Gender Differences in Adult Attention-Deficit/Hyperactivity Disorder: Results From the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)

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ABSTRACT

Background: Gaining insight into possible gender differences in the clinical presentation of adults with attention-deficit/hyperactivity disorder (ADHD) is of relevance in order to conduct appropriate screening and treatment interventions in both genders.

Method: The analyses compared (1) prevalence and sociodemographic correlates, (2) frequency of ADHD core symptoms, (3) rates of subtypes, (4) prevalence of comorbid mental health conditions, and (5) rates of risky/impulsive behaviors, as well as health and social correlates, in men and women with ADHD in a nationally representative, US population–based sample. Face-to-face psychiatric interviews were conducted according to *DSM-IV* criteria in 34,653 adults from the US National Epidemiologic Survey on Alcohol and Related Conditions (Wave 2, 2004–2005).

Results: While the prevalence of lifetime ADHD was significantly higher in men than in women (OR = 1.46, 95% CI = 1.22–1.76), the rate of persistent ADHD did not significantly differ across genders (OR = 1.23, 95% CI = 0.96–1.58). Compared to men with persistent ADHD, women with persistent ADHD, despite having lower rates of hyperactive symptoms, presented with similar ADHD subtypes profile and rates of risky behaviors (except for reckless driving), as well as with significantly more anxiety and perceived mental health impairment ($P = .032$). Results were similar when considering lifetime ADHD.

Conclusions: Our findings show that, despite different symptom profiles and comorbidities, men and women have similar rates of current ADHD and of risky behaviors associated with the disorder. Women with ADHD should receive as much attention as their male counterparts.

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Attention-deficit/hyperactivity disorder (ADHD) occurs in about 5% of school-aged children.[1] Impairing symptoms of ADHD persist in as many as 65% of cases in adulthood.[2]

In children, male-to-female ratios in clinical samples range from 9:1 to 6:1, whereas ratios for population-based studies are approximately 3:1.[3] These findings have stimulated research on possible ADHD gender differences. An early meta-analysis[3] found significantly lower levels of hyperactivity, lower rates of externalizing disorders, and greater intellectual impairment in girls than in boys with ADHD. Results were, in part, mediated by referral source. Indeed, rates of inattention, internalizing behaviors, peer aggression, and peers' disliking were significantly lower in girls than in boys in nonclinical, but not in clinic-referred, populations. A subsequent meta-analysis[4] including also studies in adults substantially confirmed these findings. Girls with ADHD might be less likely to be referred to clinics than boys due to lower levels of disruptive behaviors, so that girls seen in treatment clinics would be the most severely affected.[3] Therefore, assessing gender differences within clinic-referred samples is likely to lead to incorrect conclusions regarding the clinical presentation of ADHD in girls.

Results from studies in children may be further inapplicable to adults with ADHD because of developmental processes. Available studies on gender differences in adults with ADHD have been conducted mostly in referred clinical populations and overall show mixed results, although most[5–7] of them failed to find significant gender differences in ADHD clinical features. Similarly to studies in children, the conclusion of these studies may be hampered by referral bias. To our knowledge, there are no published studies on possible gender differences in terms of ADHD symptoms type/severity, comorbid conditions, and correlates in nationally representative community samples of adults with ADHD.

Understanding similarities and differences in adult ADHD clinical presentation is pivotal from a public health standpoint in order to plan and conduct appropriate screening and treatment interventions in both genders. Such research may be of particular relevance to support efforts for the advancement of women's health, since most of the literature in ADHD has focused on men.[4]

To address this gap, we draw on data from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC),[8] a large representative sample of the US adult population. We aimed to compare (1) prevalence and sociodemographic correlates, (2) frequency of ADHD core symptoms, (3) rates of subtypes, (4) prevalence of comorbid

Clinical Points

- Data on possible gender differences in attention-deficit/hyperactivity disorder (ADHD) in terms of symptom type and severity, comorbid conditions, and correlates in nationally representative community samples of adults with ADHD are lacking.
- This study shows for the first time that, despite having different symptom profiles and comorbidities, men and women have similar rates of current ADHD and of risky behaviors associated with the disorder.

mental health conditions, and (5) rates of risky/impulsive behaviors, as well as health and social correlates, in men and women with ADHD. Given the exploratory nature of the study, no a priori hypotheses were formulated.

METHOD

Sample and Procedures

The NESARC[8] target population at Wave 1 (2001–2002) was the civilian noninstitutionalized population 18 years and older residing in households and group quarters[9] (group living arrangements) in the United States. One sample person from each household or group quarters' unit was randomly selected for interview. Blacks, Hispanics, and adults aged 18–24 years were oversampled, with data adjusted for oversampling, household- and person-level nonresponse, since these subgroups have been underrepresented in previous comorbidity surveys in the United States.[10] Interviews were conducted by experienced lay interviewers with extensive training and supervision. All procedures received full human subjects review and approval from the US Census Bureau and US Office of Management and Budget.

The Wave 2 interview (2004–2005) was conducted approximately 3 years later. Excluding ineligible respondents (eg, deceased), the Wave 2 response rate was 86.7%, reflecting 34,653 completed interviews.[11] Participants were ≥ 20 years old. Wave 2 NESARC weights include a component that adjusts for nonresponse, demographic factors, and psychiatric diagnoses to ensure that the Wave 2 sample approximated the target population, that is, the original sample minus attrition between the 2 waves. Adjustment for nonresponse was successful,[11] as the Wave 2 respondents and the original target population did not significantly differ on age, race/ethnicity, gender, socioeconomic status, or presence of any substance, mood, anxiety, or personality disorder. ADHD symptoms were assessed in Wave 2.

Measures

Sociodemographic/socioeconomic variables. Sociodemographic measures included age, sex, race/ethnicity, nativity, education, and individual income.

