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RESEARCH ARTICLE

Mental Health and High-Cost Health Care Utilization: New Evidence from Axis II Disorders

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Objective. To analyze the associations between Axis II (A2) disorders and two measures of health care utilization with relatively high cost: emergency department (ED) episodes and hospital admissions.

Data Source/Study Setting. Wave I (2001/2002) and Wave II (2004/2005) of the National Longitudinal Survey on Alcohol and Related Conditions (NESARC).

Study Design. A national probability sample of adults. Gender-stratified regression analysis adjusted for a range of covariates associated with health care utilization.

Data Collection. The target population of the NESARC is the civilian noninstitutionalized population aged 18 years and older residing in the United States. The cumulative survey response rate is 70.2 percent with a response rate of 81 percent ($N = 43{,}093$) in Wave I and 86.7 percent ($N = 34{,}653$) in Wave II.

Principal Findings. Both men and women with A2 disorders are at elevated risk for ED episodes and hospital admissions. Associations are robust after adjusting for a rich set of confounding factors, including Axis I (clinical) psychiatric disorders. We find evidence of a dose–response relationship, while antisocial and borderline disorders exhibit the strongest associations with both measures of health care utilization.

Conclusions. This study provides the first published estimates of the associations between A2 disorders and high-cost health care utilization in a large, nationally representative survey. The findings underscore the potential implications of these disorders on health care expenditures.

Key Words. Axis II disorders, mental health, health care utilization, ED episodes, hospital admissions

Despite recent interest in how clinical conditions such as substance abuse, depression, and schizophrenia impact health care utilization, little is known about the role of Axis II personality disorders (A2 disorders). A2 disorders are an understudied class of psychiatric conditions that lead to diminished social functioning and impose substantial costs on both the disordered person and those with whom he or she interacts. As defined by the American Psychiatric

Association (2000), A2 disorders are "pervasive, inflexible and enduring patterns of inner experiences and behavior that can lead to clinically significant distress or impairment in social, occupational, or other areas of functioning." The prevalence of A2 disorders among adults in the United States is approximately 9–16 percent (Reich, Yates, and Nduaguba 1989; Samuels et al. 2002; Grant et al. 2004; Crawford et al. 2005; Lenzenweger 2008). For comparison, 9 percent of the adult population suffers from depression and 4.7 percent meets the clinical definition for alcohol abuse (Hasin et al. 2007; Gonzalez et al. 2010). Interestingly, no study has investigated the role of A2 disorders in health care utilization using a nationally representative dataset.

Although awareness of A2 disorders among the general public is limited, these disorders may be particularly relevant for understanding how mental health conditions contribute to high-cost health care utilization. A2 disorders have been empirically linked with poor physical health (Pietrzak, Wagner, and Petry 2007; El-Gabalawy, Katz, and Sareen 2010), obesity (Mather et al. 2008; Petry et al. 2008), injuries (Chen et al. 2008), suicidal attempts (Brent et al. 1994), substance abuse (Rounsaville et al. 1998), other mental health conditions (Grant et al. 2008), and violence (Yu, Geddes, and Fazel 2012). These behaviors are risk factors for high-cost health care utilization (Olfson and Klerman 1992; Lowenstein et al. 1998; Pirkis et al. 2001; Cohen and Krauss 2003; Olfson et al. 2003; Zavala and French 2003; French, Gumus, and Turner 2008; Balsa et al. 2009; French, Fang, and Balsa 2011; Kaskie et al. 2011; Cawley and Meyerhoefer 2012). Empirical studies evaluating possible risk factors for excessive health care utilization generally do not consider A2 disorders, as these diagnoses are typically not contained in nationally representative datasets. Studies of specific subpopulations find that individuals affected by A2 disorders are more likely to use high-cost health care services (Morasco et al. 2006; Wagner, Pietrzak, and Petry 2008), but the generalizability of these studies remains unclear. Assessing whether A2 disorders are statistically significant predictors of health care utilization in

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a nationally representative dataset is a natural extension of this line of research.

In this study we assess a previously unrecognized set of risk factors—A2 disorders—and their associations with two types of expensive health care: emergency department (ED) episodes and hospital admissions. In 2009, the mean cost of an ED episode was $1,318 and the mean cost of a hospital admission was $17,089 (Medical Expenditure Panel Survey 2009b).

To address the paucity of empirical research, we consider the following research questions: Is there a statistically significant association between A2 disorders and the probability of having a hospital admission or ED episode? Does the association vary across A2 disorder type? Is the association robust to controlling for A1 disorders?

Background on Axis II Disorders

The Diagnostic and Statistical Manual of Mental Disorders, fourth edition (*DSM-IV*) divides psychiatric disorders into two groups: A1, or clinical, disorders (e.g., depression, schizophrenia) and A2 disorders (American Psychiatric Association 2000). To be diagnosed with an A2 disorder, an individual must exhibit "an enduring pattern of inner experience and behavior that deviates markedly from the expectations of the individual's culture" (American Psychiatric Association 2000). This pattern must manifest itself in at least two of the following ways: (1) cognition (i.e., ways of perceiving oneself, others, and events); (2) affectivity (i.e., range, intensity, and appropriateness of emotional response); (3) interpersonal functioning; and (4) impulse control.

