counterparts with lifetime alcohol use disorders. Prevalences of lifetime drug use disorders and pathological gambling were modestly greater among men than among women, while nicotine dependence was modestly more frequent among women, within antisocial syndrome categories.

Associations of Antisocial Syndrome With Physical Health Measures

Unadjusted—As shown in Table 1, antisocial syndromes were significantly associated with all examined physical health status measures. Respondents with ASPD reported the highest total number of past-year provider-diagnosed medical conditions, as well as the highest prevalences of coronary and “other” heart, liver, gastrointestinal, and arthritic diseases. In addition, respondents with ASPD reported the largest numbers of inpatient admissions, days hospitalized, ED visits, and clinically significant injuries, and scored lowest on all of the SF-12v2 scales. Conversely, respondents with no antisocial syndrome had the lowest prevalences of “other” heart disease, reported the fewest inpatient hospitalizations and clinically significant injuries, and scored highest on the SF-12v2 Bodily Pain, General Health, and Vitality Scales. Respondents with “CD only” reported the smallest number of past-year medical conditions and the lowest prevalences of coronary heart disease and arthritis, and scored highest on the SF-12v2 Physical Functioning and Role Physical Scales.

Statistically significant sex by antisocial syndrome interactions were observed for total number of past-year conditions, hypertension, and arthritis, as well as SF-12v2 Vitality Scale score and number of past-year ED visits. Women reported higher numbers of past-year medical conditions than men in all groups, but the differences were most pronounced for no conditions in the groups with ASPD and no antisocial syndrome, for a single condition in the group with ASPD, and for ≥ 3 conditions in the groups with AABS, “CD only,” and no syndrome. Women with ASPD and AABS reported lower prevalences but women with “CD only” reported higher prevalences of hypertension, whereas women with ASPD, AABS, and no antisocial syndrome reported higher prevalences but women with “CD only” reported lower prevalences of arthritis, than their respective male counterparts. Women in all groups reported lower scores than their male counterparts on the SF-12v2 Vitality Scale, but the sexes diverged most markedly in the ASPD group. Conversely, women in all groups reported more ED visits than their male counterparts, but least strikingly so among those with no antisocial syndrome.

Adjusted—Table 2 depicts adjusted associations of antisocial syndromes with measures of physical health status and care utilization. ASPD and AABS were significantly but modestly associated with total number of past-year conditions, coronary heart and gastrointestinal diseases, inpatient hospitalizations and inpatient days, ED visits, and clinically significant injuries. ASPD was also significantly associated with liver disease and lower scores on the SF-12v2 PCS, Role Physical, and Bodily Pain Scales, whereas AABS was significantly associated with “other” heart disease and lower scores on the SF-12v2 General Health and Vitality Scales. A slight gradient was observed indicating increasingly strong associations of ASPD and AABS with increasing numbers of past-year ED visits. Conversely, except for single occurrences of inpatient hospitalizations, ED visits, and clinically significant injuries, “CD only” was not significantly associated with physical health status.

A statistically significant sex by antisocial syndrome interaction was observed only for arthritis. Associations with ASPD were significant among both men and women, but more weakly among women, whereas the association with AABS was significant only among men. Arthritis was not associated with “CD only” in either sex.

Discussion

Our findings replicate and extend to the general adult U.S. population those of previous clinical^{12,18} and epidemiologic^{11,13,14} studies indicating significant associations of ASPD with selected chronic diseases and injuries. This study also extends the results of previous work by identifying similarity in directions and magnitudes of associations with health conditions (total past-year conditions, coronary heart and gastrointestinal diseases, and clinically significant injuries) and care utilization (hospitalizations, inpatient days, and ED visits) between ASPD and AABS. In addition, the present findings suggest, for the first time, sex specificity of adjusted associations between antisocial syndromes in adulthood and arthritis, but not other health conditions or measures of utilization.

