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Cohort Change in the Prevalence of ADHD Among U.S. Adults: Evidence of a Gender-Specific Historical Period Effect

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Abstract

Objective: To document inter- and intra-cohort changes in adult ADHD and examine whether changes vary by gender. **Method:** We analyze data from the 2007 and 2012 U.S. National Health Interview Survey. **Results:** The prevalence of ADHD among adults aged 18 to 64 years increased from 3.41% in 2007 to 4.25% in 2012. As expected, patterns of inter- and intra-cohort change varied by gender. At younger ages, inter-cohort gender differences are more distinct due to a spike in prevalence among boys/men born in or after 1980. Consistent with a gender-specific historical period effect, recent intra-cohort increases among women have narrowed the gender gap. **Conclusion:** The gender gap in the prevalence of ADHD among adults decreased by 31.1% from 2007 to 2012 due to increased prevalence among adult women of all ages. We discuss these results in relation to diagnostic practice, adult health and well-being, data limitations and needs, and directions for future research. *(J. of Att. Dis. 2021; 25(6) 771-782)*

Keywords

ADHD, adult health, gender, prevalence, cohort change, historical period effect

The prevalence of attention deficit hyperactivity disorder (ADHD) among adults is a function of children and adolescents who have been diagnosed with ADHD aging into adulthood, diagnoses that have occurred during adulthood, and mortality. As such, the point prevalence of ADHD in the adult population, especially at younger ages when mortality is less of a concern, is largely shaped by changes in historical context and policy that differentially shape the experiences of cohorts and historical period effects that have broad effects across all age groups.

In part, due to data limitations, no national, population-representative study has been able to examine inter- and intra-cohort changes in ADHD among adults. To a substantial degree, inter-cohort variation reflects changes in diagnostic criteria, lay referral, and professional practice that affected children and adolescents as they came of age during different historical time periods. Using repeated cross-sectional data from two or more points in time, adults born and raised in different historical periods can be compared at the same age to reveal the extent of inter-cohort change. Intra-cohort variation among adults primarily reflects change in the propensity to diagnose during a particular historical period. Such an effect has the potential to impact all age groups, although subpopulations may be differentially impacted. Using repeated cross-sectional data from two or more points in time, synthetic cohorts can be constructed to estimate change as cohorts age.

In this article, we use data from the 2007 and 2012 U.S. National Health Interview Survey (NHIS) to document inter- and intra-cohort changes in adult ADHD and examine whether these vary by gender. Our study is limited to these two cross-sectional surveys because they are the only years that the NHIS asked adults whether they had ever been diagnosed with ADHD.

Historical Context

The history of the medicalization of childhood deviance, including excessive hyperactivity, inattentiveness, and impulsivity, and the evolution of the diagnostic criteria for the psychiatric condition that encompasses those behaviors, are both well-documented (Conrad & Schneider, 1980/2010; Conrad, 2008; Lange, Reichl, Lange, Tucha, & Tucha, 2010). The development of the contemporary diagnosis "ADHD" can be traced back as far as 1798, from the initial description in the medical literature of similar symptoms in children to the more recent establishment and repeated

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revision of a formal diagnostic category that now applies to children and adults (Centers for Disease Control [CDC], 2008, 2018; Conrad & Bergey, 2014). As noted by Conrad and Schneider (1980/2010), the discovery of the paradoxical effect of amphetamine on children's behavior and learning problems in 1937, and the recommendations of a task force sponsored by the U.S. Public Health Service and the National Association for Crippled Children and Adults in 1966, set the stage for the American Psychiatric Association (APA) to develop a formal diagnosis that aimed to encapsulate the symptoms that were most troubling to parents, teachers, and children.

Partly in response to then-current debates centering on the validity of "Minimal Brain Dysfunction" as an explanation for children's excessive inattention, impulsivity, and hyperactivity, in 1968, the APA included "Hyperkinetic Reaction of Childhood" in the second revision of its *Diagnostic and Statistical Manual of Mental Disorders* (2nd ed.; *DSM-II*). Both Minimal Brain Dysfunction and Hyperkinetic Reaction of Childhood are direct precursors of the diagnostic category ADHD. In 1980, the criteria for Hyperkinetic Reaction of Childhood were refined, and the third revision of the APA's *DSM* included criteria for a disorder named "Attention Deficit Disorder (ADD) (With or Without Hyperactivity)" (Spitzer & Cantwell, 1980). The *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed.; *DSM-III*) included separate symptom lists for inattention, impulsivity, and hyperactivity (Barkley, 2006). In the 1987 revision of the *DSM-III* (*Diagnostic and Statistical Manual of Mental Disorders* [3rd ed., revised; *DSM-III-R*]), ADD (With and Without Hyperactivity) was renamed "ADHD" to formally consolidate inattentiveness, impulsiveness, and hyperactivity into a single diagnostic category (Conrad & Potter, 2000).

