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The lifetime impact of attention-deficit hyperactivity disorder: Results from the National Epidemiologic Survey on Alcohol and Related Conditions

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Abstract

Background—To presents nationally representative data on the lifetime independent association between attention deficit hyperactivity disorder (ADHD) and psychiatric comorbidity, correlates, quality of life and treatment-seeking in the United States.

Method—Data were derived from a large national sample of the US population. Face-to-face surveys of more than 34,000 adults ages 18 years and older residing in households were conducted during the 2004-2005 period. Diagnoses of ADHD, axis I and II disorders were based on the Alcohol Use Disorder and Associated Disabilities Interview Schedule-DSM-IV Version.

Results—ADHD was associated independently of the effects of other psychiatric comorbidity with increased risk of bipolar disorder, generalized anxiety disorder, post-traumatic stress disorder (PTSD), specific phobia and, narcissistic, histrionic, borderline, antisocial, and schizotypal personality disorders. A lifetime history of ADHD was also associated with increased risk of engaging in behaviors reflecting lack of planning and deficient inhibitory control, with high rates of adverse events, lower perceived health, social support and higher perceived stress. Fewer than half of individuals with ADHD had ever sought treatment, and about one quarter had ever received medication. The average age of first treatment contact was 18.40 years.

Conclusions—ADHD is common and associated with a broad range of psychiatric disorders, impulsive behaviors, greater number of number of traumas, lower quality of life, perceived social support and social functioning, even after adjusting for additional comorbidity. When treatment is sought, it is often in late adolescence or early adulthood, suggesting the need to improve diagnosis and treatment of ADHD.

Attention-deficit hyperactivity disorder (ADHD), characterized by inattention, hyperactivity and impulsivity, is one of the most common childhood-onset psychiatric disorders (Centers for Disease Control and Prevention (CDC)., 2010; Merikangas *et al.* 2010). It is associated

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with increased rates of family conflict, poor peer relationships (Able *et al.* 2007; Barkley *et al.* 2006), unintentional injuries or trauma (Barkley *et al.* 1993; Swensen *et al.* 2004), impaired driving, substance use disorders, low educational achievement, decreased work performance (Kessler *et al.* 2009; Mannuzza *et al.* 1993), and high health-care costs (Leibson *et al.* 2001; Meyers *et al.* 2010). Impairing symptoms of ADHD may persist into adulthood in as many as 65% of cases (Faraone *et al.* 2006a). The persistence of ADHD suggests that the impact of the disorder goes often beyond childhood and adolescence, and that most health care professionals, not only pediatricians and child psychiatrists, are likely to encounter individuals with ADHD in their clinical practice.

Despite the public health importance of ADHD, several key areas remain understudied. For example, prior studies have shown that individuals with ADHD are at an increased risk for substance use disorders (Biederman *et al.* 2006b; Elkins *et al.* 2007) and other psychiatric disorders (Biederman *et al.* 1991; Biederman *et al.* 2006b; Elkins *et al.* 2007; Kessler *et al.* 2006). However, to date, no study has examined which psychiatric disorders are independently associated with ADHD and for which the association disappears after controlling for other disorders. Furthermore, although the comorbidity of ADHD with Axis I disorders has been extensively documented, no community study has investigated the association between ADHD and personality disorders or the extent to which comorbidity contributes to explain the levels of disability (Biederman *et al.* 2006a; Fayyad *et al.* 2007) and poor social functioning (Able *et al.* 2007; Barkley *et al.* 2006) consistently documented in individuals with ADHD.

The relationship between ADHD and impulsive behaviors is also poorly understood. Clinical studies have indicated that ADHD often co-occurs with behaviors characterized by lack of planning or deficient inhibitory control (Barkley, 1997; Swanson, 2003), such as reckless driving (Barkley *et al.* 1993; Fried *et al.* 2006), and gambling problems (Faregh and Derevensky, 2010). However, whether those associations extend to individuals in the general population is unknown (Froehlich *et al.* 2007).

There is also scarce information regarding treatment-seeking patterns among individuals with ADHD. The National Comorbidity Study Adolescent Supplement (NCS-A) found that 59.8% of individuals with attention-deficit/hyperactivity disorder had sought treatment for ADHD at the time of the survey (Merikangas *et al.* 2011). However, because its age range is 13 to 18 years, its results cannot be extrapolated to adults. By contrast, the National Comorbidity Survey Replication (Kessler *et al.* 2006), which focuses exclusively on adults, found that 25.2% of the respondents had received treatment for ADHD during the last year, but did not provide information on lifetime cumulative treatment rates, which are important to evaluate unmet treatment needs (Biederman *et al.* 2006b; Fayyad *et al.* 2007; Kessler *et al.* 2006).

