

# Attention deficit/hyperactivity disorder misdiagnosis : the influence of gender, race and age

Melissa Renee Edwards

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Attention Deficit/Hyperactivity Disorder Misdiagnosis:

The Influence of Gender, Race and Age

Melissa Renee Edwards

The University of Toledo

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## Introduction

Attention-deficit/hyperactivity disorder (ADHD) is one of the leading childhood mental health disorders. Prevalence estimates of ADHD have increased greatly due, in part, to the addition of subtypes in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM). Other findings for increased prevalence continue to be reviewed. Several studies have highlighted the non-diagnostic factors that individuals perceive to be diagnostic resulting in misidentification. Gender, age and race play substantial roles in the cause for disproportionate diagnoses (Sciutto & Eisenberg, 2007).

Although there are several components associated with ADHD diagnosis, no one diagnostic tool or measure has proven to create enough standardization to free public and healthcare provider concern. Some researchers believe the disorder is primarily contextual while others strongly believe there are true genetic components that cause neurodevelopmental problems, regardless of context (Newmark, 2015). Cerebral and functional imaging studies have demonstrated structural, neurochemical and functional differences in ADHD patients (Waite, 2010).

Due to the subjectivity and symptom variance seen with ADHD between girls and boys, children and adults, cynicism of the validity of diagnostic measures persists. As a result, concerns of over-prescribing remain. A part of the reason for continued controversy includes the fear of stimulant abuse and diversion (Connor, 2011).

## Background

In 2011, the U. S. Centers for Disease Control and Prevention reported that the prevalence of ADHD in children aged 4 to 17 years old was 11%, representing 6.4 million

children diagnosed with ADHD and 4.2 million taking psychostimulants. This is a significant increase from 30 years ago when the rate of ADHD was estimated to be only 3% to 5%. The prevalence of ADHD increased by approximately 35% from 2003 to 2011. Although this dramatic increase in ADHD diagnosis is recognized, no single cause has been determined. Research suggests overdiagnosis due to insufficient diagnostic evaluation, societal pressure for treatment, and other various influences (Newmark, 2015).

Research is demonstrating that the male-to-female ratio of ADHD diagnosis is disproportionate and suggests that far more males receive diagnosis and treatment. This remarkable difference is thought to be due to the differences in expression of the disorder among boys and girls. Contributing to the diagnostic imbalance is the application of heuristic principles (Bruchmuller, Margraf & Schneider, 2012).

Caucasian adolescent males are more often diagnosed with ADHD than their African American counterparts. When African American adolescent males present problem traits similar to their Caucasian peers, African American males are more likely to be diagnosed with Conduct Disorder (CD) (Clark, 2007). Diagnostic similarities are noticed in young children as well. Although equally as likely to exhibit ADHD-related behaviors, African American children are less likely than Caucasian children to be diagnosed with ADHD (Morgan, Hillemeier, Farkas, & Maczuga, 2014).

There are many barriers to correctly diagnosing adult ADHD. Commonly recognized as a childhood disorder, lack of definitive diagnostic tools for adults creates clinical challenges. ADHD criterion from the DSM focuses on childhood symptoms and has limited diagnostic validity for adults (Weisler & Goodman, 2008).

Misdiagnosis prompts a pharmacological debate for ADHD overtreatment in children, adolescents and adults. Stimulants are the first line drug for ADHD treatment. There are still many questions and concerns surrounding side effects and safety with these types of drugs (Sciutto & Eisenberg, 2007).

### **Problem Statement**

ADHD is one of the most diagnosed childhood disorders with increasing recognition of persistence into adulthood. With growing prevalence rates, there is public concern for misdiagnosis and the influential factors that contribute to such, resulting in overprescription of psychotropic drugs.

### **Purpose**

This project will recognize the influential factors that contribute to ADHD diagnosis, and provide awareness of contributing aspects to misdiagnosis.

### **Research Question**

“Is ADHD misdiagnosed? The influence of client gender, race and age on diagnostic prevalence”

### **Definitions**

N/A

## **Methodology**

### **Search terms:**

“attention deficit hyperactivity disorder,” “adhd,” “overdiagnosis,” “misdiagnosis,”  
“ethnicity”

### **Databases:**

PubMed, Google Scholar, CINAHL, PsycINFO

### **Inclusion and exclusion criteria for articles:**

All articles must be originally printed in English. No location restrictions will be applied.  
Additionally, year restrictions will not be placed on research.



## Literature review

### The prevalence of ADHD

Overdiagnosis versus underdiagnosis of ADHD is greatly debated and driven, in part, by variations in prevalence estimates across countries and differences between DSM versions, including broadening diagnostic criteria. Several studies analyzed, including DSM-III, DSM-III-R and DSM-IV, focused on prevalence estimates as researchers noted its importance as an anchoring effect for clinician comfort in ADHD diagnosis. Findings suggested clinicians less commonly consider a medical condition that is not as prevalent for diagnosis compared to one that is pervasive (Thomas, Sanders, Doust, Beller, & Glasziou, 2015).

A systematic review was conducted, inclusive of children 18 years old and younger, to examine whether prevalence estimates increased with the publication of different editions of the DSM. Diagnostic criteria from DSM-III, DSM-III-R and DSM-IV were included, in any language. Results indicated that prevalence estimates were lower when using DSM-III-R compared to DSM-III and DSM-IV (Thomas et al., 2015). Researchers of the study noted the inclusion of ADHD subtypes present in both DSM-III and DSM-IV criteria, allowing for diagnosis of a larger group of children.