Following the initial effort by psychiatrists to formally define a medical/psychiatric condition that encapsulated hyperactivity, inattention, and impulsivity, the number of popular and educational media articles on hyperactivity increased substantially (Conrad & Schneider, 1980/2010; see Table 4). Subsequently, as ADD, and then ADHD, became more culturally resonant, and the definitions of ADD/ADHD were revised and expanded, the number of children diagnosed with what we now call ADHD increased by 50% (Conrad & Potter, 2000; Newcorn et al., 1989). Based on data from the NHIS, the prevalence of ADHD among 5- to 17-year-old children has continued to increase, from 5.7% in 1997 to 10% in 2016 (Boyle et al., 2011; CDC, 2018). Analyses of data from the Medical Expenditure Panel Study (MEPS) indicate that rates of ever being diagnosed with ADHD increased from 8.5% in 2008 to 10.4% in 2012 among 5- to 12-year-old children and remained at about 13% for children aged 13 to 17 years (Anderson, 2018). In 2014 to 2015, rates were substantially higher among children in poor families (14.5%) relative to children in upper-income families (9.3%) and among those receiving only public insurance (15%) relative to those with any private insurance or no insurance (10%) (Anderson, 2018).

Adult ADHD

ADHD is increasingly recognized as a lifespan/life-course disorder (Conrad & Potter, 2000; Conrad & Slodden, 2013; Fletcher, 2014; Lensing, Zeiner, Sandvik, & Opjordsmoen, 2015), with negative implications for adult educational, occupational, and marital outcomes (Klein et al., 2012), adult health (Landes & London, 2021) and mortality (London & Landes, 2016). In part, this is due to the observation that the large number of children diagnosed with ADHD in the late 1980s and early 1990s have aged into adulthood, with many still experiencing symptoms (Conrad & Potter, 2000). However, this is also due to the expansion of the diagnostic category to include adults. Coincident with the initial delineation of diagnostic criteria in the 1960s, which were limited to children and adolescents below the age of 18 years, clinicians began to recognize and describe similar symptomatology among adults (Barkley, Murphy, & Fischer, 2008). Over time, clinical reports of adult ADHD proliferated, and by the late 1980s and early 1990s, knowledge of adult ADHD was common (Barkley et al., 2008; Conrad & Potter, 2000).

During this period, clinicians developed age-appropriate criteria to diagnose ADHD in adults. In 1994, the APA first included adult ADHD as an official diagnostic category in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; Barkley et al., 2008; Conrad & Potter, 2000). During the period from 1996 to 2007, the prevalence of adult ADHD has been estimated to be between 2.5% and 4.7%, with variance attributed to measurement approach, sample characteristics, and context (Bernardi et al., 2012; Bitter, Simon, Bálint, Mészáros, & Czobor, 2010; Faraone & Biederman, 2005; Heiligenstein, Conyers, Berns, & Smith, 1998; Kessler et al., 2006; Landes & London, 2021; London & Landes, 2016; Murphy & Barkley, 1996). Three studies report ADHD prevalence among adults using nationally representative samples: Kessler and colleagues (2006) report an ADHD prevalence rate of 4.4% among adults in the 2001 to 2003 National Comorbidity Survey Replication (NCS-R); Bernardi and colleagues (2012) report a lifetime prevalence rate of 2.51% among adults in the 2001/2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC); and London and Landes (2016) report an ADHD prevalence rate of 3.3% among adults in the 2007 NHIS.

Gender Differences in ADHD

The rapid expansion of ADHD among children and adults has disproportionately affected boys and men. Although it

was not the primary focus of his research, Conrad's (1975, 1976, 1977) early studies on hyperkinetic children noted that hyperactivity was more common in boys than girls. This observation led him to question whether "hyperactivity is an extreme form of socially acceptable (and expected) sex role behavior in boys?" (1977, p. 284). This hypothesis was further refined in a study of boys and girls with ADD by Berry, Shaywitz, and Shaywitz (1985), which confirmed that hyperactive behaviors were more common among boys. These investigators suggested that there may be a "silent minority" of girls with ADD because the primary emphasis on hyperactivity in the diagnostic criteria led to underdiagnosis among female children and adolescents (Berry et al., 1985). Prevalence rates for children confirm the gender disparity in diagnosis, with studies reporting a male-to-female ratio of 10 to 1 in clinical samples and 3 to 1 in national surveys (Biederman et al., 2002; Williamson & Johnston, 2015). Using data from the 2001 NHIS, Cuffe, Moore, and McKeown (2005) reported an ADHD prevalence rate of 4.2% for boys and 1.8% for girls aged 4 to 17 years.

Although it is not as pronounced as the gender disparity among children and adolescents, Biederman, Faraone, Knee, and Munir (1990) first reported a gender disparity among adults in 1990. Subsequent research indicated that adult women with ADHD were less likely to have conduct disorders and, as a result, were probably under-identified relative to adult men (Biederman, Faraone, Monuteaux, Bober, & Cadogen, 2004; Biederman et al., 1994). Using data from the NCS-R, Kessler and colleagues (2006) report adult ADHD prevalence at 5.4% for males and 3.2% for females. Results from the NESARC confirm a similar gender disparity, with prevalence at 3.0% for males and 1.9% for females (Bernardi et al., 2012). Using data from the 2007 NHIS, Landes and London (2021) find that women are significantly underrepresented in the population of adults ever diagnosed with ADHD relative to the total population; women constitute 53% of the total population, but only 37.4% of the population of adults who report ever being diagnosed with ADHD. A study by Bitter and colleagues (2010) that is based on a sample of patients in a general practitioner's practice in Budapest, Hungary, reports a lower overall prevalence rate, but confirms a distinct gender disparity (2.1% of males vs. 1.1% of females). The lower rate likely reflects the delayed expansion of ADHD as a diagnosis outside of the United States (Conrad & Bergey, 2014).