DSM-IV divides A2 disorders into three clusters. Cluster A, which incorporates a cognitive dimension (Paris 2003), includes paranoid, schizoid, and schizotypal disorders. People with Cluster A disorders have abnormal ideas, speak and act in strange ways, and have difficulty relating to others (American Psychiatric Association 2000).

Cluster B, which corresponds to externalizing dimensions (Paris 2003), includes antisocial, borderline, histrionic, and narcissistic disorders. People with Cluster B disorders tend to act in dramatic, emotional, and erratic fashions; have difficulty with impulsive behavior; act out; and often violate social norms (American Psychiatric Association 2000). They are frequently hostile toward others and/or self-abusive.

Cluster C, which corresponds to internalizing dimensions (Paris 2003), includes avoidant, dependent, and obsessive–compulsive (note that the A2 obsessive–compulsive disorder evaluated here has different features from A1

obsessive–compulsive disorders) disorders. People with Cluster C disorders are anxious, fearful, and excessively afraid of social interactions, and of feeling out of control (American Psychiatric Association 2000). Appendix A offers a summary of the traits commonly associated with each A2 disorder.

Although competing theories persist regarding the relative roles of genetics and early childhood environment in determining A2 disorders, most of the literature seems to suggest a confluence of "nature and nurture" (American Psychiatric Association 2000; Yudofsky 2005). In other words, an individual may enter the world with a genetic predisposition toward development of an A2 disorder, but early childhood experiences determine whether certain tendencies are borne out. The literature is in agreement that A2 disorders are extremely difficult to treat and change once they emerge. Unlike A1 disorders, which are defined for a particular time period, A2 disorders are assessed as lifetime diagnoses (American Psychiatric Association 2000). Once an individual develops an A2 disorder, he or she is expected to suffer from this condition for the remainder of his or her life.

Conceptually, if A2 disorders are physically and mentally debilitating, they should be significantly related to ED episodes and hospital admissions, and the relationship should differ across A2 disorders. For example, borderline disorder is associated with a need for attention, intolerance for being alone, repeated crises and acts of self-injury, and impulsivity. Persons affected by this disorder may seek personal contact and affirmation, perhaps leading to increased utilization of health care. Acts of self-injury such as wrist cutting may require medical attention.

A defining feature of antisocial disorder is a predisposition toward violence, substance use, and anger, and a disregard for personal safety of the disordered person and those around him or her. These characteristics may result in elevated risk for health care utilization through several mechanisms: overdosing on substances, injuries sustained in violent altercations or lack of regard to personal safety, and poor attention to overall health.

Conversely, persons affected by schizoid, schizotypal, and avoidant disorders shun activities that require interaction with others, whereas those who suffer from paranoid disorder are deeply distrustful of others. Persons affected by these disorders may avoid interactions with health care providers and thus be at lower risk for an ED episode or hospital admission. Alternatively, these disorders may lead to lower use of essential outpatient and preventive care in the short run, resulting in increased utilization of acute care in the long run.

The direction of the relationships with health care utilization is less clear for disorders such as obsessive–compulsive or histrionic. Those who suffer

from obsessive–compulsive disorder are preoccupied with rules, orderliness, and control. Their attention to detail might lead to improved health (e.g., unrelentingly adhering to recommended health guidelines) and avoidance of risky behaviors (e.g., sensation-seeking activities), and thus lower high-cost health care utilization. Alternatively, such persons may believe that any health problem, no matter how minor, requires comprehensive medical attention.

Histrionic disorder is associated with an extreme focus on physical appearance, problems with impulsivity, and constant need for attention. Focus on physical appearance may yield good health (e.g., through regular exercise) and lower utilization of health care. Alternatively, impulse control and need for attention may result in increased health care utilization through injuries or attention seeking. Thus, there seems to be a strong, yet complex, conceptual link between A2 disorders and health care utilization.

DATA AND EMPIRICAL METHODS

Data

We obtain data from the National Epidemiological Survey on Alcohol and Related Conditions (NESARC), a large and nationally representative longitudinal survey conducted by the U.S. Bureau of the Census for the National Institute on Alcohol Abuse and Alcoholism (NIAAA). Wave I was fielded between August 2001 and May 2002 ($N = 43{,}093$), and Wave II was fielded between August 2004 and August 2005 ($N = 34{,}653$). Data were collected via computer-assisted personal interviews conducted in respondents' homes by trained census interviewers. The interviewers had on average 5 years of experience administering census and health-related surveys. Prior to administering the NESARC, the interviewers completed 10 days of training under the direction of NIAAA staff. The Waves I and II response rates were 81 and 86.7 percent, leading to a cumulative response rate of 70.2 percent (National Institute on Alcohol Abuse and Alcoholism 2010). These rates are comparable to other major health services surveys such as the Medical Expenditure Panel Survey, which had overall response rates from 61 to 67 percent between 2001 and 2005 (Medical Expenditure Panel Survey 2009a).

We define measures for health care utilization and personal characteristics using Wave II information. We use data from both waves to construct our A2 variables as neither wave includes the full set of A2 disorders recognized by the APA. Although the NESARC is a longitudinal dataset, we do not use this feature of the data in our study. Given the enduring nature of A2

disorders, use of standard longitudinal data techniques (e.g., first-difference models) is not feasible. After excluding respondents with missing information, our analysis sample includes 19,815 women and 14,385 men.

