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July 2008

# Diagnosed Attention Deficit Hyperactivity Disorder and Learning Disability: United States, 2004–2006



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Centers for Disease Control and Prevention  
National Center for Health Statistics

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# Vital and Health Statistics

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Data From the National Health  
Interview Survey

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Centers for Disease Control and Prevention  
National Center for Health Statistics

Hyattsville, Maryland  
July 2008  
DHHS Publication No. (PHS) 2008–1565

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## Objectives

This report presents national estimates of the prevalence of diagnosed attention deficit hyperactivity disorder (ADHD) and learning disability (LD) in U.S. children 6–17 years of age and describes the prevalence of these conditions for children with selected characteristics. The use of educational and health care services and the prevalence of other health conditions are contrasted for children with ADHD without LD, LD without ADHD, both conditions, and neither condition.

## Methods

Estimates are based on data from the National Health Interview Survey (NHIS), an ongoing national household survey of the civilian noninstitutionalized population of the United States. The analysis focuses on 23,051 children 6–17 years of age in the child sample of the 2004, 2005, and 2006 NHIS.

## Results

About 5% of children had ADHD without LD, 5% had LD without ADHD, and 4% had both conditions. Boys were more likely than girls to have each of the diagnoses (ADHD without LD, LD without ADHD, and both conditions). Children 12–17 years of age were more likely than children 6–11 years of age to have each of the diagnoses. Hispanic children were less likely than non-Hispanic white and non-Hispanic black children to have ADHD (with and without LD). Children with Medicaid coverage were more likely than uninsured children and privately insured children to have each of the diagnoses. Children with each of the diagnoses were more likely than children with neither ADHD nor LD to have other health conditions. Children with ADHD were more likely than children without ADHD to have contact with a mental health professional, use prescription medication, and have frequent health care visits. Children with LD were more likely than children without LD to use special education services.

**Keywords:** children's health • learning and behavioral disorders • health care utilization

# Diagnosed Attention Deficit Hyperactivity Disorder and Learning Disability: United States, 2004–2006

by Patricia N. Pastor, Ph.D., and Cynthia A. Reuben, M.A.,  
*Office of Analysis and Epidemiology*

## Highlights

### Prevalence

- The percentage of children 6–17 years of age with ADHD (with and without LD) increased slowly from 1997 through 2006, whereas the percentage of children with LD (with and without ADHD) did not change significantly.
- Approximately 5% of children had ADHD without LD, 5% had LD without ADHD, and 4% had both conditions.
- Boys were more likely than girls to have each of the diagnoses (ADHD without LD, LD without ADHD, and both conditions).
- Hispanic children were less likely than non-Hispanic black children and non-Hispanic white children to have ADHD (with and without LD).
- Children with Medicaid were more likely than uninsured children or privately insured children to have each of the diagnoses.

### Other Health Conditions

- Children with each of the diagnoses (ADHD without LD, LD without ADHD, and both conditions) were more likely than children with neither ADHD nor LD to have other chronic health conditions.

### Use of Health Care and Educational Services

- Children with each of the diagnoses (ADHD without LD, LD without ADHD, and both conditions) were more likely than children with neither condition to use health care and educational services.
- Children with ADHD (with and without LD) were more likely than children without ADHD to have contact with a mental health professional, use prescription medication, and have frequent health care visits.
- Children with LD (with and without ADHD) were more likely than children without LD to use special education services.

## Introduction

Over the past three decades in the United States, behavioral and learning disorders have emerged as major chronic conditions affecting the development of school-aged children and adolescents (1,2). Educators have reported a rise in the number of children with these disorders (3). Pediatricians have also reported an increased number of children with outpatient visits related to behavioral and emotional disorders (4,5). During this period, special education programs have expanded greatly, thereby increasing the number of students receiving services for

behavioral and learning disorders (6,7). Additionally, a marked increase has also been observed in the number of children with emotional and behavioral disorders who are treated with psychotropic medications (8). All these trends indicate the need for health surveys to monitor the number and characteristics of children diagnosed with behavioral and learning disorders.

This report examines two commonly diagnosed conditions causing behavioral and learning problems in children, attention deficit hyperactivity disorder (ADHD) and learning disability (LD). The findings update and expand upon the estimates presented in a 2002 *Vital and Health Statistics* series report, "Attention Deficit Disorder and Learning Disability: United States, 1997–98," which examined the prevalence of diagnosed ADHD and LD in children 6–11 years of age (9). This report provides a national picture of children with diagnosed ADHD and LD by describing 1) recent trends in these diagnoses, 2) the prevalence of these diagnoses among children with selected sociodemographic characteristics, 3) other health conditions of children with these diagnoses, and 4) the use of educational and health services by children with these diagnoses.

In contrast to many previous studies that have examined the characteristics of all children with ADHD or all children with LD, this report takes into account the frequent co-occurrence of ADHD and LD. Most of the analyses are for children with ADHD without LD, LD without ADHD, both conditions, and neither condition. Analyses of the trends in ADHD and LD examine the changes over time in the percentage of children with all diagnoses of ADHD (with and without LD) and children with all diagnoses of LD (with and without ADHD). This report presents estimates for all children 6–17 years of age and compares findings for boys, girls, children 6–11 years of age, and children 12–17 years of age.

## Data and Methods

### Survey Procedures

The data source for this report is the 2004, 2005, and 2006 National Health Interview Survey (NHIS). The NHIS is an ongoing multistage probability sample survey conducted by the National Center for Health Statistics (NCHS) and is representative of the civilian noninstitutionalized population of the United States. The sampling design for the NHIS permits the merging of data from 2004, 2005, and 2006 into a single sample. During these 3 survey years, 104,292 households participated in NHIS, resulting in a response rate of 87%.

In each family with children under 18 years of age, one child was randomly selected to be included in the child sample. Additional information for this child was obtained by interviewing an adult family member who was knowledgeable about the child's health. This report examines data for the 23,051 children 6–17 years of age in the 2004–2006 child sample. The final response rate for sample children from 2004 through 2006 was 78% to 79%. In approximately 92% of the families, a parent was the respondent providing information about the sample child. The respondent for the child is referred to as a parent throughout this report. In addition, the term "younger children" refers to children 6–11 years of age, and the term "older children" refers to children 12–17 years of age.

Data were collected on the child's sociodemographic characteristics, including age at interview, sex, race, ethnicity, birthweight, family structure, mother's level of education, and health insurance coverage. The information collected about health conditions included diagnoses of ADHD, LD, mental retardation and other developmental delay, hearing and vision problems, allergies, asthma, and other chronic health conditions. Use of educational services was measured by asking if a child was currently receiving special education services and if these services were for an emotional or

behavioral problem. Use of health care services during the past 12 months was assessed by asking if a parent had seen or talked to various types of providers about the health of the child and how often the child had been seen by a health care provider. Use of medication was determined by asking if a child had a condition for which he or she had regularly taken prescription medication for at least 3 months. A detailed description of the NHIS sample design and the survey questionnaires for 2004, 2005, and 2006 are available from the website, [http://www.cdc.gov/NCHS/about/major/nhis/quest\\_data\\_related\\_1997\\_forward.htm](http://www.cdc.gov/NCHS/about/major/nhis/quest_data_related_1997_forward.htm).

Percentages and standard errors were calculated using SUDAAN, a statistical program for survey data analysis that adjusts for the effects of complex sampling designs (10). Differences between percentages were evaluated for statistical significance at the 0.05 level with two-tailed statistical tests. No adjustments were made for multiple comparisons. Logistic regression was used to determine the average annual percentage change in the prevalence of ADHD and LD from 1997 through 2006.

### Measurement of Diagnosed ADHD and LD

Parents were asked the following questions to determine if a child had a previous diagnosis of ADHD or LD:

- Has a doctor or health professional ever told you that (sample child) had attention deficit hyperactivity disorder (ADHD) or attention deficit disorder (ADD)?
- Has a representative from a school or a health professional ever told you that (sample child) had a learning disability?

The item nonresponse rate for the questions on ADHD and LD was 0.4%. The final sample for the analysis ( $n = 22,969$ ) excluded 82 children who had missing information on ADHD or LD. Diagnosed cases reported by parents were not verified by comparing survey responses with information from the medical or school records of children.



Undiagnosed cases of ADHD and LD were not included because the survey questions only asked parents about diagnosed cases of ADHD and LD. In the results section of this report, mentions of children with ADHD, LD, or both diagnoses refer to children whose parents reported that their child was ever diagnosed with ADHD, LD, or both conditions.

## Results

### Trends in Diagnosed ADHD and LD, 1997–2006

- The average annual increase in the percentage of children with all diagnoses of ADHD (with and without LD) was 3% from 1997 through 2006. No significant average annual change was found in the percentage of children with all diagnoses of LD (with and without ADHD) (Figure 1).
- An increase in the percentage of children with ADHD was observed among both boys (2%) and girls (4%) (Figure 2).
- Among younger children 6–11 years of age, no significant change was found in the percentage of children

with ADHD. However, among older children 12–17 years of age, an increase occurred in the percentage of children with ADHD, an average annual increase of 4% (Figure 3).

### Prevalence of Diagnosed ADHD and LD by Selected Sociodemographic Characteristics, 2004–2006

#### Overall prevalence

- Approximately 4.7% of children 6–17 years of age had ADHD without LD, 4.9% had LD without ADHD, and 3.7% had both conditions (Table 1).