Several explanations for the documented gender disparity in ADHD prevalence have been advanced in the literature. These generally fall into two categories: inherent biological differences between males and females; and a systemic gender bias in referral and diagnosis. Studies that attribute a gender disparity in prevalence to inherent biological differences between boys/men and girls/women rely on consistent evidence that males display more hyperactive/impulsive behavior than females (Biederman et al., 1994, 2002, 2004; Gaub & Carlson, 1997; Gershon, 2002; Williamson & Johnston, 2015). Those holding this theoretical perspective have shown the following: Men may require less familial genetic burden of risk to develop ADHD than women; the clinical course of ADHD varies by gender, with men exhibiting symptoms earlier in life than women; and symptoms among men are more likely to abate over time (Martin et al., 2018; Williamson & Johnston, 2015). Studies that attribute the gender disparity in ADHD prevalence to systematic bias argue that the traditional diagnostic criteria for ADHD are based primarily on symptoms observed among males with ADHD, such as hyperactivity (Martin et al., 2018; Staller & Faraone, 2006; Williamson & Johnston, 2015). Due to this fact, and social biases about male behavior as risky or aggressive (Bell & Figert, 2010; Hart, Grand, & Riley, 2006; Riska, 2003; Timimi, 2011), professionals who initially identify symptoms of ADHD and those who formally diagnose ADHD may to some extent view ADHD as a distinctively male disorder. As a result, they may fail to notice and/or readily diagnose ADHD in girls/women (Biederman et al., 2004; Gershon, 2002; Martin et al., 2018; Staller & Faraone, 2006; Williamson & Johnston, 2015).

To the extent that a systematic bias against diagnosing ADHD in girls/women existed in the past, and possibly continues, there are reasons to surmise that it may be subsiding. While overall ADHD treatment rates increased among all adults in the early 2000s, there is evidence that growth in ADHD medication usage among adults grew more rapidly among women than men in the population with private, employer-sponsored health insurance (Castle, Aubert, Verbrugge, Khalid, & Epstein, 2007; CDC, 1989; Express Scripts, 2014). This increase was observed across all age groups and geographic regions. In addition, during this period, there has been increasing attention paid in the literature to subtypes of ADHD (Faraone & Biederman, 2005; Murphy, Barkley, & Bush, 2002; Wilens et al., 2009), which has heightened awareness of potential gender differences in symptom presentation, the overrepresentation of girls/women in underdiagnosed subtypes, and the need for better symptom recognition and diagnosis among girls/women (Biederman et al., 2004; Gershon, 2002; Ramtekkar, Reiersen, Todorov, & Todd, 2010; Sprafkin, Gadow, Weiss, Schneider, & Nolan, 2007). These factors may have contributed to increased diagnosis of ADHD among girls/women in the United States in recent periods.

Hypotheses

Building from the available literature, this study examines ADHD prevalence rates among adults using the 2007 and 2012 NHIS. While prior studies document overall

prevalence rates among adults, no study to date reports prevalence rates by birth cohort. Thus, it has not been possible to trace how the historical development of ADHD has been associated with inter-cohort changes in the percent of the adult population ever diagnosed with ADHD. We have several hypotheses.

Hypothesis 1: Due to the expansion of ADHD as a diagnostic category over the past 50 years, we expect to find general growth in ADHD prevalence among adults across all birth cohorts.
Hypothesis 1a: However, we also expect to see a distinct spike in prevalence in the birth cohorts born in or after 1980, which coincides with the period when ADHD was formally recognized as a consolidated diagnostic category by the APA. Individuals in these birth cohorts were afforded more lifetime exposure to ADHD as an official diagnostic category than those born prior to 1980.
Hypothesis 2: We also expect to see evidence of a period effect from 2007 to 2012, with an increase in ADHD prevalence at all or most ages during this time period. We expect this period effect because of the increased emphasis on adult diagnosis in recent years.
Hypothesis 3: Finally, we expect that that these changes in ADHD prevalence by birth cohort and over time will differ by gender.
Hypothesis 3a: Specifically, we predict that the spike in prevalence occurring in birth cohorts born in or after 1980 will be less pronounced among women as a result of the historic under-identification of ADHD among women.
Hypothesis 3b: In contrast, we expect that the hypothesized period effect may be more pronounced among women as a result of delayed diagnosis, more substantial abatement of symptoms with age among men, and the increasing recognition of symptoms and subtypes of ADHD that are more common among women during this period.

Data and Method

Sample

We use data from the 2007 and 2012 NHIS Sample Adult Files. The NHIS is an annual survey conducted through face-to-face interviews by the National Center for Health Statistics (NCHS). The NCHS uses a complex, multistage, stratified sampling design to obtain a sample representative of the civilian, noninstitutionalized U.S. population. We limit the sample to participants who were 18 to 64 years old at the time of the survey. We use 2007 and 2012 data because those are the only 2 years that the NHIS includes a measure of ADHD diagnosis for adults. Adults with missing data on the ADHD diagnosis measure (0.14%) were excluded from the study.