Additionally, this study analyzed the impact of variables on prevalence estimates for DSM-III, DSM-III-R and DSM-IV. In meta-regressions for studies conducted with DSM-III criteria, there was a significant increase in prevalence estimates when the informants were parents compared to clinicians. Parents' estimates were 8% higher (Thomas et al., 2015). In fact, the prevalence of parent-reported diagnosed ADHD has tripled to more than 10% of children, since publication of DSM-IV (Batstra, Nieweg, Pijl, Van Tol, & Hadders-Algra, 2014). In studies establishing the prevalence of ADHD by using DSM-III-R criteria, no study variables

aided in explaining heterogeneity. When using DSM-IV criteria, only the region in which the study was conducted was significant; the Middle East had 3% higher prevalence estimates of ADHD than North America (Thomas et al.).

A qualitative review evaluated 14 prevalence studies, obtained from PsycINFO, to determine validity of DSM-IV prevalence estimates for school-aged children in the United States. The study was inclusive of moderating variables, such as the number and type of informants, sample characteristics, including age, and the method of assessment. The analysis showed the overall prevalence of ADHD varied considerably depending on the assessment method and age. ADHD prevalence was more likely to be lower and within the 3 to 7% range for younger children, ages 4 to 8, and above the 3 to 7% range for older children, ages 9 to 17 (Sciutto & Eisenberg, 2007).

As observed in another finding, the prevalence of ADHD was more likely to be lower and within the 3 to 7% range when random and larger samples were used; whereas significantly higher prevalence rates were reported in non-random samples (Sciutto & Eisenberg, 2007). Researchers noted that due to significant variations in methodology, prevalence rates are not as reliable for interpretable evidence for ADHD overdiagnosis in children (Cohen, Riccio, & Gonzalez, 1994).

Further supporting that prevalence estimates vary as a function of study design and sample size, is a study that demonstrated conservative estimates (1% to 5%) occurring in population-based studies of students with documented ADHD diagnoses. The highest estimates (16% to 26%) occurred in studies involving smaller samples sizes and participants who met ADHD screening criteria rather than students with a known ADHD diagnosis (LeFever, Dawson, & Morrow, 1999).

Researchers, as early as the 1980s, have recognized the variation in ADHD prevalence. A qualitative review of various studies indicated greater latitude in ADHD diagnoses in North America. Researcher Rutter noted that only 1-2% of pediatric patients in the United Kingdom with “normal” intelligence were diagnosed as hyperactive, whereas the prevalence in North America was higher and more variable ranging from 2-20%. Diagnosis in the United Kingdom requires a pervasive picture including multiple settings, home, school, etc. In addition, significant aggressive behavior cannot be present. However, it was noted that inconsistencies existed in the pervasive picture requirement for diagnosis in North America, as clinicians diagnose more children with a situational ADHD presentation (Rutter, Cox, Tupling, Berger, & Yule, 1975).

### **Childhood ADHD diagnosis**

ADHD is one of the most commonly diagnosed childhood disorders. There is common conception that ADHD is overdiagnosed with suggestion that it is a ‘desirable diagnosis’ for some parents (Smelter & Rasch, 1996). Researchers of a meta-analytic study focused on DSM-IV prevalence that defined ADHD overdiagnosis to be the rate of false positives exceeding the number of false negatives. Results indicated that there was insufficient justification to conclude that ADHD is overdiagnosed. Researchers of this study also acknowledged media influence on the perception of overdiagnosis (Sciutto & Eisenberg, 2007).

However, studies that are more recent suggest childhood ADHD overdiagnosis. One study evaluated 92 children that were referred to an ADHD clinic and categorized as actual or suspected ADHD diagnosis. After a more comprehensive evaluation was performed, just 22% were given a primary diagnosis of ADHD and 37% given a secondary diagnosis of ADHD

(Cotuono, 1993). A similar study discovered that 62% of clinic referrals for ADHD were not confirmed ADHD cases after further assessment (Desgranges & Karsky, 1995).

Variability in ADHD assessment is a factor that may contribute to increased false positives. A study performed in 2005 found that a large majority of psychologist did not regularly follow assessment procedures that are consistent with best practice guidelines. Similarly, another study found that primary care physicians relied predominantly on interviews and most did not adhere to the DSM criteria. However, from qualitative reviews, researchers faced challenges to have sufficient evidence in favor of false positive over false negative ADHD diagnoses (Sciutto & Eisenberg, 2007).

Studies have demonstrated a link between the relative age of children and diagnosis of ADHD. Researchers from the University of British Columbia investigated the phenomena of younger children in the same grade as other children that are almost a year older, with the presumption that younger children appear to be immature compared to their peers and inappropriately diagnosed. Researchers referred to this as the “relative age effect.” The study investigated this effect by involving 937, 943 children, 6 to 12 years old. Children included in the study were almost one year younger than their classmates. Results indicated that children were 39% more likely to be diagnosed and 48% more likely to be treated with medication for ADHD if born in December compared to January (Morrow, 2012).

Several tools exist for ADHD diagnosis and several studies evaluated their efficacy. Continuous performance tests (CPTs) are computer-based and measure inattention and impulsivity of children. Gordon’s Diagnostic System (GDS), Test of Variables of Attention (TOVA), Conners’ Continuous Performance Task (CCPT) and the Intermediate Visual and Auditory Continuous Performance Test (IVA) are commercially available CPTs (Gupta & Kar,

2010). Researchers evaluated the validity of CPTs and results were unfavorable. False negative rates ranged from 20 to 37%, leading researchers to caution that “normal” CPT results should not be used as confirmation to exclude a diagnosis of ADHD (Greenberg & Waldman, 1993).