#### Sex

- Boys were more likely than girls to have each of the diagnoses (ADHD without LD, LD without ADHD, and both conditions) (Table 1 and Figure 4).
- Boys (6.7%) were more than twice as likely as girls (2.5%) to have ADHD without LD (Table 1 and Figure 4).
- Boys (5.1%) were about twice as likely as girls (2.3%) to have both conditions (Table 1 and Figure 4).
- Boys (5.6%) were about one-third more likely than girls (4.3%) to

have LD without ADHD (Table 1 and Figure 4).

#### Age

- Older children 12–17 years of age were more likely than younger children 6–11 years of age to have each of the diagnoses (ADHD without LD, LD without ADHD, and both conditions) (Table 1 and Figure 5).

#### Low birthweight

- Children with low birthweight were more likely than children without low birthweight to have LD (with and without ADHD) (Table 1).
- Low birthweight was not associated with ADHD without LD (Table 1).
- In each sex and age group, children with low birthweight were more likely than children without low birthweight to have LD (with and without ADHD) (Table 2).

#### Race and ethnicity

- Hispanic children were less likely than non-Hispanic black children or non-Hispanic white children to have ADHD (with and without LD) (Table 1 and Figure 6).
- No significant racial or ethnic differences were found in the percentage of children having LD without ADHD (Table 1 and Figure 6).
- In each sex and age group, Hispanic children were less likely than non-Hispanic children to have ADHD without LD (Table 2).

#### Family structure

- Children who lived in a mother-only family were more likely than those in a two-parent family to have each of the three diagnoses (ADHD without LD, LD without ADHD, and both conditions) (Table 1).
- In each sex and age group, children living in a mother-only family were more likely than those living in a two-parent family to have both ADHD and LD (Table 2).
- Among boys, younger children, and older children, those living in a

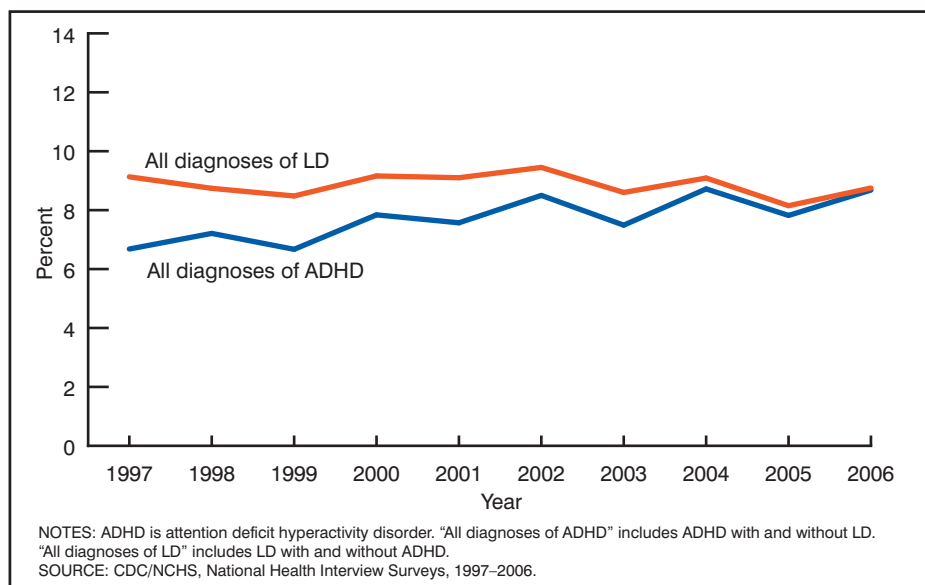


Figure 1. All diagnoses of ADHD and learning disability (LD) among children 6–17 years of age: United States, 1997–2006

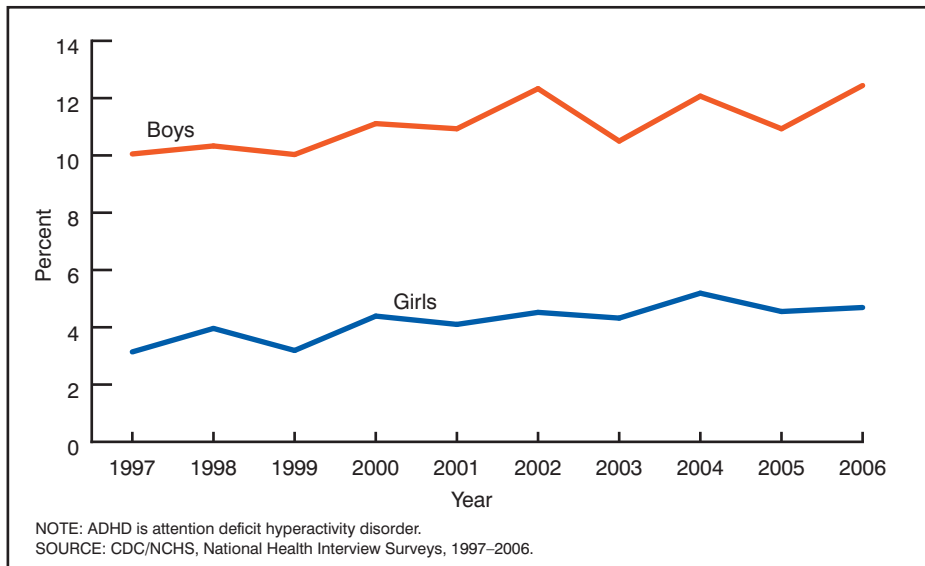


Figure 2. All diagnoses of ADHD among children 6-17 years of age, by sex: United States, 1997-2006

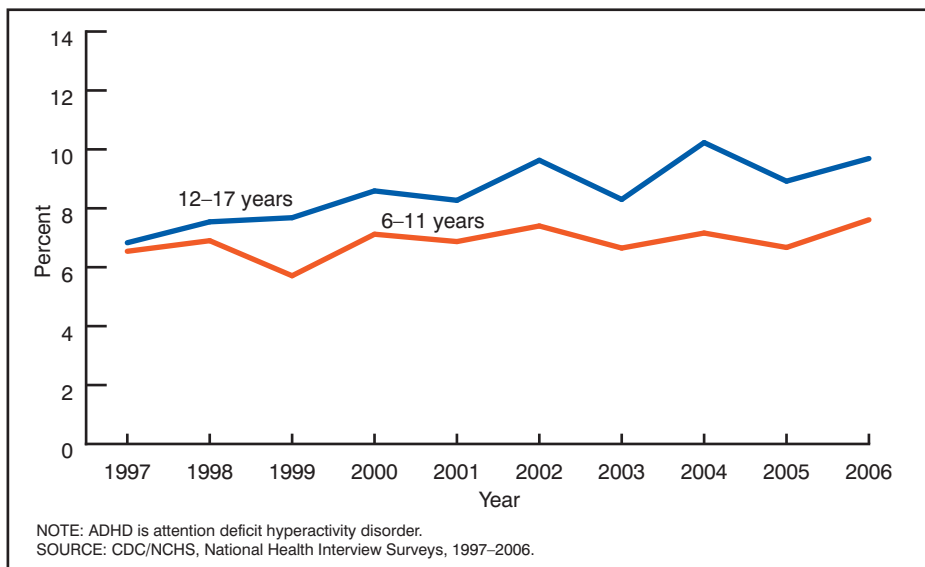


Figure 3. All diagnoses of ADHD among children 6-17 years of age, by age group: United States, 1997-2006

mother-only family were more likely than those living in a two-parent family to have ADHD without LD (Table 2).

- Among boys and younger children, those living in a mother-only family were more likely than those in a two-parent family to have LD without ADHD (Table 2).

### Health insurance coverage

- Children with Medicaid coverage were more likely than uninsured children and privately insured children to have each of the diagnoses (ADHD without LD, LD without ADHD, and both conditions) (Table 1 and Figure 7).
- Among boys and younger children, those with Medicaid coverage were more likely than either uninsured or privately insured children to have each of the diagnoses (Table 2).

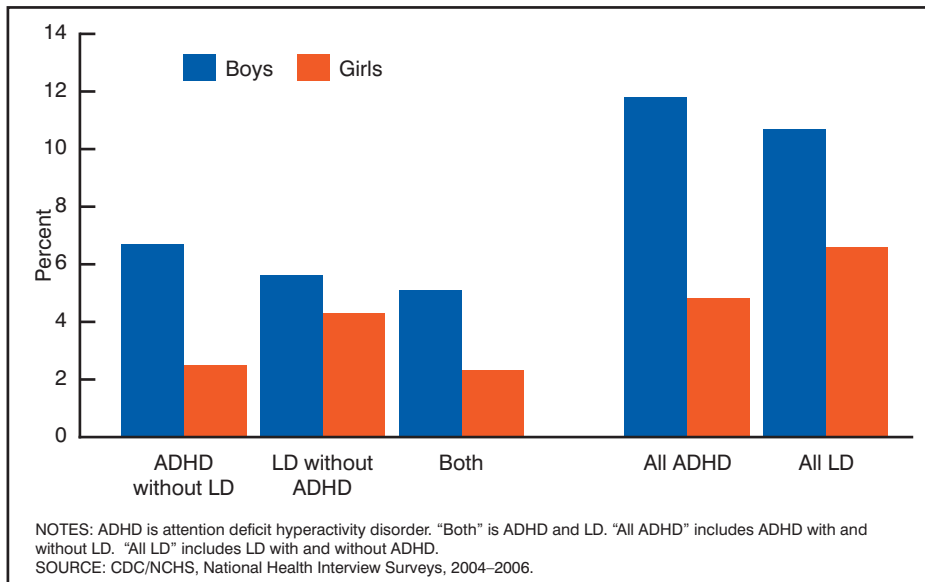
- Among girls and older children, those with Medicaid coverage were more likely than uninsured or privately insured children to have LD (with and without ADHD) (Table 2).