The goal of this study was to fill these gaps in knowledge of adult ADHD by drawing on data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), a large representative sample of the United States adult population. Our goals were to: 1) investigate independent associations between ADHD and comorbid psychiatric disorders controlling for other Axis I and Axis II comorbid disorders; 2) examine the associations between ADHD and impulsive behaviors; 3) compare quality of life, perceived health, level of social support and stress among individuals with and without ADHD; and 4) estimate rates of treatment-seeking among individuals with ADHD.

METHOD

The National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) (Grant *et al.* 2004b; Grant *et al.* 2009) was the source of data. The NESARC target population at Wave 1 was the civilian non-institutionalized population 18 years and older residing in households and group quarters. Blacks, Hispanics, and adults 18-24 were oversampled, with data adjusted for oversampling, household- and person-level non-response. Interviews were conducted by experienced lay interviewers with extensive training and supervision (Grant *et al.* 2004b; Grant *et al.* 2009). All procedures, including informed consent, received full ethical review and approval from the U.S. Census Bureau and U.S. Office of Management and Budget. After excluding respondents who were ineligible for Wave 2 (e.g., deceased), 34,653 respondents were re-interviewed, and sample weights were developed to additionally adjust for Wave 2 non-response. Weighted data were then adjusted to be representative of the civilian population of the United States on socioeconomic variables based on the 2000 Decennial Census (Grant *et al.* 2009).

Diagnostic Assessment

Sociodemographic measures included age, sex, race/ethnicity, nativity, and marital status. Socioeconomic measures included education, insurance type, employment status and individual income.

The diagnostic interview was the Alcohol Use Disorder and Associated Disabilities Interview Schedule—DSM-IV Version (AUDADIS-IV (Grant *et al.* 2007a)) Wave 2 version (Grant *et al.* 2007b), a valid and reliable fully structured diagnostic interview designed for use by professional interviewers who are not clinicians.

ADHD was assessed at the Wave 2 of the NESARC, responders were asked the symptoms of DSM-IV ADHD. Consistent with DSM-IV, lifetime and childhood AUDADIS-IV diagnoses of ADHD required the respondent to meet the DSM-IV symptom thresholds. Subtypes were included as well, accordingly to the DSM-IV definition. Twenty symptom items operationalized the 18 ADHD criteria. Symptoms had to be present for at least 6 months, have onset before the age of 18 and interfere significantly with social, school, or work functioning. The age of onset criterion was increase to 18 years old, as endorsed by the DSM-V ADHD committee (Faraone *et al.* 2006b; Kieling *et al.* 2010). Test-retest reliability for ADHD was good (k=0.71) (Ruan *et al.* 2008). Internal consistency reliability of the ADHD symptom items (Cronbach's α =0.89) was excellent (Ruan *et al.* 2008).

Mood disorders assessed by the AUDADIS included DSM-IV major depressive disorder (MDD), dysthymia, and bipolar I and II disorder. Anxiety disorders included DSM-IV panic disorder, social anxiety disorder, specific phobias, generalized anxiety disorder (Williams *et al.* 2003) and posttraumatic stress disorder (PTSD). Personality disorders assessed on a lifetime basis at Wave 1 and included avoidant, dependent, obsessive-compulsive, paranoid, schizoid, histrionic and antisocial personality disorders. Borderline, schizotypal and narcissistic personality disorders were measured at Wave 2. AUDADIS-IV methods to diagnose these disorders are described in detail elsewhere (Grant *et al.* 2006; Hasin *et al.* 2005). Test–retest reliabilities for AUDADIS-IV mood, anxiety, impulsive and personality disorders in the general population and clinical settings were fair to good (k=0.40–0.77) (Canino *et al.* 1999; Grant *et al.* 2003; Petry *et al.* 2005; Ruan *et al.* 2008). Convergent validity was good to excellent for all affective, anxiety, and personality diagnoses (Compton *et al.* 2005; Grant *et al.* 2003; Grant *et al.* 2004a; Grant *et al.* 2005; Grant *et al.* 2006; Hasin *et al.* 2005; Ruan *et al.* 2008), and selected diagnoses showed good agreement (k =0.64–0.68) with psychiatrist reappraisals (Canino *et al.* 1999).

Extensive AUDADIS-IV questions covered DSM-IV lifetime prevalence and 12-month incidence diagnoses for alcohol and drug-specific abuse and dependence for 10 classes of substances. The good to excellent (k=0.70–0.91) test–retest reliability of AUDADIS-IV substance use disorder diagnoses has been documented in clinical and general population samples (Canino *et al.* 1999; Chatterji *et al.* 1997; Grant *et al.* 1995; Grant *et al.* 2003; Hasin *et al.* 1997; Ruan *et al.* 2008). Convergent, discriminant and construct validity of AUDADIS-IV substance use disorder criteria and diagnoses were good to excellent (Hasin and Paykin, 1999; Hasin *et al.* 1990; Hasin *et al.* 2003), including in the World Health Organization/National Institutes of Health International Study on Reliability and Validity (Cottler *et al.* 1997; Hasin *et al.* 1997; Pull *et al.* 1997; Room *et al.* 1996) where clinical reappraisals documented good validity of DSM-IV alcohol and drug use disorder diagnoses (k=0.54–0.76). Consistent with DSM-IV, 'primary' AUDADIS-IV diagnoses excluded disorders that were substance-induced or due to general medical conditions. Furthermore, diagnoses of MDD ruled out bereavement.