Another study reviewed the GDS CPT specifically to assess and classify children with a pre-school history of language disorders for the presence of ADHD. The 5<sup>th</sup> and 25<sup>th</sup> percentiles were used as thresholds for 11 possible outcomes on three GDS tasks. Sensitivity was 60% and specificity was 46% at the 5<sup>th</sup> percentile. At the 25<sup>th</sup> percentile, sensitivity was 88% and specificity was 23%. Such results indicated the GDS has clinical usage in ruling out a diagnosis of ADHD in children with a history of language disorders; however, it is not suitable to confirm an ADHD diagnosis in this population. Many studies have further confirmed inconsistencies with CPTs for differentiating ADHD from other clinical groups (Reilly, Cunningham, Richards, et al., 1999).

It is clear that impairments in sustained attention are present to a certain degree in all children with psychiatric disorders, so assessing the cognitive functions that are specifically impaired in ADHD and incorporating that into diagnostic measure is important. A study conducted through the Department of Child and Adolescent Psychiatry of the University Hospital in Utrecht, Netherlands focused on distinguishing deficits in children with ADHD and children with other psychiatric disorders, classified by DSM-III-R. The 191 all boys study group, aged 6 to 13, were divided by disorder, including ADHD, oppositional defiant disorder (ODD) or conduct disorder (CD), anxiety or dysthymia and pervasive developmental disorder. In addition, two groups of patients with ADHD and comorbidity of ODD or CD and comorbidity of anxiety or dysthymia were included. Visual sustained attention tasks results were compared to controls. Children with ADHD were slower, more inaccurate, more impulsive, less responsive to

feedback, and exhibited less perceptual sensitivity and stability of performance, resulting in decreased vigilance with time. However, the only distinguishable factors specific to ADHD were decreased responsiveness to feedback and the extent of the decrease in vigilance (Swaab-Barneveld et al., 2000).

Other more recent studies on children with ADHD have identified more unique underlying cognitive dysfunction, specific to ADHD. These studies revealed that children with ADHD show deficits in subsystems of attention including alerting, orienting, and executive network. Further studies, using the Attentional Network Task system (ANT) confirmed ADHD children have difficulty maintaining an alert state in the absence of warning signals (Blane & Marrocco, 2004). Other studies using task similar to ANT support previous study findings by ADHD children displaying slowed response times to abrupt visual cues particularly when faced with conflicting spatial cues (Oberlin, Alford, & Marrocco, 2005).

Many study results are in agreement with the idea that individuals with ADHD have a deficiency in one sub-component of executive control processes, response inhibition (Sergeant, Oosterlaan, & van der Meere, 1999). However, other studies have linked response inhibition to CD as well (Oosterlaan, Logan, & Sergeant, 1998). Many studies have failed to control for comorbid diagnosis so the association between response inhibition and CD may be due to the large overlap with ADHD (Pennington & Ozonoff, 1996).

Competing studies, which have controlled for subclinical symptoms, reported that response inhibition is specific to ADHD and not primarily related to CD. Researchers further reported that the relationship between response inhibition and conduct problems was not significant when controlling for hyperactivity; however, the relationship between response

inhibition and hyperactivity remained significant when controlling for conduct problems (Berlin & Bohlin, 2002).

A Belgian study conducted in 2013 on Flemish children analyzed the impact of instructional context on classroom behavior specifically comparing children with ADHD withdrawn from medication to their non-ADHD classmates. Thirty-one children diagnosed with ADHD, 25 boys and 6 girls, aged 6 to 12 years old, were compared to the same sex and age matched controls. Generalized estimation equation analyses demonstrated children with ADHD were less focused than controls during individual work and large group teachings. However, children with ADHD were equally focused during small group work. Also, shorter attention span was noted during specific subjects including mathematics, language and science but on-task attention span was optimal during music and arts. Findings also suggested that despite receiving more direction from teachers, children with ADHD showed lower levels of on-task behavior where high self-regulatory, information processing and motivational demands were necessary (Imeraj et al., 2013).

### **Adult ADHD diagnosis**

A once withstanding view of ADHD as a self-remitting condition that subsides following puberty has been altered by the results of longitudinal studies reported in the 1980's. Research suggested that 50% to 65% of children diagnosed with ADHD continue to demonstrate symptoms into adulthood (Conners et al., 1999). Investigators found that neurocognitive and biological findings in adults, including patterns of genetic transmission and anomalies in brain imaging, are comparable to those in children with ADHD. ADHD is now conceptualized as a

lifespan disorder rather than just a childhood condition and although adult ADHD is increasingly recognized, there is no consensus on diagnostic criteria (McGough & Barkley, 2004).

A review of various diagnostic criteria performed by several researchers included Wender Utah criteria, DSM-IV criteria and laboratory assessment methods, which currently have no foundation in clinical diagnostic criteria. The review established validity for both the Wender Utah and DSM-IV criteria to identify clinically impaired adults with ADHD. However, still lacking universally accepted diagnostic criteria and more research that adequately defines diagnostic thresholds for adult ADHD, clinicians risk both overdiagnosis and underdiagnosis. Laboratory-based diagnostic methods were reviewed as having value in the assessment of cognitive disabilities but results of the analysis showed no significant contribution to the clinical diagnosis of adult ADHD (McGough & Barkley, 2004).

One study performed established and confirmed factor analyses and normative data for the Conners' Adult ADHD Rating Scale (CAARS), which provides quantitative measure of adult ADHD symptomatology. The normative sample consisted of 839 adults, with an age range of 18 to 81 years old. A clinical sample was also utilized and consisted of 167 adults that were referred to an outpatient ADHD clinic for assessment. Each sample received the research version of the scale. There were 93 items, under nine symptom domains that were rated using a four-point Likert scale. Results of the study indicated that the nine domains could resolve to 4 factor structures with 42 items. The factors included inattention/cognitive problems, hyperactivity/restlessness, impulsivity/emotional lability and problems with self-concept, which entailed items related to low self-esteem, self-criticism and failure to confront challenges (Conners et al., 1999).