### Mother's level of education

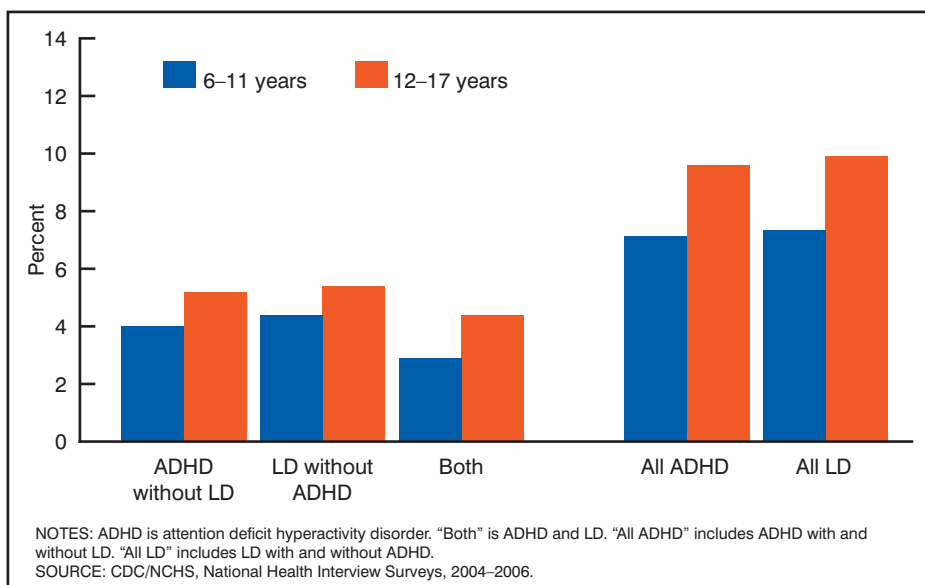
- Overall, a curvilinear relationship was found between mother's education and ADHD without LD. This diagnosis was most often reported for children whose mothers had intermediate levels of education (having a high school diploma but not having a bachelor's degree) (Table 1).
- In each sex and age group, children with the least educated mothers were more likely than children with the most educated mothers to have LD without ADHD (Table 2).
- Among older children, those with the most educated mothers were twice as likely as children with the least educated mothers to have ADHD without LD (Table 2).

### Health conditions of children

- Children with each of the diagnoses (ADHD without LD, LD without ADHD, and both conditions) were more likely than children with neither ADHD nor LD to have other chronic health conditions (Table 3).
- Among children with each of the diagnoses, the prevalence of mental retardation and other developmental delay was lowest among children having ADHD without LD and highest among children having LD without ADHD (Table 3 and Figure 8).
- The prevalence of asthma did not differ significantly among children with each of the diagnoses (Table 3 and Figure 8).
- The prevalence of each of the other chronic health conditions was similar for all children with LD (with and without ADHD) (Table 3).
- Among children in each sex and age group, children with LD (with and without ADHD) were much more likely than children with neither



**Figure 4. ADHD and learning disability (LD) among children 6–17 years of age, by sex: United States, 2004–2006**



**Figure 5. ADHD and learning disability (LD) among children 6–17 years of age, by age group: United States, 2004–2006**

condition to have other health conditions (Table 3).

### Use of health care and educational services

- Children with each of the diagnoses (ADHD without LD, LD without ADHD, and both conditions) were more likely than children with neither condition to use health care and educational services (Table 4).
- Children with both ADHD and LD were more likely than children with ADHD without LD, LD without

ADHD, or neither condition to use most types of health care and educational services (Table 4).

- Children with ADHD (with and without LD) were more likely than children without ADHD to have contact with a mental health professional, use prescription medication, and have frequent health care visits (Table 4 and Figure 9).
- Children with LD (with and without ADHD) were more likely than those without LD to use special education services (Table 4 and Figure 9).

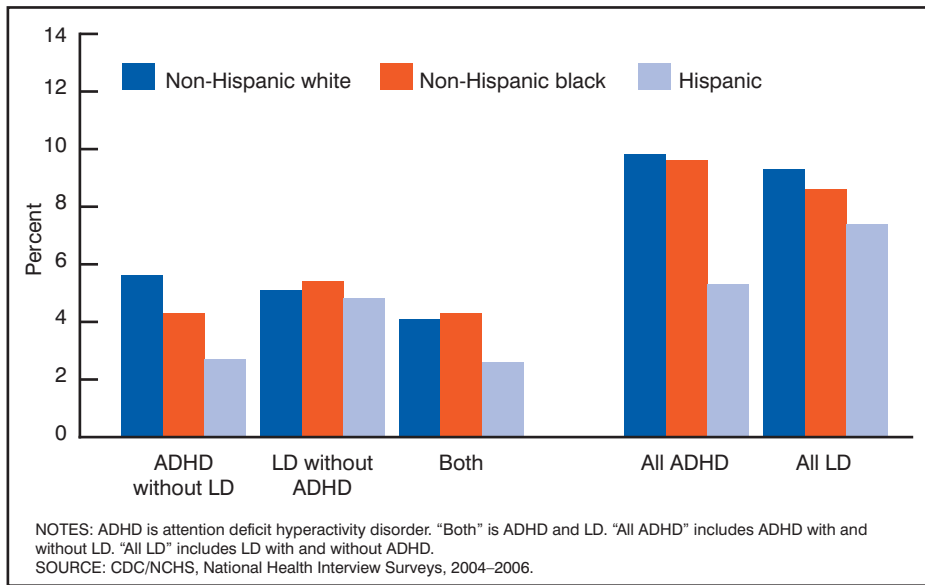
- In each sex and age group, children with each of the diagnoses were more likely than children with neither ADHD nor LD to use most health care and educational services (Table 4).

## Discussion

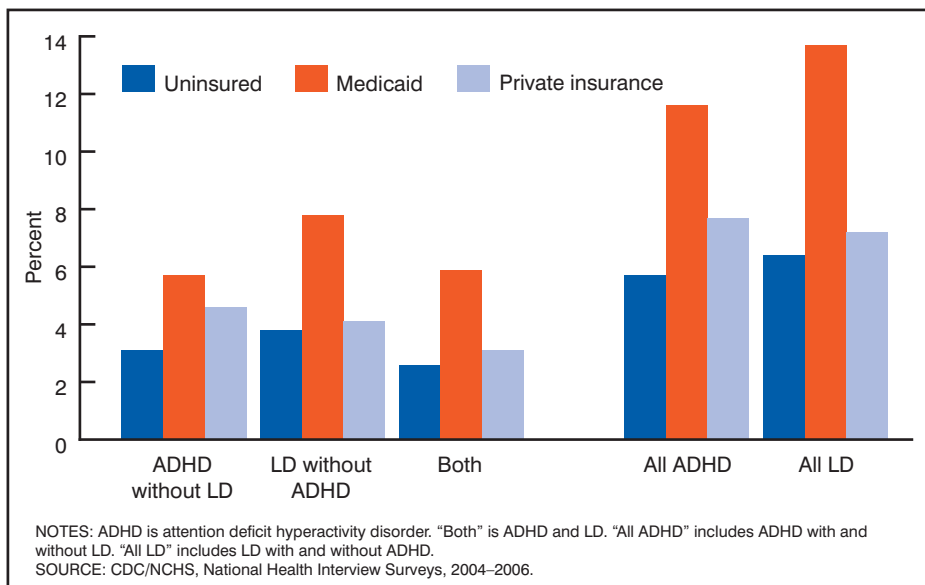
ADHD and LD are among the most prevalent and widely researched diagnoses of U.S. children. In 2006, NCHS estimated that 4.5 million school-aged children (5–17 years of age) had ever been diagnosed with ADHD and 4.6 million children with LD (11). The economic effect of these conditions on families, schools, and the health care system is substantial. A recent review, using conservative prevalence estimates, calculated the annual societal “cost of illness” for ADHD to be between \$36 and \$52 billion in 2005 dollars (12). About one-half of the students currently receiving special education services nationally are entitled to these services because of learning disability (3). Additionally, a recent national survey of special education students showed that children with ADHD are a rapidly growing group of students within special education programs (13). Given the economic and social costs associated with ADHD and LD, monitoring the number and characteristics of children who have been diagnosed with these conditions is critical.