Measures

Similar to other studies on adults with ADHD (Barkley et al., 2008; Willcutt, 2012), ADHD diagnosis is measured as a self-reported, dichotomous indicator of lifetime ADHD diagnosis status (1 = *ever diagnosed*, 0 = *never diagnosed*). In both years, the NHIS question was as follows: "Have you EVER been told by a doctor or health professional that you had Attention Deficit Disorder or Hyperactivity?" It is likely that this self-reported measure of ADHD diagnosis status does not completely differentiate between those with and without this disorder due to various diagnostic, measurement, and reporting errors. These include under- and overdiagnosis by health care providers in various subpopulations, differential self-diagnosis, and underreporting. Underreporting may reflect disavowal of the diagnosis in an attempt to manage stigma, or occur when individuals obtain a different diagnosis or experience symptom dissipation that leads them to conclude that they were misdiagnosed. Despite these limitations, we use this measure because it is the only available indicator of ADHD diagnosis status among adults that is available in the NHIS.

Analytic Approach

The NHIS uses a repeated cross-sectional rather than a panel survey design; the same population is surveyed at multiple points in time, but not the same individuals within the population. Thus, it is possible to examine change in the population and within synthetic cohorts over time, but not change at the individual level. Using data on survey year and year of age, we estimated each individual's birth year by subtracting their age in years from the year in which the individual was surveyed. We constructed synthetic cohorts based on birth year and assigned each individual to the appropriate age category in 2007 and, 5 years later, in 2012. We estimate self-reported ADHD status in each of the relevant age groups in 2007 and 2012 and array estimates for the relevant sequential age groups within each birth cohort. By doing so, we are able to measure change over 5 years at specific ages within each cohort.

We compute two statistics to help summarize the changes we observe between contiguous cohorts and within sequential age groups within synthetic cohorts. The measure of inter-cohort change compares the percentage of adults of a given age who self-report ever being diagnosed with ADHD from one cohort to the percentage of same-aged adults reporting ever being diagnosed with ADHD in another cohort. Age is constant even though the individuals were born in different years. As such, individuals from each cohort passed through childhood and lived to their current age in different historical periods. Inter-cohort differences likely capture changes in diagnostic practice and other factors that change across historical periods. Given the expansion of ADHD diagnosis

over time, we expect to observe positive inter-cohort change at all or most ages when comparing individuals in a given birth cohort to same-aged individuals in the most proximate earlier birth cohort.

The measure of intra-cohort change compares the percentage of adults who self-report ever being diagnosed with ADHD at a given age to that same group when they are 5 years older. Given that all participants in the NHIS are adults, we would expect no or minimal change if self-report was perfectly accurate and no diagnosis occurred in adulthood. We know that neither of those conditions pertains. We assume that there are countervailing reporting biases and measurement error, and thus focus on net change. Positive net intra-cohort change likely reflects increased diagnosis of ADHD among adults in that age range over the 5-year period of observation. Negative net intra-cohort change likely reflects increased disavowal of diagnosis among adults in that age range over the 5-year period. No change might accurately reflect no change or could reflect a balance of countervailing changes.

We begin by focusing on the total population. Given known differences in ADHD diagnosis patterns across historical time for men and women, we then repeat the analysis separately for men and women.

All analyses were conducted using Stata 15.1 (College Station, TX). All analyses are weighted in accordance with guidelines provided by the NCHS (2016). Person weights are adjusted for nonresponse, as well as to Census control totals for sex, age, and race/ethnicity populations (post-stratification).

Results

Total Population

Overall, in 2007, we estimate the prevalence of ADHD in the population of 18- to 64-year-old adults to be 3.41%. After 5 years, in 2012, we estimate the prevalence to be 4.25%. This represents an increase of 24.6%.

Table 1 presents results for the total population, which can largely be understood with reference to cohort and historical period effects. Looking first at the bolded numbers that form the diagonal from the upper right to the lower left corners of the table, it is clear that the percentage ever diagnosed with ADHD in 2007 is lower among older persons (upper right) than among younger persons (lower left) and increases with each subsequent birth cohort as indicated by the inter-cohort change values detailed five rows below each bolded estimate. This pattern reflects birth cohort differences, rather than aging and age difference, as it captures the historical period during which individuals passed through childhood, the time when most ADHD is diagnosed, and changes in diagnostic policy and practice. The diagnosis of ADHD has become more widespread over time (i.e., it is more common in more recent birth cohorts). Thus, the percent ever diagnosed with ADHD in 2007 is 1.64% among those born from 1948 to 1952 and 5.82% among those born from 1978 to 1982, compared with 7.01% among those born from 1983 to 1987, and 7.55% among those born from 1988 to 1989. The 1978 to 1982 birth cohort that is shaded in the figure is the cohort of children who would have been most immediately affected by the substantial changes to the *DSM* criteria that were promulgated during the 1980s. Indeed, it is this group that shows the largest inter-cohort change relative to same-aged persons born 5 years earlier (+3.14 inter-cohort change). Overall, compared with same-aged persons born 5 years earlier, each more-recent birth cohort has a higher percentage ever diagnosed with ADHD. This result is signified by the consistently positive inter-cohort change statistics.

