HHS Public Access

Author manuscript

J Dev Behav Pediatr. Author manuscript; available in PMC 2018 September 01.

Published in final edited form as:

J Dev Behav Pediatr. 2017 September ; 38(7): 455–464. doi:10.1097/DBP.0000000000000477.

A National Profile of Attention-Deficit Hyperactivity Disorder Diagnosis and Treatment Among US Children Aged 2 to 5 Years

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Abstract

Objective—Clinical guidelines provide recommendations for diagnosis and treatment of attention-deficit hyperactivity disorder (ADHD), with specific guidance on caring for children younger than 6 years. This exploratory study describes ADHD diagnosis and treatment patterns among young children in the United States using 2 nationally representative parent surveys.

Methods—The National Survey of Children's Health (2007–2008, 2011–2012) was used to produce weighted prevalence estimates of current ADHD and ADHD medication treatment among US children aged 2 to 5 years. The National Survey of Children with Special Health Care Needs (2009–2010) provided additional estimates on types of medication treatment and receipt of behavioral treatment among young children with special health care needs (CSHCN) with ADHD.

Results—In 2011 to 2012, 1.5% of young children (approximately 237,000) had current ADHD compared to 1.0% in 2007 to 2008. In 2011 to 2012, 43.7% of young children with current ADHD were taking medication for ADHD (approximately 104,000). In young CSHCN with ADHD, central nervous system stimulants were the most common medication type used to treat ADHD, and 52.8% of young CSHCN with current ADHD had received behavioral treatment for ADHD in the past year.

Conclusion—Nearly a quarter million In young CSHCN have current ADHD, with a prevalence that has increased by 57% from 2007 to 2008 to 2011 to 2012. The demographic patterns of diagnosis and treatment described in this study can serve as a benchmark to monitor service use patterns of young children diagnosed with ADHD over time.

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Disclosure: The authors declare no conflict of interest.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (www.jdbp.org).

Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Index terms

attention-deficit hyperactivity disorder; prevalence; young children; preschoolers; national surveys

Attention-deficit hyperactivity disorder (ADHD) is the most common neurodevelopmental disorder of childhood,[1] with an estimated 11% of children aged 4 to 17 years in the United States having ever received an ADHD diagnosis from a health care provider as of 2011 to 2012.[2] The diagnosed prevalence of the disorder has increased over the last decade,[2,3] with medication treatment rates also increasing and at a higher rate than for diagnosis.[2] Monitoring the prevalence of treated ADHD is important to determine if the 5.2 million children with current ADHD[2] are receiving care that is consistent with recommended best practices.

Diagnostic and treatment guidelines from the American Academy of Pediatrics outline best practices for children with ADHD, with recommendations stratified by 3 age groups: preschool-aged children, elementary school-aged children, and adolescents.[4] Recommendations for preschool-aged children (4–5 years of age) were first included in the updated guidelines published in 2011 to reflect emerging evidence regarding the diagnosis and treatment of ADHD in this population. This inclusion acknowledged that there are special circumstances to consider when diagnosing and treating young children with ADHD. Clinical guidance regarding psychopharmacological treatment specifically for very young children with psychiatric disorders has also been published for child psychiatrists.[5]

Community studies of ADHD among preschool-aged children estimate that approximately 2% to 6% of young children meet diagnostic criteria for ADHD.[6,7] A recent study of administrative claims data showed that 1.5% of children aged 2 to 5 years in Medicaid and 0.6% of children aged 2 to 5 years with employer-sponsored insurance received clinical care for ADHD.[8] The clinical presentation of ADHD among young children is predominantly the hyperactive/impulsive or combined subtypes, although stability of subtype is limited in this age group.[6] Many young children with ADHD also have co-occurring conditions,[9] such as oppositional defiant disorder, communication disorder, anxiety disorder, autism spectrum disorder, or epilepsy.[9,10] Most children diagnosed with ADHD while they are of pre-school age continue to meet criteria for the disorder into later childhood.[11] For children diagnosed with ADHD before 6 years of age, pediatricians are the provider type most likely to have made the diagnosis (37%); approximately one-quarter are diagnosed by a psychiatrist.[12]

Parent- or teacher-administered behavior therapy is recommended as the first-line treatment for preschool-aged children with ADHD, with the addition of medication only if significant functional limitations remain after an adequate trial of behavior therapy or when deemed appropriate according to clinical judgment if behavior therapy services are unavailable.[4] Clinical guidance published for child psychiatrists also recommends the use of a behavioral intervention before the prescription of medication for very young children diagnosed with ADHD.[5] A comparative effectiveness review showed that behavior therapy has high strength of evidence among preschool-aged children with disruptive behavior (including ADHD symptoms), with benefits being shown to persist for at least 6 months after treatment has been completed and without report of associated adverse events.[13] For young children with

ADHD to whom medication is considered, clinical guidance published for child psychiatrists emphasizes that although methylphenidate is more effective for ADHD in preschool-aged children than placebo, dosing should be titrated with close tracking of effectiveness and adverse effects in this young population because of differences in pharmacokinetics and higher rates of adverse effects.[14]

There are several population-based studies that used claims data to characterize the treatment of ADHD in young children. A recently published study showed that 0.6% of children younger than 5 years in Medicaid had received ADHD medication between 2000 and 2003.[15] Another study suggested that approximately three-quarters of children aged 2 to 5 years with ADHD received ADHD medication, whereas only about half received psychological treatment services.[8] Although analyses of administrative claims data provide insight into the treatment of ADHD in young children, additional understanding can be gained through national parent surveys, as these data are not contingent on the child having insurance or receiving services covered by insurance.

This study will estimate the prevalence of parent-reported ADHD diagnosis and associated current ADHD medication use among young children in the United States using the 2011 to 2012 National Survey of Children's Health (NSCH). A secondary objective is to conduct an exploratory analysis to identify differences in diagnoses and treatment patterns by sociodemographic factors and changes over time using the 2007 to 2008 NSCH. However, because the NSCH does not provide data on behavioral treatment for ADHD nor on types of medications used, this study will also consider data from the 2009 to 2010 National Survey of Children with Special Health Care Needs (NS-CSHCN). Data from the NS-CSHCN are limited to the population of children with special health care needs (CSHCN); not all children with reported ADHD meet these criteria. The NS-CSHCN data are intended to augment the understanding of the treatment of ADHD among young children, but may not be generalizable to all young children with ADHD. The NSCH data are generalizable to all young children with ADHD and therefore will be the primary focus of this study.