Health Care Utilization Variables. We examine two measures of health care utilization: dichotomous indicators for any ED episode and any hospital admission in the past year. For ED episodes, the relevant question is as follows: "In the past year how many times did you receive medical care or treatment in a hospital emergency room?" The survey question for hospitalizations is as follows: "Not counting hospitalization for delivery of a healthy live-born infant, how many separate times did you stay in the hospital overnight or longer in the past year?" We code respondents as 1 if they report any ED episodes (or hospital admissions), and 0 otherwise.

Axis II Disorders. The independent variables of primary interest are A2 disorders. NESARC administrators used the Alcohol Use Disorder and Associated Disabilities Schedule DSM-IV (AUDADIS) to classify respondents as meeting criteria for 10 A2 disorders. The validity of the AUDADIS is well documented (Grant et al. 1995, 2003; Ruan et al. 2008), and this instrument is commonly utilized to diagnosis psychiatric conditions, including A2 disorders, in survey data (Compton et al. 2005; Grant et al. 2005, 2008; Blanco et al. 2008, 2013; Hasin et al. 2011; Sareen et al. 2011). Respondents entered answers to a series of questions on lifetime behaviors into the provided laptop computer. Information collected in this confidential manner provides a more accurate assessment of A2 disorders than information collected in a medical setting (e.g., physician's office) where respondents may intentionally misreport behavior due to social stigma. NIAAA epidemiologists later applied the AUDADIS algorithm to the completed surveys and determined whether a respondent met criteria for each specific A2 disorder. To receive a classification for an A2 disorder, respondents must have endorsed a requisite number of symptoms pertaining to the given disorder (e.g., at least four of the seven criteria for avoidant disorder), with a least one symptom causing social and/or occupational dysfunction. The AUDADIS is an objective instrument and leaves little discretion to the administrator: Responses to yes/no questions are entered into the algorithm, which produces a binary indicator of meeting the disorder.

Seven A2 disorders are classified in Wave I (antisocial, avoidant, dependent, obsessive–compulsive, paranoid, schizoid, and histrionic) and four in

Wave II (antisocial, schizotypal, narcissistic, and borderline). To examine all 10 A2 disorders individually and collectively, we merge information collected in both waves and assume that the A2 disorders are stable across time. Antisocial disorder is assessed in both waves, and we code respondents as meeting the antisocial disorder criteria if they were diagnosed as such in either Wave. The correlation between antisocial disorder classifications in Waves I and II is 97 percent, as is expected for enduring conditions such as A2 disorders.

We construct several A2 disorder variables. First, we define a measure for any disorder, coded as 1 if the respondent meets the criteria for any of the 10 A2 disorders measured in the NESARC, and 0 otherwise. Second, we construct dichotomous variables associated with meeting criteria for one A2 disorder and two or more A2 disorders, which allows us to explore dose–response relationships between A2 disorders and health care utilization. Third, we create unique (nonmutually exclusive) indicators for each of the 10 specific A2 disorders. Analysis of the unique indicators will shed light on how the association with health care utilization varies across A2 disorder types.

Control Variables. In our core models we control for a set of arguably exogenous and predetermined characteristics: age, race/ethnicity, birth outside the United States, region of residence, and rural status (Specification a). To assess the robustness and stability of our findings, we estimate models that sequentially include blocks of variables: (1) past year household characteristics (household income, marital status, children in the household, education, health insurance, employment) (Specification b) and (2) past year comorbidities (A1 disorders including manic episode, schizophrenia, major depression, general anxiety; substance use including illicit drug abuse, alcohol abuse, smoking; and chronic health conditions including hypertension, Type II diabetes, heart attack, arthritis, stroke) (Specification c).

Empirical Methods

We estimate the association between A2 disorders and our measures of health care utilization with a logit model as reported in Equation (1):

$$\Pr(\mathrm{HC}_i = 1) = \mathrm{f}(\beta_0 + \beta_1' \mathrm{A2}_i + \beta_2' X_i) \tag{1}$$

where HC_i is a measure of health care utilization (ED episode or hospital admission), $\mathrm{A2}_i$ is one or more measures of A2 disorders, and X_i is a vector of personal characteristics. We report average risk differences, or marginal

effects, for health care utilization between respondents with and without A2 disorders. Risk differences are calculated by first setting the A2 disorder variable to 1 and estimating the probability or risk of the dependent variable, then resetting the A2 disorder variable to 0 and reestimating the risk of the dependent variable. The average estimated risk difference is the mean of the differences in risks. Using Stata MP Version 12 (Stata Corp 2011), we employ survey weights in all analyses and cluster standard errors around the primary sampling unit. Thus, our findings are generalizable to the United States. In unreported analyses, we reestimate all models with propensity score matching (stratification matching) and doubly robust regression to ensure that our findings are stable across different estimation techniques. The estimates generated by these alternative approaches are highly consistent in terms of sign, magnitude, and statistical significance with the core findings reported below.