In the ASPD group, the small increase in coronary heart disease was not unexpected given previously observed^{28,29} associations of childhood and adolescent CD symptoms with adverse cardiovascular risk profiles. Whether the development of AABS, which by definition excludes CD before age 15 years, is preceded or accompanied by similar patterns of cardiovascular risk, is not known and warrants further study. Of note, hypertension was not associated in the adjusted analyses with antisocial syndrome. However, the associations of ASPD and AABS with coronary heart disease could reflect excesses in these 2 groups of other risk factors, such as C-reactive protein,²⁹ diabetes mellitus, dyslipidemias, and deleterious dietary or physical activity habits. Further research that includes collection of biologic specimens from which to measure blood glucose, lipids, and markers of inflammation, as well as assessment of respondents' dietary and exercise practices, appears warranted to test these potential explanations. Other risk factors for cardiovascular disease include negative affects such as anger, depression, anxiety, and hostility⁸³ that are associated with antisociality^{4,8,9,22,24,28,84,85}; despite our adjustment for comorbid mood, anxiety, and personality disorders, the elevated odds of coronary heart disease could also reflect residual confounding by these characteristics.

By contrast, the association of liver disease with ASPD, independent of known risk factors including alcohol use disorders, average daily ethanol consumption during respondents' heaviest lifetime drinking, and BMI, was unexpected. Because respondents with ASPD reported greater prevalences of selected other conditions as well, the elevated odds of liver disease could simply reflect an increased likelihood that individuals already in care for one or more medical conditions will have additional problems identified. Alternatively, the use of respondents' average daily ethanol volume during heaviest lifetime drinking as our alcohol consumption measure may have masked the deleterious effects of recurrent "spikes" in intake,^{86,87} with residual confounding leading to a spurious association. Therefore, we fit 3 ancillary models to determine whether alternative approaches to controlling for the potentially confounding effects of ethanol consumption could explain this association. Each model included both average daily ethanol intake and 1 additional measure of lifetime alcohol consumption referring to the period of respondents' heaviest lifetime drinking: frequency of drinking largest number of drinks per day, frequency of drinking ≥ 5 drinks in 1 day, and largest quantity of drinks consumed in 1 day. Associations with AABS (ORs=1.5, 1.5, and 1.5, respectively) remained similar; those with "CD only" (ORs= 1.6, 1.4, and 1.6, respectively) changed modestly across these models and remained nonsignificant. Associations with ASPD increased moderately (ORs=3.5, 3.5) when frequency of drinking largest number of drinks and largest quantity of drinks, respectively, were included, though less so with frequency of ≥ 5 drinks in 1 day (OR=3.2) as the second consumption measure. This robust association with ASPD could reflect variations in other risk factors for both alcoholic and nonalcoholic liver disease, e.g., nutritional status, insulin resistance, and diabetes,⁸⁸⁻⁹⁴ by antisocial syndrome in ways not fully accounted for by control for BMI. Because we only queried respondents about diabetes mellitus in Wave 2 and did not assess their dietary habits, we cannot examine the

plausibility of this explanation. The elevated prevalence of liver disease among respondents with ASPD could also be accounted for by viral hepatitis, particularly hepatitis C, which can be transmitted both by injection drug use and, to a lesser extent, via risky sexual behaviors, as well as through transfusions of blood from infected donors.⁹⁵ Of note, however, less than 1% of the sample reported any history of injection drug use, including only 1 respondent with “CD only.”

Our findings concerning injuries are consistent with the prominence of impulsive, reckless, and aggressive behavior in the clinical presentations of both ASPD and AABS.^{35,36,40-42} Conversely, associations of antisociality in adulthood with arthritis have not previously been reported. We did not ask whether respondents were diagnosed with rheumatoid, osteo-, or other types of arthritis. However, joint injury is a risk factor for osteoarthritis.^{96,97} Thus, if a substantial proportion of respondents with arthritis, especially among those with ASPD, had osteoarthritis, the observed associations could reflect injuries related to reckless or aggressive behavior. That women with ASPD displayed a smaller excess than men, and women with AABS did not demonstrate a significant elevation in odds whereas men with AABS did, is of interest given the lower prevalences of both ASPD and AABS among women, and the higher prevalences of arthritis among women in the groups with ASPD, AABS, and no antisocial syndrome. Both incidence and prevalence of osteoarthritis are greater among men than among women before age 50, but the reverse is true after age 50⁹⁷; conversely, both incidence and prevalence of rheumatoid arthritis are higher in women,⁴⁹ though female:male incidence ratios decrease in late life due to increasing incidence among men and plateauing incidence among women.^{50,51} Thus, the sex-specific variation in patterns of association could reflect both heterogeneity in types of arthritis across antisocial syndromes, and perhaps a smaller contribution of antisociality to prevalence among women than among men. Further investigations that examine types of arthritis separately by sex and age are needed to clarify the nature, magnitude, and mechanisms of sex-specific associations with antisocial syndromes.