METHODS

The 2 national surveys used in this report are the National Survey of Children's Health (NSCH; administered in 2007–2008 and 2011–2012)[16,17] and the National Survey of Children with Special Health Care Needs (NS-CSHCN; 2009–2010).[18] Both surveys were conducted by the Centers for Disease Control and Prevention's National Center of Health Statistics (NCHS), with direction and funding from the Health Resources and Services Administration. These surveys used the State and Local Area Integrated Telephone Survey mechanism and are both cross-sectional, random-digit-dialed telephone surveys of parents and guardians (hereafter referred to as parents) reporting on the health of a randomly selected child living in the household. The 2007 to 2008 NSCH consisted of a landline sample only, but a cell phone sample was added to supplement the landline sample for the 2009 to 2010 NS-CSHCN and 2011 to 2012 NSCH to account for the increasing prevalence of cell phone-only households. Overall response rates for these surveys were 46.7% for the 2007 to 2008 NSCH, 23.0% for the 2011 to 2012 NSCH, and 25.5% for the 2009 to 2010 NS-CSHCN. NCHS provides sample weights that are used to produce nationally

representative estimates of survey indicators; these weights include adjustments that attempt to account for differential rates of nonresponse across demographic groups.

The NSCH is designed to monitor the health of all noninstitutionalized children living within the United States. The survey included several questions related to attention-deficit hyperactivity disorder (ADHD); namely, whether the parent had ever been told by a doctor or other health care provider that their child had ADHD, the age at which the child first received the ADHD diagnosis (2011–2012 NSCH only), whether the child currently has ADHD, and, if the child has current ADHD, whether the child is currently taking medication for ADHD and the current level of ADHD severity (mild, moderate, or severe). The survey also included questions about the diagnosis of other mental and developmental conditions. These analyses considered current depression, anxiety problems, behavioral problems such as conduct disorder or oppositional defiant disorder, autism spectrum disorder, developmental delay, and intellectual disability; developmental delay or intellectual disability were grouped together for these analyses. The analyses presented here are limited to responses by parents of children aged 2 to 5 years (24–71 months, hereafter referred to as young children; 2007–2008 n = 17,889; 2011–2012 n = 19,897) and focus on children with parent-reported current ADHD.

In addition to the NSCH, this study used data from the NS-CSHCN because it included more detailed questions about ADHD treatment among its survey population. The target population of the NS-CSHCN was non-institutionalized US children who meet criteria for having a special health care need. To determine eligibility for the survey, the responding parent first completed a 5-component screener determining whether: (1) the child needs or uses medicine other than vitamins prescribed by a doctor; (2) the child needs or uses more medical care, mental health, or educational services than is usual for most children of the same age; (3) the child is limited or prevented in any way in his or her ability to do the things most children of the same age can do; (4) the child needs or gets special therapy, such as physical, occupational, or speech therapy; or (5) the child has any kind of emotional, developmental, or behavioral problem for which he or she needs treatment or counseling. If the child met one or more of these criteria because of a medical, behavioral, or other health condition that has lasted or is expected to last 12 or more months, he/she was considered to be a child with a special health care need (CSHCN) and was eligible for this survey. In the 2011 to 2012 NSCH, approximately 87% of children aged 2 to 17 years with current ADHD met criteria for having a special health care need.[19]

The NS-CSHCN contained the same questions as the NSCH about the child’s history of an ADHD diagnosis, current ADHD status, and current ADHD severity. Questions were also asked to identify children who had been diagnosed with a co-occurring mental or developmental disorder (depression, anxiety problems, behavioral or conduct problems, autism spectrum disorder, developmental delay, and intellectual disability or mental retardation). The survey also contained additional questions on ADHD treatment for children with current ADHD; specifically, if the child had received behavioral treatment for attention deficit disorder or ADHD, including classroom management, peer interventions, social skills training, or cognitive-behavioral therapy in the past year (hereafter referred to as “behavioral treatment”); and if the child had taken ADHD medication in the past year and

past week. If the child had taken medication in the past week, the responding parent was asked to list which medication(s), with the parent reading the name of the medication from the medication bottle when available to ensure accuracy. Reported medications taken for ADHD were grouped into stimulants (amphetamine and mixed amphetamine salts, dextroamphetamine, dexmethylphenidate, lisdex-amfetamine, and methylphenidate) and non-stimulants (aripiprazole, atomoxetine, clonidine, fluoxetine, guanfacine, risperidone, and sertraline). There were 328 completed interviews for CSHCN aged 2 to 5 years (24–71 months, hereafter referred to as young CSHCN) who had current ADHD and complete responses for the section of ADHD-related questions.

All analyses were completed with SAS-Callable SUDAAN version 11.0.1 (RTI International, Durham, NC) to account for the complex survey design and to incorporate the sample weights. Weighted population and prevalence estimates of current ADHD and current ADHD medication from the 2007 to 2008 and 2011 to 2012 NSCH are reported among all children aged 2 to 5 years; prevalence estimates are also calculated for the following demographic subgroups: child sex, child race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, non-Hispanic other or multiple race), US region of residence (Northeast, Midwest, South, or West), highest education level of any parent residing in the household (less than high school degree, high school degree, or more than high school diploma), household income relative to the federal poverty level (<100%, 100–200%, or >200%), and health insurance status (non-public, public, or uninsured). Estimates that are unstable (i.e., have a relative standard error greater than 30%) are identified with asterisks and should be interpreted with caution. Prevalence ratios were also calculated to compare differences between demographic groups and estimate change over time from 2007 to 2008 to 2011 to 2012. Prevalence of receipt of behavioral treatment and type of ADHD medication were estimated among young CSHCN with current ADHD also using the above demographic characteristics, ADHD severity, and presence of a co-occurring mental or developmental condition using the 2009 to 2010 NS-CSHCN. For outcomes with more than one statistically significant bivariate comparison, a logistic regression model considering all significant independent variables was run and reduced using backward stepwise selection (alpha = .05) to identify indicators that remained significant after adjusting for the other significant independent variables.