RESULTS

Sample Characteristics

Table 1 reports sample proportions for our A2 disorder and health care utilization measures. The prevalence of past year ED episodes is 23 percent among women and 21 percent among men. Thirteen percent of women and 11 percent of men report a hospital admission in the past year. Twenty percent of women and 23 percent of men meet the criterion for at least one A2 disorder. Nine percent of women and 10 percent of men have two or more A2 disorders. Obsessive-compulsive is the most prevalent disorder (8 percent of the sample) among women. The most common A2 disorders among men are narcissistic and obsessive-compulsive, each with 8 percent of the sample. Bivariate analysis using χ^2 tests shows that differences in the health care utilization variables are statistically different between individuals with and without an A2 disorder ($p < 0.01$). Appendix B reports control variables for women and men by A2 disorder status.

Associations of Axis II Disorders with ED Episodes

Tables 2 and 3 report estimation results from the logit models of any ED episodes for women and men. The results are presented sequentially for Specifications a, b, and c.

Women with A2 disorders are at elevated risk of an ED episode, and this result is robust across specifications that sequentially include additional

Table 1: Weighted Prevalence of Health Care Utilization and Axis II Disorders, Adult Women and Men in the NESARC

	Women	*Men*
Outcome variables		
ED episode	0.23	0.21
Hospital admission	0.13	0.11
A2 disorder variables		
Any A2 disorder	0.20	0.23
One A2 disorder	0.11	0.13
Two or more A2 disorders	0.09	0.10
Paranoid A2 disorder	0.05	0.04
Schizoid A2 disorder	0.03	0.03
Schizotypal A2 disorder	0.04	0.04
Antisocial A2 disorder	0.02	0.06
Borderline A2 disorder	0.06	0.06
Histrionic A2 disorder	0.02	0.02
Narcissistic A2 disorder	0.05	0.08
Avoidant A2 disorder	0.03	0.02
Dependent A2 disorder	0.01	0.00
Obsessive–compulsive A2 disorder	0.08	0.08
Unweighted *N*	19,815	14,385

Note. Differences in outcome variables by A2 disorder status (any A2 disorder vs. no A2 disorder) are statistically significant at the $p < .01$ level (χ^2 test).

covariates (Table 2). In specifications that include an indicator for any A2 disorder, the risk differences range from 9.0 percentage points in Specification a to 4.0 percentage points (an attenuation of 44 percent) in Specification c ($p < .001$). These risk differences imply that, at the sample mean (23 percent), women with any A2 disorder are 17–39 percent more likely to report an ED episode than women with no A2 disorders. Moreover, the findings are consistent with a dose–response relationship in that the estimated risk difference is quantitatively larger for two or more A2 disorders than one A2 disorder. In models that include the 10 indicators, antisocial and borderline disorders display the strongest associations with the risk of an ED episode. Women with antisocial (borderline) disorder are 7–11 (6–14) percentage points more likely to report an ED episode than women who do not suffer from this condition. Women with a paranoid disorder are at higher risk for an ED episode than women without this disorder, but the association is attenuated substantially and becomes statistically indistinguishable from zero after controlling for comorbidities in Specification c.

Consistent with results for the female sample, men with one or more A2 disorders are at higher risk for an ED episode than men who are not affected

Table 2: Selected Estimation Results for Axis II Disorders and ED Episodes, Adult Women in the NESARC (unweighted $N = 19{,}815$)

	Specification a[†]		*Specification b*[‡]		*Specification c*[§]	
	Risk Diff.	*95% CI*	*Risk Diff.*	*95% CI*	*Risk Diff.*	*95% CI*
Regressions with A2 predictor variable = Any disorder						
Any A2 disorder	0.09***	[0.07,0.11]	0.07***	[0.05,0.09]	0.04***	[0.02,0.05]
Regressions with A2 predictor variable = Number of disorders						
1 A2 disorder	0.06***	[0.03,0.08]	0.05***	[0.02,0.07]	0.03*	[0.00,0.05]
2 + A2 disorders	0.13***	[0.11,0.16]	0.10***	[0.07,0.12]	0.05***	[0.02,0.08]
Regressions with A2 predictor variable = Type of disorder						
Paranoid	0.06**	[0.02,0.10]	0.04*	[0.00,0.08]	0.03	[−0.01,0.07]
Schizoid	0.01	[−0.03,0.06]	0.00	[−0.04,0.05]	−0.01	[−0.05,0.03]
Schizotypal	0.01	[−0.03,0.05]	0.01	[−0.03,0.04]	−0.01	[−0.05,0.03]
Antisocial	0.11***	[0.05,0.17]	0.09**	[0.03,0.14]	0.07**	[0.02,0.13]
Borderline	0.14***	[0.10,0.18]	0.11***	[0.07,0.14]	0.06**	[0.02,0.09]
Histrionic	−0.01	[−0.06,0.04]	−0.01	[−0.06,0.04]	−0.01	[−0.06,0.04]
Narcissistic	0.02	[−0.01,0.05]	0.02	[−0.01,0.05]	0.02	[−0.01,0.05]
Avoidant	−0.00	[−0.05,0.04]	−0.01	[−0.05,0.03]	−0.01	[−0.05,0.03]
Dependent	−0.01	[−0.09,0.08]	−0.04	[−0.11,0.04]	−0.04	[−0.12,0.04]
Obsessive–compulsive	0.02	[−0.01,0.06]	0.03	[−0.01,0.06]	0.02	[−0.01,0.05]

Note. Sample proportion with an ED episode = 0.23. All models are estimated with logit and account for survey design with the Stata MP Version 12 survey commands. Coefficients are adjusted risk differences. Risk differences are calculated by first setting the A2 disorder variable to 1 and estimating the probability or risk of the dependent variable, then resetting the A2 disorder variable to 0 and reestimating the risk of the dependent variable. The average estimated risk difference is the mean of the differences in risks. The first set of results applies to a binary measure for any A2 disorder, the second set includes binary measures for 1 A2 disorder and 2 + A2 disorders, and the third set includes all A2 disorders as separate dummy variables. Each cell is from a separate regression.