The elevated odds of inpatient hospitalizations, more inpatient days, and more ED visits among respondents with both ASPD and AABS could reflect their increased morbidity. However, their greater hospital utilization might also reflect impairment by antisociality of their ability to form effective working relationships with care providers and resultant interference with successful outpatient management of chronic diseases, risk factors, and injuries. Poor patient-provider relations could involve stigmatization or therapeutic nihilism by providers, suboptimal adherence to prescribed regimens or attendance at medical appointments by patients, or both. Concern about poor patient-provider rapport has been explicitly raised to date only regarding fully diagnosable ASPD,^{16,98,99} but increasing evidence of the strong similarity between individuals with AABS and those with ASPD^{31,36,37,41-43} suggests that AABS may also be associated with challenging patient-provider interactions.

That “CD only” was associated with single but not multiple past-year occurrences of hospitalization, ED utilization, and clinically significant injury, and with no chronic diseases or dimensions of physical health-related impairment as measured by the SF-12v2, suggests that it may carry limited adverse impact on current physical health status in adults. We advance this assertion cautiously, however, because our findings are at variance with those from both cross-sectional and birth cohort studies that indicated significant associations of CD and conduct problems with cardiovascular risk factors^{28,29} and chronic medical conditions^{25,30} in late adolescence and early to middle adulthood. Both recall and social desirability biases may have led to underreporting of CD behaviors, particularly among respondents whose symptoms ceased long before they were interviewed and whose current behavior therefore differed considerably from their past behavior.¹⁰⁰ Relatedly, we did not query respondents who endorsed CD behaviors about whether they completely ceased those behaviors, but only asked if the behaviors occurred since age 15. Some who acknowledged conduct problems since age

15 may have remitted long before their NESARC interviews. Nock et al.²² showed remitted CD to be associated with less risk than “active” CD for persistence from the lifetime to the past-year time frame of comorbid substance use and other mental disorders. However, whether this is also true for general medical conditions has not been examined.

Limitations

In addition to the issues raised previously in relation to specific findings, this study's limitations include the NESARC's reliance on self-reported data. Respondents' comprehension of their medical diagnoses may have been inaccurate and differential by antisocial syndrome. Almost 1 in 4 respondents with ASPD and “CD only” and 1 in 8 with AABS did not complete high school and thus may have been at high risk for limited health-related literacy. A further consideration is that lying, scamming, and conning for secondary gain are among the defining features of antisocial syndromes. However, we can identify no obvious source of secondary gain, or alternatively of differential stigma, for respondents based on whether or not they reported past-year medical conditions, injuries, hospitalizations, or other indices of poor health status, particularly given the rigorous guarantees of confidentiality in the survey.

Additional limitations include the cross-sectional nature of our data, which precludes inferences about the temporality and causality of the associations we observed. Longitudinal data are needed to address these points and to identify mechanisms underlying the associations. Wave 2 of the NESARC, which was recently completed, will yield important longitudinal data that bear on some of these questions, as we inquired for a second time about past-year diagnoses of conditions first queried in Wave 1 and readministered the SF-12v2. In addition, we asked respondents to report past-year diagnoses of diabetes, hypercholesterolemia, HIV/AIDS and other sexually transmitted diseases, and stroke, as well as current risk factors including patterns of physical activity. Finally, we note that the NESARC's target population was, by design, the general adult population residing in civilian households and group quarters. It did not include incarcerated individuals; similarly, despite the inclusion of a group quarters sampling frame, it may also have underrepresented homeless adults. The sampling design of the NESARC eliminates selection biases that could result from ascertainment of respondents in institutional settings, including prisons, where prevalences and severity of antisocial syndromes, other psychiatric disorders and general medical conditions, and comparative associations between antisocial syndromes and both psychiatric and general medical comorbidity, may differ substantially from those observed in the general population.¹⁰¹ However, the extent to which the findings of the present study would resemble or differ from those obtained in institutional samples is unclear.