RESULTS

National Survey of Children's Health

According to the 2011 to 2012 National Survey of Children's Health (NSCH), 1.5% of young children (24–71 months) had parent-reported current attention-deficit hyperactivity disorder (ADHD), a population estimate of approximately 237,000 young children. Of these, more than 20% were children younger than 4 years (before 48 months; approximately 49,000), though children aged 4 to 5 years were over 3 times as likely to have current ADHD than children aged 2 to 3 years (2.2% vs 0.7%, $p < .0001$). There were a number of other key demographic differences in the population of young children with current ADHD (Table 1). Boys were more than twice as likely as girls to have current ADHD (prevalence ratio [PR] = 2.63; 95% confidence interval [CI], 1.67–4.14). Non-Hispanic black children

were more likely than non-Hispanic white children to have current ADHD (PR = 2.32; 95% CI, 1.30–4.17), and Hispanic children were less likely than non-Hispanic white children to have the disorder (PR = 0.50; 95% CI, 0.26–0.95). Young children living in poverty or covered by public insurance were more likely to have current ADHD. Young children living in the western United States were less likely to have current ADHD than those living in other US regions. Nearly all indicators that were independently significant by bivariate comparison remained so in the logistic regression model; only the comparison of non-Hispanic black children to non-Hispanic white children was no longer statistically significant after adjusting for sex, age, insurance status, poverty status, and region of residence.

In addition to the approximately 49,000 children under 48 months with current ADHD, approximately 73,000 of the 4 to 5 year olds with current ADHD received the ADHD diagnosis before they turned 4 years old (39.6% of 4 to 5 year olds with current ADHD). Nearly one-third of young children with current ADHD had parent-reported severe ADHD (29.3%), 41.3% had moderate ADHD, and 29.4% had mild ADHD. More than half of young children with current ADHD were also reported to currently have at least 1 of 5 types of co-occurring conditions (58.6%). Of all young children with current ADHD, 36.4% had developmental delay or intellectual disability, 35.5% had another behavioral disorder, 16.0% had an autism spectrum disorder, 15.3% had anxiety problems, and *9.6% had depression. Young children with mild ADHD were less likely to have a current co-occurring mental or developmental condition (36.7%) than those with moderate or severe ADHD (61.3 and 78.3%, respectively; $p = .02$). Among young children with current ADHD, 85.1% met criteria for having a special health care need.

Of young children with current ADHD, 43.7% (approximately 104,000) were currently taking medication for ADHD. Children aged 2 to 3 years with current ADHD were less likely to be taking medication than children aged 4 to 5 years (*12.6% vs 51.8%, $p = .008$), and non-Hispanic black children with current ADHD were less likely to be taking medication than non-Hispanic white children (21.3% vs 52.5%, $p = .02$). However, the difference by race/ethnicity was no longer significant after controlling for child age. There were no other significant demographic differences regarding medication usage among young children with current ADHD (Table 1). Young children with mild ADHD were less likely to currently be taking medication (*22.0%) than young children with moderate (51.7%) or severe (55.7%) ADHD ($p = .03$). A similar proportion of young children with ADHD and another co-occurring condition took medication (42.9%) compared to children with only ADHD (44.2%, $p = .89$).

From 2007 to 2008 to 2011 to 2012, there was a 57% increase in the prevalence of current ADHD among children aged 2 to 5 years, estimated at 1.0% in 2007 to 2008 and 1.5% in 2011 to 2012 (an increase in population size of approximately 85,000 children). The increase in prevalence was statistically significant for children aged 4 to 5 years, children living in households with more than a high school level of education, and non-Hispanic black children (Table 2); the differences remained statistically significant for children living in households with more than a high school level of education and non-Hispanic black children after adjusting for other significant demographic indicators. Additionally, the

percentage of children aged 2 to 5 years who had current ADHD and were taking medication for ADHD more than doubled from 2007 to 2008 to 2011 to 2012, from 0.3% to 0.7%. The proportion of young children with current ADHD who were taking medication remained similar from 2007 to 2008 to 2011 to 2012 (34.5% vs 43.7%, $p = .28$); this pattern was consistent across most demographic groups (Table 2).

National Survey of Children with Special Health Care Needs

Of the children with special health care needs (CSHCN) aged 2 to 5 years with current ADHD, 51.3% had taken ADHD medication in the past year and 44.2% had taken medication in the past week. The percentage of young CHSCN with current ADHD who took medication in the past week (44.2%) is similar to the percentage of young children with current ADHD currently taking medication from the 2011 to 2012 NSCH (43.7%).

Of young CSHCN with current ADHD, 52.8% had received behavioral treatment in the past year. There were few statistically significant demographic group differences for receipt of behavioral treatment (Supplemental Digital Content, Table 1, http://links.lww.com/JDBP/A140); only CSHCN in the non-Hispanic other race group were more likely to have received behavioral treatment than other racial/ethnic groups. Young CSHCN with a co-occurring mental or developmental condition were also more likely to have received behavioral treatment than young CSHCN with ADHD alone (59.2% vs 32.8%, $p = .03$). The difference for non-Hispanic other race CSHCN remains significant after controlling for presence of a co-occurring condition.

Among young CSHCN with ADHD, 19.1% received both medication in the past week and behavioral treatment in the past year. More young CSHCN with ADHD had received behavioral treatment alone (33.7%) than medication alone (25.1%), and 22.1% of young CHSCN with ADHD received neither treatment. The distribution of treatment combinations did not differ statistically for any demographic groups except for by region of residence (Supplemental Digital Content, Table 1, http://links.lww.com/JDBP/A140). CSHCN in the West were more likely to have received behavioral treatment alone, while children in the South and Midwest were more likely to receive medication alone, and CSHCN in the Northeast were the most likely to have received neither treatment.

Of young CSHCN who had taken ADHD medication in the past week, 69.9% had taken a central nervous system stimulant, the most common medication type reported and the only class of medication with an Food and Drug Administration (FDA) indication to treat ADHD in children younger than 6 years. Among non-stimulant medications, other medication types reported included risperidone (taken by *14.3% of young CSHCN taking medication for ADHD), clonidine (*12.1%), and guanfacine (9.6%). Less than 2% of young CSHCN taking medication for ADHD were taking atomoxetine, aripiprazole, fluoxetine, or sertraline. Overall, 33.5% of young CSHCN taking medication for ADHD were taking a non-stimulant medication, and of these, 67.2% were taking a non-stimulant medication that is FDA approved to treat ADHD (clonidine, guanfacine, or atomoxetine; 22.2% of all young CSHCN with ADHD taking medication). Half of young CSHCN taking non-stimulant medication for ADHD (50.0%) were taking a non-stimulant medication that does not have an FDA indication to treat ADHD at any age (16.5% of all young CSHCN with ADHD and

taking medication), all but one of these children in the sample had a co-occurring condition. There were few statistically significant demographic group differences in stimulant and non-stimulant medication usage among young CSHCN who took medication for ADHD (Supplemental Digital Content, Table 2, http://links.lww.com/JDBP/A140). CSHCN in the non-Hispanic other race group were more likely to have taken a stimulant medication and less likely to have taken a non-stimulant medication than non-Hispanic white children. CSHCN living in a household with a high school diploma as the highest level of education were more likely to be taking a non-stimulant medication for ADHD compared to those living in households with higher levels of education. These differences remained statistically significant after controlling for the other indicator in a multivariable logistic regression model.