[†]Specification a adjusts for age, race, ethnicity, birth outside the United States, region of residence, and rural status.

[‡]Specification b adjusts for Specification a variables, household income, marital status, children in the household, education, health insurance, and employment.

[§]Specification c adjusts for Specification b variables, past year A1 disorders, substance use indicators, and doctor-diagnosed chronic conditions.

***$p < .001$; **$p < .01$; *$p < .05$.

by these disorders (Table 3). Results from Specification a show that men with any A2 disorder are 7.0 percentage points more likely to report an ED episode than men with no A2 disorders ($p < .001$). The association is attenuated by 57 percent to 3.0 percentage points after controlling for comorbidities in Specification c, but it remains statistically significant ($p < .01$). These risk differences represent a 14–33 percent increase in the probability of an ED episode among

Table 3: Selected Estimation Results for Axis II Disorders and ED Episodes, Adult Men in the NESARC (unweighted $N = 14{,}385$)

	Specification a[†]		*Specification b*[‡]		*Specification c*[§]	
	Risk Diff.	*95% CI*	*Risk Diff.*	*95% CI*	*Risk Diff.*	*95% CI*
Regressions with A2 predictor variable = Any disorder						
Any A2 disorder	0.07***	[0.05,0.09]	0.05***	[0.03,0.07]	0.03**	[0.01,0.05]
Regressions with A2 predictor variable = Number of disorders						
1 A2 disorder	0.04***	[0.02,0.07]	0.03**	[0.01,0.06]	0.03*	[0.00,0.05]
2 + A2 disorders	0.10***	[0.07,0.13]	0.07***	[0.04,0.10]	0.04*	[0.01,0.07]
Regressions with A2 predictor variable = Type of disorder						
Paranoid	0.01	[−0.03,0.06]	0.01	[−0.04,0.05]	0.00	[−0.04,0.05]
Schizoid	0.06	[−0.00,0.11]	0.05	[−0.00,0.11]	0.04	[−0.01,0.09]
Schizotypal	0.05*	[0.01,0.09]	0.04	[−0.00,0.08]	0.02	[−0.02,0.06]
Antisocial	0.02	[−0.01,0.06]	0.01	[−0.02,0.05]	0.00	[−0.03,0.04]
Borderline	0.10***	[0.06,0.14]	0.08***	[0.04,0.12]	0.05*	[0.01,0.09]
Histrionic	−0.04	[−0.09,0.02]	−0.04	[−0.09,0.01]	−0.04	[−0.09,0.01]
Narcissistic	0.03	[−0.01,0.07]	0.03	[−0.00,0.07]	0.03	[−0.01,0.06]
Avoidant	−0.03	[−0.09,0.03]	−0.04	[−0.10,0.01]	−0.04	[−0.09,0.02]
Dependent	0.22*	[0.04,0.39]	0.16*	[0.00,0.32]	0.14	[−0.03,0.31]
Obsessive–compulsive	0.01	[−0.02,0.04]	0.01	[−0.02,0.04]	0.01	[−0.02,0.04]

Note. Sample proportion with an ED episode = 0.21. All models are estimated with logit and account for survey design with the Stata MP Version 12 survey commands. Coefficients are adjusted risk differences. Risk differences are calculated by first setting the A2 disorder variable to 1 and estimating the probability or risk of the dependent variable, then resetting the A2 disorder variable to 0 and reestimating the risk of the dependent variable. The average estimated risk difference is the mean of the differences in risks. The first set of results applies to a binary measure for any A2 disorder, the second set includes binary measures for 1 A2 disorder and 2 + A2 disorders, and the third set includes all A2 disorders as separate dummy variables. Each cell is from a separate regression.

[†]Specification a adjusts for age, race, ethnicity, birth outside the United States, region of residence, and rural status.

[‡]Specification b adjusts for Specification a variables, household income, marital status, children in the household, education, health insurance, and employment.

[§]Specification c adjusts for Specification b variables, past year A1 disorders, substance use indicators, and doctor-diagnosed chronic conditions.

***$p < .001$; **$p < .01$; *$p < .05$.

men at the sample mean (21 percent) and are consistent with a dose–response relationship. In models that control for the set of 10 A2 disorders, borderline disorder displays the strongest association with risk for an ED episode. In Specification c, men with borderline disorder are 5.0 percentage points more likely to report an ED episode than men without this disorder. Schizotypal and dependent disorders are also associated with increased risk for an ED

episode, but the risk differences are attenuated and become indistinguishable from zero after adjusting for household characteristics in Specification b or comorbidities in Specification c.