Impulsive behaviors and lifetime trauma

Behaviors reflecting deficits in executive functions, such as lack of planning and deficient inhibitory control, were also examined. Specifically, the study queried about problems with gambling and spending too much money, reckless driving, quitting jobs without knowing what to do next and having sudden changes in personal goals or career plans. Questions came from the borderline and antisocial personality disorder modules of the AUDADIS-IV, both of which have good reliability (k =0.71 and k=0.67, respectively) (Ruan *et al.* 2008).

As part of the post-traumatic stress disorder (PTSD) diagnostic module, all NESARC respondents were asked if they ever experienced any of the 23 traumatic events described during the interview. Lifetime trauma exposure was measured as the number of traumatic events the respondent experienced.

Last 12 months perceived health, social support and stress

Perceived general health during the last 12 months was assessed using the Short Form 12 version 2 (Ware *et al.* 2002) (Ware *et al.* 2002), a reliable and valid measure of disability used in population surveys, which includes the physical component summary, social functioning scale, role emotional scale, and mental health scale (Ware *et al.* 2002). Low social support during the last 12 months was assessed using the Interpersonal Support Evaluation List (ISEL-12), a 12-item scale designed to measure social support (Cohen *et al.* 1997). The Perceived Stress Scale-4 (PSS-4) assesses the individual propensity to perceive an event as stressful, based on the individual's locus of control and self efficacy (Cohen and Williamson, 1988). Higher values indicate greater likelihood to perceive events as stressful and lower sense of self-efficacy.

Treatment history

Respondents were classified as receiving lifetime treatment if they: (1) visited a doctor, counselor, therapist or psychologist to get help for ADHD; or (2) were prescribed medications to alleviate symptoms related to ADHD. Respondents receiving treatment were also asked the age at which they first sought treatment.

Statistical analyses

Weighted percentages and means were computed to derive sociodemographic and clinical characteristics of respondents with and without a lifetime diagnosis of ADHD. Logistic regression yielded odd ratios (ORs), indicating measures of association between a lifetime diagnosis of ADHD and sociodemographic characteristics, lifetime and 12 months

comorbidity, associated impulsive behaviors, and adverse outcomes. Two sets of logistic regressions, yielding adjusted ORs (AORs) were conducted to examine each outcome (e.g., comorbid psychiatric disorders, associated lifetime number of trauma). The first set adjusted only for sociodemographic characteristics that differed between individuals with and without a lifetime history of ADHD. The second set further adjusted for the presence of other comorbid psychiatric disorders that differed between individuals with and without a lifetime history of ADHD to identify the independent contribution of ADHD to the outcome of interest (e.g., associated impulsive behaviors).

Because the combined SE of two means (or percents) is always equal to or less than the sum of the standard errors of those two means, in our analyses we conservatively consider that two confidence intervals (CIs) whose values do not overlap differ significantly from one another (Agresti, 2002). We consider significant odds ratios those whose CI does not include 1. Standard errors and 95% CIs for all analyses were estimated by using SUDAAN (Research Triangle Institute, 2004), to adjust for the design effects of the NESARC.

RESULTS

Sociodemographic and Socioeconomic Characteristics (Table 1)

The overall lifetime prevalence of the combined subtype of ADHD was 2.51% (CI=2.28-2.76). The odds of ADHD were significantly lower in women than in men (OR =0.64, CI=0.54-0.75) and in Blacks (OR =0.62, CI= 0.48-0.79), Hispanics (OR =0.66, CI= 0.50-0.86), and Asian Americans (OR =0.34, CI= 0.17-0.69) than among whites. Being U.S.-born, never married, or in the youngest cohort (ages 18–29) increased the risk for ADHD. The risk of ADHD was inversely related to age and to individual and family income.

Lifetime and 12-month comorbidity (Table 2)

Most individuals with a lifetime history of ADHD (94.98%) had a lifetime history of at least one psychiatric diagnosis, compared to 64.54% in non-ADHD (OR =10.40, CI=7.07-15.30). Individuals with ADHD were significantly more likely than those without ADHD to have a lifetime Axis I disorder (OR =7.73, CI=5.70-10.50) and a personality disorder (OR =6.56, CI=5.52-7.79). All psychiatric disorders, with the exception of alcohol abuse, were significantly associated with ADHD. The strongest associations were with borderline personality disorder (OR=9.32, CI=7.73–11.22), schizotypal personality disorder (OR=8.07, CI=6.58–9.91), dependent personality disorder (OR=8.79, CI=5.34–14.46) and bipolar disorder (OR=7.60, CI=6.24–9.25). A similar pattern was observed when 12-month, rather than lifetime diagnoses of axis I disorders, were examined (supplemental online material). Most individuals with a lifetime history of ADHD (71.84%) had at least one psychiatric diagnosis during the last 12 months, compared to 33.12% in non-ADHD (OR =5.15, CI=4.24-6.26).