DSM-IV diagnoses. The Alcohol Use Disorder and Associated Disabilities Interview Schedule-*DSM-IV* Version (AUDADIS-IV) Wave 2 version[12] was used to generate *DSM-IV* diagnoses.

ADHD. As in our previous studies,[13,14] for the diagnosis of ADHD, 6 or more inattention and/or hyperactive symptoms had to be present for at least 6 months (criterion A), be associated with impairment in 2 or more settings (criterion C), and interfere significantly with social, school, or work functioning (criterion D). Screening questions on core ADHD symptoms, if positive, were followed by additional questions to assess all *DSM-IV* criteria. To be consistent with evidence showing validity of late-onset diagnosis and with *DSM-5* ADHD criteria,[15] symptoms had to be present before age 12 years, rather than some symptoms being present before age 7 years as per *DSM-IV* and *DSM-IV-TR*.[16] To assess the age-at-onset criterion, all subjects were asked at which age ADHD symptoms appeared for the first time. Symptom continuity was assessed by a set of questions targeting the timing of symptoms onset and offset. As in a previous study,[14] *persistent ADHD* was defined by the current presence of the aforementioned criteria at Wave 2. *Remitted ADHD* was defined as at least 2 months without symptoms at Wave 2. Lifetime ADHD was calculated by adding the rates of persistent and remitted ADHD. Main ADHD subtypes (corresponding to the *DSM-5* current ADHD "presentations"[15]) were defined as per *DSM-IV* and *DSM-IV-TR*.[16] Test-retest reliability for ADHD was good ($\kappa = 0.71$).[17] Internal consistency of the ADHD symptom items (Cronbach $\alpha = .89$) was excellent.[17]

Other diagnoses. As reported elsewhere,[17,18] the AUDADIS-IV test-retest reliability for other *DSM-IV* diagnoses was fair/good to excellent. Additionally, good to excellent agreement has been reported between the lay-administered AUDADIS and best estimate diagnoses for most diagnoses.[19]

Behavioral correlates. The study queried about lifetime problems with "quitting jobs without knowing what to do next," "gambling or spending too much money," "sudden changes in personal goals or career plans," and "reckless driving." As in a previous study,[13] questions were drawn from the borderline and antisocial personality disorder modules of the AUDADIS-IV. The reliability for borderline personality and antisocial personality disorders were both good ($\kappa = 0.71$ and $\kappa = 0.67$, respectively).[17]

Health and social correlates. Perceived general health during the last 12 months was assessed by using the Short Form-12 Health Survey, Version 2 (SF-12),[20] a reliable and valid measure of disability, which yields a physical component summary as well as social functioning, role emotional, and mental health subscales. 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.[21] Propensity to perceive an event as stressful, based on the individual's locus of control and self-efficacy, was assessed with the Perceived Stress Scale-4.[22]

Statistical Analyses

Weighted percentages, means, and odds ratios (ORs) were computed to derive prevalence, sociodemographic, clinical characteristics, and treatment rates of respondents with and without ADHD stratified by gender. Logistic regression

Table 1. Sociodemographic Characteristics Considering Individuals With Persistent ADHD