Implications

Our findings suggest that assessments of burden related to antisocial behavioral syndromes, particularly ASPD and AABS, need to include consideration of comorbidity with selected chronic diseases and injuries. While the associations of these conditions with antisocial syndromes were small, the conditions are sufficiently prevalent in the general population, and associated with sufficient morbidity, mortality, and cost,^{47,89,97,102-106} that any increases associated with antisociality may be important from clinical, public health, and economic perspectives. The prominence of impulsivity, recklessness, and disregard for norms and rules in both syndromes may pose challenges to the successful management, particularly in outpatient settings, of common chronic diseases such as coronary heart disease and associated risk factors, in which disciplined self-regulation of diet, physical activity, and medication adherence figure prominently.^{99,107} Similarly, the impulsivity, recklessness and aggressiveness commonly seen among antisocial adults may pose challenges to injury prevention and management. Therefore, our findings indicate the need to improve

identification by clinicians of antisocial behavioral syndromes and to increase the availability of effective treatments for them as well as for comorbid medical conditions.

Among affected adults, comorbid mental disorders are more likely than ASPD to result in clinical attention⁴; this is likely to be true in AABS as well. Our findings therefore give further support for careful assessment of both antisocial behavior histories and general medical status in mental health treatment settings. Time and resource constraints may complicate the assessment of antisociality in general medical settings. Nevertheless, the results of this study argue for inquiry into antisocial behavior histories among medical patients, particularly those with coronary heart, liver, gastrointestinal, or arthritic diseases, or injuries, as well as those who repeatedly require hospital care. These findings also underscore the need for appropriate referrals to and from, and collaborations between, general medical and mental health care providers to optimize the management of this challenging patient population.

ASPD has responded poorly to available treatments.¹⁰⁸ While AABS is more prevalent than ASPD and “CD only” among adults in the general U.S. population,¹ interventions targeting AABS have not been described, perhaps because AABS is not currently a diagnosable DSM disorder. Moreover, it remains unclear whether specific antisocial symptoms, e.g., violent behavior or impulsivity, may be more amenable to targeted interventions, such as stress and anger management, than the broader syndromes. The findings of this study provide further evidence of the need to develop effective, developmentally and culturally appropriate interventions for antisocial syndromes over the life course, including attention within their framework to the identification and management of co-occurring medical conditions and risk factors. Pending the availability of effective interventions, our results further suggest the potential value of identifying strategies to optimize successful partnerships between antisocial patients and medical care providers, perhaps by allowing them to “work around” the adverse impacts of antisociality. Because of their manipulative tendencies and disregard for norms and rules, strict limit setting has been identified as an essential feature of clinical management of patients with ASPD.⁹⁹ Other possible strategies warranting investigation might include focusing on ways for antisocial patients to maximize near-term gratification through outcomes valued by them that also promote improvements in clinical status.

In addition to evaluating overall effectiveness and acceptability, it will be important to assess variations in outcomes of the management of comorbidity between antisocial syndromes and common medical conditions across clinically relevant subgroups. Subgroups potentially of interest include those defined by sociodemographic characteristics; age at onset, persistence, and symptom predominance (e.g., overt aggression versus covert behaviors like irresponsibility in work or financial matters) of antisocial syndromes; ages at onsets of associated medical conditions; presence versus absence of specific comorbid substance use and other mental disorders; and family histories of antisocial syndromes and specific medical conditions. Appropriate prioritization, timing, and sequencing of clinical interventions in these subgroups of patients should also be investigated.