After adjusting for sociodemographic characteristics, all associations were reduced but maintained significant. However, after further adjusting for other comorbid psychiatric disorders, only the associations with lifetime and 12-month alcohol dependence, bipolar disorder, specific phobia, PTSD, GAD, psychotic disorder, schizotypal, narcissistic, borderline, histrionic and antisocial personality disorder remained positive and statistically significant. ADHD was negatively and significantly associated with schizoid personality disorder and dysthymia. All other associations were no longer significant.

Impulsive behaviors and number of traumas (Table 3)

The prevalence of behaviors reflecting lack of planning and deficient inhibitory control was higher among individuals with ADHD than those without ADHD. Individuals with ADHD were more likely to develop lifetime problems with gambling or spending too much money (OR=4.95, CI=3.98–6.17), to drive recklessly (OR=2.81, CI=2.22–3.55), to frequently quit a job without knowing what to do next (OR=4.82, CI=4.02–5.78), and to experience many sudden changes in personal or career goals (OR=4.55, CI=3.75–5.51). After adjusting for sociodemographic and comorbid disorders, all associations remained significant.

Individuals with ADHD had a significantly greater number of lifetime traumatic events than individuals without ADHD. This difference maintained significance after adjusting for sociodemographic and comorbidity.

Perceived health, social support and stress (Table 4)

Individuals with ADHD had significantly lower scores on the SF-12 physical, social, emotional, and mental subscales. They scored significantly higher on the PSS-4 ($t= 13.15$, $p <0.0001$) and significantly lower on the ISEL-12 than individuals without ADHD ($t= -6.50$, $p <0.0001$). All differences remained significant after adjusting for sociodemographic characteristics and comorbidity.

Lifetime treatment history (Table 5)

The lifetime rate of treatment seeking for ADHD was 44.02% (CI= 39.97-48.14) and the average age for first treatment seeking was 18.40 years. Counseling and psychotherapy was received by 41.07% of the sample (CI=37.11%-45.14%), with an average age for first treatment of 18.65 years. Only 27.61% (CI=23.93%-31.62%) were prescribed medication to treat ADHD. The average age of first treatment for medication was 20.63 years of age.

DISCUSSION

In a large, nationally representative sample of US adults, individuals with a lifetime history of ADHD had an increased prevalence of all psychiatric disorders, even after adjusting for sociodemographic characteristics. However, after adjusting for other comorbid disorders ADHD was independently associated only with increased risk of bipolar disorder, narcissistic, histrionic, borderline, antisocial, schizotypal personality disorder, GAD, PTSD, and specific phobia. Furthermore, after adjusting for comorbidity, individuals with a lifetime history of ADHD had a significantly higher tendency to engage in behaviors reflecting lack of planning and deficient inhibitory control, and to experience high rates of adverse consequences, including trauma. ADHD was also associated with significantly lower perceived health, social support and higher stress. Although lifetime treatment rates for ADHD were 44.02%, the average age of first treatment contact was 18.40 years of age, suggesting that ADHD was undertreated in this cohort.

Consistent with previous findings (Kessler *et al.* 2006), our unadjusted analyses showed that ADHD was associated with a broad range of lifetime Axis I disorders (Fayyad *et al.* 2007; Kessler *et al.* 2006). Consistent with clinical studies (Miller *et al.* 2008), we also found extensive comorbidity with Axis II disorders, which had not been previously examined in national, community samples. After adjusting for other comorbid disorders, individuals with ADHD had higher rates of bipolar disorder, cluster B personality disorders, GAD and PTSD. The higher than expected rate of co-occurrence between ADHD and bipolar disorder has been previously noted across different ages in clinical samples (Nierenberg *et al.* 2005; Singh *et al.* 2006), and is consistent with the documented genetic (Faraone *et al.* 2001), neuroanatomical (Biederman *et al.* 2008a), and cognitive-style commonalities between both

disorders (Doyle *et al.* 2005). Previous studies also documented an association between childhood ADHD and cluster B personality disorders (Bernstein *et al.* 1996; Miller *et al.* 2008), clinical studies of ADHD adults have documented higher levels of neuroticism (Jacob *et al.* 2007), novelty seeking and harm avoidance (Faraone *et al.* 2009; Jacob *et al.* 2007), and reward dependence (Faraone *et al.* 2009). Although the association with cluster B personality disorders may be partly due to overlapping diagnostic criteria, the disorders may also co-occur because of common temperamental traits (Anckarsater *et al.* 2006), or exposure to common environmental risk factors such as adverse early experiences with fear or anger (Lara *et al.* 2006). The high rates of GAD may be a consequence of the increasing difficulties adapting to the psychosocial environment due to impairments in executive functions (Faraone *et al.* 2000). Furthermore, individuals with ADHD are exposed to higher risks of accidents and major life events (Barkley, 2002; Barkley *et al.* 2006), which in turn may explain the high rates of PTSD.