Associations of Axis II Disorders with Hospital Admissions

Tables 4 and 5 present selected estimates from the hospital admission regressions for women and men and the organization is similar to that in Tables 2 and 3. Moreover, the pattern of results is consistent with the ED episode findings—women and men with A2 disorders are at elevated risk for a hospital admission.

In Specification a, women with any A2 disorder are 6 percentage points more likely to report a hospital admission than women without such a disorder ($p < .001$) (Table 4). After adjusting for household characteristics and comorbidities, the association is reduced to 2 percentage points (an attenuation of 67 percent) but remains statistically significant ($p < .05$). These risk differences imply that, at the sample mean (13 percent), women with A2 disorders are 15–46 percent more likely to report a hospital admission than women without A2 disorders. Specifications with indicators for one A2 disorder and two or more A2 disorders again show evidence consistent with a dose–response relationship. When we estimate models with 10 A2 disorder indicators, we find that antisocial and borderline disorders display the strongest associations with risk of a hospital admission. In Specification c, women with antisocial (borderline) disorder are 10 (4) percentage points more likely to report a hospital admission ($p < .05$).

Consistent with the results among women, A2 disorders have a statistically significant and quantitatively large association with the probability of a hospital admission among men (Table 5). In Specification a, having an A2 disorder is associated with a 5 percentage point increase in the probability of a hospital admission ($p < .001$). Adjusting for household characteristics and comorbidities reduces the estimated risk difference to 3 percentage points (or an attenuation of 40 percent), but the association remains highly significant ($p < .001$). These risk differences imply a 27–45 percent increase in the risk of a hospital admission for men at the sample mean (11 percent). In specifications that include indicators for one A2 disorder and two or more A2 disorders, the results are mixed. Having only one A2 disorder is associated with a 4–5 percentage point increase in the probability of a hospital admission ($p < .001$). Surprisingly, the risk difference for two or more disorders is smaller in magnitude and insignificant after adjusting for comorbidities (Specification c).

Table 4: Selected Estimation Results for Axis II Disorders and Hospital Admissions, Adult Women in the NESARC (unweighted $N = 19{,}815$)

	Specification a[†]		*Specification b*[‡]		*Specification c*[§]	
	Risk Diff.	*95% CI*	*Risk Diff.*	*95% CI*	*Risk Diff.*	*95% CI*
Regressions with A2 predictor variable = Any disorder						
Any A2 disorder	0.06***	[0.04,0.07]	0.04***	[0.02,0.06]	0.02*	[0.00,0.03]
Regressions with A2 predictor variable = Number of disorders						
1 A2 disorder	0.03**	[0.01,0.05]	0.03*	[0.00,0.05]	0.01	[−0.01,0.03]
2 + A2 disorders	0.09***	[0.06,0.11]	0.06***	[0.04,0.08]	0.03*	[0.00,0.05]
Regressions with A2 predictor variable = Type of disorder						
Paranoid	0.02	[−0.01,0.06]	0.01	[−0.02,0.04]	0.01	[−0.02,0.03]
Schizoid	0.03	[−0.01,0.07]	0.02	[−0.02,0.06]	0.01	[−0.03,0.04]
Schizotypal	−0.01	[−0.04,0.02]	−0.02	[−0.05,0.01]	−0.03*	[−0.06,−0.01]
Antisocial	0.13***	[0.07,0.19]	0.11***	[0.05,0.17]	0.10***	[0.05,0.16]
Borderline	0.10***	[0.06,0.13]	0.07***	[0.04,0.10]	0.04*	[0.01,0.07]
Histrionic	−0.02	[−0.05,0.02]	−0.02	[−0.05,0.02]	−0.01	[−0.05,0.02]
Narcissistic	0.00	[−0.02,0.03]	0.01	[−0.02,0.04]	0.01	[−0.02,0.04]
Avoidant	0.00	[−0.03,0.04]	0.00	[−0.03,0.03]	0.00	[−0.03,0.04]
Dependent	0.01	[−0.06,0.08]	−0.02	[−0.07,0.03]	−0.02	[−0.08,0.03]
Obsessive–compulsive	0.01	[−0.02,0.03]	0.01	[−0.01,0.03]	0.00	[−0.02,0.03]

Note. Sample proportion with a hospital admission = 0.13. All models are estimated with logit and account for survey design with the Stata MP Version 12 survey commands. Coefficients are adjusted risk differences. Risk differences are calculated by first setting the A2 disorder variable to 1 and estimating the probability or risk of the dependent variable, then resetting the A2 disorder variable to 0 and reestimating the risk of the dependent variable. The average estimated risk difference is the mean of the differences in risks. The first set of results applies to a binary measure for any A2 disorder, the second set includes binary measures for 1 A2 disorder and 2 + A2 disorders, and the third set includes all A2 disorders as separate dummy variables. Each cell is from a separate regression.

[†]Specification a adjusts for age, race, ethnicity, birth outside the United States, region of residence, and rural status.

[‡]Specification b adjusts for Specification a variables, household income, marital status, children in the household, education, health insurance, and employment.

[§]Specification c adjusts for Specification b variables, past year A1 disorders, substance use indicators, and doctor-diagnosed chronic conditions.

***$p < .001$; **$p < .01$; *$p < .05$.

However, the confidence intervals for these parameter estimates overlap, so we cannot definitively rule out a dose–response relationship. In specifications that control for each of the 10 A2 disorder indicators, borderline displays the broadest association with the probability of a hospital admission, although this relationship is attenuated and becomes indistinguishable from zero after conditioning on comorbidities.