	Men With ADHD, n = 178 (53.06%)		Women With ADHD, n = 162 (46.94%)		Men vs Women With ADHD[a]		Non-ADHD Men, n = 14,402 (47.86%)		Non-ADHD Women, n = 19,911 (52.14%)		Men vs Women Without ADHD[a]	
Characteristic	%	95% CI	%	95% CI	OR	95% CI	%	95% CI	%	95% CI	OR	95% CI
Race/ethnicity												
White	76.51	66.16–84.44	82.09	75.69–87.1	…	Reference	71.16	67.87–74.25	70.52	67.32–73.53	…	Reference
Black	4.22	2.40–7.33	7.69	4.43–13.01	0.59	0.26–1.34	10.14	8.9–11.54	11.98	10.63–13.48	**0.84**	**0.78–0.9**
Native American	5.39	2.19–12.66	3.05	1.08–8.30	1.89	0.47–7.70	2.03	1.67–2.46	2.3	1.92–2.75	0.87	0.72–1.06
Asian	2.41	0.59–9.33	0.77	0.20–2.95	3.35	0.46–24.36	4.37	3.32–5.73	4.24	3.33–5.37	1.02	0.86–1.21
Hispanic	11.47	5.79–21.48	6.40	4.18–9.68	1.92	0.85–4.36	12.30	10.04–14.98	10.97	8.81–13.56	**1.11**	**1.03–1.20**
Nativity												
US-born	93.18	85.65–96.90	96.79	93.15–98.5	…	Reference	85.59	82.56–88.17	86.47	83.41–89.03	…	Reference
Foreign-born	6.82	3.10–14.35	3.21	1.47–6.85	2.21	0.72–6.82	14.41	11.83–17.44	13.53	10.97–16.59	1.08	0.99–1.17
Age, y												
18–29	37.76	28.41–48.12	28.86	21.29–37.8	…	Reference	16.81	15.97–17.70	15.56	14.85–16.30	…	Reference
30–44	28.32	20.71–37.41	38.54	30.46–47.30	0.56	0.29–0.29	30.39	29.4–31.41	29.07	28.23–29.93	0.97	0.89–1.05
45–64	32.85	24.60–42.32	28.89	20.73–38.70	0.87	0.42–1.80	35.50	34.51–36.50	33.87	33.13–34.61	0.97	0.9–1.05
≥65	1.07	0.34–3.35	3.71	1.63–8.20	0.22	0.05–1.02	17.29	16.45–18.17	21.51	20.7–22.33	**0.74**	**0.68–0.81**
Education												
Less than high school	16.78	10.23–26.29	10.03	6.32–15.24	2.11	0.96–4.65	14.09	13.14–15.10	13.96	12.94–15.05	1.00	0.91–1.09
High school graduate	35.45	26.81–45.16	29.62	21.74–38.93	1.51	0.83–2.77	27.04	25.73–28.40	27.79	26.75–28.85	0.96	0.91–1.02
Some college or higher	47.77	38.13–57.57	60.36	50.81–69.17	…	Reference	58.87	57.25–60.47	58.25	56.98–59.51	…	Reference
Individual income												
$0–$19,999	46.56	37.00–56.37	71.66	63.30–78.75	…	Reference	27.66	26.36–29.00	55.2	53.9–56.50	…	Reference
$20,000–$34,999	22.40	15.88–30.64	17.89	12.4725.01	**1.93**	**1.01–3.69**	24.54	23.52–25.59	21.86	21.05–22.69	**2.24**	**2.08–2.42**
$35,000–$69,999	24.84	17.45–34.08	8.49	4.29–16.12	**4.50**	**1.84–10.99**	31.07	30.00–32.16	18.21	17.34–19.12	**3.40**	**3.15–3.68**
≥$70,000	6.20	2.47–14.68	1.95	0.68–5.44	**4.88**	**1.13–21.14**	16.73	15.41–18.14	4.73	4.18–5.34	**7.07**	**6.31–7.91**
Family income												
$0–$19,999	30.21	21.38–40.78	33.76	25.41–43.26	…	Reference	15.60	14.67–16.59	23.03	21.93–24.16	…	Reference
$20,000–$34,999	19.36	13.53–26.92	23.13	16.02–32.20	0.94	0.42–2.07	18.00	17.13–18.90	19.66	18.79–20.56	**1.35**	**1.24–1.48**
$35,000–$69,999	28.64	21.33–37.27	24.85	17.86–33.45	1.29	0.63–2.62	33.55	32.36–34.77	31.06	30.21–31.92	**1.59**	**1.48–1.72**
≥$70,000	21.79	14.89–30.75	18.26	12.15–26.53	1.33	0.58–3.07	32.84	31.19–34.54	26.25	24.78–27.78	**1.85**	**1.72–1.98**
Marital status												
Married, living with someone as if married	46.41	36.77–56.33	55.95	47.12–64.43	…	Reference	67.65	66.5–68.67	60.5	59.32–61.67	…	Reference
Widowed, divorced, or separated	18.24	12.40–26.01	23.57	17.48–30.99	0.93	0.48–1.81	12.73	12.12–12.37	24.46	23.66–25.27	**0.47**	**0.43–0.50**
Never married	35.35	26.78–44.97	20.48	13.77–29.35	**2.08**	**1.12–3.87**	19.62	18.52–20.77	15.04	14.11–16.02	**1.17**	**1.08–1.26**
Employment status												
Employed	68.95	59.71–76.90	57.36	48.90–65.42	…	Reference	72.92	71.93–73.89	57.87	56.79–58.95	…	Reference
Unemployed	31.05	23.10–40.29	42.64	34.58–51.10	0.61	0.36–1.02	27.08	26.11–28.07	42.13	41.05–43.21	**0.51**	**0.48–0.54**

[a]Significant ORs and 95% CIs are in bold.
Abbreviations: ADHD = attention-deficit/hyperactivity disorder, OR = odds ratio.

analyses used gender as predictor and each of the conditions assessed as the outcome. Gender-by-ADHD interactions (where "women" was the reference group) were presented to assess whether differences between men and women with ADHD reflected gender differences in the general (entire) population or were specific to ADHD. We used SUDAAN (version 9.0),[23] to adjust for the design effects of the NESARC. Significance was defined as $P < .05$ (2-tailed).

RESULTS

Prevalence and Sociodemographic Correlates

There were 340 respondents (178 men, 162 women) who met criteria for persistent ADHD (Table 1) and 616 respondents (322 men and 294 women) who presented with lifetime ADHD. The prevalence of persistent ADHD was not significantly different between men and women (1.13% vs 0.92% of the entire sample; OR = 1.23, 95% CI = 0.96–1.58), while lifetime ADHD was significantly more prevalent among men than among women (2.31% vs 1.59% of the entire sample; OR = 1.46, 95% CI = 1.22–1.76).

Men with persistent ADHD were significantly more likely than women with persistent ADHD to have an individual annual income equal to or above $20,000, as in the non-ADHD population, and to have never been married (Table 1). Similar results were found when considering individuals with lifetime ADHD (data available upon request from the corresponding author).

ADHD Symptoms

Considering individuals with persistent ADHD, 1 symptom of inattention and 5 symptoms of hyperactivity were significantly more frequent in men versus women (Table 2). None of the ADHD symptoms were significantly more frequent in women than in men. The mean total number of symptoms was numerically higher in men than in women, but the difference did not reach significance ($P = .053$).

In individuals with lifetime ADHD, the same pattern was found, except for the lack of significant difference in the frequency of the inattentive item. The mean total number of symptoms was significantly higher in men than in women with lifetime ADHD ($P = .0098$).