After adjusting for comorbidity, individuals with ADHD did not have higher rates of substance use disorders. Prior studies that have assessed the effect of psychiatric comorbidity of the association between ADHD and SUD, with highly variable methods and sample sizes, focused mostly on oppositional defiant and conduct disorders (August *et al.* 2006; Barkley *et al.* 1990; Biederman *et al.* 2001; Biederman *et al.* 2008b; Burke *et al.* 2001; Elkins *et al.* 2007; Molina *et al.* 2007). Results have been contradictory, leaving unanswered the question of whether the association with ADHD with subsequent SUD is independent or mediated by comorbidity with oppositional defiant or conduct disorders. Our results seem to support the hypothesis that the association between ADHD and substance use disorders is mediated by comorbidity with other externalizing disorders, such as oppositional defiant or conduct disorders. It also provides new evidence suggesting that, at least in some cases, the association between ADHD and SUD may be mediated by anxiety disorders, which were highly comorbid with ADHD in our sample.

The mediating effect of comorbidity on the association between ADHD and SUD may have important clinical implications. Pharmacological treatment of ADHD appears to reduce the risk of developing substance use disorders (Faraone and Wilens, 2003; Wilens *et al.* 2003). This may be due to the improvement of ADHD symptoms or possibly through other mechanism, such as improvement of mood (Candy *et al.* 2008), suggesting the potential efficacy of medications other than stimulants, or even psychotherapy, in preventing the development of SUD in individuals with ADHD. The association between SUD and different ADHD subtypes and symptoms may be mediated by different comorbid disorders (Lee *et al.* 2011). Alternatively, different comorbid conditions may predict SUD based on their shared risk factors (i.e. disruptive parental style, trauma history) (Lee *et al.* 2011). Future studies should seek to examine the pathways linking different conditions to the development of SUD associated with ADHD in order to tailor subjective preventive interventions. Because it is possible that our results from the general population may differ from those in clinical samples, which typically ascertain patients with greater severity, future work in clinical samples needs to determine if the association between ADHD and SUD can be accounted for by comorbid conditions.

Individuals with ADHD were more likely than those without ADHD to engage in a variety of impulsive behaviors such as spending too much money and experiencing gambling problems (Faregh and Derevensky, 2010), reckless driving (Barkley *et al.* 1993; Fried *et al.* 2006) or quitting a job without knowing what to do next. Because the results held after adjusting for comorbidity, they indicate that these impulsive behaviors are independently associated with ADHD. ADHD shares with impulse control disorders difficulties delaying rewards (Sonuga-Barke *et al.* 2003), as well as decision-making styles predisposing to risk-taking choices. The high rates of impulsive behaviors (Barkley, 2002), lack of attention

(Barkley *et al.* 2002), or deficient inhibitory control among individuals with ADHD may also help explain their greater risk of trauma.

Our study found that less than half of individuals with ADHD ever sought treatment, and only about one quarter ever received medication. These rates are slightly lower than those reported by the NCS-A, which focused on adolescents (Merikangas *et al.* 2010), but consistent with the 12-month treatment rates from the National Comorbidity Survey Replication, which also focused on adults (Kessler *et al.* 2006). Overall, these results document important unmet needs for individuals with ADHD. An important, novel finding of our study was that the mean age among those who sought treatment was over 18 years. ADHD is traditionally thought of as a disorder of childhood and adolescence generally treated by child psychiatrists and psychologists (Faraone *et al.* 2006a). Because our findings suggest that symptoms of ADHD often persist beyond adolescence, they suggest a need for primary care doctors and mental health professionals working with adults to become familiar with the diagnoses and current treatments for ADHD. Many of these professional may be currently unfamiliar with the evidence-based assessment and treatment of patients with ADHD (Epstein *et al.* 2008).

Our study has the limitations common to most large-scale surveys. First, the diagnosis of ADHD was endorsed directly by the subject, without additional support from a caregiver, spouse or parent. Studies that rely on information provided by informants are associated with significantly higher ADHD prevalence rates than those based on information provided only by the patient (Polanczyk *et al.* 2007). This may help explain, at least partially, the lower ADHD prevalence of the present study compared to the 4.4% estimated prevalence of the National Comorbidity Survey Replication (Kessler *et al.* 2006). Second, ADHD was assessed only at Wave 2. Therefore, longitudinal studies are needed to examine prospectively the course of ADHD in the general population. Third, because the NESARC sample included only civilian households, information was unavailable on individuals in prison, who have higher rates of ADHD (Rosler *et al.* 2004). Forth, the NESARC did not include assessment of eating disorders, which have been associated with ADHD (Cortese *et al.* 2007). Fifth, the NESARC sample includes individuals with ADHD onset as late as at 18 years of age, which is not in strict agreement with the DSM-IV definition, although the group revising ADHD diagnostic criteria will likely increase the age at onset into adolescence (Kieling *et al.* 2010). Furthermore, age of onset may moderate some of the associations examined (e.g. with measures of quality of life and comorbid disorders).