### Prevalence of Diagnosed ADHD and LD

Past estimates of the prevalence of ADHD and LD have varied, in part, because of differences in the criteria used for identifying these conditions and the types of samples selected. The aim of this study was to describe the prevalence of diagnosed ADHD and LD using parent reports from a large, nationally representative health survey. Because this study focused on the prevalence of diagnosed conditions, the findings reflect not only the underlying prevalence of these conditions, but also the effects of factors related to a professional diagnosis of these



**Figure 6. ADHD and learning disability (LD) among children 6-17 years of age, by race and ethnicity: United States, 2004-2006**



**Figure 7. ADHD and learning disability (LD) among children 6-17 years of age, by insurance coverage at interview: United States, 2004-2006**

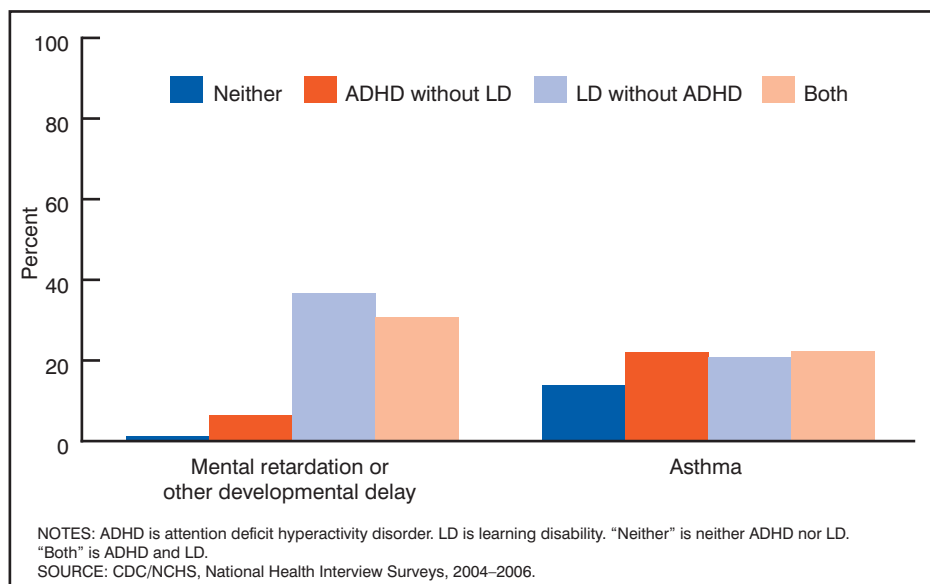
conditions. Factors influencing the likelihood that a child with these conditions receives a diagnosis include access to health care and educational services, local practices of health care and education professionals, and parental attitudes toward behavioral and learning conditions.

Few studies have estimated the national prevalence of diagnosed ADHD. Recently, two other studies using data from national surveys reported prevalence estimates of diagnosed ADHD among school-age children similar to the prevalence rate of

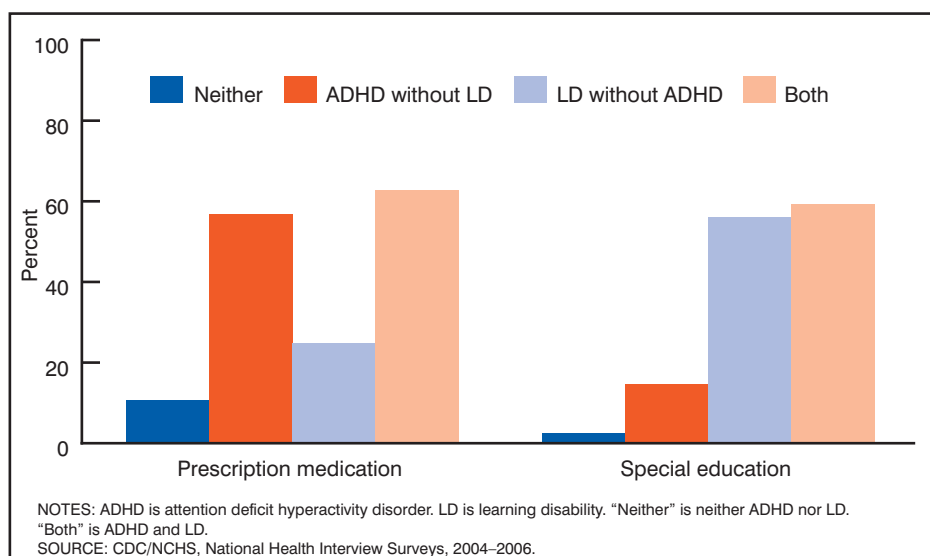
this study—8.4% (95% confidence interval: 8.1%–8.8%). Visser et al., using data from the 2003 National Survey of Children’s Health (NSCH), estimated the prevalence of diagnosed ADHD among U.S. children 4–17 years of age to be 7.8% (95% confidence interval: 7.4%–8.1%) (14). Braun et al., using data from the 1999–2002 National Health and Nutrition Examination Survey (NHANES), estimated the prevalence of diagnosed ADHD among children 4–15 years of age to be 8.2% (15).

Other recent findings from the 2001–2004 NHANES indicate that children with parent reports of diagnosed ADHD and children meeting the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) criteria for ADHD are overlapping, although not identical, groups of children (16). Using detailed data from the Diagnostic Interview Schedule for Children in the 2001–2004 NHANES, Froehlich et al. determined that 8.7% of children 8–15 years of age met the DSM-IV criteria for ADHD during the year prior to the survey. Another 3.3% of children did not meet the diagnostic criteria for ADHD, but had a parent report of a previous diagnosis of ADHD and had received ADHD medications during the year prior to the survey. Among all children meeting the DSM-IV criteria for ADHD, approximately one-half had a parent report of a previous diagnosis of ADHD.

Similarly, national estimates of diagnosed LD are scarce. Recently, Altarac and Saroha, using data from the 2003 NSCH, estimated the prevalence of diagnosed LD among children 3–17 years of age to be 9.7% (95% confidence interval: 9.4%–10.1%) (17). This estimate is slightly higher than the prevalence rate of diagnosed LD in this study of 8.7% of children 6–17 years of age (95% confidence interval: 7.9%–9.4%). Both survey estimates of the prevalence of LD substantially exceed the national estimate of approximately 6% based on special education enrollment data. The discrepancy between the estimates of LD based on survey results and the estimates based on enrollment data may be due, in part, to parents’ interpretation of the term “learning disability.” Because the survey questions only asked about “a learning disability” and did not define specifically which disorders are considered LD, parents may have interpreted the term to describe a wide range of learning and developmental problems. Additionally, the survey questions asked parents about any previous diagnosis of LD, whereas special education enrollment data only describe children in special education with a current diagnosis of LD.



**Figure 8. Mental retardation or other developmental delay and asthma among children 6-17 years of age, by diagnostic group: United States, 2004-2006**



**Figure 9. Use of prescription medication and special education among children 6-17 years of age, by diagnostic group: United States, 2004-2006**

Recent survey estimates of diagnosed ADHD and LD have not examined the joint occurrence of these conditions. However, many clinical and community studies have reported differing estimates of the co-occurrence of ADHD and LD (18). In this study, 28% of children diagnosed with either ADHD or LD had reports of having been diagnosed with both conditions. The co-occurrence of diagnosed ADHD and LD reflects the effect of shared genetic and environmental factors that are associated with the development and the diagnosis of both of these conditions. Additionally, simply being

diagnosed with one condition may increase the likelihood that a child is evaluated for the other condition.

In regard to trends, no other recent survey estimates of changes in the prevalence of either diagnosed ADHD or LD are available. Results from past community and clinical studies and reviews of patient records suggest that the number of children having a diagnosis of ADHD and the number using ADHD medication have increased greatly since the 1970s (19). Findings from this study show that, more recently, the prevalence of diagnosed ADHD has continued to increase,

especially among older children. Similarly, special education enrollment data suggest that the percentage of students with a specific learning disability increased markedly during the 1970s and 1980s (3). More recently, though, the increase in the percentage of students enrolled in special education for a specific learning disability has slowed. Estimates from this study also show no significant change in the prevalence of diagnosed LD reported by parents from 1997 through 2006.

## Factors Associated with Diagnosed ADHD or LD

*Demographic factors*—The current finding that older children compared with younger children were more likely to have been diagnosed with either ADHD or LD is similar to the findings from the 2003 NSCH (14,17). Although a number of factors may contribute to differences between younger and older children, a higher "lifetime" prevalence rate among older children would be expected because of their longer exposure to the possibility of evaluation and diagnosis. Additionally, the finding that boys compared with girls were more likely to have been diagnosed with either ADHD or LD is also similar to the findings from the 2003 NSCH. This result is not surprising because nearly all studies of ADHD and LD have reported a higher prevalence of these conditions in boys than in girls (19). Although the reasons that boys are more often diagnosed with ADHD, LD, or both conditions are not fully understood, the more frequent disruptive behavior of boys, especially in school settings, has been mentioned as a possible explanation for the sex disparity in diagnosed ADHD (20).

The finding of a positive association between low birthweight (less than 2,500 grams) and the prevalence of diagnosed LD (with and without ADHD) in this study also concurs with the results of other recent investigations. Using data from the 2002 NHIS, Stein et al. found moderately low birthweight (1,500-2,499 grams) was associated with a higher prevalence of any diagnosis of ADHD or LD in children 3-12 years of age (21). The association

between moderately low birthweight and each of the conditions persisted even after controlling for confounding factors.

*Social and economic factors—*

Because of differences in the coding of race, findings from this study cannot be compared with those in the 2003 NSCH. In regard to ethnicity, though, a few comparisons are possible. This study and the 2003 NSCH reported a lower prevalence of diagnosed ADHD among Hispanic children compared with non-Hispanic children. Less access to health care and language barriers are explanations that have been offered for the lower prevalence of diagnosed ADHD reported by Hispanic parents (22).