Table 2. Prevalence of ADHD Symptoms in Men and Women With Persistent ADHD

	Men With ADHD, n = 178 (53.06%)		Women With ADHD, n = 162 (46.94%)		Men vs Women With ADHD[a]	
ADHD Symptom	%	95% CI	%	95% CI	OR	95% CI
Often does not give close attention to details or makes careless mistakes in schoolwork, work, or other activities	83.00	75.47–88.57	82.04	73.91–88.05	1.07	0.55–2.06
Often has trouble keeping attention on tasks or play activities	78.05	68.54–85.31	77.26	68.29–84.27	1.05	0.51–2.16
Often does not seem to listen when spoken to directly	88.06	79.71–93.26	78.30	69.68–84.99	2.04	0.89–4.71
Often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace	90.88	83.60–95.12	81.60	74.69–86.96	**2.25**	**1.05–4.80**
Often has trouble organizing activities	55.51	46.05–64.59	63.95	54.75–72.23	0.70	0.40–1.23
Often avoids, dislikes, or doesn't want to do things that take a lot of mental effort for a long period of time	81.92	72.95–88.39	88.13	78.77–93.69	0.61	0.25–1.48
Often loses things needed for tasks and activities	48.69	39.43–58.05	53.43	44.31–62.34	0.83	0.50–1.37
Is often easily distracted	92.66	87.83–95.67	89.32	81.70–94.00	1.51	0.63–3.61
Is often forgetful in daily activities	66.74	57.43–74.91	66.67	58.43–74.01	1.00	0.59–1.71
Often fidgets with hands or feet or squirms in seat when sitting still is expected	85.78	78.60–90.83	73.72	65.46–80.59	**2.15**	**1.11–4.17**
Often gets up from seat when remaining in seat is expected	67.73	59.14–75.27	54.03	44.19–63.56	**1.79**	**1.03–3.10**
Often excessively runs about or climbs when and where it is not appropriate (restless)	91.21	84.87–95.05	76.34	68.38–82.79	**3.22**	**1.52–6.79**
Often has trouble playing or doing leisure activities quietly	66.22	57.06–74.30	50.65	41.66–59.59	**1.91**	**1.15–3.17**
Is often "on the go" or often acts as if "driven by a motor"	81.50	73.93–87.25	63.40	54.51–71.47	**2.54**	**1.41–4.59**
Often talks excessively	62.81	53.13–71.56	71.50	62.85–78.81	0.67	0.39–1.17
Often blurts out answers before questions have been finished	58.10	48.94–66.74	58.35	49.68–66.54	0.99	0.59–1.66
Often has trouble waiting one's turn	54.94	45.68–63.87	46.83	38.03–55.83	1.38	0.82–2.33
Often interrupts or intrudes on others	66.49	57.04–74.78	63.94	55.11–71.92	1.12	0.65–1.92
	Mean	SE	Mean	SE	*t* Score	*P* Value
Total no. of symptoms	13.20	0.29	12.39	0.28	1.97	.0530

[a]Significant ORs and 95% CIs are in bold.
Abbreviations: ADHD = attention-deficit/hyperactivity disorder, OR = odds ratio, SE = standard error.

Table 3. Prevalence of ADHD Subtypes in Men and Women With Persistent ADHD

	Men With ADHD, n = 178 (53.06%)		Women With ADHD, n = 162 (46.94%)		Men vs Women With ADHD[a]	
ADHD Subtype	%	95% CI	%	95% CI	OR	95% CI
Inattentive	33.61	25.98–42.22	36.94	28.73–45.97	0.86	0.50–1.50
Hyperactive-impulsive	20.60	13.80–29.61	20.88	14.13–29.74	0.98	0.48–1.99
Combined	45.78	36.88–54.97	42.18	33.86–50.97	1.16	0.69–1.94

[a]None of the ORs and 95% CIs were significant.
Abbreviations: ADHD = attention-deficit/hyperactivity disorder, OR = odds ratio.

ADHD Subtypes

No significant differences were found in the prevalence of subtypes between men and women with persistent ADHD (Table 3). Considering lifetime ADHD, the combined subtype was significantly more frequent in men than in women (OR = 1.49, 95% CI = 1.01–2.18), although the lower 95% CI was close to nonsignificance.

Psychiatric Comorbidities

Past 12-month comorbidities. Considering individuals with persistent ADHD, men had significantly higher rates of past 12-month substance use disorder (any), alcohol dependence, drug use disorder (any), and drug dependence, as well as significantly lower rates of anxiety disorders (any), specific phobia, and posttraumatic stress disorder (Table 4). Many of the gender differences reflected gender differences in the total sample. A similar pattern was found when considering individuals with lifetime ADHD (data available upon request from the corresponding author).

Lifetime comorbidity. Among individuals with persistent ADHD, compared to women, men had significantly higher rates of lifetime substance disorder (any), alcohol use disorder (any), alcohol dependence, antisocial personality disorder, and conduct disorder, as well as significantly lower rates of mood disorders (any), major depressive disorder, anxiety disorders, psychotic disorder, and avoidant personality disorder (Table 5). A number of gender differences reflected gender differences in the total sample. Interaction was significant for "any Axis I disorder," 2 anxiety disorders (any anxiety disorder and specific phobia), and for psychotic disorder, which increased the prevalence of all these disorders in women versus men with ADHD in relation to gender differences found in the total population. A similar pattern was found in individuals with lifetime ADHD (data available upon request from the corresponding author).

Behavioral Correlates (lifetime)

Compared to women with persistent ADHD, men with persistent ADHD had significantly higher rates only for "reckless driving" (OR = 2.88, 95% CI = 1.37–6.06), which reflected gender differences in the entire sample since interactions between ADHD and gender were not significant (available upon request from the corresponding author). The same pattern was found in individuals with lifetime ADHD ("reckless driving": OR = 2.71, 95% CI = 1.59–4.62).