Table 5: Selected Estimation Results for Axis II Disorders and Hospital Admissions, Adult Men in the NESARC (unweighted $N = 14{,}385$)

	Specification a[†]		*Specification b*[‡]		*Specification c*[§]	
	Risk Diff.	*95% CI*	*Risk Diff.*	*95% CI*	*Risk Diff.*	*95% CI*
Regressions with A2 predictor variable = Any disorder						
Any A2 disorder	0.05***	[0.03,0.06]	0.04***	[0.02,0.05]	0.03***	[0.01,0.04]
Regressions with A2 predictor variable = Number of disorders						
1 A2 disorder	0.05***	[0.03,0.07]	0.04***	[0.02,0.06]	0.04***	[0.02,0.06]
2 + A2 disorders	0.05***	[0.02,0.07]	0.03*	[0.01,0.05]	0.01	[−0.01,0.03]
Regressions with A2 predictor variable = Type of disorder						
Paranoid	−0.03	[−0.06,0.00]	−0.03	[−0.06,0.00]	−0.03*	[−0.06,−0.00]
Schizoid	0.02	[−0.03,0.06]	0.01	[−0.03,0.06]	0.01	[−0.03,0.04]
Schizotypal	0.03	[−0.00,0.06]	0.02	[−0.01,0.05]	0.00	[−0.03,0.03]
Antisocial	0.02	[−0.01,0.05]	0.01	[−0.01,0.04]	0.01	[−0.02,0.03]
Borderline	0.06***	[0.03,0.10]	0.05**	[0.01,0.08]	0.03	[−0.00,0.06]
Histrionic	−0.02	[−0.06,0.01]	−0.02	[−0.06,0.01]	−0.02	[−0.06,0.01]
Narcissistic	−0.00	[−0.03,0.02]	−0.00	[−0.03,0.02]	−0.00	[−0.03,0.02]
Avoidant	0.04	[−0.02,0.09]	0.02	[−0.03,0.08]	0.02	[−0.04,0.07]
Dependent	0.03	[−0.09,0.14]	−0.01	[−0.12,0.09]	−0.02	[−0.12,0.08]
Obsessive–compulsive	0.02	[−0.01,0.05]	0.02	[−0.01,0.05]	0.02	[−0.00,0.05]

Note: Sample proportion with a hospital admission = 0.11. All models are estimated with logit and account for survey design with the Stata MP Version 12 survey commands. Coefficients are adjusted risk differences. Risk differences are calculated by first setting the A2 disorder variable to 1 and estimating the probability or risk of the dependent variable, then resetting the A2 disorder variable to 0 and reestimating the risk of the dependent variable. The average estimated risk difference is the mean of the differences in risks. The first set of results applies to a binary measure for any A2 disorder, the second set includes binary measures for 1 A2 disorder and 2 + A2 disorders, and the third set includes all A2 disorders as separate dummy variables. Each cell is from a separate regression.

[†]Specification a adjusts for age, race, ethnicity, birth outside the United States, region of residence, and rural status.

[‡]Specification b adjusts for Specification a variables, household income, marital status, children in the household, education, health insurance, and employment.

[§]Specification c adjusts for Specification b variables, past year A1 disorders, substance use indicators, and doctor-diagnosed chronic conditions.

***$p < .001$; **$p < .01$; *$p < .05$.

ROBUSTNESS CHECKS

Although the NESARC diagnostic algorithm's validity has been established in a range of settings, Trull and colleagues contend that this algorithm may overestimate the prevalence of A2 disorders and develop more restrictive diagnostic rules (Trull et al. 2010). Both algorithms require the respondent to

endorse the requisite number of *DSM-IV* symptoms for the specific disorder. The key difference is that in the Trull algorithm, all symptoms (not just one as in the NESARC algorithm) must cause social or occupational dysfunction. Although fewer respondents are likely to be classified as meeting A2 disorder criteria using the Trull algorithm than the NESARC algorithm, it is not clear which algorithm is better able to capture true A2 disorder status. If disordered persons underreport behaviors used to classify A2 disorders (perhaps due to social desirability concerns), then the Trull algorithm is likely to produce false negatives. Relatedly, the Trull algorithm will miss persons who correctly report that many (but not all) symptoms cause social or occupational dysfunction. Disordered persons may have made choices in their work and personal relationships, and other aspects of their life to avoid problematic situations. Thus, it is reasonable to expect that a truly disordered person will not report substantial dysfunction for all symptoms. Alternatively, the NESARC algorithm may classify persons with subclinical behaviors as meeting the A2 disorder criteria. However, our objective here is not to estimate disorder prevalence but to understand the association between A2 disorders and health care utilization. What is relevant for our study is whether, and to what extent, measurement error in A2 disorder classification leads to biased estimates. Both forms of measurement error described above (underdiagnosis and overdiagnosis) should lead to a conservative estimate of the association between A2 disorders and health care utilization. As a sensitivity check, we classify A2 disorders using the Trull algorithm and reestimate all models. The prevalence of any A2 disorder using the Trull algorithm is substantially lower than the prevalence estimates using NESARC criteria: 8.5 percent among men and 7.4 percent among women. Nevertheless, the estimated associations are consistent in sign and statistical significance, although as expected, the coefficient estimates are larger in magnitude.