In summary, our results indicate that ADHD is common and associated with a broad range of psychiatric disorders, impulsive behaviors, and greater number of number of traumas, even after adjusting for additional comorbidity. Less than half of individuals with ADHD seek treatment during lifetime and when treatment is sought, it is often in late adolescence or early adulthood. Improving the diagnoses and treatment of ADHD may help decrease its burden on individuals, their families and society at large.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Sociodemographic and Socioeconomic Characteristics of individuals with and without ADHD in the NESARC[a]

	ADHD			General Population			OR[b]		
	N=807; 2.51%			N=33,846; 9.49%					
	%	CI		%	CI		OR	CI	
Sex									
Male	58.69	54.69	62.57	47.64	46.96	48.32	1.00	1.00	1.00
Female	41.31	37.43	45.31	52.36	51.68	53.04	0.64	**0.54**	**0.75**
Race/Ethnicity									
White	78.60	74.69	82.05	70.71	67.51	73.73	1.00	1.00	1.00
Black	7.67	5.98	9.79	11.14	9.87	12.54	0.62	**0.48**	**0.79**
Native American	3.60	2.23	5.75	2.15	1.83	2.53	1.50	0.93	2.43
Asian	1.64	0.77	3.44	4.34	3.40	5.52	0.34	**0.17**	**0.69**
Hispanic	8.49	6.23	11.46	11.66	9.47	14.27	0.66	**0.50**	**0.86**
Nativity									
US-born	94.63	92.62	96.11	85.92	82.89	88.48	1.00	1.00	1.00
Foreign-born	5.37	3.89	7.38	14.08	11.52	17.11	0.35	**0.26**	**0.47**
Age									
18-29	30.54	26.34	35.09	15.97	15.35	16.62	1.00	1.00	1.00
30-44	33.59	29.56	37.88	29.64	28.91	30.37	0.59	**0.47**	**0.75**
45-64	31.82	27.74	36.20	34.68	34.05	35.33	0.48	**0.37**	**0.62**
65+	4.05	2.79	5.83	19.71	19.01	20.42	0.11	**0.07**	**0.16**
Education									
less than high school	16.34	13.09	20.23	13.96	13.08	14.89	1.27	0.97	1.67
high school graduate	29.71	25.90	33.82	27.43	26.37	28.51	1.18	0.96	1.44
some college or higher	53.95	49.35	58.48	58.61	57.34	59.87	1.00	1.00	1.00
Individual income									
$0-19,999	20.93	17.78	24.48	41.95	40.83	43.07	1.00	1.00	1.00
$20,000-34,999	5.90	3.97	8.67	23.15	22.45	23.86	0.76	**0.62**	**0.93**

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	ADHD			General Population			OR[b]		
	N=807; 2.51%			N=33,846; 9.49%					
	%	CI		%	CI		OR	CI	
$35,000-69,999	51.50	47.36	55.63	24.38	23.61	25.17	0.70	**0.56**	**0.88**
$70,000+	21.67	18.74	24.91	10.52	9.66	11.45	0.46	**0.30**	**0.70**
Family income									
$0-19,999	28.39	24.73	32.35	19.37	18.46	20.32	1.00	1.00	1.00
$20,000-34,999	19.87	16.84	23.30	18.86	18.17	19.58	0.72	**0.57**	**0.91**
$35,000-69,999	28.49	24.88	32.39	32.29	31.49	33.11	0.60	**0.49**	**0.75**
$70,000+	23.25	19.63	27.32	29.47	28.01	30.96	0.54	**0.42**	**0.69**
Marital status									
married, living with someone as if married	54.92	50.52	59.25	64.02	63.04	64.98	1.00	1.00	1.00
widowed, divorced or separated	19.02	16.06	22.37	18.86	18.33	19.40	1.18	0.94	1.48
never married	26.06	22.55	29.90	17.12	16.23	18.06	1.77	**1.44**	**2.19**

[a] Figures in bold face are significant at $p < 0.05$.