Many of the findings related to other socioeconomic factors in this study were also similar to the results of the 2003 NSCH. Children in mother-only families were noted in both surveys to have a higher prevalence of diagnosed ADHD and LD. Children with health insurance coverage (any type) were noted in both surveys to have a higher prevalence of diagnosed ADHD. This study further found that the prevalence of diagnosed ADHD was similar among children with private insurance coverage and children with Medicaid. Although many factors may contribute to the differences between insured and uninsured children, access to health care may make it more likely that a child with ADHD will be diagnosed. Additionally, the positive association between Medicaid and diagnosed ADHD may reflect, in part, the influence of a diagnosis of ADHD on a child's eligibility for Medicaid coverage (23).

The findings from this study and those based on the 2003 NSCH suggest a complex relationship between a mother's level of education and the conditions of ADHD and LD. As expected from other studies of learning difficulties and poor academic outcomes, both studies show a lower prevalence of LD (with and without ADHD) among children whose mothers had the highest level of education, compared with children whose mothers had the lowest level of education. The unexpected result of an overall curvilinear relationship between mothers' education

and diagnosed ADHD (children whose mothers had intermediate levels of education had the highest prevalence of this diagnosis) may be due, in part, to the confounding effects of other factors such as Hispanic ethnicity.

## Health Conditions and Service Use

Past clinical and community studies have reported a higher prevalence of other mental and physical disorders among children with ADHD, compared with children without ADHD (19). Similarly, studies of children with learning disorders have noted a higher prevalence of developmental, behavioral, and physical disorders in these children, compared with children without learning disorders (17). This study also showed that children with diagnoses of ADHD without LD, LD without ADHD, or both conditions more often had reports of other health conditions compared with children with neither condition. The finding that children with diagnosed ADHD or LD are seen more often by health care professionals may explain partially the higher prevalence of other health conditions among children with diagnosed ADHD, LD, or both conditions. In this study, the full extent of co-occurring health conditions is probably understated because of the absence of questions in the NHIS about other mental health conditions. Other recent studies have shown that many children with diagnosed ADHD meet the criteria for at least one other mental disorder. Among the most frequently co-occurring disorders in children with ADHD are oppositional defiant disorder and conduct disorder (19).

Children with diagnosed ADHD, LD, or both conditions also used educational and health care services much more often than children with neither condition. Given the potential effect of ADHD and LD on a child's academic progress, family relationships, and peer interactions, the higher level of health care and educational service use among diagnosed children, compared with undiagnosed children, is not surprising. Moreover, the other health conditions of children with diagnosed

ADHD and LD may be another factor contributing to the greater use of health care and educational services.

## Study Limitations

The results of this study are limited in several ways. First, the results only describe the prevalence, sociodemographic characteristics, health conditions, and service use of children with a parent report of diagnosed ADHD or LD. The results do not describe the prevalence and characteristics of children who have the conditions but who have never been diagnosed. Furthermore, among children with parent reports of diagnosed LD, what is not known is if all parents understood "learning disability" to mean one of the specific LDs (disabilities related to listening, speaking, basic reading skills, reading comprehension, written expression, mathematical calculation, or mathematical reasoning). Some parents may have interpreted the term in a more general sense that could include any difficulty that a child has with learning, such as learning problems due to visual, hearing, or motor disabilities; mental retardation; emotional disturbance; or environmental, cultural, or economic disadvantage. The relatively large percentage of children with LD who were reported by parents to also have mental retardation or some other developmental delay suggests that parents may have interpreted the question about LD to include learning problems other than specific LDs. Neither school nor health records were obtained to determine the accuracy of parent reports of either diagnosed ADHD or LD.

Additionally, information about the severity and duration of a child's condition(s) was not collected in NHIS. Moreover, because of the cross-sectional design of NHIS, identifying how particular factors influence the diagnosis of ADHD, LD, or both conditions was not possible. NHIS includes only a few questions about health care and educational services utilized by children. More detailed information about current and past service use, including specific types of prescription medication, forms

of behavioral treatment, and providers of these treatments, would improve the description of service use. Information about other mental disorders of children with ADHD, LD, or both conditions could also enhance the understanding of the health care and educational needs of these children.

## Conclusion

Given the substantial burden associated with ADHD and LD for children, their families, and society, there remains a continuing need to monitor the national prevalence of these conditions. This study provides an overview of the number, characteristics, health conditions, and service use of school-aged children who had parent reports of diagnosed ADHD and LD in 2004–2006. This report contains information that may help educators, health planners, and health professionals assess the service needs of children with diagnosed ADHD and LD.

## References

1. Federal Interagency Forum on Child and Family Statistics. America's children: Key national indicators of well-being, 2007. Washington, DC. 2007.
2. New Freedom Commission on Mental Health. Achieving the promise: Transforming mental health care in America. Final report. DHHS pub no SMA-03-3832. Rockville, MD. 2003.
3. U.S. Department of Education, Office of Special Education and Rehabilitative Services, Office of Special Education Programs. 2005 Report to Congress on the implementation of the Individuals with Disabilities Education Act; vol. 1. Washington, DC. 2007.
4. Kelleher KJ, McInerney TK, Gardner WP, Childs GE, Wasserman RC. Increasing identification of psychosocial problems: 1979–1996. *Pediatrics* 105(6):1313–21. 2000.
5. Grupp-Phelan J, Harman JS, Kelleher KJ. Trends in mental health and chronic condition visits by children presenting for care at U.S. emergency departments. *Public Health Rep* 122:55–61. 2007.
6. Wagner M, Blackorby J. Disability profiles of elementary and middle school students with disabilities. Menlo Park, CA: SRI International. 2002.
7. Wagner M, Kutash K, Duchnowski AJ, Epstein MH, Sumi WC. The children and youth we serve: A national picture of the characteristics of students with emotional disturbances receiving special education. *Journal of Emotional and Behavioral Disorders* 13:79–96. 2005.
8. Thomas CP, Conrad P, Casler R, Goodman E. Trends in the use of psychotropic medications among adolescents, 1994 to 2001. *Psychiatr Serv* 57:63–9. 2006.
9. Pastor PN, Reuben CA. Attention deficit disorder and learning disability: United States, 1997–98. National Center for Health Statistics. *Vital Health Stat* 10(206). 2002.
10. Shah BV, Barnwell BG, Bieler GS. SUDAAN user's manual, release 7.5. Research Triangle Park, North Carolina: Research Triangle Institute. 1997.
11. Bloom B, Cohen RA. Summary health statistics for U.S. children: National Health Interview Survey, 2006. National Center for Health Statistics. *Vital Health Stat* 10(234). 2007.
12. Pelham WE, Foster M, Robb JA. The economic impact of attention-deficit/hyperactivity disorder in children and adolescents. *J Pediatric Psychol* 32(6):711–27. 2007.
13. Schnoes C, Reid R, Wagner M, Marder C. ADHD among students receiving special education services: A national survey. *Exceptional Children* 72:483–96. 2006.
14. Visser SN, Lesesne CA, Perou R. National estimates and factors associated with medication treatment for childhood attention-deficit/hyperactivity disorder. *Pediatrics* 119:S99–106. 2007.
15. Braun JM, Kahn RS, Froehlich T, Auinger P, Lanphear BP. Exposures to environmental toxicants and attention deficit hyperactivity disorder in U.S. children. *Environ Health Perspect* 114:1904–9. 2006.
16. Froehlich TE, Lanphear BP, Epstein JN, Barbaresi WJ, Katusic SK, Kahn RS. Prevalence, recognition, and treatment of attention-deficit/hyperactivity disorder in a national sample of US children. *Arch Pediatr Adolesc* 161:857–64. 2007.
17. Altarac M, Saroha E. Lifetime prevalence of learning disability among US children. *Pediatrics* 119:S77–83. 2007.
18. Barkley RA. Attention-deficit hyperactivity disorder. 2d ed. New York: Guilford Press. 1998.
19. Smith BH, Barkley RA, Shapiro CJ. Attention-deficit/hyperactivity disorder. In: Mash EJ, Barkley RA, editors. *Treatment of childhood disorders*. 3d ed. New York, NY: Guilford Press. 2006.
20. Derks EM, Hudziak JJ, Boomsma DI. Why more boys than girls with ADHD receive treatment: A study of Dutch twins. *Twin Res Hum Genet* 10:765–70. 2007.
21. Stein REK, Siegel MJ, Bauman LJ. Are children of moderately low birth weight at increased risk for poor health? A new look at an old question. *Pediatrics* 118:217–23. 2006.
22. Stevens J, Harman JS, Kelleher KJ. Ethnic and regional differences in primary care visits for attention-deficit hyperactivity disorder. *J Dev Behav Pediatr* 25:318–25. 2004.
23. Social Security Administration. Disability evaluation under Social Security (Blue Book—June 2006). Available from: <http://www.ssa.gov/disability/professionals/bluebook/>. 2006.