DISCUSSION

This study describes the epidemiology of attention-deficit hyperactivity disorder (ADHD) diagnosis and treatment among young children in the United States based on 2 nationally representative parent surveys. According to National Survey of Children's Health (NSCH) data, approximately 237,000 young children had current ADHD in 2011 to 2012, with 44% of these young children receiving medication as treatment. Several demographic groups had a higher prevalence of current ADHD diagnosis (boys, 4 to 5 year olds, children living in households below 200% of the federal poverty line, children with public or no insurance, and children living in the Northeast, Midwest, or South), although there were fewer demographic differences in the proportion of young children with ADHD currently taking medication. A comparison with estimates from the 2007 to 2008 NSCH showed an increase of 57% in current ADHD prevalence in this population, with a doubling of the population of children with current ADHD receiving medication treatment (from 51,000 to 104,000 children). The relative increases in magnitude are similar to those for school-aged children,[2] where the rate of increase is higher for medication than for current diagnosis. However, the increase in the population size of young children with ADHD receiving ADHD medication also seems to be a function of the increase in diagnosis in this population, as the proportion of those with ADHD who were treated with medication remained statistically similar from 2007 to 2008 to 2011 to 2012. The 2009 to 2010 National Survey of Children with Special Health Care Needs (NS-CSHCN) showed that just over half of young children with special health care needs (CSHCN) and current ADHD had received behavioral treatment in the past year (52.8%).

In 2011 to 2012, there were more than 100,000 children aged 2 to 5 years with current ADHD who received the diagnosis before they turned 4 years old. These findings extend what we know about the timing of diagnosis among school-aged children[2] and further suggest that there is a sizeable cohort of children being identified with ADHD at a very young age. Regarding diagnosis for this age group, the most rigorous published assessments of the validity of ADHD in preschoolers focuses on older preschoolers, with limited data establishing validity or reliability of the categorical diagnosis of ADHD in toddlers.[20–24] The diagnosis of mental disorders in very young children requires a comprehensive assessment process to differentiate between the many causes of behavioral dysregulation, and the data used for our study do not allow for evaluation of the quality of the assessments

used to make the clinical diagnoses that were reported by parents in these surveys. Our study estimates the number of young children who received an ADHD diagnosis before the age of 4 years, reflecting the frequency that this diagnosis is made in young children in standard clinical practice despite the limited clinical guidance on diagnosing ADHD in this age group.

For young children with ADHD, the primary value of early identification lies in early access to patient-specific, safe, and effective treatment, potentially influencing the developmental trajectory of the disorder. Only about half of young CHSCN with ADHD had received any behavioral treatment, which includes the types of behavior therapy indicated as first-line treatment for ADHD in this age group by the American Academy of Pediatrics.[4] This recommendation is supported by the relative weight of evidence on the effectiveness of behavior therapy and the risk of adverse effects with medications.[4,5,25] Also of note, 22% of young CSHCN with ADHD had received neither medication nor behavioral treatment. Although the subgroup differences did not reach statistical significance, nearly one-third of young CHSCN with ADHD in several demographic groups (e.g., non-Hispanic black or Hispanic CHSCN, CSHCN living in a household with less than a high school level of education) had received neither treatment, suggesting that there may be differences in availability or uptake of treatment in some demographic subgroups.

Similar to research with clinical populations,[9] this study shows that more than half of young children with current ADHD also had another mental or developmental condition. The most common co-occurring conditions were developmental delay/intellectual disability or a disruptive behavior disorder, such as conduct disorder or oppositional defiant disorder. Several co-occurring conditions were more common in this young age group than in older children with ADHD, particularly developmental delay, intellectual disability, and autism spectrum disorder.[26,27] The presence of a co-occurring condition plays a role in the treatment patterns among young children with ADHD. Although there were no differences in medication treatment for young children with ADHD by co-occurring condition status, young CSHCN with ADHD and a current co-occurring condition were more likely to have received behavioral treatment in the past year than young CSHCN with ADHD alone.

This study also shows that stimulants were the most common medication type reported among young children with ADHD, which corresponds to similar findings from studies of school-aged children.[28] However, approximately one-third of young CSHCN with current ADHD treated with medication had taken a non-stimulant medication in the past week. Methylphenidate and atomoxetine are the only medications that have been studied in rigorous, large randomized controlled trials in preschoolers with ADHD.[29,30] Other medications that are prescribed to treat ADHD have not been studied with randomized clinical trials in young children, although in clinical practice, alpha agonists are used extensively to treat children with ADHD who have cardiac concerns, and risperidone has been approved by the Food and Drug Administration to treat autism and irritability in children older than 60 months.[31] However, the long-term safety for any of the medications used to treat ADHD in children younger than 5 years has not been established. Using these cross-sectional survey data, it is not possible to know whether children taking non-stimulant medications had previously failed a stimulant or whether the medication was being used to

treat a co-occurring condition, but the rates of non-stimulant medications, especially among 2 to 3 year olds, is striking given the lack of safety and efficacy data for these medications in this young population. Other researchers have found that among very young children taking other psychotropic medications (i.e., antipsychotics), most had not received psychotherapy.[32] The authors of that study concluded that this exposes concerns about safety and supports the conclusions of a recent review that there is a need to improve access to evidence-based psychosocial and behavioral treatments for children with mental disorders.[33]