It is clear that misdiagnosis of adult ADHD may have detrimental effects, as seen in the following longitudinal study, which included 500 adults with self-reported diagnoses of ADHD and 501 gender and age-matched controls. Results demonstrated that adults with ADHD were twice as likely to be arrested, almost twice as likely to be divorced, more likely to be unemployed and less likely to report satisfaction with social and family life, or life achievements in general. The study also demonstrated that adults with ADHD had increased likelihood to engage in risk-taking behaviors and were almost twice as likely to be addicted to tobacco and 1.5 times as likely to have used recreational drugs compared with controls (Biederman et al., 2006).

A similar study compared younger adults that were diagnosed with ADHD in childhood with non-ADHD young adults as the control. Results showed the ADHD group was less likely to have finished high school, three times more likely to be unemployed and four times more likely to have contracted a sexually transmitted disease. Regarding driving habits, those with ADHD were almost three times more likely to report being involved in more than three vehicular crashes than the control group (Barkley, Fischer, Smallish, & Fletcher, 2006).

Analysis of data obtained from two claims databases of inpatient, outpatient and prescription drug services included 2252 adults with ADHD compared with an age and gender-matched group of 2252 adults without ADHD. Results demonstrated that more adults with ADHD had comorbid conditions including depression (17.1% vs. 2.9%;  $P < 0.01$ ), anxiety (13.8% vs. 3.5%;  $P < 0.01$ ), drug or alcohol abuse (5.1% vs. 1.9%;  $P < 0.01$ ), asthma (4.7% vs. 2.9%;  $P < 0.01$ ), bipolar disorder (4.5% vs. 0.6%;  $P < 0.01$ ), or accidents and injury (2.0% vs. 1.5%;  $P = 0.18$ ). Adults with ADHD also showed increased truancies from work than the control group (43 vs. 29;  $P < 0.05$ ) (Secnik, Swensen, & Lage, 2005).

One study showed cost to the US economy as a result of underdiagnoses of adult ADHD. The documented cost to the US economy directly stemming from underemployment associated with ADHD was researched to be as high as 100 billion dollars per year. The statistics of this study did not include additional costs associated with the frequent comorbid psychiatric and cognitive disorders associated with ADHD (Biederman, 2012).

A survey of 400 primary care physicians revealed 48% were not confident diagnosing adult ADHD, 44% believed the diagnostic criteria for adult ADHD to be vague and 72% reported it was more difficult to diagnose adults than children. Such uncertainty with diagnoses resulted in 67% referral to a specialist for adult ADHD diagnosing, compared to only a 2-3% referral for other psychiatric disorders such as depression and generalized anxiety disorder. Primary care physicians of the survey were in agreement with several factors contributing to high deferral percentage including diagnostic criteria being better suited to children, non-specificity of symptoms, high incidence of comorbid disorders, and lack of definitive instruments (Weisler & Goodman, 2008).

Underdiagnoses of adults with ADHD have shown to affect parenting. Research of parents with ADHD indicated that they have difficulty with instrumental and organizational tasks of parenting such as being consistent, monitoring child activities and child behavior, performing household tasks and managing daily routines. Parents with such deficits have shown to have increased stress and feelings of inadequacy and failure (Waite, 2010). Supporting studies of parents with ADHD have shown that mothers especially have lower levels of self-esteem and increased levels of depression, self-blame and social isolation when compared to the control group of mothers without ADHD (Chronis-Tuscano et al., 2008). Fathers with ADHD

demonstrated more negative and authoritarian discipline compared to fathers without ADHD (Arnold, O'Leary, & Edwards, 1997).

Researchers at the University of Maryland conducted a systematic study of preschool children with ADHD and found that parents of children with ADHD are 24 times more likely to have the disorder than are parents of children without ADHD (Chronis et al., 2003). Another study that focused on families with ADHD children supported the increased likelihood of parents having the disorder as well, showing approximately 20% of mothers and 30% of fathers with ADHD symptoms (Pauls, 1991).

A Turkish study, which consisted of 85 psychiatrists that worked for five or more years in mental health, showed that most accepted adult ADHD as a diagnosis, but 4.7% did not. Interestingly, despite the overwhelming literature supporting stimulants as the gold standard for ADHD treatment, almost 50% of Turkish psychiatrist had negative views on prescribing, with 40% reporting unwillingness to prescribe stimulants due to fear with drug abuse (Aksoy, Baysal, Aksoy, Tufan, & Maner, 2015).

### **Gender influences on ADHD diagnosis**

Several studies have shown the influence of client gender on diagnosis. In representative population-based studies, the male-to-female ratio of ADHD is 3:1. In clinical studies, the male-to-female ratio is approximately between 5:1 and 9:1. These values indicate that more males receive treatment for ADHD symptoms. Researchers suggest this variance may be explained by differences in expression of the disorder among boys and girls (Gershon & Gershon, 2002).

Several studies have proposed that girls with ADHD show less behavioral and conduct problems than boys with ADHD. In a meta-analysis on gender differences in ADHD

symptomatology, it was concluded that girls with ADHD were less hyperactive and demonstrated less aggressive behavior than boys with ADHD (Gaub & Carlson, 1997).

Additionally, girls were more likely to be predominantly inattentive subtype of ADHD, which, in many cases is assumed less disruptive in a classroom environment. This is thought to contribute to less likely diagnosis and treatment for girls with ADHD (Bruchmüller, Margraf, & Schneider, 2012).