Historical period effects tend to affect all age groups. Such influences are reflected in the intra-cohort change statistics presented in Table 1, one column to the right and one row below each bolded estimate. Specifically, change from one age group to the next within a given cohort reflects new diagnoses in adulthood over the period 2007 to 2012. The number next to each bolded number is the percent ever diagnosed with ADHD at different, contiguous ages within the same cohort; the number below that is the estimated intra-cohort change over the 5-year period. We see that the intra-cohort changes are always positive, with the exception of the 1953 to 1957 cohort. For that cohort, the change is very small—the smallest change observed in any cohort—and negative (–0.05). Thus, at each age, we see increasing adult diagnosis, which is what we would expect to see during the 2007 to 2012 period.

Intra-cohort change reflects the net result of false negatives, false positives, and new diagnoses among adults over the 5-year interval. We don't know the extent to which individuals disavow ever being diagnosed with ADHD (i.e., false negatives), or whether this varies with age. We assume that false positives are rare given the stigma associated with being diagnosed with ADHD. Thus, beyond possible age-related variance in false negatives, the positive intra-cohort changes within each cohort are likely to primarily reflect new diagnoses across the adult age spectrum. Examination of the intra-cohort change statistics indicates that largest intra-cohort change occurs among those in the 1988 to 1989 birth cohort, who were 18 to 19 years in 2007 (and therefore 23-24 years in 2012), and the 1963 to 1967 birth cohort, who were 40 to 44 years and 45 to 49 years old, respectively, in 2007 (and therefore 45-49 years and 50-54 years in 2012). The data utilized for this project do not allow us to empirically examine or draw conclusions about the mechanisms that may account for the relatively large intra-cohort changes observed at these ages during this time period.

Table 1. Prevalence of Self-Reported ADHD and Inter- and Intra-Cohort Change, by Birth Cohort and Observed Ages, 2007 and 2012 NHIS.

Age (in years)											
	18-19	23-24	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Birth cohort											
1948-1952										**1.64**	1.72
Intra-cohort change										—	+0.08
Inter-cohort change										—	—
1953-1957									**2.10**	2.05	
Intra-cohort change									—	−0.05	
Inter-cohort change									—	+0.41	
1958-1962								**2.43**	3.50		
Intra-cohort change								—	+1.07		
Inter-cohort change								—	+1.40		
1963-1967							**2.50**	3.66			
Intra-cohort change							—	+1.16			
Inter-cohort change							—	+1.23			
1968-1972						**2.71**	3.39				
Intra-cohort change						—	+0.68				
Inter-cohort change						—	+0.89				
1973-1977					**3.15**	3.97					
Intra-cohort change					—	+0.82					
Inter-cohort change					—	+1.26					
1978-1982				**5.82**	6.29						
Intra-cohort change				—	+0.47						
Inter-cohort change				—	+3.14						
1983-1987			**7.01**	7.43							
Intra-cohort change			—	+0.42							
Inter-cohort change			—	+1.61							
1988-1989		8.68									
Intra-cohort change	—	+1.13									
Inter-cohort change	—	—									

Note. NHIS = National Health Interview Survey.

Gender Differences

Given the documented differences in the history of ADHD diagnosis among males and females, and in the timing of the expansion in ADHD diagnosis, we repeated the analysis separately for men and women. As expected, rates of ever being diagnosed with ADHD among men (Table 2) were substantially higher than they were among women (Table 3). There are both similarities and differences in patterns of inter- and intra-cohort change among men and women.

Overall, the prevalence of ADHD among men increased from 4.48% in 2007 to 4.99% in 2012. As seen in Table 2, among men, the percent ever diagnosed with ADHD in 2007 increased from 2.25% in the earliest birth cohort (1948-1952), to 11.16% in the most recent birth cohort (1988-1989). The inter-cohort change statistics are always positive; relative to same-aged men born 5 years earlier, each more recent cohort of men had a higher percent ever diagnosed with ADHD. The birth cohort that was likely most immediately affected by the changes in the *DSM* during the 1980s (1978-1982) had the highest inter-cohort change (+3.61). Among men, the intra-cohort changes are always positive, except among the most recent (1988-1989) and earliest (1948-1952) birth cohorts (and therefore the youngest and oldest men). It is possible that the youngest are more likely to disavow childhood ADHD diagnoses, whereas the oldest are subject to differential mortality; however, we do not have data to empirically evaluate those hypotheses.

Overall, the prevalence of ADHD among women increased from 2.42% in 2007 to 3.57% in 2012. As seen in Table 3, among women, the percent ever diagnosed with ADHD in 2007 increases with each subsequent birth cohort from 1.07% in the 1948 to 1952 birth cohort to 4.44% in the 1983 to 1987 birth cohort, then declines to 3.70% in the 1988 to 1989 birth cohort. The inter-cohort changes statistics are always positive and, as is the case for men, the largest inter-cohort change is seen for the 1978 to 1982 birth

Table 2. Prevalence of Self-Reported ADHD and Inter- and Intra-Cohort Change Among Men, by Birth Cohort and Observed Ages, 2007 and 2012 NHIS.