[b] OR=Odd Ratios

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Table 2

Lifetime psychiatric comorbidity of individuals with and without ADHD in the NESARC[a]

	ADHD			General Population											
	N=807; 2.51%			N=33,846; 97,49%											
	%	CI		%	CI		OR[b]	CI		AOR[c]	CI		AOR[d]	CI	
Any psychiatric	94.98	92.78	96.54	64.54	63.22	65.84	10.40	7.07	15.30	7.57	5 15	11.13	**7.57**	**5.15**	**11.13**
Any Axis I disorder	92.64	90.22	94.50	61.95	60.52	63.36	7.73	5.70	10.50	5.59	4.13	7.58	**3.24**	**2.35**	**4.47**
Any substance use disorders	71.68	67.30	75.68	44.45	42.88	46.03	3.16	2.60	3.85	2.16	1.75	2.67	1.22	0.98	1.53
Nicotine Dependence	44.82	40.49	49.24	22.57	21.55	23.61	2.79	2.35	3.31	1.91	1 60	2.28	0.92	0.74	1.14
Any alcohol use disorder	57.01	52.30	61.60	33.97	32.48	35.49	2.58	2.14	3.11	1.87	1.53	2.29	0.88	0.71	1.10
Alcohol abuse	18.08	14.86	21.82	19.33	18.31	20.39	0.92	0.72	1.17	0.78	0.61	1.00	0.84	0.66	1.07
Alcohol dependence	38.93	34.76	43.28	14.64	13.91	15.40	3.72	3.11	4.44	2.48	2.04	3.01	1.24	1.00	1.55
Any drug use disorder	35.68	31.87	39.67	11.39	10.74	12.09	4.31	3.65	5.10	2.75	2.29	3.30	1.19	0.95	1.49
Drug abuse	27.88	24.48	31.56	9.70	9.12	10.32	3.60	3.01	4.30	2.30	1.89	2.79	1.10	0.87	1.40
Drug dependence	15.16	12.30	18.55	3.07	2.78	3.39	5.65	4.44	7.19	3.35	2.61	4.31	1.01	0.73	1.38
Any Mood Disorder	60.50	56.41	64.45	23.13	22.36	23.91	5.09	4.27	6.07	4.53	3.77	5.44	**1.97**	**1.50**	**2.59**
Major depressive disorder	26.39	22.73	30.41	16.17	15.55	16.80	1.86	1.51	2.29	1.74	1.40	2.16	0.96	0.72	1.27
Bipolar disorder	33.56	29.37	38.03	6.23	5.88	6.61	7.60	6.24	9.25	5.56	4.49	6.89	**2.47**	**1.87**	**3.25**
Dysthymia	6.09	4.41	8.37	3.36	3.15	3.60	1.86	1.31	2.64	1.72	1.20	2.48	**0.62**	**0.39**	**0.98**
Any anxiety disorder	60.74	56.43	64.90	27.24	26.29	28.21	4.13	3.45	4.95	3.93	3.29	4.71	**1.85**	**1.47**	**2.31**
Panic disorder	22.00	18.89	25.46	7.02	6.62	7.44	3.74	3.05	4.57	3.22	2.62	3.98	1.10	0.81	1.48
Social anxiety disorder	22.82	19.37	26.68	6.62	6.22	7.05	4.17	3.38	5.15	3.39	2.73	4.22	1.12	0.84	1.49
Specific phobia	35.75	31.64	40.08	14.61	13.89	15.36	3.25	2.70	3.92	3.07	2.53	3.71	**1.39**	**1.09**	**1.77**
Posttraumatic stress disorder	21.99	18.55	25.87	6.02	5.68	6.38	4.40	3.52	5.51	4.17	3.30	5.26	**1.84**	**1.37**	**2.48**
Generalized anxiety disorder	25.99	22.34	30.01	7.19	6.77	7.64	4.53	3.69	5.57	4.23	3.41	5.24	**1.42**	**1.05**	**1.93**
Pathological gambling	1.54	0.82	2.88	0.39	0.30	0.49	4.04	2.01	8.12	3.26	1.60	6.65	1.13	0.49	2.58
Conduct disorder	20.23	17.02	23.87	4.27	3.95	4.62	5.68	4.56	7.09	3.62	2.86	4.58	1.20	0.88	1.63
Psychotic disorder	8.81	6.75	11.41	2.97	2.65	3.33	3.16	2.33	4.28	3.14	2.28	4.32	**1.42**	**1.02**	**1.99**
Any personality disorder	62.79	58.59	66.81	20.46	19.72	21.22	6.56	5.52	7.79	5.25	4.40	6.25	**2.82**	**2.25**	**3.54**

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	ADHD			General Population											
	N=807; 2.51%			N=33,846; 97,49%											
	%	CI		%	CI		OR[b]	CI		AOR[c]	CI		AOR[d]	CI	
Avoidant	10.61	8.50	13.16	2.11	1.90	2.34	5.50	4.26	7.11	3.85	2.92	5.06	0.94	0.66	1.33
Dependent	3.06	2.01	4.64	0.36	0.27	0.47	8.79	5.34	14.46	5.41	3.16	9.27	0.89	0.46	1.70
Obsessive-compulsive	19.34	16.17	22.97	7.78	7.35	8.24	2.84	2.28	3.54	2.55	2.04	3.19	0.85	0.63	1.15
Paranoid	14.76	11.98	18.04	4.06	3.76	4.39	4.09	3.20	5.21	3.04	2.34	3.96	0.71	0.51	1.00
Schizoid	9.19	7.14	11.75	2.91	2.67	3.17	3.38	2.55	4.48	2.65	1.98	3.55	**0.65**	**0.45**	**0.95**
Schizotypal	22.42	19.04	26.21	3.46	3.19	3.75	8.07	6.58	9.91	6.10	4.90	7.58	**2.27**	**1.70**	**3.04**
Narcisistic	25.16	21.82	28.83	5.69	5.31	6.10	5.57	4.59	6.76	4.85	3.92	6.01	**2.23**	**1.75**	**2.85**
Borderline	33.69	29.90	37.71	5.17	4.83	5.54	9.32	7.73	11.22	6.83	5.59	8.36	**2.84**	**2.19**	**3.68**
Histrionic	10.74	8.34	13.72	1.57	1.42	1.74	7.54	5.71	9.95	5.25	3.92	7.04	**1.62**	**1.12**	**2.34**
Antisocial	18.86	15.80	22.35	3.46	3.16	3.78	6.49	5.17	8.15	3.98	3.12	5.07	**1.53**	**1.13**	**2.07**