There is strong evidence that gender differences alone are not solely responsible for boys with ADHD receiving treatment two to three times more often than girls with ADHD. A German study conducted assessed the influence of heuristics and biases. The study consisted of 473 psychotherapists, including psychologists, psychiatrists and social workers that specialized in children and adolescents. Four case vignettes were created on the basis of the DSM-IV and ICD-10 criteria of ADHD. The first vignette contained all of the information required to diagnose ADHD, combined type. The second vignette was identical to the first, except two criteria necessary to diagnose ADHD were excluded. The third vignette had three missing criteria, and the fourth vignette fulfilled all criteria for general anxiety disorder, with some symptom overlap representative of ADHD. To assess if gender influenced therapists', all vignettes were created in boy and girl versions and a logistic regression analysis was performed (Bruchmüller et al., 2012).

Results of this study showed that ADHD was diagnosed more frequently in the boy vignettes than in the girl vignettes. In fact, twice as many ADHD diagnoses were given to the boys compared to the girls. For the girl vignette, no significant difference existed between the proportion of false positive (11.3%) and false negative (7.5%) diagnoses. However, in the boy vignette, there were much more false positive (21.8%) than false negative (6.6%) diagnoses. This

reveals that boys are more readily overdiagnosed with ADHD than girls (Bruchmüller et al., 2012).

Teachers are often a primary information source regarding ADHD diagnoses in schoolchildren, so their perception is influential. Researchers conducted a survey involving 52 randomly selected teachers from eight different Midwestern elementary and junior high schools. Each teacher completed a survey of ADHD in the classroom and two school version ADHD rating scale-IV worksheets. The child's age, gender and ethnicity were a part of these forms. Results indicated that males had a significantly higher mean score than females. It was proposed that the higher score for males was due to teacher and parent perception regarding males having more aggressive and disruptive behaviors (Havey, 2005).

Researchers surveyed 225 public and private school teachers on ADHD causes and interventions most effective for students. Results showed the largest percentage of teachers, 47%, believed there was a biochemical component to ADHD and 90% believed the ideal intervention combined behavior modification and medication. Within this study, researchers noted that teachers from private schools and teachers that had larger classes, reported higher rates of ADHD, thereby over-identifying students, particularly males (Glass & Wegar, 2000).

### **Cultural and race influences on ADHD diagnosis**

In addition to gender influences, studies have also indicated that culture and race play a role in diagnostic outcomes for ADHD. Rates of ADHD are reported to be higher within those cultures that have a lower tolerance for the behaviors associated with the disorder. One study evaluated 60 elementary school teachers from twelve Midwestern rurally located schools to rate the amount of children teachers suspected to have ADHD. Results indicated that students

meeting diagnostic criteria were predominantly White males (Havey, 2005). Conversely, an earlier study reported higher rates of ADHD among African Americans than Caucasians (Reid et al., 2000).

Dr. Clark of Troy University noted that persistent discrepancies with ADHD diagnosis cause more African American males to be classified as having behavior problems that mimic CD rather than ADHD (Clark, 2007). Even when problem traits are presented similarly to Caucasian adolescent males, studies show African American adolescent males are more likely to be diagnosed with CD (Spencer & Oatts, 1999). Researchers also discovered that educators are more likely to attribute classroom inattentiveness in African American adolescent males as disruptive and aggressive, which are behavioral traits that more closely resemble CD as well. Black teenage males are more likely to be classified as having inappropriate behavior, rather than their behavior serving as an indicator for a greater underlying behavioral condition (Serwatka, Deering, & Grant, 1995).

Research that is more recent concluded that teachers' perception of aggressive behavior primarily stemmed from the manner in which black males walked, classroom posture and attire. Researchers discovered that black male students are disproportionately misrepresented for reasons including the perception of their movement. Regarding gait, one study showed black males were viewed as incapable of achieving goals if they did not walk erect with synchronized legs and arms, at a steady pace with head straight (La Vonne, McCray, & Webb-Johnson, 2001). Contrasting results were reported when white teenage males demonstrated similar symptoms of inattentiveness and restlessness in the classroom. Teachers were more likely to identify them as having ADHD and as a result, proper management of special education services, counseling and medication was provided (Fabrega, Ulrich, & Mezzich, 1993).

It is clear that discrepancies for ADHD diagnosis exist within the classroom amongst black and white teenagers. Other cultural studies have shown that Western culture especially plays a role in child ADHD diagnosis. Western culture encourages a lifestyle that is 'hyperactive,' and loss of extended family support with a breakdown in the authority of adults is normal (Timimi & Taylor, 2004).

In the United States, what is known of parental response to children with ADHD has mostly come from studies performed on middle class European-American families. Research indicates that European-American parents have a lower tolerance for an incessant display of ADHD symptoms, are more likely to consider the symptoms as a medical disorder and seek professional help faster than parents from other ethnic backgrounds. Regarding African American and Hispanic families, studies showed that these families have a greater stigma of mental health illnesses and therefore are less likely to accept ADHD as a diagnosis. Minority families also demonstrated increased tolerance of ADHD symptoms before seeking professional help and were more able to maintain a unique cultural perspective on ADHD (Waite, 2010).

A longitudinal study performed examined the ethnic disparities in ADHD diagnosis from kindergarten to eighth grade along with treatment disparities. The database maintained by the National Center for Education Statistics was utilized to obtain the cohort of U.S. children that entered kindergarten in 1998, resulting in 17,100 children in the study. Results indicated minority children were less likely to receive ADHD diagnosis than white children. Statistically, African Americans, Hispanics and children of other ethnicities were 69%, 50% and 46% lower, respectively, than whites for ADHD diagnosis (Paul L Morgan, Staff, Hillemeier, Farkas, & Maczuga, 2013).