Health and Social Correlates (12-month)

In the unadjusted analyses, among individuals with persistent ADHD, women had significantly

Table 4. Twelve-Month Comorbidity in Men and Women With Persistent ADHD and Gender Effects in the Entire Sample

	Men With ADHD, n = 178 (53.06%)		Women With ADHD,[a] n = 162 (46.94%)		Men vs Women With ADHD		Interaction Between Gender and ADHD[b]	
Wave 2 Past Year	%	95% CI	%	95% CI	OR	95% CI	AOR	95% CI
Any Axis I disorder (excluding conduct disorder)	68.83	59.16–77.09	75.60	67.83–82.00	0.71	0.41–1.24	0.71	0.41–1.23
Any substance use disorder	50.07	40.58–59.56	32.46	24.41–41.70	**2.09**	**1.19–3.65**	1.12	0.65–1.96
Any alcohol use disorder	27.62	19.43–37.66	15.43	9.62–23.85	2.09	0.99–4.43	0.69	0.32–1.47
Alcohol abuse	8.60	5.08–14.20	7.25	3.37–14.91	1.20	0.46–3.17	**0.36**	**0.14–0.96**
Alcohol dependence	19.02	12.26–28.31	8.19	4.47–14.51	**2.63**	**1.10–6.33**	1.07	0.44–2.61
Any drug use disorder	13.71	8.39–21.61	4.88	2.36–9.82	**3.09**	**1.20–8.00**	1.43	0.53–3.84
Drug abuse	5.87	2.92–11.45	4.11	1.80–9.08	1.46	0.47–4.54	0.58	0.18–1.84
Drug dependence	7.84	3.74–15.72	0.78	0.19–3.18	**10.83**	**2.08–56.45**	**7.06**	**1.32–37.66**
Nicotine dependence	36.26	27.70–45.79	26.02	18.60–35.12	1.62	0.91–2.87	1.24	0.70–2.21
Any mood disorder	28.44	20.87–37.45	39.30	31.91–47.22	0.61	0.35–1.07	1.25	0.71–2.21
Major depression	11.27	5.97–20.26	11.27	7.01–17.61	1.00	0.41–2.45	2.34	0.95–5.79
Bipolar	17.17	11.88–24.16	27.30	20.27–35.67	0.55	0.30–1.02	0.83	0.44–1.58
Dysthymia	0.78	0.18–3.26	1.34	0.38–4.54	0.58	0.09–3.96	1.12	0.16–7.75
Any anxiety disorder	36.60	27.63–46.59	57.70	49.50–65.50	**0.42**	**0.25–0.70**	0.88	0.53–1.46
Panic disorder	8.56	4.89–14.57	16.45	11.18–23.54	0.48	0.22–1.04	0.94	0.42–2.10
Social anxiety disorder	10.86	6.84–16.83	17.85	12.04–25.65	0.56	0.28–1.12	0.80	0.39–1.61
Specific phobia	15.81	10.08–23.93	30.69	23.82–38.53	**0.42**	**0.25–0.73**	0.92	0.54–1.59
Posttraumatic stress disorder	12.22	7.68–18.90	23.02	15.34–33.05	**0.47**	**0.23–0.96**	1.03	0.49–2.15
Generalized anxiety disorder	16.76	10.40–25.90	27.10	20.35–35.11	0.54	0.28–1.06	1.21	0.61–2.38
Psychotic disorder	2.79	1.01–7.47	6.65	3.46–12.39	0.40	0.12–1.39	0.39	0.11–1.40

[a]Reference group.
[b]Interaction term of the logistic regression with gender (women as reference group); significant ORs and 95% CIs are in bold.
Abbreviations: ADHD = attention-deficit/hyperactivity disorder, AOR = adjusted odds ratio, OR = odds ratio.

Table 5. Lifetime Comorbidity in Men and Women With Persistent ADHD and Gender Effects in the Entire Sample