[a] Figures in bold face are significant at $p < 0.05$

[b] OR=Odd Ratios

[c] Adjusted for Sociodemographic characteristics

[d] Adjusted for Sociodemographic characteristics and other psychiatric disorders

Table 3

Impulsive behaviors and number of trauma among individuals with and without ADHD in the NESARC[a]

	ADHD			General Population											
	N=807; 2.51%			N=33,846; 97.49%											
Deficient inhibitory control	**%**	**CI**		**%**	**CI**		**OR[b]**	**CI**		**AOR[c]**	**CI**		**AOR[d]**	**CI**	
Problem with gambling or spending too much money	22.53	19.07	26.40	5.54	5.23	5.87	4.95	3.98	6.17	3.83	3.07	4.78	**1.92**	**1.47**	**2.51**
Reckless driving	25.99	21.88	30.56	11.11	10.38	11.89	2.81	2.22	3.55	2.11	1.66	2.68	**1.32**	**1.02**	**1.72**
Lack of planning															
More than once quitting a job without knowing what to do next	45.49	40.97	50.08	14.75	14.14	15.38	4.82	4.02	5.78	3.39	2.83	4.05	**1.70**	**1.40**	**2.06**
Many sudden changes in personal goals or career plans	26.23	22.78	30.01	7.25	6.90	7.63	4.55	3.75	5.51	3.53	2.88	4.34	**1.63**	**1.30**	**2.06**
	Mean	**S.E.**		**Mean**	**S.E.**		**T score**	**P-value**		**Wald-F test**	**P-value**		**Wald-F test**	**P-value**	
Number of lifetime traumas	5.78	0.15		3.28	0.03		17.29	<0.0001		292.08	<0.0001		100.39	<0.0001	

[a] Figures in bold face are significant at $p < 0.05$

[b] OR=Odd Ratios

[c] Adjusted for Sociodemographic characteristics

[d] Adjusted for Sociodemographic characteristics and other psychiatric disorders

Table 4

Last twelve months perceived health, social support and stress of individuals with and without ADHD in the NESARC

	ADHD		General Population							
	N=807; 2.51%		N=33,846; 97.49%							
	Mean	S.E.	Mean	S.E.	T score	p-value	Wald-F test	p-value[a]	Wald-F test	p-value[b]
SF-12										
Physical component	48.89	0.49	50.29	0.11	−2.94	0.0046	23.41	<0.0001	5.42	**0.0230**
Mental component	45.37	0.51	51.58	0.08	−12.14	<0.0001	132.05	<0.0001	16.85	**0.0001**
Social functioning	46.24	0.49	51.77	0.08	−10.96	<0.0001	122.32	<0.0001	21.31	<**0.0001**
Role emotional	44.83	0.53	49.52	0.09	−8.81	<0.0001	88.21	<0.0001	10.91	**0.0016**
Mental health	45.77	0.52	52.09	0.09	−12.20	<0.0001	130.27	<0.0001	19.24	<**0.0001**
Interpersonal Social Support (ISEL-12)	40.68	0.29	42.58	0.05	−6.50	<0.0001	41.66	<0.0001	11.06	**0.0015**
Perceived Stress Scale – 4 (PSS4)	5.65	0.13	3.82	0.03	13.15	<0.0001	152.78	<0.0001	22.37	<**0.0001**

[a] Adjusted for Sociodemographic characteristics

[b] Adjusted for Adjusted for Sociodemographic characteristics and other psychiatric disorders

Table 5
Lifetime treatment history of individuals with ADHD in the NESARC

Lifetime treatment History	%	CI	
Ever sought any treatment	44.02	39.97	48.14
Ever talking to a therapist for ADHD	41.07	37.11	45.14
Ever taking medication for ADHD	27.61	23.93	31.62
	Mean[a]	S.E.	
First age at any treatment	18.40	0.74	
First age talking to a therapist for ADHD	18.65	0.78	
First age taking medication for ADHD	20.63	1.07	

[a]Among individuals who sought treatment