Overall, researchers are seemingly in agreement with ADHD diagnostic disparities for minorities. Furthermore, the validity of ADHD rating scales across different ethnic groups is understudied. Many researchers consider the African American adolescent male the least studied, and therefore, the least understood gender and race in the United States (Blake & Darling, 1994).

### **Pharmacotherapy concerns with ADHD**

Misdiagnosis can have a direct and negative impact on treatment and as seen in several studies, overdiagnosis of ADHD results in a more frequent recommendation for medication (Bruchmüller et al., 2012). The rate of stimulant treatment for ADHD has risen dramatically over the last 15 years. Many studies have revealed rates of medication use exceeding documented prevalence rates. However, opposing research to overprescription concerns suggest that stimulant use has increased for those that are statistically less likely to be diagnosed, such as girls and adults, suggesting improved recognition and increased awareness of ADHD (Sciutto & Eisenberg, 2007).

The most prescribed psychostimulant for the treatment of ADHD is methylphenidate. The mechanism of action of methylphenidate assists in the hypothesis of determining the cause for ADHD as being dopaminergic dysfunction. Methylphenidate blocks the dopamine transporter that reuptakes dopamine following release, thereby increasing synaptic levels. Human imaging provides evidence for increased synaptic dopamine following inhibition of dopamine transporter by methylphenidate. It has great potential for abuse because of its effects on reward pathways in the brain. Abuse in youth has increased seven-fold from 1993 to 1999 and at least 5% of college students have used methylphenidate for non-medical use (Roeding et al., 2014).



The prominent use of methylphenidate encouraged researchers to study its effects, providing data on the implications for the role of methylphenidate in addiction with a focus on gender. The study performed by Roeding analyzed sex differences in adolescent methylphenidate sensitization in rats, where behavioral sensitization to psychostimulants was mediated by an increase in dopaminergic activity in brain areas including the striatum and nucleus accumbens. The study concluded that adolescent female rats demonstrated higher sensitization to methylphenidate than male rats (Roeding et al., 2014).

Another study examined the effectiveness of methylphenidate. A group of researchers conducted a double-blind study, which included 401 adults aged 18-63 years old with ADHD. The participants were given 18 milligrams, 36 milligrams, 72 milligrams, or placebo daily, for five weeks. Conners' Adult ADHD Rating Scale was utilized as the primary measure of treatment response. ADHD participants that received one of the three doses had greater improvements in their rating scale scores than those that received the placebo (Weisler & Goodman, 2008).

Immediate release treatments of methylphenidate and amphetamine require multiple daily doses and are more likely to be abused than the extended-release formulations. This is a concern that has been directed more toward the adult population, rather than adolescents and children. An analysis reviewed United States prescribing patterns for long-acting and short-acting ADHD medications by primary care providers, pediatricians and psychiatrists. The analysis showed that short-acting or long-acting ADHD treatments varied by specialty. Long-acting ADHD medication represented 56% of primary care prescriptions, 64% psychiatrist prescriptions and 79% pediatric prescriptions. Another analysis examined ADHD treatments by patient age and results indicated that long-acting drugs made up 78% of ADHD prescriptions in pediatric

patients, considered to be 0-17 years old and 49% of adult ADHD prescriptions (Weisler & Goodman, 2008).

An additional analysis noted between 1990 and 2005 there was a rapid increase in pediatric prescriptions for many psychiatric medications, not stimulants alone. The review concluded a five-fold increase for antipsychotics between 1993 and 2002 and a three-fold increase for antidepressants between 1997 and 2002. The results indicated the rise in stimulating prescriptions for pediatric ADHD was simply part of a greater movement toward pharmacotherapy interventions for the treatment of behavioral and mental health disorders (Connor, 2011).

Comparisons of the prevalence of ADHD in pediatrics aged 4 to 17 years (7.8%) with stimulant prescription rates between 4.3% and 4.4% do not promote the idea of a liberal stimulant overprescribing culture. Data from the National Health and Nutrition Examination Survey provided a nationally representative probability sample of children aged 8 to 15 years living in the community with an ADHD prevalence rate of 7.8%. However, only 48% of the pediatric ADHD sample received any mental health care over the past 12 months (Connor, 2011).

Connor (2011) identified the complexity of stimulant prescription rates and its variance by geographic location, age and gender. In an eleven-county epidemiological study of mental health status among children in western North Carolina, 7.3% of children were receiving stimulants but only 3.4% of children met a diagnosis of ADHD, which implied geographic areas of overprescribing do exist.

Researchers also studied the benefits of adding behavioral therapy to stimulant intervention in children diagnosed with ADHD. Results indicated that adding psychosocial

interventions with methylphenidate had minimal advantages to improving symptoms affecting academic functioning, emotional status and social functioning (Hechtman et al., 2004).

## Discussion

There is still much controversy surrounding ADHD diagnosis. It is evident there are many subjective, influential factors that contribute to diagnosis, raising the question, “is ADHD misdiagnosed?” Several studies have shown increased prevalence rates with the addition of DSM versions. It makes sense that the increase is due, in part, to the addition of ADHD subtypes with the latter DSM versions, which allows for a more inclusive diagnosis.

Additionally, other correlations to increased prevalence have been recognized, such as more recent media coverage. Although lacking significant statistics on the impact media has on ADHD, some researchers acknowledge media reports of ADHD as having provided parent and clinician comfort for the diagnosis. In fact, ADHD has seemingly become such a household name that one study showed parent estimations of reported child symptoms to be 8% higher when compared with clinicians. Increased parent reporting was also associated with publication of DSM-IV, the most recent edition in the study inclusive of DSM-III, DSM-III-R and DSM-IV. It may be concluded that three subtypes, instead of the bi-dimensional diagnosis in DSM-III or the unidimensional diagnosis offered in DSM-III-R, was the cause of parent-diagnosed ADHD tripling to more than 10% of children with the DSM-IV publication. From research, it seems the increased prevalence may be attributed to media awareness, familial informant comfort and subtype inclusion in more recent versions of the DSM.