	Men With ADHD, n = 178 (53.06%)		Women With ADHD,[a] n = 162 (46.94%)		Men vs Women With ADHD		Interaction Between Gender and ADHD[b]	
Wave 2 and Wave 1 Combined Lifetime	%	95% CI	%	95% CI	OR	95% CI	AOR	95% CI
Any psychiatric diagnosis (including new conduct disorder)	93.43	86.51–96.93	95.01	89.08–97.80	0.75	0.24–2.31	0.56	0.18–1.75
Any Axis I disorder (including new conduct disorder)	88.40	80.75–93.26	93.60	87.75–96.75	0.52	0.21–1.30	**0.40**	**0.16–1.00**
Any substance disorders	75.45	67.12–82.23	61.20	51.69–69.93	**1.95**	**1.09–3.47**	0.79	0.44–1.41
Nicotine dependence	47.97	38.54–57.54	37.85	29.05–47.53	1.51	0.86–2.65	1.07	0.61–1.89
Any alcohol use disorder	65.35	56.37–73.35	45.58	36.42–55.04	**2.25**	**1.33–3.81**	0.71	0.42–1.21
Alcohol abuse	21.38	14.16–30.97	14.88	8.84–23.95	1.56	0.76–3.18	0.61	0.29–1.25
Alcohol dependence	43.96	35.23–53.09	30.70	23.08–39.54	**1.77**	**1.04–3.02**	0.73	0.43–1.24
Any drug use disorder	42.14	33.46–51.34	29.93	22.41–38.70	1.71	0.95–3.06	0.81	0.45–1.46
Drug abuse	33.72	26.05–42.35	23.43	16.52–32.12	1.66	0.92–3.01	0.74	0.40–1.36
Drug dependence	17.30	11.34–25.47	12.28	7.87–18.67	1.49	0.71–3.13	0.82	0.38–1.78
Any mood disorder	48.77	39.81–57.81	71.13	62.00–78.82	**0.39**	**0.22–0.69**	0.73	0.41–1.32
Major depressive disorder	19.50	12.96–28.28	31.72	23.18–41.69	**0.52**	**0.27–0.99**	1.11	0.58–2.13
Bipolar disorder	29.14	21.72–37.86	39.28	30.90–48.34	0.64	0.38–1.07	0.77	0.45–1.32
Dysthymia	3.60	1.63–7.75	5.44	2.82–10.26	0.65	0.22–1.94	1.25	0.42–3.76
Any anxiety disorder	49.27	39.43–59.17	79.10	71.92–84.82	**0.26**	**0.15–0.44**	**0.52**	**0.30–0.89**
Panic disorder	16.96	11.41–24.46	36.44	28.23–45.54	**0.36**	**0.20–0.65**	0.74	0.40–1.38
Social anxiety disorder	20.77	14.83–28.29	33.63	25.71–42.59	**0.52**	**0.30–0.90**	0.71	0.40–1.25
Specific phobia	23.92	16.89–32.72	54.39	45.64–62.88	0.26	0.15–0.45	0.56	0.33–0.97
Posttraumatic stress disorder	13.84	9.08–20.54	30.05	21.77–39.87	**0.37**	**0.19–0.72**	0.82	0.42–1.60
Generalized anxiety disorder	21.16	14.01–30.66	36.04	28.15–44.76	**0.48**	**0.25–0.89**	1.03	0.55–1.93
Psychotic disorder	5.97	3.33–10.46	14.21	8.93–21.84	**0.38**	**0.17–0.85**	**0.45**	**0.20–0.99**
Any personality disorder	64.41	54.46–73.26	60.07	51.34–68.20	1.20	0.70–2.07	0.99	0.57–1.70
Avoidant	8.69	5.53–13.41	16.35	11.08–23.45	**0.49**	**0.25–0.94**	0.69	0.34–1.39
Dependent	1.92	0.50–7.06	6.46	3.40–11.92	0.28	0.06–1.34	0.46	0.09–2.40
Obsessive-compulsive	22.60	14.97–32.62	25.02	18.06–33.57	0.87	0.47–1.64	0.86	0.46–1.62
Paranoid	12.38	7.34–20.12	21.74	15.48–29.63	0.51	0.24–1.07	0.68	0.32–1.45
Schizoid	7.03	3.53–13.49	10.88	6.57–17.50	0.62	0.24–1.57	0.60	0.23–1.54
Schizotypal	22.44	15.84–30.79	20.54	14.76–27.85	1.12	0.60–2.09	0.96	0.51–1.82
Narcissistic	23.35	16.82–31.46	19.42	13.47–27.18	1.26	0.69–2.33	0.76	0.41–1.41
Borderline	30.34	23.04–38.79	39.16	30.74–48.28	0.68	0.40–1.14	0.75	0.44–1.27
Histrionic	10.43	6.33–16.71	16.45	10.44–24.96	0.59	0.30–1.15	0.55	0.26–1.12
Antisocial	26.05	17.77–36.49	12.96	8.47–19.33	**2.37**	**1.14–4.90**	0.73	0.34–1.55
Others								
Pathological gambling	1.74	0.41–7.13	1.63	0.52–5.02	1.07	0.16–6.93	0.34	0.05–2.30
New conduct disorder (including antisocial personality disorder in both Wave 1 and Wave 2)	28.12	19.63–38.51	12.96	8.47–19.33	**2.63**	**1.29–5.36**	0.87	0.41–1.82

[a]Reference group.
[b]Interaction term of the logistic regression with gender (women as reference group); significant ORs and 95% CIs are in bold.
Abbreviations: ADHD = attention-deficit/hyperactivity disorder, AOR = adjusted odds ratio, OR = odds ratio.

lower scores in the subscales "mental component summary" ($F = 4.75$, $P = .032$) and "mental health" of the SF-12 ($F = 6.69$, $P = .011$), which persisted even after adjustment for sociodemographic and psychiatric comorbidity in the past year. No other significant differences were found between men and women with ADHD. After adjustment, similar results were found also when considering lifetime ADHD ("mental component summary": $F = 8.19$, $P = .005$; "mental health" of the Short Form 12 version 2: $F = 10.92$, $P = .0015$).

DISCUSSION

Studies addressing gender differences in ADHD have been recently criticized by some authors (eg, Davies[24]) who pointed out that they have mostly focused on children or adolescents, have been underpowered, have used inappropriate diagnostic criteria, and have been influenced by referral bias. Our study aimed to address these limitations.

Prevalence of ADHD

Our results show that, while prevalence of lifetime ADHD is significantly higher in men than in women, the rate of persistent ADHD does not significantly differ across genders. We note that the ADHD prevalence reported in our study is lower than that found in the National Comorbidity Survey Replication (NCS-R)[25] (4.4%). Differences in the age-at-onset criterion might contribute to an explanation for this. As reported above, in our study, ADHD symptoms had to be present before age 12 years. By contrast, in the NCS-R, at least 2 criterion A symptoms before age 7 years (criterion B) were required. It is therefore possible that, in the NCS-R, subjects with several ADHD symptoms occurring after age 12 years (but 2 or more symptoms before age 7) were classified as ADHD cases, whereas they would have not been classified as such in our study.

ADHD Symptoms

Most of the ADHD symptoms that were significantly more frequent in men than in women fell within the "hyperactive" domain. A meta-analysis[4] in children with ADHD showed that all 3 ADHD core symptom domains (inattention, hyperactivity, and impulsivity) were more frequent in boys than in girls with ADHD. Our results highlight how, in adults, inattention and impulsivity are dimensions that are as important in women as in men.

In children, the frequency of ADHD symptoms, in particular the most disruptive ones, may increase referral in boys. In adults, male-to-female ratio is more balanced.[26] However, our results suggest that significantly more frequent disruptive behaviors might still lead to men being more frequently referred than women because of disruptive symptoms.

ADHD Subtypes

No previous national study has reported the prevalence of ADHD subtypes separately in men and women. Population-based studies[27,28] in children have provided mixed findings. Our study adds novel data suggesting that, across the lifespan, significantly higher rates of ADHD combined type may contribute to higher referral rates in men with ADHD, since individuals with the combined type might be more easily referred than those with the inattentive type due to their disruptive behavior. However, this referral bias would not be relevant when considering persistent ADHD.