Age (in years)											
	18-19	23-24	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Birth cohort											
1948-1952										**2.25**	1.71
Intra-cohort change										—	−0.54
Inter-cohort change										—	—
1953-1957									**2.44**	2.34	
Intra-cohort change									—	−0.10	
Inter-cohort change									—	+0.09	
1958-1962								**3.55**	3.27		
Intra-cohort change								—	−0.28		
Inter-cohort change								—	+0.83		
1963-1967							**2.94**	4.06			
Intra-cohort change							—	+1.12			
Inter-cohort change							—	+0.51			
1968-1972						**2.57**	3.28				
Intra-cohort change						—	+0.71				
Inter-cohort change						—	+0.34				
1973-1977					**4.27**	4.34					
Intra-cohort change					—	+0.07					
Inter-cohort change					—	+1.77					
1978-1982				**8.77**	7.88						
Intra-cohort change				—	−0.89						
Inter-cohort change				—	+3.61						
1983-1987			**9.77**	10.74							
Intra-cohort change			—	+0.97							
Inter-cohort change			—	+1.97							
1988-1989	**11.16**	10.34									
Intra-cohort change	—	−0.82									
Inter-cohort change	—	—									

Note. NHIS = National Health Interview Survey.

cohort. Among women, with the exception of the 1954 to 1957 birth cohort, the intra-cohort change statistics are always positive. They also tend to be larger than those observed among men of the same age in the same cohort. This pattern is consistent with the notion that the diagnosis of ADHD among adult women was higher than among adult men during the 2007 to 2012 historical period; however, we cannot explicitly examine that explanation empirically with available data.

For ease of comparison and analysis, Figure 1 provides a visual summary of all of the information presented in Tables 1 to 3. Examination of Figure 1 reveals several insights. First, the overall large increase in the percentage who report that they were ever diagnosed with ADHD that is evident between the 1973 to 1977 and 1978 to 1982 cohorts (left-most panel) was driven largely by the sharp inter-cohort increase among men (middle panel). Inter-cohort change among women has been more gradual and consistent; the inter-cohort spike seen among men is not evident among women even though this was the largest inter-cohort change documented among women. Second, the net positive overall intra-cohort change in the percentage reporting that there were ever diagnosed with ADHD observed at most ages (left-most panel) was driven primarily by period- and age-specific intra-cohort changes among women (right-most panel). Over the period from 2007 to 2012, we see some evidence of intra-cohort increases in self-reported ADHD diagnosis among men in their 20s and 40s, but also some evidence of decreases or stasis at other ages.

Generally, the prevalence of ADHD among women is below that of men in 2007. However, among women, quite large intra-cohort changes are evident at virtually every age, especially in more recent cohorts whose members were observed at younger ages. As a result, as seen in Figure 2, by 2012, the prevalence of self-reported ADHD status was similar for men and women more than 30 years. For example, in the 1958 to 1962 cohort in 2012 (dark blue line), the prevalence among 50- to 54-year-old men and women,

Table 3. Prevalence of Self-Reported ADHD and Inter- and Intra-Cohort Change Among Women, by Birth Cohort and Observed Ages, 2007 and 2012 NHIS.

Age (in years)											
	18-19	23-24	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
Birth cohort											
1948-1952										**1.07**	1.72
Intra-cohort change										—	+0.65
Inter-cohort change										—	—
1953-1957									**1.80**	1.77	
Intra-cohort change									—	−.03	
Inter-cohort change									—	+0.70	
1958-1962								**2.32**	3.72		
Intra-cohort change								—	+1.40		
Inter-cohort change								—	+1.92		
1963-1967							**2.11**	3.28			
Intra-cohort change							—	+1.17			
Inter-cohort change							—	+.96			
1968-1972						**2.84**	3.50				
Intra-cohort change						—	+0.66				
Inter-cohort change						—	+1.39				
1973-1977					**2.07**	3.64					
Intra-cohort change					—	+1.57					
Inter-cohort change					—	+0.80					
1978-1982				**3.07**	4.89						
Intra-cohort change				—	+1.82						
Inter-cohort change				—	+2.82						
1983-1987			**4.44**	4.50							
Intra-cohort change			—	+0.06							
Inter-cohort change			—	+1.43							
1988-1989	**3.70**	7.09									
Intra-cohort change	—	+3.39									
Inter-cohort change	—	—									

Note. NHIS = National Health Interview Survey.