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Past-Year Physician-Diagnosed Chronic Medical Conditions and Respondent-Related Injuries, Physical Health-Related Impairment and Disability, and Hospital Care Utilization by Antisocial Behavioral Syndrome

Table 1

Characteristic, % or mean (SE)	Males (n=18,518)				Females (n=24,575)				Total (n=43,093)		p-values			
	ASPD ^a (n=949)	AABS ^b (n=2,916)	“CD Only” ^c (n=258)	No Antisocial Behavioral Syndrome (n=14,395)	ASPD ^a (n=473)	AABS ^b (n=2,102)	“CD Only” ^c (n=157)	No Antisocial Behavioral Syndrome (n=21,843)	ASPD ^a (n=1,422)	AABS ^b (n=5,018)		“CD Only” ^c (n=415)	No Antisocial Behavioral Syndrome (n=36,238)	
Total number of past-year health care provider-diagnosed medical conditions													0.005	0.0218
None	65.4% (2.02)	67.6% (1.04)	71.7% (3.15)	71.8% (0.79)	60.7% (2.79)	64.5% (1.31)	70.3% (3.94)	63.9% (0.68)	64.1% (1.66)	66.5% (0.86)	71.2% (2.50)	67.4% (0.66)		
1	17.4% (1.66)	20.8% (0.86)	15.9% (2.59)	17.6% (0.53)	22.5% (2.58)	20.6% (1.14)	17.3% (3.41)	20.3% (0.41)	18.8% (1.38)	20.8% (0.66)	16.3% (2.13)	19.1% (0.38)		
2	10.0% (1.31)	6.7% (0.57)	9.8% (2.51)	6.6% (0.28)	8.3% (1.55)	7.7% (0.68)	7.0% (2.23)	9.8% (0.30)	9.5% (0.99)	7.1% (0.45)	8.9% (1.85)	8.4% (0.24)		
≥ 3	7.3% (1.02)	4.9% (0.47)	2.7% (1.12)	4.0% (0.23)	8.6% (1.37)	7.2% (0.72)	5.4% (1.84)	6.1% (0.23)	7.7% (0.80)	5.7% (0.42)	3.5% (0.98)	5.2% (0.19)		
Coronary heart disease ^d	8.1% (1.27)	4.9% (0.49)	3.6% (1.35)	4.6% (0.25)	6.5% (1.23)	6.1% (0.65)	3.6% (1.64)	5.0% (0.21)	7.7% (0.99)	5.3% (0.40)	3.6% (1.02)	4.8% (0.17)		0.5266
“Other” heart disease ^e	7.9% (1.01)	5.1% (0.48)	6.4% (2.01)	4.6% (0.23)	8.5% (1.42)	8.4% (0.79)	6.6% (2.16)	6.4% (0.25)	8.1% (0.82)	6.2% (0.45)	6.4% (1.64)	5.6% (0.19)		0.1916
Hypertension	15.1% (1.41)	17.1% (0.81)	16.1% (2.80)	17.3% (0.55)	14.4% (2.03)	15.1% (1.00)	17.0% (3.53)	20.4% (0.45)	14.9% (1.14)	16.4% (0.63)	16.3% (2.23)	19.0% (0.43)		0.0128
Liver disease	3.8% (0.85)	1.4% (0.21)	0.9% (0.88)	0.5% (0.08)	1.7% (0.59)	0.8% (0.20)	0.0% (0.00)	0.5% (0.05)	3.3% (0.64)	1.2% (0.16)	0.6% (0.60)	0.5% (0.05)		0.1950