Psychiatric Comorbidities

For most of the comorbid disorders, the gender differences seen in individuals with ADHD reflected those in the general population, which, in turn, are consistent with findings from other national surveys.[29]

The significantly higher prevalence of past 12-month and lifetime substance use disorders in men versus women with ADHD (persistent or lifetime) as well as the significantly higher rates of 12-month and lifetime anxiety disorders in women versus men with ADHD in a national population-based sample are novel findings that may contribute to explain the higher rates of self-referral in women compared to men with ADHD[26] due to comorbid internalizing disorders (in particular anxiety). The findings may also explain the increased referral by others (rather than self-referral) in men compared to women with ADHD due to comorbid substance use disorders. Higher rates of self-referral in women and referrals by others in men, overall, would contribute to a more balanced sex ratio in adults seen in clinics for ADHD. This interpretation needs to be considered with caution since this study was not set out to explicitly assess referral pathways. However, our explanation is in line with the results of a report[30] on the same sample that did not find any significant gender differences on rates of referral for ADHD (the authors could not analyze referral by others vs self-referral).

Our results are in line with the conclusions of a meta-analysis[4] that included population-based and clinical studies in children and adults with ADHD and showed significantly higher rates of internalizing disorders in females and of externalizing disorders in males with ADHD.

Behavioral Correlates

Overall, men and women with persistent or lifetime ADHD presented with similar, rather than different, risky/impulsive behaviors. Only reckless driving was significantly more frequent in men compared to women with ADHD (persistent or lifetime), reflecting the pattern in the general population. Therefore, overall our findings indicate that women with ADHD may be equally impaired by such problems as men with ADHD. This is consistent with our finding of no significant differences in the frequency of impulsive ADHD core symptoms in men versus women with ADHD. We note that risky/impulsive correlates might be due to ADHD itself or to comorbid disorders.

Health and Social Correlates

Our results showed that, after controlling for sociodemographic and past 12-month comorbid mental conditions, men and women with ADHD presented a similar

profile of health and social correlates, although, compared to men, women with ADHD perceived themselves as more impaired from a mental health standpoint, which, once again, may contribute to increased self-referral.

Limitations

Our findings should be considered in the light of study limitations. First, ADHD was diagnosed using the same criteria in men and women, which may not be suitable to detect gender-specific differences. This reflects the current ADHD diagnostic process according to *DSM* (and *ICD*) criteria. Second, the assessment of childhood ADHD was retrospective. Although some researchers have shown that retrospective report can lead to underestimation[31] or overestimation[32] of ADHD prevalence, the reliability and validity of retrospective report of ADHD symptoms have been shown in several studies (eg, Epstein and Kollins[33] and Ward et al[34]). Third, ADHD symptoms, as well as related impairments, were endorsed directly by the participants, without additional information from a third person. This may have contributed to an underestimate of the prevalence of ADHD, since 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.[1] However, the appropriateness of the use of external reports for the diagnosis of ADHD in adults is controversial.[35] Fourth, it is possible that, due to the greater prevalence of antisocial behavior among men than women with ADHD, more men enter the correctional system and may not be ascertainable in clinical or epidemiologic studies.[36] Thus, differences in comorbidity profiles might be even more significant than what we found.

CONCLUSION

Our results contribute to an explanation for the more balanced sex ratio found in ADHD adult clinics compared to that reported in childhood, when the greater disruptive nature of ADHD in boys most likely drives their increased referral to consultation.[3] Overall, our study suggests that women with ADHD, who have in general been neglected from a clinical and research standpoint, should receive as much attention as men with ADHD. When screening for ADHD in adults, focusing on inattention and impulsivity (rather than on overtly disruptive behaviors) and on comorbid internalizing behaviors may help increase the detection of ADHD in women, who may be as impaired as their male counterparts.

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Potential conflicts of interest: **Dr Cortese** received royalties form Aargon Healthcare from 2012 to 2014. In the past year, **Dr Faraone** received income, travel expenses and/or research support from, and/or has been on an advisory board for Pfizer, Ironshore, Shire, Akili Interactive Laboratories, CogCubed, Alcobra, VAYA Pharma, Neurovance, Impax, and NeuroLifeSciences; and has received research support from the National Institutes of Health (NIH). His institution is seeking a patent for the use of sodium-hydrogen exchange inhibitors in the treatment of attention-deficit/hyperactivity disorder. In previous years, he received consulting fees or was on advisory boards or participated in continuing medical education programs sponsored by Shire, Alcobra, Otsuka, McNeil, Janssen, Novartis, Pfizer, and Eli Lilly. Dr Faraone receives royalties from books published by Guilford Press (*Straight Talk about Your Child's Mental Health*) and Oxford University Press (*Schizophrenia: The Facts*). **Drs Bernardi, Wang**, and **Blanco** declare no competing conflicts of interest.

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Additional information: The original data set for the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) is available from the National Institute on Alcohol Abuse and Alcoholism (http://www.niaaa.nih.gov).