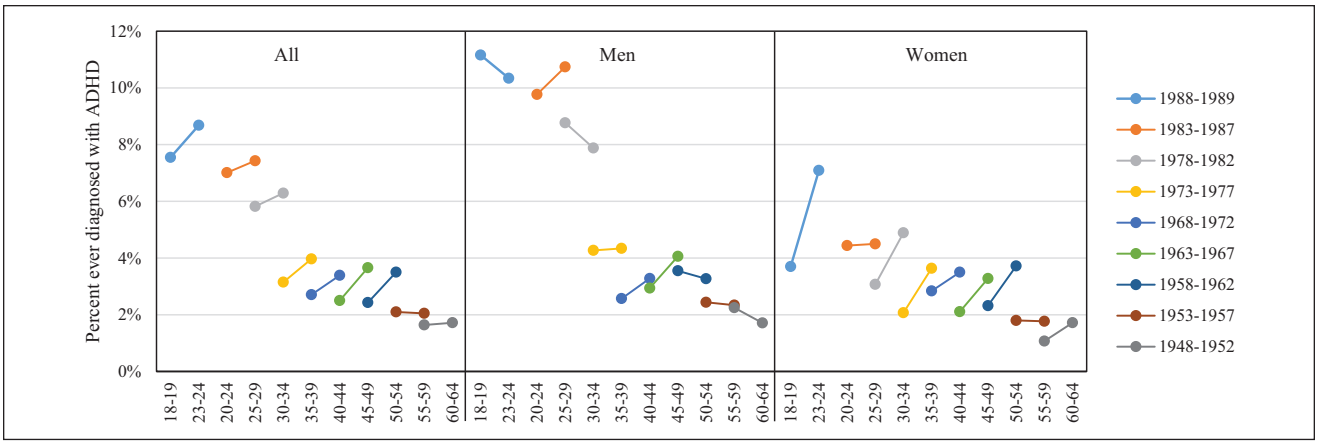

Figure 1. Summary of inter- and intra-cohort change in self-reported ADHD by cohort and observed age, overall and by gender, 2007 and 2012 NHIS.

Note. NHIS = National Health Interview Survey.

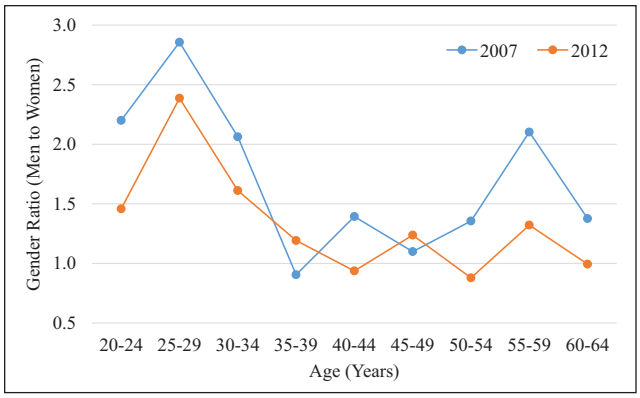

Figure 2. Gender ratio of self-reported ADHD, by age group and year, 2007 and 2012 NHIS.
Note. NHIS = National Health Interview Survey.

respectively, was 3.27% and 3.72%. At younger ages, within-cohort differences among men and women are more distinct largely due to the spike among men who were born in or after 1980. Relatively larger, recent, intra-cohort increases among women in these more recent cohorts are narrowing the gap. Overall, the gender gap in adult ADHD prevalence decreased by 31.1% from 2.06 percentage points in 2007 to 1.42 percentage points in 2012.

Discussion

Based on the documented history of the expansion of ADHD among children and adults, we hypothesized that there would be substantial inter-cohort differences in the prevalence of ADHD among adults. Such inter-cohort variation would, in part, reflect the fact that children from different cohorts pass through the prime ages of ADHD diagnosis in different historical periods characterized by different propensities for lay symptom recognition and referral, and for physician diagnosis. We also hypothesized that there would be a net intra-cohort increase in ADHD diagnosis over the 5-year period from 2007 to 2012. Intra-cohort change, in part, would reflect adult diagnosis of ADHD during this historical period. Finally, given the historical under-recognition of ADHD in girls and women, as well as the recent emphasis on symptoms that are thought to be more characteristic of the presentation of ADHD in girls/women than in boys/men, we expected that the hypothesized increase in adult diagnosis would be disproportionately concentrated among women and would serve to narrow that gender gap in the percentage ever diagnosed with ADHD. We found support for all three hypotheses.

Specifically, we document a 24.6% increase in the overall prevalence of ADHD in the population of 18- to 64-year-old adults, from 3.41% in 2007 to 4.25% in 2012. Net of the inter-cohort changes we expected on the basis of historical diagnostic revision and expansion, we observed substantial intra-cohort changes. These intra-cohort increases were driven primarily by increases over this 5-year period in the percentage of adult women of virtually all ages who reported ever being diagnosed with ADHD—a gender-specific historical period effect. The relatively large, recent, intra-cohort increases among women of all ages resulted in a narrowing of the gender gap in the prevalence of adult ADHD. Overall, the gender gap decreased by 31.1%, from 2.06 percentage points in 2007 to 1.42 percentage points in 2012. Our results are consistent with recent studies that have documented increased use of prescription ADHD medications among adult women with private, employer-sponsored health insurance (Anderson, 2018; Castle et al., 2007). However, our analyses suggest that media headlines like some that followed the release of the Express Scripts (2014) report—"Adult Women are the New Face of ADHD" (Jacobson, 2014)—are not accurate. The prevalence of ADHD is still higher among adult men than among adult women even though diagnoses have increased in the recent past among women of all ages, and especially among young adult women (i.e., adult women born in the most recent cohorts who have thus far been observed in young adulthood).