**Table 1. Diagnosed attention deficit hyperactivity disorder (ADHD) and learning disability (LD) among children 6–17 years of age, by selected characteristics: United States, 2004–2006**

Characteristic	ADHD without LD <sup>1</sup>	LD without ADHD <sup>2</sup>	Both <sup>3</sup>	All ADHD <sup>4</sup>	All LD <sup>5</sup>
	Percent (standard error) <sup>6</sup>				
Total . . . . .	4.7 (0.2)	4.9 (0.2)	3.7 (0.2)	8.4 (0.2)	8.7 (0.4)
Sex					
Boys . . . . .	6.7 (0.5)	5.6 (0.3)	5.1 (0.3)	11.8 (0.4)	10.7 (0.4)
Girls . . . . .	2.5 (0.2)	4.3 (0.3)	2.3 (0.2)	4.8 (0.2)	6.6 (0.3)
Age					
6–11 years . . . . .	4.0 (0.3)	4.4 (0.3)	2.9 (0.2)	7.1 (0.3)	7.4 (0.3)
12–17 years . . . . .	5.2 (0.3)	5.4 (0.3)	4.4 (0.3)	9.6 (0.3)	9.9 (0.4)
Birthweight					
Low (less than 2,500 grams) . . . . .	5.3 (0.6)	7.6 (0.8)	6.5 (0.6)	11.7 (0.9)	14.1 (1.0)
Not low (2,500 grams or more) . . . . .	4.6 (0.2)	4.7 (0.2)	3.5 (0.2)	8.1 (0.2)	8.1 (1.0)
Race and ethnicity <sup>7</sup>					
Non-Hispanic white . . . . .	5.6 (0.3)	5.1 (0.3)	4.1 (0.2)	9.8 (0.3)	9.3 (0.3)
Non-Hispanic black . . . . .	4.3 (0.4)	5.4 (0.5)	4.3 (0.4)	8.6 (0.6)	9.6 (0.6)
Hispanic . . . . .	2.7 (0.3)	4.8 (0.3)	2.6 (0.3)	5.3 (0.4)	7.4 (0.4)
Family structure <sup>8</sup>					
Mother only . . . . .	6.1 (0.4)	5.8 (0.4)	5.1 (0.4)	11.2 (0.6)	11.0 (0.5)
Mother and father . . . . .	4.1 (0.2)	4.6 (0.2)	3.1 (0.2)	7.1 (0.3)	7.7 (0.3)
Health insurance coverage at interview					
Uninsured . . . . .	3.1 (0.4)	3.8 (0.4)	2.6 (0.4)	5.7 (0.6)	6.4 (0.6)
Medicaid <sup>9</sup> . . . . .	5.7 (0.4)	7.8 (0.5)	5.9 (0.4)	11.6 (0.6)	13.7 (0.6)
Private <sup>10</sup> . . . . .	4.6 (0.2)	4.1 (0.2)	3.1 (0.2)	7.7 (0.3)	7.2 (0.3)
Mother's education					
Less than high school graduate . . . . .	3.1 (0.4)	5.8 (0.5)	3.3 (0.4)	6.4 (0.5)	9.1 (0.6)
High school graduate or GED <sup>11</sup> . . . . .	5.1 (0.4)	5.0 (0.3)	4.2 (0.4)	9.2 (0.5)	9.2 (0.5)
Some college . . . . .	5.2 (0.3)	5.4 (0.4)	4.3 (0.3)	9.5 (0.5)	9.7 (0.5)
Bachelor degree or more . . . . .	4.2 (0.3)	3.7 (0.3)	2.3 (0.3)	6.5 (0.4)	6.0 (0.4)

<sup>1</sup>"ADHD without LD" includes children who have ever had a diagnosis of ADHD and have never had a diagnosis of LD.

<sup>2</sup>"LD without ADHD" includes children who have ever had a diagnosis of LD and have never had a diagnosis of ADHD.

<sup>3</sup>"Both" includes children who have ever had a diagnosis of both ADHD and LD.

<sup>4</sup>"All ADHD" includes children who have ever been diagnosed with ADHD. The category includes children with ADHD with and without LD.

<sup>5</sup>"All LD" includes children who have ever been diagnosed with LD. The category includes children with LD with and without ADHD.

<sup>6</sup>Unknowns for the variables of interest are not included in denominators used for the calculation of percentages and standard errors.

<sup>7</sup>Data are not shown for non-Hispanic children of other races because of small sample size.

<sup>8</sup>Mother and father refer to biological, adoptive, step, and foster parents. Data are not shown for children in other family types because of small sample size.

<sup>9</sup>Medicaid includes children insured only by Medicaid.

<sup>10</sup>Private includes children covered by private insurance, those with non-Medicaid public insurance, and those with both private and public insurance.

<sup>11</sup>GED is General Educational Development high school equivalency diploma.

SOURCE: CDC/NCHS, National Health Interview Survey.



**Table 2. Diagnosed attention deficit hyperactivity disorder (ADHD) and learning disability (LD) among children 6–17 years of age, by sex, age group, and selected characteristics: United States, 2004–2006**

Characteristic	Boys			Girls			6–11 years of age			12–17 year of age		
	ADHD without LD <sup>1</sup>	LD without ADHD <sup>2</sup>	Both <sup>3</sup>	ADHD without LD <sup>1</sup>	LD without ADHD <sup>2</sup>	Both <sup>3</sup>	ADHD without LD <sup>1</sup>	LD without ADHD <sup>2</sup>	Both <sup>3</sup>	ADHD without LD <sup>1</sup>	LD without ADHD <sup>2</sup>	Both <sup>3</sup>
	Percent (standard error) <sup>4</sup>											
Total . . . . .	6.7 (0.3)	5.6 (0.3)	5.1 (0.3)	2.5 (0.2)	4.3 (0.3)	2.3 (0.2)	4.4 (0.3)	4.6 (0.3)	2.8 (0.3)	5.0 (0.2)	5.3 (0.3)	4.6 (0.3)
Birthweight												
Low (less than 2,500 grams) . . . . .	7.5 (1.0)	7.9 (1.0)	8.9 (1.0)	3.0 (0.7)	7.4 (1.2)	4.0 (0.7)	5.6 (0.9)	8.4 (1.2)	5.6 (0.9)	4.9 (0.8)	6.9 (0.9)	7.3 (0.9)
Not low (2,500 grams or more) . . . . .	6.7 (0.3)	5.3 (0.3)	4.7 (0.3)	2.5 (0.2)	4.0 (0.3)	2.1 (0.2)	4.2 (0.3)	4.2 (0.3)	2.5 (0.2)	5.0 (0.3)	5.1 (0.3)	4.4 (0.3)
Race and ethnicity <sup>5</sup>												
Non-Hispanic white . . . . .	8.0 (0.4)	5.5 (0.3)	5.6 (0.4)	3.1 (0.3)	4.7 (0.4)	2.5 (0.2)	5.1 (0.4)	4.6 (0.4)	3.0 (0.3)	6.1 (0.4)	5.6 (0.3)	5.2 (0.3)
Non-Hispanic black . . . . .	6.6 (0.7)	6.6 (0.7)	5.9 (0.7)	2.0 (0.3)	4.1 (0.6)	2.7 (0.5)	4.5 (0.6)	5.1 (0.7)	3.4 (0.5)	4.2 (0.5)	5.6 (0.6)	5.1 (0.7)
Hispanic . . . . .	4.0 (0.5)	5.5 (0.5)	3.7 (0.4)	1.3 (0.2)	4.0 (0.4)	1.5 (0.3)	2.7 (0.4)	4.8 (0.4)	2.2 (0.3)	2.7 (0.4)	4.7 (0.5)	3.1 (0.4)
Family structure <sup>6</sup>												
Mother only . . . . .	9.5 (0.7)	7.1 (0.6)	7.5 (0.7)	2.8 (0.4)	4.7 (0.5)	2.9 (0.4)	6.3 (0.6)	5.4 (0.5)	4.5 (0.5)	5.8 (0.2)	6.2 (0.5)	5.7 (0.6)
Mother and father . . . . .	5.6 (0.4)	5.1 (0.4)	4.1 (0.3)	2.4 (0.2)	4.1 (0.3)	1.9 (0.2)	3.7 (0.3)	4.1 (0.3)	2.1 (0.2)	4.4 (0.3)	5.1 (0.3)	4.0 (0.3)
Health insurance coverage at interview												
Uninsured . . . . .	4.7 (0.7)	4.7 (0.7)	3.9 (0.7)	1.4 (0.3)	2.8 (0.5)	1.3 (0.4)	2.5 (0.6)	2.9 (0.5)	2.4 (0.6)	3.5 (0.6)	4.5 (0.6)	2.8 (0.6)
Medicaid <sup>7</sup> . . . . .	8.5 (0.8)	8.2 (0.7)	8.3 (0.7)	2.9 (0.4)	7.3 (0.7)	3.6 (0.4)	6.1 (0.6)	7.4 (0.7)	4.3 (0.4)	5.2 (0.5)	8.2 (0.7)	7.8 (0.7)
Private <sup>8</sup> . . . . .	6.5 (0.4)	4.8 (0.3)	4.2 (0.3)	2.6 (0.2)	3.4 (0.3)	2.0 (0.2)	3.9 (0.3)	3.7 (0.3)	2.2 (0.2)	5.2 (0.3)	4.5 (0.3)	3.9 (0.3)
Mother's education												
Less than high school graduate . . . . .	4.8 (0.6)	6.5 (0.7)	4.8 (0.6)	1.4 (0.3)	5.1 (0.6)	1.9 (0.4)	3.1 (0.5)	5.1 (0.6)	2.6 (0.4)	3.1 (0.5)	6.5 (0.7)	4.1 (0.6)
High school graduate or GED <sup>9</sup> . . . . .	6.9 (0.6)	5.4 (0.5)	5.6 (0.6)	3.1 (0.4)	4.6 (0.5)	2.7 (0.4)	5.3 (0.6)	4.5 (0.5)	3.2 (0.4)	4.9 (0.5)	5.4 (0.5)	5.0 (0.5)
Some college . . . . .	7.4 (0.6)	6.0 (0.5)	5.7 (0.6)	2.9 (0.4)	4.8 (0.5)	2.8 (0.4)	5.7 (0.5)	4.6 (0.5)	3.3 (0.4)	4.7 (0.4)	6.2 (0.5)	5.2 (0.5)
Bachelor degree or more . . . . .	6.1 (0.6)	4.7 (0.5)	3.4 (0.4)	2.1 (0.4)	2.7 (0.4)	1.1 (0.2)	2.5 (0.4)	3.9 (0.5)	1.5 (0.3)	6.0 (0.6)	3.6 (0.4)	3.2 (0.4)

<sup>1</sup>"ADHD without LD" includes children who have ever had a diagnosis of ADHD and have never had a diagnosis of LD.