REFERENCES

1. Polanczyk GV, Willcutt EG, Salum GA, et al. ADHD prevalence estimates across three decades: an updated systematic review and meta-regression analysis. *Int J Epidemiol*. 2014;43(2):434–442.
2. Faraone SV, Biederman J, Mick E. The age-dependent decline of attention deficit hyperactivity disorder: a meta-analysis of follow-up studies. *Psychol Med*. 2006;36(2):159–165.
3. Gaub M, Carlson CL. Gender differences in ADHD: a meta-analysis and critical review. *J Am Acad Child Adolesc Psychiatry*. 1997;36(8):1036–1045.
4. Gershon J. A meta-analytic review of gender differences in ADHD. *J Atten Disord*. 2002;5(3):143–154.
5. Babinski DE, Pelham WE Jr, Molina BS, et al. Women with childhood ADHD: comparisons by diagnostic group and gender. *J Psychopathol Behav Assess*. 2011;33(4):420–429.
6. Biederman J, Faraone SV, Spencer T, et al. Gender differences in a sample of adults with attention deficit hyperactivity disorder. *Psychiatry Res*. 1994;53(1):13–29.
7. Rucklidge J, Brown D, Crawford S, et al. Attributional styles and psychosocial functioning of adults with ADHD: practice issues and gender differences. *J Atten Disord*. 2007;10(3):288–298.
8. Grant BF, Stinson FS, Dawson DA, et al. Co-occurrence of 12-month alcohol and drug use disorders and personality disorders in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Arch Gen Psychiatry*. 2004;61(4):361–368.
9. American Community Survey (ACS). US Census Bureau Web site. https://www.census.gov/programs-surveys/acs/.
10. Grant BF, Stinson FS, Dawson DA, et al. Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Arch Gen Psychiatry*. 2004;61(8):807–816.
11. Grant BF, Goldstein RB, Chou SP, et al. Sociodemographic and psychopathologic predictors of first incidence of *DSM-IV* substance use, mood and anxiety disorders: results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions. *Mol Psychiatry*. 2009;14(11):1051–1066.
12. Grant BF, Harford TC, Dawson DA, et al. The Alcohol Use Disorder and Associated Disabilities Interview schedule (AUDADIS): reliability of alcohol and drug modules in a general population sample. *Drug Alcohol Depend*. 1995;39(1):37–44.
13. Bernardi S, Faraone SV, Cortese S, et al. The lifetime impact of attention deficit hyperactivity disorder: results from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). *Psychol Med*. 2012;42(4):875–887.
14. Cortese S, Faraone SV, Bernardi S, et al. Adult attention-deficit hyperactivity disorder and obesity: epidemiological study. *Br J Psychiatry*. 2013;203(1):24–34.
15. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. Fifth Edition. Washington, DC: American Psychiatric Association; 2013
16. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*. Fourth Edition. Washington, DC: American Psychiatric Association; 1994.
17. Ruan WJ, Goldstein RB, Chou SP, et al. The Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV): reliability of new psychiatric diagnostic modules and risk factors in a general population sample. *Drug Alcohol Depend*. 2008;92(1–3):27–36.
18. Grant BF, Hasin DS, Stinson FS, et al. The epidemiology of *DSM-IV* panic disorder and

agoraphobia in the United States: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *J Clin Psychiatry*. 2006;67(3):363–374.
19. Canino G, Bravo M, Ramírez R, et al. The Spanish Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS): reliability and concordance with clinical diagnoses in a Hispanic population. *J Stud Alcohol*. 1999;60(6):790–799.
20. Ware J, Kosinski M, Turner-Bowker D, et al. *How to Score Version 2 of the SF-12 Health Survey*. Lincoln, RI: Quality Metrics; 2002.
21. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav*. 1983;24(4):385–396.
22. Cohen S, Williamson G. Perceived stress in a probability sample of the US. In: Spacapam S, ed. *The Social Psychology of Health: Claremont Symposium on Applied Social Psychology*. Newbury Park, CA: Sage; 1988.
23. SUDAAN, Version 9.0 [computer program]. Research Triangle Park, NC: Research Triangle Institute; 2004.
24. Davies W. Sex differences in attention deficit hyperactivity disorder: candidate genetic and endocrine mechanisms. *Front Neuroendocrinol*. 2014;35(3):331–346.
25. Kessler RC, Adler L, Barkley R, et al. The prevalence and correlates of adult ADHD in the United States: results from the National Comorbidity Survey Replication. *Am J Psychiatry*. 2006;163(4):716–723.
26. Biederman J, Faraone SV, Monuteaux MC, et al. Gender effects on attention-deficit/hyperactivity disorder in adults, revisited. *Biol Psychiatry*. 2004;55(7):692–700.
27. Gaub M, Carlson CL. Behavioral characteristics of *DSM-IV* ADHD subtypes in a school-based population. *J Abnorm Child Psychol*. 1997;25(2):103–111.
28. Neuman RJ, Sitdhiraksa N, Reich W, et al. Estimation of prevalence of *DSM-IV* and latent class-defined ADHD subtypes in a population-based sample of child and adolescent twins. *Twin Res Hum Genet*. 2005;8(4):392–401.
29. Seedat S, Scott KM, Angermeyer MC, et al. Cross-national associations between gender and mental disorders in the World Health Organization World Mental Health Surveys. *Arch Gen Psychiatry*. 2009;66(7):785–795.
30. Dakwar E, Levin FR, Olfson M, et al. First treatment contact for ADHD: predictors of and gender differences in treatment seeking. *Psychiatr Serv*. 2014;65(12):1465–1473.
31. Barkley RA, Fischer M, Smallish L, et al. The persistence of attention-deficit/hyperactivity disorder into young adulthood as a function of reporting source and definition of disorder. *J Abnorm Psychol*. 2002;111(2):279–289.
32. Mannuzza S, Klein RG, Klein DF, et al. Accuracy of adult recall of childhood attention deficit hyperactivity disorder. *Am J Psychiatry*. 2002;159(11):1882–1888.
33. Epstein JN, Kollins SH. Psychometric properties of an adult ADHD diagnostic interview. *J Atten Disord*. 2006;9(3):504–514.
34. Ward MF, Wender PH, Reimherr FW. The Wender Utah Rating Scale: an aid in the retrospective diagnosis of childhood attention deficit hyperactivity disorder. *Am J Psychiatry*. 1993;150(6):885–890.
35. Matte B, Rohde LA, Grevet EH. ADHD in adults: a concept in evolution. *Atten Defic Hyperact Disord*. 2012;4(2):53–62.
36. Kessler RC, Adler LA, Barkley R, et al. Patterns and predictors of attention-deficit/hyperactivity disorder persistence into adulthood: results from the National Comorbidity Survey Replication. *Biol Psychiatry*. 2005;57(11):1442–1451.

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