Although the DSM provides descriptive criteria for the diagnosis of ADHD, there are qualitative and quantitative differences in the ways in which these criteria have been defined in practice and research. These differences are seen in the conceptualization of attention deficit, impulsivity and hyperactivity problems and with the measures used to operationally define them. This contributes to inconsistencies in reported prevalence of ADHD.

Researchers have long studied childhood ADHD diagnosis, as this is one of the most commonly diagnosed disorders. Concerns of misdiagnosis remain as prevalence continues to rise. Several studies have indicated that over-diagnosis is occurring as seen in the study that evaluated 92 children that were referred to an ADHD clinic. Only 22% of the 92 children were given a primary diagnosis of ADHD. Another study supported over-diagnosis after concluding that 62% of the clinic referrals for ADHD were not actually ADHD cases after a more comprehensive evaluation.

In relation to ADHD and appropriate child diagnosis, studies reviewing the age of children diagnosed seemed to be significant as well. Researchers noted that children almost one year younger than their classmates were 39% more likely to be diagnosed. Many studies relating specific age and appropriate diagnosis did not specify whether the school was private or public, or the average number of students in each classroom. These influences could make a difference in the tolerance level of children displaying ADHD-like symptoms.

More doubt on the accuracy of child ADHD diagnosis was created with studies that focused on the similarities seen in other disorders, such as conduct disorder, oppositional defiant disorder, or even different anxiety disorders. The study conducted by the Department on Child and Adolescent Psychiatry of the University in Utrecht showed that when given visual sustained attention task, the only distinguishing ADHD factors were decreased responsiveness to feedback and the degree of decreased vigilance.

Counterarguments against the interconnectedness of ADHD symptoms with other childhood disorders include the observation that those with ADHD demonstrate ADHD-specific deficiencies in alerting, orienting and sub-components of executive control processes like response inhibition. Future research needs to be performed to more successfully define traits that

are specific to ADHD. Also, further research is needed where comorbid diagnoses are controlled, considering substantial commonality with disorders creates diagnostic concerns.

Further arguments made suggest that even if future research was performed to identify more ADHD-specific qualities, tools that are still utilized, such as continuous performance tests, have shown to be unreliable with clarifying the diagnosis. Based on the finding that false negative rates with CPT usage was as high as 37%, it's understandable why criticism exist. Two of the primary criticisms regarding CPTs are related to its reliability and its limitations in not being able to discriminate between ADHD and other disorders.

It is clear that researchers have spent a lot of time to distinguish between ADHD and non-ADHD symptoms. In the Belgian study performed in 2013, the finding that children with ADHD had lower attention span to their non-ADHD peers with an overall mean difference of 10% is consistent with most other research results performed in classroom environments. Researchers believe this to be educationally relevant as inattention problems in grade school are often a reason for clinical referral and may predict scholastic underachievement later in life.

A limitation of this study, and studies similar to this, is the naturalistic class environment, which is a less-controlled setting. One must consider the effect of the camera, the presence of the examiner and other interferences that were impossible to control. However, because children with ADHD and non-ADHD children were observed in the classroom with the same disturbances, researchers assume the effects were similar for both groups. This assumption may be false because it is known that many children with ADHD have a sub-optimal baseline for sustained attention.

Another limitation of this study was the two-day time frame under which the study was performed. The findings cannot be generalized to all school days or to all settings. The study also

relates to Flemish elementary classrooms and results may not be representative of other parts of the world.

Researchers considered teacher knowledge of the study, with awareness of which children were involved, as a limitation as well. Teachers may have interacted with students differently because researchers were observing them. The quantity of teacher supervision was assessed, but not the quality. Future research on the effects of teacher-child interactions, including positive versus negative feedback, is needed. To fully appreciate the effect of teachers' practices on children, researchers agree that a quasi-experimental study where levels of teacher supervision are similar for both ADHD and non-ADHD groups should be performed and outcomes compared.

In this Belgian study, it was clear that ADHD children had better performance in small groups; but, it was unclear to what extent peer interactions during small group work influenced this behavior. This raises the question of whether the better outcome was because there was less distraction in smaller groups, or if it was due to positive peer interactions. Further research needs to explore the impact that peers have on productiveness in small groups.

Longitudinal studies have created validity surrounding the fact that ADHD exist into adulthood and concern for accurate diagnosis persist. Many researchers acknowledged the challenge that exist in diagnosing adult ADHD considering the diagnostic criteria focuses on childhood expression of symptoms. In many studies, it was clear that untreated adult ADHD had significant impact and poor outcomes. In fact, 72% of adults with ADHD felt that it had lifelong detrimental effects.

Controlled studies have shown that untreated ADHD in adults leads to more marriage separations and divorces, increased likelihood of problems making friends, interpersonal

problems and more unemployment. In younger adults, not properly diagnosing and treating ADHD resulted in more car accidents, more sexually transmitted diseases and a lower likelihood to graduate from high school.

Much doubt has been created surrounding the efficacy of the DSM for appropriate adult ADHD diagnosis. Researchers of one study, which focused specifically on the DSM-IV-TR, noted the criteria has never been validated in adults. This makes it extremely challenging for healthcare providers to accurately diagnose, especially because research has shown that more adults with ADHD have comorbid conditions like anxiety, depression, bipolar disorder or substance abuse.