Our study is subject to a number of limitations. First, an important limitation of the results presented herein is the difference in target populations of the NSCH and the NS-CHSCN. Although the NSCH is representative of all non-institutionalized children living in the United States at the time of the survey, the NS-CSHCN only includes children who met special health care need criteria. Although most young children with current ADHD meet this criteria (85%), because of this requirement, the young children with ADHD represented in NS-CSHCN will likely have different condition expression than those ineligible for the NS-CSHCN and may have different treatment patterns as a result, limiting comparability of results between the 2 surveys. Other factors that may affect comparability between the 2 surveys are timing of implementation (2011–2012 for the most recent NSCH; 2009–2010 for the NS-CSHCN) and the inclusion of a cell phone sample in the NS-CSHCN and 2011 to 2012 NSCH but not in the 2007 to 2008 NSCH. An additional limitation is that the overall response rate for each survey was low and may be subject to bias, although sample weights were used to adjust for nonresponse. The introduction of the cell phone sample contributed to the particularly low response rates for the 2009 to 2010 NS-CSHCN and 2011 to 2012 NSCH. List-assisted sampling methods were used to select landlines from banks of numbers known to include residences; similar techniques were not available for cell phone samples. This resulted in more unanswered calls and therefore lower response rates for the cell phone portion of the sample, but the lower rate is unlikely to reflect large differences in potential non-response bias.[16,34]

Another limitation of these surveys is that these indicators rely on parent report, and the report of an ADHD diagnosis or co-occurring condition was not validated against medical records or clinical evaluation. However, previous work has suggested that estimates of ADHD prevalence in school-aged children from parent-reported data are similar to those produced using administrative claims.[35] A related limitation is that though the responding parent was asked to report the medication(s) their child was taking for ADHD, some medications may have been prescribed to treat a co-occurring condition rather than ADHD specifically. Another limitation is the specificity of the question about behavioral treatment, as the question is worded to include a broad definition of behavioral intervention. There is not a way to distinguish those who received evidence-based behavior therapy from those who received other types of behavioral intervention, so it is likely that some young children who were reported to have received behavioral treatment did not get the recommended type of behavior therapy. Additionally, this question did not explicitly list parent training as an example of behavioral intervention, and therefore, this type of behavioral intervention may have been underreported. Further, this question asked only about receipt of behavioral treatment in the past year, so young children with ADHD who had received behavioral treatment only prior to the previous year would not have been identified. Finally, due to the

relatively small sample size of young children with ADHD in both surveys, approximately one-third of prevalence estimates presented for demographic subgroups are unstable and may not be reliable. These estimates are indicated by footnotes in the tables and should be interpreted with caution. However, estimates referred to in the text either meet existing standards for reliability and precision (i.e., have a relative standard error less than 30%) or are identified with an asterisk if they have a relative standard error greater than or equal to 30%. Moreover, it is worth noting that comparisons of 2 unreliable estimates (i.e., estimates with large standard errors) can be statistically significant if their difference is sufficiently large.[36] All significant comparisons highlighted in the text and tables were evaluated at conventional levels (alpha = .05). This study was conceptualized as an exploratory analysis with the intention of identifying characteristics associated with the diagnosis and treatment of ADHD among young children. As such, the priority was to minimize the possibility of Type II error (i.e., failure to identify true associations) and therefore results were not adjusted for multiple comparisons, an approach that is intended to reduce potential Type I error (falsely identifying an association as significant when it is not in actuality) but also increases the likelihood of Type II error.

CONCLUSION

This study provides an overview of the diagnosis and treatment of attention-deficit hyperactivity disorder (ADHD) among young children in the United States using 2 nationally representative parent surveys. Results can be used as a historical benchmark of diagnosis and treatment of ADHD in this population before and during the 2011 introduction of clinical practice guidelines by the American Academy of Pediatrics[4] and after the 2007 publication of practice parameters for child psychiatrists.[14] These benchmarks may help inform future research to evaluate the extent of changes in the clinical care of ADHD in young children following implementation of these sets of guidelines. Furthermore, as more children are being diagnosed with ADHD during their preschool-aged years, it will be important to monitor service use patterns of young children diagnosed with ADHD over time to inform research and policies regarding the use of clinical best practices to support the health and development of young children with ADHD.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

References

1. Perou R, Bitsko RH, Blumberg SJ, et al. Mental health surveillance among children–United States, 2005–2011. MMWR Surveill Summ. 2013; 62(suppl 2):1–35.
2. Visser SN, Danielson ML, Bitsko RH, et al. Trends in the parent-report of health care provider-diagnosed and medicated attention-deficit/hyperactivity disorder: United States, 2003–2011. J Am Acad Child Adolesc Psychiatry. 2014; 53:34–46. e32. [PubMed: 24342384]
3. Akinbami, LJ., Liu, X., Pastor, PN., et al. Attention Deficit Hyperactivity Disorder Among Children Aged 5–17 Years in the United States, 1998–2009. Hyattsville, MD: CDC National Center for Health Statistics; 2011.