<sup>2</sup>"LD without ADHD" includes children who have ever had a diagnosis of LD and have never had a diagnosis of ADHD.

<sup>3</sup>"Both" includes children who have ever had a diagnosis of both ADHD and LD.

<sup>4</sup>Unknowns for the variables of interest are not included in denominators used for the calculation of percentages and standard errors.

<sup>5</sup>Data are not shown for non-Hispanic children of other races because of small sample size.

<sup>6</sup>Mother and father refer to biological, adoptive, step, and foster parents. Data are not shown for children in other family types because of small sample size.

<sup>7</sup>Medicaid includes children insured only by Medicaid.

<sup>8</sup>Private includes children covered by private insurance, those with non-Medicaid public insurance, and those with both private and public insurance.

<sup>9</sup>GED is General Educational Development high school equivalency diploma.

SOURCE: CDC/NCHS, National Health Interview Survey.

**Table 3. Selected health conditions among children 6–17 years of age, by diagnostic group, sex, and age group: United States, 2004–2006**

Health conditions	Neither <sup>1</sup>	ADHD without LD <sup>2</sup>	LD without ADHD <sup>3</sup>	Both <sup>4</sup>
	(N = 19,973)	(N = 1,032)	(N = 1,124)	(N = 840)
All youth				
Percent (standard error) <sup>5</sup>				
Mental retardation or other developmental delay <sup>6</sup> . . .	1.2 (0.1)	6.5 (0.9)	36.6 (1.9)	30.8 (2.1)
Hearing or vision problems <sup>7</sup> . . . . .	2.8 (0.2)	4.5 (0.8)	6.3 (0.9)	9.6 (1.3)
Allergies <sup>8</sup> . . . . .	26.8 (0.4)	36.8 (1.8)	39.1 (1.8)	42.8 (2.1)
Asthma <sup>9</sup> . . . . .	13.7 (0.3)	22.0 (1.6)	20.8 (1.4)	22.2 (1.9)
Other chronic health conditons <sup>10</sup> . . . . .	3.6 (0.2)	5.7 (0.9)	12.6 (1.2)	12.4 (1.4)
Boys				
Mental retardation or other developmental delay <sup>6</sup> . . .	1.6 (0.2)	6.8 (1.0)	37.1 (2.3)	29.9 (2.4)
Hearing or vision problems <sup>7</sup> . . . . .	2.8 (0.2)	4.7 (1.0)	6.4 (1.2)	8.5 (1.5)
Allergies <sup>8</sup> . . . . .	27.4 (0.6)	36.8 (2.2)	40.5 (2.3)	40.4 (2.5)
Asthma <sup>9</sup> . . . . .	15.9 (0.5)	22.8 (1.9)	23.1 (1.9)	24.1 (2.4)
Other chronic health conditons <sup>10</sup> . . . . .	3.3 (0.2)	5.3 (1.1)	13.3 (1.6)	11.5 (1.6)
Girls				
Mental retardation or other developmental delay <sup>6</sup> . . .	0.9 (0.1)	5.8 (1.9)	35.9 (3.0)	32.8 (3.7)
Hearing or vision problems <sup>7</sup> . . . . .	2.6 (0.2)	4.1 (1.4)	6.3 (1.3)	12.2 (2.6)
Allergies <sup>8</sup> . . . . .	26.2 (0.5)	36.7 (3.5)	37.1 (2.9)	48.3 (3.9)
Asthma <sup>9</sup> . . . . .	11.5 (0.4)	19.7 (3.1)	17.6 (2.2)	17.6 (2.7)
Other chronic health conditons <sup>10</sup> . . . . .	3.9 (0.2)	6.8 (1.7)	11.7 (1.9)	14.3 (2.9)
6–11 years of age				
Mental retardation or other developmental delay <sup>6</sup> . . .	1.5 (0.2)	8.9 (1.5)	41.2 (2.8)	34.4 (3.4)
Hearing or vision problems <sup>7</sup> . . . . .	2.4 (0.2)	3.3 (1.0)	5.6 (1.3)	10.3 (2.1)
Allergies <sup>8</sup> . . . . .	27.1 (0.6)	40.5 (2.8)	37.6 (2.7)	48.4 (3.6)
Asthma <sup>9</sup> . . . . .	13.1 (0.4)	22.5 (2.4)	21.3 (2.1)	21.5 (2.8)
Other chronic health conditons <sup>10</sup> . . . . .	3.1 (0.2)	6.0 (1.3)	13.1 (1.9)	14.1 (2.6)
12–17 years of age				
Mental retardation or other developmental delay <sup>6</sup> . . .	1.0 (0.1)	4.5 (1.0)	32.8 (2.5)	28.7 (2.6)
Hearing or vision problems <sup>7</sup> . . . . .	3.0 (0.2)	5.6 (1.3)	6.9 (1.2)	9.2 (1.6)
Allergies <sup>8</sup> . . . . .	26.5 (0.5)	33.8 (2.3)	40.3 (2.4)	39.6 (2.7)
Asthma <sup>9</sup> . . . . .	14.2 (0.4)	21.6 (2.1)	20.3 (2.0)	22.5 (2.5)
Other chronic health conditons <sup>10</sup> . . . . .	4.2 (0.2)	5.5 (1.2)	12.2 (1.6)	11.4 (1.7)

<sup>1</sup>“Neither” includes children who have never had a diagnosis of either ADHD or LD.

<sup>2</sup>“ADHD without LD” includes children who have ever had a diagnosis of ADHD and have never had a diagnosis of LD.

<sup>3</sup>“LD without ADHD” includes children who have ever had a diagnosis of LD and have never had a diagnosis of ADHD.

<sup>4</sup>“Both” includes children who have ever had a diagnosis of both ADHD and LD.

<sup>5</sup>Unknowns for the variables of interest are not included in denominators used for the calculation of percentages and standard errors.

<sup>6</sup>Parental report of diagnosed mental retardation, other developmental delay, autism, or Down syndrome.

<sup>7</sup>Parental report of blindness, deafness, or serious difficulty seeing or hearing.

<sup>8</sup>Parental report of a digestive allergy, skin allergy, hay fever, respiratory allergy, or frequent ear infections (three or more) during the past 12 months.

<sup>9</sup>Parental report of ever having a diagnosis of asthma.

<sup>10</sup>Parental report of diagnosed cerebral palsy, muscular dystrophy, cystic fibrosis, sickle cell anemia, diabetes, arthritis, or heart disease; also a parental report of frequent diarrhea or colitis, anemia, or seizures during the past 12 months.

NOTES: ADHD is attention deficit hyperactivity disorder. LD is learning disability. *N* is sample size.

SOURCE: CDC/NCHS, National Health Interview Survey.

**Table 4. Use of selected educational and health care services among children 6–17 years of age, by diagnostic group, sex, and age group: United States, 2004–2006**