Also challenging is that developmental, social and environmental variances between children and adults affect symptom manifestation. Hyperactivity in children may appear as restlessness in adults. Adult symptoms can be masked by compensatory life choices, such as having a physically demanding job where maintaining high energy is viewed as beneficial.

A study that focused on 85 psychiatrists in Turkey demonstrated that although most acknowledge adult ADHD as a valid diagnosis, 60% screen for ADHD only when the patient specifically asks, 20% reported they never screen for ADHD and 75% were unwilling when depression and anxiety were present. Interestingly, the records where the study was performed indicated that out of 194,200 patients that were evaluated for the year, only four were diagnosed with ADHD, giving a 0.02% prevalence. The main limitation of this study was the low response rate, averaged at 5.2% of psychiatrists practicing in Turkey. However, the values represent the need to educate psychiatrists practicing in Turkey on adult ADHD.

Differences in ADHD presentation based on gender create another diagnostic challenge. From countless studies, it is known that boys have higher diagnostic rates than girls for ADHD,



primarily due to symptom expression. However, as seen in a German study, variation in symptom expression is not the only cause for increased male diagnoses. Biases contribute as well. As seen in the study where various male and female vignettes were presented to healthcare professionals with males and females presenting identically, 21.8% false positives for males existed, a 10.5% increase from the female false positive value. Limitations of the study include the validity of diagnostic and treatment decisions based on written case vignettes compared with real-life settings. The lack of personal responsibility for decisions, along with not being able to obtain more information to confirm a diagnosis, contributes to limitations. However, all case vignettes mentioned or excluded some or all relevant diagnostic criteria based on DSM-IV criteria.

Racial perceptions pose yet another diagnostic challenge. Many study results showed that minority children were less likely to receive an ADHD diagnosis compared to white children. In fact, research has shown that even when problem traits present similarly, black males are more likely to be diagnosed with conduct disorder, rather than ADHD. Culturally sensitive monitoring needs to be increased to ensure that all children are appropriately screened, diagnosed and treated.

Limitations in research exist for racial and ethnic disparities in ADHD diagnosis. The majority of findings are based on research that was performed on middle class Europeans. This seems to perpetuate the problem of diagnosis because clinicians are disproportionately responsive to Caucasian children and parents. Clinicians have had minimal information on African Americans, Hispanics and children of other ethnicities, leading to underdiagnosis and misdiagnosis.

Another understudied area is the possibility that the difference in diagnoses within cultures comes from white children that are comparatively overdiagnosed. Most of the analyses are based on samples of US-born children, which limit the generalizability of the findings. The lack of disparities research on ADHD diagnosis across other countries and cultures warrants greater attention. In addition, further research must be performed to determine if the observed diagnostic disparities are specific to ADHD or include other conditions.

Stimulants are the first-choice drugs in pharmacological treatment of ADHD in children as well as in adults. Many studies have demonstrated the behavioral benefits of including stimulant drugs; however, it is extremely important that healthcare providers always consider the potential for drug abuse. As one study showed, healthcare specialty prescribing habits differ when considering short-acting or long-acting treatments. Short-acting medications typically require frequent doses throughout the day, resulting in an increased likelihood for misuse. Many researchers agree that there is a lack of studies on long-term effects of ADHD drugs in all ages. Future research must be conducted to determine if stimulant use by children facilitates abuse of other substances.

## Conclusion

ADHD is an extremely controversial diagnosis and given the range of prevalence estimates, it is apparent that there is still need for diagnostic standardization. Most research continues to support the validity of ADHD; however, the subjective nature of the diagnosis continues to create concern. Influential factors such as client gender, race and age play important roles in diagnostic rates and treatment accessibility. Most research has been performed on European American males. It is important to continue to review the effect that each influential factor places on diagnosis for females and minorities.

The diagnostic process for ADHD is complex. Teacher and parent referrals play a substantial role in diagnosis; therefore, their perception of ADHD symptoms is significant. Many studies have shown that African American males who present similarly to their Caucasian peers are more likely to be diagnosed with conduct disorder. Researchers noted components such as gait contributed to teacher referral, a characteristic that is not part of the DSM for ADHD diagnosis. Increasing the availability of culturally and linguistically sensitive screenings to minorities is necessary, as they have unmet treatment needs that may contribute to later achievement gaps.

Similarly, the development of diagnostic tools for adults needs to be a focus area. Longitudinal studies have shown the continuance of symptoms into adulthood. Although many adults with ADHD seemingly appear to have better coping mechanisms than children, proper treatment has still shown to have better outcomes with benefits outweighing potential negative side-effects. Continued controversy over whether ADHD is misdiagnosed and stimulants overprescribed reflect ongoing public discomfort. Likewise, research has unveiled clinician discomfort with diagnosis of diverse groups.

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### **Abstract**

**Objective:** Studies show increased prevalence rates of attention-deficit/hyperactivity disorder (ADHD) that may indicate misdiagnosis and overtreatment. This review discusses the influential factors of gender, race and age that contribute to ADHD diagnosis, and focuses on the subjective and often times biased nature of diagnosis.

**Methods:** Terms including attention deficit hyperactivity disorder, overdiagnosis, misdiagnosis and ethnicity were searched in PubMed, Google Scholar, PsycINFO, and CINAHL. Inclusion and exclusion criteria included publications originally printed in English. No restrictions were placed on location or year.

**Results:** Males are reported to be diagnosed more frequently than females and Caucasians more than African Americans and Hispanics. Adult ADHD tends to be misdiagnosed or undiagnosed, as overlapping symptomatology with other conditions is common in this population.

**Conclusion:** The literature demonstrates racial disparities and influential factors of gender and age in diagnosis. Standardization of diagnostic tools and screening cultural sensitization is appropriate for underdiagnosed populations including females and minorities.

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