4. American Academy of Pediatrics. ADHD: clinical practice guideline for the diagnosis, evaluation, and treatment of attention-deficit/hyperactivity disorder in children and adolescents. Pediatrics. 2011; 128:1007–1022. [PubMed: 22003063]
5. Gleason MM, Egger HL, Emslie GJ, et al. Psychopharmacological treatment for very young children: contexts and guidelines. J Am Acad Child Adolesc Psychiatry. 2007; 46:1532–1572. [PubMed: 18030077]
6. Egger HL, Angold A. Common emotional and behavioral disorders in preschool children: presentation, nosology, and epidemiology. J Child Psychol Psychiatry. 2006; 47:313–337. [PubMed: 16492262]
7. Wichstrom L, Berg-Nielsen TS, Angold A, et al. Prevalence of psychiatric disorders in preschoolers. J Child Psychol Psychiatry. 2012; 53:695–705. [PubMed: 22211517]
8. Visser SN, Danielson ML, Wolraich ML, et al. Vital signs: national and state-specific patterns of attention deficit/hyperactivity disorder treatment among insured children aged 2–5 Years—United States, 2008–2014. MMWR Morb Mortal Wkly Rep. 2016; 65:443–450. [PubMed: 27149047]
9. Posner K, Melvin GA, Murray DW, et al. Clinical presentation of attention-deficit/hyperactivity disorder in preschool children: the preschoolers with attention-deficit/hyperactivity disorder treatment study (PATS). J Child Adolesc Psychopharmacol. 2007; 17:547–562. [PubMed: 17979577]
10. Surén P, Bakken IJ, Aase H, et al. Autism spectrum disorder, ADHD, epilepsy, and cerebral palsy in Norwegian children. Pediatrics. 2012; 130:e152–e158. [PubMed: 22711729]
11. Riddle MA, Yershova K, Lazzaretto D, et al. The preschool attention-deficit/hyperactivity disorder treatment study (PATS) 6-year follow-up. J Am Acad Child Adolesc Psychiatry. 2013; 52:264–278. [PubMed: 23452683]
12. Visser SN, Zablotsky B, Holbrook JR, et al. Diagnostic experiences of children with attention-deficit/hyperactivity disorder. Natl Health Stat Rep. 2015:81.
13. Charach A, Carson P, Fox S, et al. Interventions for preschool children at high risk for ADHD: a comparative effectiveness review. Pediatrics. 2013; 131:e1584–e1604. [PubMed: 23545375]
14. American Academy of Child and Adolescent Psychiatry. Practice parameter for the assessment and treatment of children and adolescents with attention-deficit/hyperactivity disorder. J Am Acad Child Adolesc Psychiatry. 2007; 46:894–921. [PubMed: 17581453]
15. Garfield LD, Brown DS, Allaire BT, et al. Psychotropic drug use among preschool children in the Medicaid program from 36 states. Am J Public Health. 2015; 105:524–529. [PubMed: 25602884]
16. Centers for Disease Control and Prevention. 2011–2012 National Survey of Children's Health Frequently Asked Questions. 2013. Available at: http://www.cdc.gov/nchs/slaits/nsch.htm
17. Blumberg SJ, Foster EB, Frasier AM, et al. Design and operation of the national survey of children's health, 2007. Vital Health Stat 1. 2012; 55:1–149.
18. Bramlett MD, Blumberg SJ, Ormson AE, et al. Design and operation of the national survey of children with special health care needs, 2009–2010. Vital Health Stat. 2014; 1:1–271.
19. National Survey of Children's Health. [Accessed July 1, 2016] NSCH 2011/12. Data query from the child and adolescent health measurement initiative. Available at: www.childhealthdata.org
20. Law EC, Sideridis GD, Prock LA, et al. Attention-deficit/hyperactivity disorder in young children: predictors of diagnostic stability. Pediatrics. 2014; 133:659–667. [PubMed: 24639272]
21. Tandon M, Si X, Luby J. Preschool onset attention-deficit/hyperactivity disorder: course and predictors of stability over 24 months. J Child Adolesc Psychopharmacol. 2011; 21:321–330. [PubMed: 21851190]
22. Bufferd SJ, Dougherty LR, Carlson GA, et al. Psychiatric disorders in preschoolers: continuity from ages 3 to 6. Am J Psychiatry. 2012; 169:1157–1164. [PubMed: 23128922]
23. Merkt, J., Siniatchkin, M., Petermann, F. Neuropsychological measures in the diagnosis of ADHD in preschool: can developmental research inform diagnostic practice?. J Atten Disord. 2016. Available at: https://www.ncbi.nlm.nih.gov/pubmed/27006414
24. Lahey BB, Pelham WE, Loney J, et al. Three-year predictive validity of DSM-IV attention deficit hyperactivity disorder in children diagnosed at 4–6 years of age. Am J Psychiatry. 2004; 161:2014–2020. [PubMed: 15514401]

25. Charach, A., Dashti, B., Carson, P., et al. Attention Deficit Hyperactivity Disorder: Effectiveness of Treatment in At-risk Preschoolers; Long-term Effectiveness in All Ages; and Variability in Prevalence, Diagnosis, and Treatment. Rockville, MD: Agency for Healthcare Research and Quality; 2011.

26. Jensen CM, Steinhausen H-C. Comorbid mental disorders in children and adolescents with attention-deficit/hyperactivity disorder in a large nationwide study. Atten Defic Hyperact Disord. 2015; 7:27–38. [PubMed: 24942707]

27. Larson K, Russ SA, Kahn RS, et al. Patterns of comorbidity, functioning, and service use for US children with ADHD, 2007. Pediatrics. 2011; 127:462–470. [PubMed: 21300675]

28. Visser SN, Bitsko RH, Danielson ML, et al. Treatment of attention deficit/hyperactivity disorder among children with special health care needs. J Pediatr. 2015; 166:1423–1430. e1422. [PubMed: 25841538]

29. Greenhill L, Kollins S, Abikoff H, et al. Efficacy and safety of immediate-release methylphenidate treatment for preschoolers with ADHD. J Am Acad Child Adolesc Psychiatry. 2006; 45:1284–1293. [PubMed: 17023867]

30. Kratochvil CJ, Vaughan BS, Stoner JA, et al. A double-blind, placebo-controlled study of atomoxetine in young children with ADHD. Pediatrics. 2011; 127:e862–e868. [PubMed: 21422081]

31. FDA. [Accessed December 22, 2015] Drugs@FDA. 2015. Available at: http://www.accessdata.fda.gov/scripts/cder/drugsatfda/index.cfm?fuseaction=Search.SearchAction&SearchType=BasicSearch&SearchTerm=RISPERIDONE

32. Olfson M, Crystal S, Huang C, et al. Trends in antipsychotic drug use by very young, privately insured children. J Am Acad Child Adolesc Psychiatry. 2010; 49:13–23. [PubMed: 20215922]

33. McHugh RK, Barlow DH. The dissemination and implementation of evidence-based psychological treatments. A review of current efforts. Am Psychol. 2010; 65:73–84. [PubMed: 20141263]

34. Centers for Disease Control and Prevention National Center for Health Statistics State and Local Area Integrated Telephone Survey. [Accessed June 26, 2017] 2009–2010 National Survey of Children with Special Health Care Needs Frequently Asked Questions. 2011. Available at: http://www.cdc.gov/nchs/slaits/cshcn.htm

35. Visser SN, Danielson ML, Bitsko RH, et al. Convergent validity of parent-reported attention-deficit/hyperactivity disorder diagnosis: a cross-study comparison. JAMA Pediatr. 2013; 167:674–675. [PubMed: 23700143]

36. Rosner, B. Fundamentals of Biostatistics. 5. Duxbury, MA: Duxbury Resource Center; 2000.

J Dev Behav Pediatr. Author manuscript; available in PMC 2018 September 01.