The large intra-cohort increase in the prevalence of ever being diagnosed with ADHD from 2007 to 2012 among women from the most recent cohorts (i.e., younger women) is noteworthy. These women passed through childhood and adolescence during a time when ADHD diagnostic practices were highly institutionalized for boys and were increasingly, but belatedly, being institutionalized for adult men and for girls and adult women. It has been argued that the expansion of ADHD diagnosis among adults (arguably men in particular until recently) was in part driven by changes in diagnostic criteria, concern about underdiagnosis, physician practices, and patient demand for a medical explanation for the day-to-day problems they were experiencing (Conrad, 2008; Conrad & Potter, 2000). As a result, individuals diagnosed with ADHD often adopt biomedical or psychological language to describe their own behavior as problematic and/or underperforming at the expense of recognizing the ways in which the problem of ADHD may be located in the larger social structure (Bröer & Heerings, 2013; Conrad & Potter, 2000; Conrad & Schneider, 1980/2010; Danforth & Navarro, 2001; Singh, 2002). We think it is important for future research to consider the possibility that contemporary young adult women who were primed in childhood and adolescence to know about ADHD are seeking (i.e., consumer-driven medicalization; see Barker, 2008) or being encouraged to accept ADHD diagnosis to try to label and address problems they are encountering in the transition to adulthood.

The primary limitations of this study result from the fact that the NCHS has included a single-item, self-reported measure of ADHD in the Sample Adult questionnaire only in the 2007 and 2012 NHIS. As ADHD is a single-item measure, we cannot take into account age of diagnosis, duration of diagnosis, or other measures of symptomatology and/or treatment that may vary within and between cohorts, and by gender. Because it is self-reported, it may be underreported. Although research shows that adults with ADHD are reliable in their self-reports of diagnosis and symptoms (Kooij et al., 2008), underreporting may occur if adults choose to disavow, or feel they have outgrown, the diagnosis. As a result of these two limitations in the measurement of ADHD in the NHIS, we caution that our findings describe changes in the prevalence of self-reported adult ADHD over a 5-year period of time. In addition, the NHIS uses a repeated cross-sectional, rather than a panel, survey design, and, as noted above, only included the questions about ADHD among adults at two points in time. As a result, our analysis of intra- and inter-cohort change is based upon limited synthetic cohorts, not actual cohorts comprising the same individuals followed over time. Finally, given the limited measurement of ADHD among adults, it is not possible to analyze prevalence rates prior to 2007 or beyond 2012. Thus, while reasonable to think that the intra- and inter-cohort changes in ADHD prevalence rates are indicative of a larger trend that extends beyond these years, we are not able to test this assumption.

Informed by studies reporting substantial gender differences in the prevalence of ADHD, scholars contend that females have historically been less likely than males to receive a diagnosis of ADHD. This differential in diagnosis has been attributed to inherent biological differences between males and females and/or gender bias in the diagnosis and treatment of ADHD. Although the results from this study do not allow us to differentiate between these arguments, our assumption is that potential biological differences between males and females that relate to ADHD diagnosis would not drastically change over short periods of time such as the 5-year interval we used in this study. Thus, it seems most likely to us that the gender-specific historical period effect that we document is due primarily to changes in diagnostic practices and a reduction in diagnostic bias that affected adult women more than adult men. It is plausible that this change reflects increased recognition of historical underdiagnosis among girls/women and a good-faith effort by physicians to address unmet need. In the current period, increased attention to subtypes of ADHD that are more prevalent among women and to symptom presentation that is more common among women may be contributing factors to both changes in physician and patient-consumer behaviors that lead to increased diagnosis. However, we cannot rule out other influences (e.g., efforts by pharmaceutical companies to cultivate an available margin in the market if other parts of the market are saturated) that may also be driving the change we document. We encourage researchers to take up these questions in future research.

We believe that the results from our analyses provide valuable information and additional empirical evidence of continued expansion of ADHD among adults—particularly women—over the period from 2007 to 2012. Moreover, we believe that each of the limitations of this study point to the need for more robust data on adults with ADHD. We recognize that the NCHS recently completed a revision process aimed at reducing the number of questions included in the survey and will field its revised survey in 2019 (NCHS, 2018). Although it would be ideal to expand the number of questions in the NHIS devoted to adult ADHD to include age of onset and type and duration of treatment, we realize that this is not a likely outcome during a time of reduction in research funding. Nevertheless, we do think that including the single-item, self-reported question utilized in the 2007 and 2012 Sample Adult questionnaires every year that the NHIS is fielded is warranted and feasible. At present, a single-item, parent-reported measure of ADHD is included in every year of the Sample Child questionnaire. Our proposal would add a parallel item for adults. This one small change would greatly improve our ability to analyze inter- and intra-cohort changes in adult ADHD prevalence over time, even though it would not address all the limitations discussed above.

We believe strongly that further research on adult ADHD is crucial to inform public health policy and research in the United States. ADHD is a life-course condition that often extends into and is diagnosed in adulthood. It has a direct effect on adult health outcomes (Landes & London, 2021) and mortality (London & Landes, 2016). There is also increasing concern that the expansion of ADHD medication use among women of childbearing age can have consequences for fetal outcomes (Anderson et al., 2018; Anderson et al., 2020). In addition, it might moderate other adult health processes and outcomes in ways that are currently underappreciated due to the lack of data. We believe that including a measure of ever being diagnosed with ADHD, at a minimum, every time the Sample Adult questionnaire is fielded would allow the NHIS to more fully accomplish its stated goal of monitoring and improving the health of the U.S. population, and enhance our understanding of population health patterns for adults with ADHD.

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