Gastrointestinal disease ^f	8.8% (1.14)	6.4% (0.55)	3.4% (1.38)	3.7% (0.20)	14.9% (2.00)	9.9% (0.78)	8.6% (2.35)	6.3% (0.23)	10.5% (1.10)	7.7% (0.46)	5.1% (1.24)	5.1% (0.16)		0.8202
Arthritis	18.2% (1.49)	14.2% (0.87)	12.6% (2.77)	12.4% (0.48)	22.6% (2.49)	18.5% (1.12)	11.0% (2.66)	21.0% (0.55)	19.4% (1.22)	15.8% (0.74)	12.0% (2.11)	17.2% (0.47)		0.0008
SF-12 Physical Component Scale score	49.5 (0.47)	51.0 (0.23)	50.9 (0.72)	51.3 (0.13)	49.4 (0.72)	50.3 (0.30)	50.4 (0.77)	50.0 (0.13)	49.4 (0.40)	50.7 (0.20)	50.7 (0.57)	50.6 (0.12)		0.1519
SF-12 Physical Functioning Scale score	51.1 (0.42)	52.3 (0.20)	52.2 (0.66)	52.4 (0.11)	48.3 (0.64)	50.3 (0.26)	51.1 (0.79)	50.6 (0.12)	50.3 (0.38)	51.6 (0.17)	51.9 (0.52)	51.4 (0.10)		0.5423
SF-12 Role Physical Scale Score	49.7 (0.48)	51.5 (0.23)	52.2 (0.60)	52.1 (0.13)	47.9 (0.67)	49.8 (0.27)	49.9 (0.83)	50.5 (0.12)	49.2 (0.42)	50.9 (0.18)	51.4 (0.49)	51.2 (0.11)		0.9052
SF-12 Bodily Pain Scale Score	47.6 (0.54)	50.0 (0.27)	50.7 (0.69)	51.3 (0.13)	46.4 (0.75)	47.9 (0.32)	48.7 (1.07)	49.6 (0.12)	47.3 (0.44)	49.2 (0.21)	50.1 (0.60)	50.3 (0.10)		0.7399
SF-12 General Health Scale Score	48.0 (0.50)	49.9 (0.26)	49.5 (0.94)	51.5 (0.16)	45.9 (0.71)	48.2 (0.33)	47.4 (1.18)	50.3 (0.16)	47.5 (0.41)	49.3 (0.23)	48.8 (0.79)	50.8 (0.14)		0.4698
SF-12 Vitality Scale score	52.3 (0.46)	53.4 (0.23)	54.2 (0.77)	55.7 (0.14)	47.5 (0.66)	50.1 (0.25)	51.0 (0.97)	53.2 (0.13)	51.0 (0.38)	52.2 (0.18)	53.2 (0.63)	54.3 (0.12)		0.0100
Number of past-year inpatient hospitalizations ^g														0.5877
None	87.9% (1.25)	90.0% (0.70)	89.5% (1.89)	91.4% (0.34)	81.3% (2.19)	87.7% (0.90)	89.8% (2.88)	89.4% (0.25)	86.1% (1.10)	89.2% (0.55)	89.6% (1.63)	90.3% (0.22)		
1	8.6% (1.07)	7.2% (0.61)	9.1% (1.90)	6.1% (0.28)	12.1% (1.89)	8.2% (0.74)	8.1% (2.64)	7.5% (0.23)	9.5% (0.95)	7.6% (0.48)	8.8% (1.59)	6.9% (0.18)		
≥ 2	3.5% (0.69)	2.8% (0.34)	1.4% (0.62)	2.5% (0.15)	6.6% (1.29)	4.1% (0.57)	2.1% (1.25)	3.0% (0.13)	4.4% (0.60)	3.3% (0.30)	1.6% (0.57)	2.8% (0.10)		
Total past-year inpatient														0.0031
														0.7292