Table 1

Weighted Prevalence Estimates of Parent-Reported Attention-Deficit Hyperactivity Disorder Diagnosis and Medication Treatment Among US Children Aged 2 to 5 Years by Sociodemographic Characteristics (National Survey of Children's Health, 2011–2012)

		Current ADHD		Current ADHD and Taking ADHD Medication		Proportion Receiving Medication of Those with Current ADHD	
Characteristic	**Unweighted, n**	**Weighted % (SE)**	**PR[a] (95% CI)**	**Weighted % (SE)**	**PR[a] (95% CI)**	**Weighted % (SE)**	**PR[a] (95% CI)**
Overall	19,897	1.5 (0.2)		0.7 (0.1)		43.7 (5.4)	
Sex							
Boys	10,165	*2.1 (0.3)*	**2.63 (1.67–4.14)**	**1.0 (0.2)**	**3.09 (1.60–5.98)**	45.5 (6.6)	1.17 (0.69–2.01)
Girls	9732	*0.8 (0.2)*	Ref.	**0.3 (0.1)**	Ref.	38.8 (9.0)	Ref.
Age group, yr							
2–3	9385	*0.7[c] (0.2)*	**0.29 (0.15–0.55)**	*0.1[d] (0.05)*	**0.07 (0.02–0.27)**	**12.6[d] (8.1)**	**0.24 (0.07–0.88)**
4–5	10,512	*2.2 (0.3)*	Ref.	*1.2 (0.2)*	Ref.	**51.8 (5.7)**	Ref.
Race/ethnicity							
Non-Hispanic white	12,068	**1.4 (0.2)**	Ref.	0.7 (0.2)	Ref.	52.5 (7.3)	Ref.
Non-Hispanic black	1861	**3.2 (0.8)**	*2.32 (1.30–4.17)*	0.7[c] (0.3)	0.94 (0.42–2.13)	21.3[c] (8.1)	*0.41 (0.18–0.90)*
Hispanic, any race	3062	**0.7 (0.2)**	**0.50 (0.26–0.95)**	0.4[c] (0.2)	0.54 (0.21–1.37)	56.7 (14.0)	1.08 (0.62–1.88)
Non-Hispanic other	2483	**2.0 (0.6)**	1.47 (0.80–2.69)	1.0[c] (0.4)	1.41 (0.56–3.57)	50.5 (13.7)	0.96 (0.53–1.75)
Highest education of any parent in household							
Less than high school	1296	1.9 (0.5)	1.52 (0.85–2.72)	0.4[c] (0.2)	0.71 (0.28–1.77)	19.6[c] (8.1)	0.47 (0.19–1.12)
12 yr, high school graduate	3036	1.8 (0.4)	1.48 (0.88–2.50)	1.0 (0.3)	1.97 (1.00–3.90)	56.1 (11.2)	1.33 (0.80–2.23)
More than high school	15,215	1.2 (0.2)	Ref.	0.5 (0.1)	Ref.	42.1 (7.2)	Ref.
Household income relative to federal poverty level[b]							
<100%	3752	*2.7 (0.4)*	**3.46 (2.02–5.91)**	**1.0 (0.2)**	**2.85 (1.28–6.35)**	36.2 (7.4)	0.82 (0.44–1.56)
100%–200%	3900	*1.8 (0.4)*	**2.27 (1.25–4.11)**	**1.0 (0.3)**	**2.93 (1.28–6.71)**	56.8 (10.5)	1.29 (0.70–2.39)
>200%	12,245	*0.8 (0.2)*	Ref.	**0.3[c] (0.1)**	Ref.	43.9 (11.0)	Ref.
Region							
Northeast	3342	*1.5[c] (0.5)*	**2.23 (1.03–4.83)**	**0.6[c] (0.3)**	2.65 (0.83–8.46)	41.3[c] (15.8)	1.19 (0.46–3.07)
Midwest	4520	*2.1 (0.4)*	**3.10 (1.75–5.50)**	**1.0 (0.3)**	**4.53 (1.81–11.35)**	50.9 (9.9)	1.46 (0.73–2.93)
South	7057	*1.7 (0.3)*	**2.58 (1.51–4.42)**	**0.7 (0.2)**	**3.11 (1.32–7.35)**	41.9 (8.1)	1.20 (0.60–2.41)

Characteristic	Unweighted, n	Current ADHD		Current ADHD and Taking ADHD Medication		Proportion Receiving Medication of Those with Current ADHD	
		Weighted % (SE)	PR[a] (95% CI)	Weighted % (SE)	PR[a] (95% CI)	Weighted % (SE)	PR[a] (95% CI)
West	4978	*0.7 (0.1)*	Ref.	**0.2[c] (0.1)**	Ref.	34.8 (10.3)	Ref.
Insurance status							
Non-public insurance	11,879	*0.7 (0.2)*	Ref.	**0.4[c] (0.1)**	Ref.	**52.5 (11.4)**	Ref.
Public insurance	7015	*2.4 (0.3)*	**3.41 (2.03–5.71)**	**0.9 (0.2)**	**2.54 (1.23–5.26)**	**39.1 (6.2)**	0.75 (0.44–1.26)
No insurance	739	*1.3[d] (0.7)*	1.83 (0.61–5.46)	**0.8[d] (0.6)**	2.24 (0.52–9.58)	**64.1[c] (23.3)**	1.22 (0.53–2.80)

Percentage estimates in italics indicate a χ^2 test *p*-value less than or equal to .001; percentage estimates in bold indicate a χ^2 test *p*-value between .001 and .05.

[a]Prevalence ratio in bold indicates statistically significant difference from reference group at the α = .05 level and remains statistically significant after adjustment for other significant indicators in a logistic regression model. PR in italics indicates a prevalence ratio that is no longer statistically significant after adjusting for other significant indicators in a logistic regression model.

[b]Multiple imputation used to estimate value for respondents with missing data on household income (9.4% were missing).

[c]Estimate is unstable and may be unreliable. It has a relative standard error between 30% and 50% and should be interpreted with caution.

[d]Estimate is unreliable. It has a relative standard error larger than 50% and should not be used except for inferential statistics (e.g., comparisons with other estimates). ADHD, attention-deficit hyperactivity disorder; 95% CI, 95% confidence interval; PR, prevalence ratio; SE, standard error.

J Dev Behav Pediatr. Author manuscript; available in PMC 2018 September 01.