Returning to the core findings presented earlier, we identify the strongest associations between health care utilization and antisocial and borderline disorders. To explore potential mediating mechanisms in the associations of these A2 disorders with high-cost health care utilization, we augment Specification c that controls for the 10 individual A2 disorder indicators with indicator variables for having a usual source of care, a suicide attempt, and an unintended injury in the past year. We include these variables as proxies for disregard for personal safety and health, violent behavior, and self-injury. The associations between antisocial and borderline disorders and health care utilization are attenuated in the augmented specifications, and in the case of the relationship between antisocial disorder and ED episodes among women

become indistinguishable from zero. These results suggest that disregard for personal safety and health, violent behavior, and self-injury may indeed be mechanisms through which these A2 disorders influence health care utilization.

A concern with longitudinal data such as the NESARC is nonrandom attrition. Respondents who attrite between Wave I and Wave II may be inherently different from respondents who complete both waves. Such nonrandom attrition can lead to biased estimates. In all analyses, we apply NESARC survey weights, which are designed to correct for nonrandom attrition. We examine the possibility of remaining nonrandom attrition bias by comparing prevalence rates of the seven A2 disorders collected in Wave I between respondents who (1) attrited between Waves I and II and (2) completed both waves. We find comparable A2 prevalence rates for all seven disorders between these two groups, suggesting that nonrandom attrition is unlikely to be an important source of bias. As an additional check, we reestimate our models (again focusing on the seven A2 disorders measured in Wave I) using the sample of respondents who (1) completed Wave I only and (2) completed both waves. The findings are robust across these samples and further support our assumption that nonrandom attrition is not a serious concern.

DISCUSSION

This study investigates the associations between A2 disorders and two measures of high-cost health care utilization—ED episodes and hospital admissions—using the NESARC. Our study is the first to quantitatively document the potential effects of A2 disorders, a prevalent and understudied class of psychiatric conditions that lead to social dysfunction, on health care utilization in a large and nationally representative sample. Our findings show that persons affected by A2 disorders are at elevated risk for ED episodes and hospital admissions. These associations are attenuated but remain statistically significant after adjusting for a rich set of covariates, including A1 disorders. This pattern of results suggests that personal characteristics and A1 disorders may represent pathways through which A2 disorders lead to increased health care utilization. Borderline disorder demonstrates the strongest associations with health care utilization among both men and women, whereas antisocial disorder is a strong risk factor for women.

This study has several limitations that must be considered when interpreting the findings. First, the NESARC dataset does not contain information

on all important patterns of health care utilization (e.g., prevention, outpatient), so we are not able to provide a broad analysis of the associations between all types of health care utilization and A2 disorders. Second, because our A2 disorder measures are based on self-reported survey data rather than clinician diagnoses, we cannot definitively rule out the possibility that these variables are measured with error. Another limitation pertains to potential bias from structural (i.e., reverse causality) or statistical (i.e., omitted variables) endogeneity. However, A2 disorders are determined early in life and are stable across time, thus reverse causality is unlikely. We control for a comprehensive list of personal characteristics and comorbidities, and thus minimize concerns of omitted variable bias.

Our results are timely, as rapidly escalating health care costs have generated policy debates in the United States. For example, the average annual per capita national health care expenditures were $147 in 1960 and by 2010 this number grew to $8,402 (Centers for Medicare & Medicaid Services Office of the Actuary 2010). Containing health care costs is crucial to the long-term solvency of publicly provided health insurance programs such as Medicare and Medicaid. The need for current and accurate information on health care cost containment is urgent. Reducing unnecessary ED episodes and hospital admissions is a prudent strategy to slow the growth of overall health care costs. Through this research, we demonstrate that A2 disorders in general, and antisocial and borderline disorder specifically, are significant risk factors for high-cost health care utilization. Consequently, health policy makers should consider tailoring health interventions to the specific features of A2 disorders. Substance treatment providers have adopted this strategy and have improved treatment outcomes for patients affected by A2 disorders (Ekleberry 2009).

Based on our findings, borderline disorder displays the strongest associations with hospital admissions and ED visits for both men and women. Although all A2 disorders are notoriously difficult to treat, borderline may be the most responsive condition. A set of studies that relies on small convenience samples find that dialectical behavioral therapy (DBT), a form of talk therapy, can lead to improved social functioning among persons affected with borderline disorder (Bohus et al. 2004; Kroger et al. 2006; Linehan et al. 2006). Thus, if health care providers diagnose borderline or other A2 disorders, perhaps DBT or some other evidence-based treatment could be initiated to address both the A2 disorders and related health care utilization.

In summary, we offer new information on the associations between A2 disorders, ED episodes, and hospital admissions. Building on previous

research from the clinical literature, our findings offer further justification for investments in efficacious A2 disorder treatments. Health care providers, employers, and policy makers should consider the elevated risk of health care utilization among persons affected with A2 disorders when considering strategies to contain health care costs.

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Disclosures: None.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.

Table A1: Brief Description of Axis II Disorders.

Table A2: Weighted Prevalence of Socio-Demographic Characteristics by A2 Disorder Status, Adult Women and Men in the NESARC.