Characteristic, % or mean (SE)	Males (n=18,518)				Females (n=24,575)				Total (n=43,093)		<i>p</i> -values
	ASPD ^a (n=949)	AABS ^b (n=2,916)	“CD Only” ^c (n=258)	No Antisocial Behavioral Syndrome (n=14,395)	ASPD ^a (n=473)	AABS ^b (n=2,102)	“CD Only” ^c (n=157)	No Antisocial Behavioral Syndrome (n=21,843)	“CD Only” ^c (n=415)	Antisocial Behavioral Syndrome (n=36,238)	
length of stay (days) ^g											
None	88.2% (1.23)	90.2% (0.69)	89.5% (1.89)	91.5% (0.34)	81.4% (2.20)	87.8% (0.90)	90.0% (2.87)	89.6% (0.25)	86.3% (1.10)	89.3% (0.54)	90.4% (0.21)
1-2	3.3% (0.62)	3.9% (0.48)	4.8% (1.53)	3.4% (0.20)	5.4% (1.24)	4.8% (0.58)	5.7% (2.08)	4.1% (0.16)	3.9% (0.56)	4.2% (0.38)	3.8% (0.12)
≥ 3	8.5% (1.07)	5.9% (0.49)	5.7% (1.39)	5.0% (0.24)	13.3% (1.84)	7.4% (0.70)	4.3% (2.11)	6.4% (0.20)	9.8% (0.92)	6.4% (0.39)	5.8% (0.17)
Number of past-year emergency department visits											
None	69.7% (1.88)	74.4% (0.98)	77.3% (3.37)	83.3% (0.48)	56.3% (2.72)	67.6% (1.37)	72.0% (4.37)	81.2% (0.40)	66.0% (1.57)	72.0% (0.81)	82.1% (0.38)
1	17.5% (1.54)	17.9% (0.85)	18.9% (2.96)	12.2% (0.41)	23.1% (2.42)	18.0% (0.97)	21.1% (4.26)	12.9% (0.34)	19.0% (1.33)	17.9% (0.67)	12.6% (0.31)
≥ 2	12.8% (1.47)	7.7% (0.61)	3.8% (1.28)	4.5% (0.21)	20.6% (2.35)	14.3% (0.98)	6.9% (2.36)	5.8% (0.22)	14.9% (1.29)	10.1% (0.55)	5.3% (0.16)
Number of past-year clinically significant injuries ^h											
None	66.9% (1.90)	70.9% (1.08)	77.0% (2.98)	84.8% (0.45)	72.9% (2.51)	74.5% (1.19)	75.2% (3.98)	86.2% (0.36)	68.5% (1.52)	72.2% (0.74)	85.6% (0.34)
1	23.3% (1.77)	21.0% (0.89)	19.8% (2.91)	12.0% (0.39)	18.1% (2.28)	17.5% (0.99)	20.2% (3.68)	10.9% (0.33)	21.9% (1.42)	19.7% (0.64)	11.4% (0.30)
≥ 2	9.8% (1.22)	8.2% (0.64)	3.1% (1.22)	3.3% (0.19)	9.0% (1.71)	8.1% (0.77)	4.6% (2.02)	2.9% (0.14)	9.6% (1.00)	8.1% (0.46)	3.1% (0.12)