Table 2

Weighted Prevalence Estimates of Parent-Reported Attention-Deficit Hyperactivity Disorder Diagnosis and Medication Treatment Among US Children Aged 2–5 Years by Sociodemographic Characteristics Over Time (National Survey of Children's Health, 2007–2008 and 2011–2012)

	Current ADHD			Current ADHD and Taking ADHD Medication			Proportion Receiving Medication of Those with Current ADHD		
	Weighted %			Weighted %			Weighted %		
Characteristic	**2007**	**2011**	**PR[a] (95% CI)**	**2007**	**2011**	**PR[a] (95% CI)**	**2007**	**2011**	**PR[a] (95% CI)**
Overall	1.0	1.5	**1.57 (1.10–2.23)**	0.3	0.7	**2.02 (1.22–3.34)**	34.5	43.7	1.27 (0.82–1.96)
Sex									
Boys	1.4	2.1	1.49 (0.98–2.27)	0.5	1.0	*1.94 (1.07–3.52)*	35.9	45.5	1.27 (0.76–2.10)
Girls	0.5	0.8	1.79 (0.94–3.40)	0.1[c]	0.3	2.03 (0.96–5.55)	30.1[c]	38.8	1.29 (0.57–2.92)
Age group, yr									
2–3	0.4[c]	0.7[c]	1.75 (0.71–4.30)	0.1[d]	0.1[d]	0.9 (0.12–6.70)	24.5[d]	12.6[d]	0.51 (0.08–3.14)
4–5	1.5	2.2	*1.51 (1.03–2.20)*	0.5	1.2	**2.16 (1.30–3.58)**	36.9	51.8	1.41 (0.91–2.16)
Race/ethnicity									
Non-Hispanic white	1.0	1.4	1.40 (0.86–2.28)	0.5	0.7	1.58 (0.86–2.90)	48.0	52.5	1.09 (0.67–1.80)
Non-Hispanic black	1.2[c]	3.2	**2.68 (1.16–6.20)**	0.1[d]	0.7[c]	*14.26 (3.11–65.27)*	4.0[d]	21.3[c]	**5.31 (1.04–27.19)**
Hispanic, any race	0.7[c]	0.7	1.02 (0.41–2.54)	0.0[d]	0.4[c]	**14.09 (3.60–55.10)**	4.1[d]	56.7	**13.76 (3.63–52.09)**
Non-Hispanic other	1.4[d]	2.0	1.48 (0.47–4.72)	0.7[d]	1.0[c]	1.39 (0.29–6.67)	53.8[c]	50.5	0.94 (0.31–2.80)
Highest education of any parent in household									
Less than high school	1.5[c]	1.9	1.28 (0.55–2.98)	0.3[d]	0.4[c]	1.37 (0.33–5.65)	18.3[d]	19.6[c]	1.07 (0.27–4.32)
12 yr, high school graduate	1.7	1.8	1.08 (0.54–2.16)	0.7[c]	1.0	1.53 (0.63–3.71)	39.6[c]	56.1	1.42 (0.68–2.96)
More than high school	0.6	1.2	**1.99 (1.27–3.13)**	0.2	0.5	**2.66 (1.42–4.98)**	32.9	42.1	1.28 (0.73–2.24)
Household income relative to federal poverty level[b]									
<100%	1.8	2.7	1.49 (0.85–2.61)	0.6[c]	1.0	1.52 (0.62–3.76)	35.6[c]	36.2	1.02 (0.49–2.14)
100%–200%	1.4	1.8	1.29 (0.64–2.60)	0.4[c]	1.0	*2.50 (1.08–5.78)*	29.4[c]	56.8	1.94 (0.87–4.31)
>200%	0.5	0.8	1.58 (0.87–2.88)	0.2[c]	0.3[c]	1.91 (0.76–4.78)	38.9	43.9	1.13 (0.55–2.33)
Region									
Northeast	0.9	1.5[c]	1.60 (0.68–3.77)	0.3[d]	0.6[c]	1.99 (0.50–7.98)	33.2[c]	41.3[c]	1.24 (0.41–3.81)

	Current ADHD			Current ADHD and Taking ADHD Medication			Proportion Receiving Medication of Those with Current ADHD		
	Weighted %			Weighted %			Weighted %		
Characteristic	**2007**	**2011**	**PR[a] (95% CI)**	**2007**	**2011**	**PR[a] (95% CI)**	**2007**	**2011**	**PR[a] (95% CI)**
Midwest	1.2	2.1	1.76 (0.95–3.24)	0.6[c]	1.0	1.62 (0.70–3.72)	55.3	50.9	0.92 (0.52–1.64)
South	1.0	1.7	1.65 (0.91–2.99)	0.3[c]	0.7	*2.26 (1.02–5.01)*	30.5[c]	41.9	1.37 (0.65–2.90)
West	0.6[c]	0.7	1.03 (0.45–2.35)	0.1[c]	0.2[c]	*4.21 (1.53–11.62)*	9.5[c]	34.8	**3.65 (1.17–11.42)**
Insurance status									
Non-public insurance	0.5	0.7	1.35 (0.65–2.80)	0.1[c]	0.4[c]	**3.02 (1.12–8.16)**	24.8[c]	52.5	2.12 (0.84–5.31)
Public insurance	1.8	2.4	1.37 (0.90–2.08)	0.7	0.9	1.31 (0.71–2.39)	41.0	39.1	0.95 (0.58–1.56)
No insurance	0.6[d]	1.3[d]	2.09 (0.45–9.74)	0.1[d]	0.8[d]	*8.77 (1.35–56.95)*	15.3[d]	64.1[c]	4.20 (0.72–24.46)

[a]Prevalence ratio in bold indicates statistically significant difference in 2011 to 2012 estimate compared to the estimate from 2007 to 2008 at the α = .05 level and remains statistically significant after adjustment for other significant indicators in a logistic regression model. PR in italics indicates a prevalence ratio that is no longer statistically significant after adjusting for other significant indicators in a logistic regression model.

[b]Multiple imputation used to estimate value for respondents with missing data on household income (8.9% in 2007–2008 and 9.4% in 2011–2012 were missing).

[c]Estimate is unstable and may be unreliable. It has a relative standard error between 30% and 50% and should be interpreted with caution.

[d]Estimate is unreliable. It has a relative standard error larger than 50% and should not be used except for inferential statistics (e.g., comparisons with other estimates). ADHD, attention-deficit hyperactivity disorder; 95% CI, 95% confidence interval; PR, prevalence ratio.