^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.

^d Coronary heart disease: arteriosclerosis, angina pectoris, or myocardial infarction.

^e “Other” heart disease: tachycardia or “any other heart disease.”

^f Gastrointestinal disease: stomach ulcer or gastritis.

^g Excludes admissions for normal delivery of liveborn infants.

^h Clinically significant injuries: injuries that caused respondents to seek medical help or cut down their usual activities for more than half a day.

Table 2
Adjusted Associations of Antisocial Behavioral Syndromes with Past-Year General Medical Status

Characteristic	Odds Ratios or Regression Coefficients (95% Confidence Intervals) ^{a,b}		
	ASPD ^c versus No Antisocial Behavioral Syndrome	AABS ^d versus No Antisocial Behavioral Syndrome	“CD Only” ^e versus No Antisocial Behavioral Syndrome
Total number of past-year health care provider-diagnosed medical conditions			
None	1.0 (referent)	1.0 (referent)	1.0 (referent)
1	1.3 (1.02-1.59)	1.3 (1.17-1.49)	1.0 (0.66-1.39)
2	2.1 (1.53-2.85)	1.3 (1.08-1.58)	1.4 (0.74-2.55)
≥ 3	2.0 (1.43-2.68)	1.6 (1.33-2.01)	0.8 (0.38-1.59)
Coronary heart disease ^f	1.5 (1.05-2.22)	1.3 (1.03-1.55)	0.7 (0.37-1.46)
“Other” heart disease ^g	1.4 (0.98-1.86)	1.3 (1.03-1.53)	1.4 (0.78-2.67)
Hypertension	1.0 (0.80-1.35)	1.1 (0.99-1.27)	1.1 (0.76-1.71)
Liver disease	2.9 (1.65-5.18)	1.4 (0.96-2.08)	1.2 (0.15-9.01)
Gastrointestinal disease ^h	1.5 (1.16-2.05)	1.4 (1.15-1.61)	0.8 (0.46-1.53)
Arthritis			
	Men Women 2.2 (1.69-2.76) 1.4 (1.03-1.96)	Men Women 1.4 (1.20-1.73) 1.2 (0.95-1.42)	Men Women 1.3 (0.66-2.34) 0.5 (0.26-1.04)
SF-12 Physical Component Scale score, per point	-0.8 (-1.59-0.03)	-0.4 (-0.76-0.01)	-0.3 (-1.24-0.65)
SF-12 Physical Functioning Scale score, per point	-0.5 (-1.16-0.18)	-0.1 (-0.49-0.25)	0.1 (-0.83-1.00)
SF-12 Role Physical Scale score, per point	-0.9 (-1.61-0.08)	-0.2 (-0.59-0.14)	0.3 (-0.70-1.20)
SF-12 Bodily Pain Scale score, per point	-1.0 (-1.92-0.08)	-0.3 (-0.77-0.13)	0.4 (-0.71-1.48)
SF-12 General Health Scale score, per Point	-0.8 (-1.62-0.08)	-0.8 (-1.22-0.30)	-1.5 (-3.06-0.02)
SF-12 Vitality Scale score, per point	-0.6 (-1.43-0.19)	-0.6 (-0.99-0.18)	-0.3 (-1.61-0.93)
Number of past-year inpatient hospitalizations ⁱ			
None	1.0 (referent)	1.0 (referent)	1.0 (referent)
1	1.6 (1.20-2.11)	1.3 (1.09-1.50)	1.6 (1.01-2.37)
≥ 2	1.6 (1.09-2.26)	1.4 (1.05-1.76)	0.7 (0.28-1.51)
Total past-year inpatient length of stay (days) ^j			
None	1.0 (referent)	1.0 (referent)	1.0 (referent)
1-2	1.2 (0.83-1.77)	1.3 (1.05-1.58)	1.6 (0.94-2.78)

Characteristic	Odds Ratios or Regression Coefficients (95% Confidence Intervals) ^{a,b}		
	ASPD ^c versus No Antisocial Behavioral Syndrome	AABS ^d versus No Antisocial Behavioral Syndrome	"CD Only" ^e versus No Antisocial Behavioral Syndrome
≥ 3	1.9 (1.44-2.56)	1.3 (1.10-1.59)	1.1 (0.60-1.86)
Number of past-year emergency department visits			
None	1.0 (referent)	1.0 (referent)	1.0 (referent)
1	1.3 (1.07-1.61)	1.3 (1.15-1.48)	1.5 (1.01-2.08)
≥ 2	2.2 (1.75-2.86)	1.7 (1.47-2.06)	0.8 (0.41-1.39)
Number of past-year clinically significant injuries ^f			
None	1.0 (referent)	1.0 (referent)	1.0 (referent)
1	1.6 (1.32-1.99)	1.5 (1.38-1.73)	1.6 (1.15-2.19)
≥ 2	2.0 (1.46-2.64)	2.0 (1.66-2.37)	0.8 (0.38-1.47)

^a Odds ratios estimating associations with categorical response variables are based on binary logistic regression models for dichotomous, and multinomial logistic regression models for polytomous, response variables. Regression coefficients estimating associations with continuous variables are based on normal-theory regression models.

^b All models control for age, sex, race/ethnicity, marital status, education, past-year personal income, health insurance coverage, region and urbanicity of respondent residence, body mass index, comorbid lifetime diagnoses of nicotine dependence and any mood, any anxiety, any alcohol use, any drug use, pathological gambling, and any additional personality disorders, average daily ounces of ethanol during period of heaviest lifetime drinking, frequency of use of most frequently used drug during period of heaviest lifetime use, and number of cigarettes smoked per day during most recent year of smoking.

^c ASPD: antisocial personality disorder.

^d AABS: adult antisocial behavior without conduct disorder before age 15

^e "CD Only": conduct disorder without adult antisocial behavior.

^f Coronary heart disease: arteriosclerosis, angina pectoris, or myocardial infarction.

^g "Other" heart disease: tachycardia or "any other heart disease."

^h Gastrointestinal disease: stomach ulcer or gastritis

ⁱ Excludes admissions for delivery of liveborn infants.

^j Clinically significant injuries: injuries that caused respondents to seek medical help or cut down their usual activities for more than half a day.