Educational and health care services	Neither <sup>1</sup>	ADHD without LD <sup>2</sup>	LD without ADHD <sup>3</sup>	Both <sup>4</sup>
	(N = 19,973)	(N = 1,032)	(N = 1,124)	(N = 840)
All children				
	Percent (standard error) <sup>5</sup>			
Received special education . . . . .	2.4 (0.1)	14.6 (1.3)	56.1 (1.9)	59.3 (2.1)
Received special education for emotional behavioral problem <sup>6</sup> . . . . .	†0.3 (0.0)	9.4 (1.0)	9.1 (1.1)	31.0 (2.0)
Contacted a mental health professional <sup>7</sup> . . . . .	4.0 (0.2)	31.7 (1.8)	19.7 (1.4)	46.2 (2.2)
Used prescription medication <sup>8</sup> . . . . .	10.6 (0.3)	56.9 (1.9)	24.7 (1.6)	62.7 (2.0)
Contacted a medical specialist <sup>9</sup> . . . . .	12.3 (0.3)	18.7 (1.5)	25.7 (1.7)	30.4 (2.0)
Contacted a therapist <sup>10</sup> . . . . .	4.4 (0.2)	7.6 (1.1)	25.5 (1.7)	22.7 (1.7)
Had four or more health care visits <sup>11</sup> . . . . .	21.7 (0.4)	47.7 (1.9)	41.4 (1.8)	56.7 (2.1)
Saw a general doctor for an emotional or behavioral problem <sup>12</sup> . . . . .	1.8 (0.1)	25.8 (1.7)	11.4 (1.2)	33.7 (2.2)
Boys				
Received special education . . . . .	2.9 (0.2)	16.4 (1.6)	55.2 (2.4)	59.4 (2.5)
Received special education for emotional behavioral problem <sup>6</sup> . . . . .	0.4 (0.1)	11.0 (1.3)	9.8 (1.3)	32.3 (2.5)
Contacted a mental health professional <sup>7</sup> . . . . .	3.4 (0.2)	33.3 (2.1)	19.7 (1.8)	46.0 (2.7)
Used prescription medication <sup>8</sup> . . . . .	10.5 (0.4)	58.0 (2.2)	25.2 (2.1)	63.9 (2.4)
Contacted a medical specialist <sup>9</sup> . . . . .	12.5 (0.4)	20.5 (1.8)	27.8 (2.1)	27.8 (2.3)
Contacted a therapist <sup>10</sup> . . . . .	4.9 (0.4)	8.1 (1.3)	26.6 (2.0)	22.3 (2.1)
Had four or more health care visits <sup>11</sup> . . . . .	20.0 (0.5)	45.6 (2.3)	39.3 (2.2)	56.8 (2.6)
Saw a general doctor for an emotional or behavioral problem <sup>12</sup> . . . . .	1.8 (0.2)	26.8 (2.0)	10.8 (1.5)	34.2 (2.6)
Girls				
Received special education . . . . .	1.9 (0.2)	9.5 (1.9)	57.3 (2.9)	59.1 (3.8)
Received special education for emotional behavioral problem <sup>6</sup> . . . . .	†0.2 (0.1)	4.8 (1.3)	8.2 (1.8)	28.0 (3.4)
Contacted a mental health professional <sup>7</sup> . . . . .	4.5 (0.3)	27.1 (3.2)	19.6 (2.3)	46.8 (3.9)
Used prescription medication <sup>8</sup> . . . . .	10.7 (0.4)	53.9 (3.6)	23.9 (2.5)	59.8 (3.8)
Contacted a medical specialist <sup>9</sup> . . . . .	12.2 (0.4)	13.4 (2.5)	22.8 (2.7)	36.3 (3.8)
Contacted a therapist <sup>10</sup> . . . . .	3.9 (0.2)	6.3 (2.0)	24.1 (2.9)	23.7 (3.4)
Had four or more health care visits <sup>11</sup> . . . . .	23.3 (0.6)	53.5 (3.5)	44.4 (3.0)	56.5 (3.8)
Saw a general doctor for an emotional or behavioral problem <sup>12</sup> . . . . .	1.8 (0.2)	22.8 (3.1)	12.3 (1.9)	32.6 (3.9)
6–11 years of age				
Received special education . . . . .	3.1 (0.2)	14.9 (1.8)	58.6 (2.8)	60.0 (3.5)
Received special education for emotional behavioral problem <sup>6</sup> . . . . .	†0.3 (0.1)	10.6 (1.6)	9.3 (1.4)	33.1 (3.4)
Contacted a mental health professional <sup>7</sup> . . . . .	3.4 (0.2)	35.5 (2.7)	19.9 (2.1)	53.7 (3.4)
Used prescription medication <sup>8</sup> . . . . .	9.6 (0.4)	65.9 (2.9)	23.4 (2.4)	66.4 (3.3)
Contacted a medical specialist <sup>9</sup> . . . . .	11.0 (0.4)	17.0 (2.0)	26.5 (2.6)	30.2 (3.2)
Contacted a therapist <sup>10</sup> . . . . .	4.7 (0.3)	9.8 (1.7)	36.1 (2.9)	32.8 (3.3)
Had four or more health care visits <sup>11</sup> . . . . .	21.9 (0.5)	54.9 (3.0)	43.9 (2.8)	59.7 (3.5)
Saw a general doctor for an emotional or behavioral problem <sup>12</sup> . . . . .	1.8 (0.2)	34.0 (2.7)	12.0 (1.7)	38.3 (3.5)
12–17 years of age				
Received special education . . . . .	1.6 (0.2)	14.4 (1.8)	54.0 (2.5)	58.8 (2.7)
Received special education for emotional behavioral problem <sup>6</sup> . . . . .	†0.3 (0.1)	8.4 (1.4)	8.9 (1.6)	29.8 (2.6)
Contacted a mental health professional <sup>7</sup> . . . . .	4.5 (0.3)	28.4 (2.2)	19.5 (1.9)	41.9 (2.8)
Used prescription medication <sup>8</sup> . . . . .	11.6 (0.4)	49.4 (2.6)	25.7 (2.1)	60.5 (2.6)
Contacted a medical specialist <sup>9</sup> . . . . .	13.6 (0.4)	20.1 (2.0)	25.1 (2.4)	30.5 (2.5)
Contacted a therapist <sup>10</sup> . . . . .	4.1 (0.2)	5.8 (1.3)	16.9 (1.8)	16.9 (2.0)
Had four or more health care visits <sup>11</sup> . . . . .	21.5 (0.5)	41.6 (2.5)	39.4 (2.4)	55.0 (2.7)
Saw a general doctor for an emotional or behavioral problem <sup>12</sup> . . . . .	1.8 (0.2)	18.9 (2.0)	11.0 (1.6)	31.0 (2.6)

† The standard error is 0.04.

‡ Estimate meets standards of reliability and precision. When expressed to two decimal places the relative standard error of the estimates is 30% or less.

<sup>1</sup>“Neither” includes children who have never had a diagnosis of either ADHD or LD.

<sup>2</sup>“ADHD without LD” includes children who have ever had a diagnosis of ADHD and have never had a diagnosis of LD.

<sup>3</sup>“LD without ADHD” includes children who have ever had a diagnosis of LD and have never had a diagnosis of ADHD.

<sup>4</sup>“Both” includes children who have ever had a diagnosis of both ADHD and LD.

<sup>5</sup>Unknowns for the variables of interest are not included in denominators used for the calculation of percentages and standard errors.

<sup>6</sup>Received special education services because of an emotional or behavioral problem.

<sup>7</sup>Saw or spoke to a mental health professional such as a psychiatrist, psychologist, psychiatric nurse, or clinical social worker during the past 12 months.

<sup>8</sup>Has a condition for which prescription medication had been taken regularly for at least 3 months.

<sup>9</sup>Saw or spoke to a medical specialist (other than a gynecologist, psychiatrist, or ophthalmologist) during the past 12 months.

<sup>10</sup>Saw or spoke to a physical therapist, speech therapist, respiratory therapist, audiologist, or occupational therapist.

<sup>11</sup>Four or more visits to a doctor or other health professional during the past 12 months; overnight hospitalizations, emergency room visits, home visits, or telephone calls are not included.

<sup>12</sup>Saw or spoke to a general doctor because of an emotional or behavioral problem during the past 12 months.

NOTES: ADHD is attention deficit hyperactivity disorder. LD is learning disability. N is sample size.

SOURCE: CDC/NCHS, National Health Interview Survey.

## Appendix I

### Technical Notes

#### Source of data

NHIS is a cross-sectional household interview survey with a complex survey design. Each week a probability sample of the civilian noninstitutionalized U.S. population is interviewed by personnel of the U.S. Census Bureau. Data are collected continuously throughout the year from households throughout the contiguous United States, Hawaii, and Alaska. Excluded from the sample are persons residing in nursing homes or other institutionalized settings, members of the Armed Forces, and U.S. nationals living aboard. Information is obtained by self-report or proxy report about the health, use of health care services, and other characteristics of each household member. For sample children, a family member knowledgeable about the health of the child is selected as the respondent for the child.

In 1997, NHIS was redesigned, and virtually all aspects of the questionnaire were changed. A “Basic Module” was developed consisting of five questionnaire components—Household Composition, Family Core, Sample Adult Core, Sample Child Core, and Recontact Information. This report uses data collected for the sample child from each household and draws upon results from the following sections of the Sample Child Core questionnaire: conditions, limitation of activity and health status, access to health care, and health care provider contacts. Information on the sociodemographic characteristics of sample children used in this report is from the Family Core section of the NHIS questionnaire.

#### Precision of estimates

The relative standard error (RSE) of an estimate was used as the criterion of precision. The RSE was calculated by dividing the standard error of each estimate by the estimate itself and multiplying this fraction by 100. Estimates with a RSE of greater than

30% are shown in the tables of this report with an asterisk (\*), indicating that these estimates do not meet the NCHS standard of adequate precision and stability. Standard errors in this report were calculated using the statistical package, SUDAAN, which takes into account the complex multistage sampling design.

#### Tests of significance

The test statistic used to determine if the difference between two point estimates was significantly different from zero was

$$Z = \frac{|X_a - X_b|}{\sqrt{(S_a^2 + S_b^2)}} .$$

Here  $X_a$  and  $X_b$  represent two point estimates, and  $S_a$  and  $S_b$  are the standard errors for these estimates. The critical value indicating significance at the 0.05 level was 1.96. No adjustments were made for multiple comparisons. Percentages and standard errors rounded to the second decimal place were used in the tests of significance.

#### Definition of terms

*Age*—The child’s age in years at last birthday.

*ADHD*—Parent report of a diagnosis of attention deficit hyperactivity disorder by a doctor or health professional (also called attention deficit disorder or ADD). A condition characterized by problems with attention, impulsiveness, hyperactivity, school problems, and sometimes aggression.

*ADHD without LD*—Parent report of a diagnosis of attention deficit hyperactivity disorder without a diagnosis of learning disability.

*Both*—Parent report of a diagnosis of attention deficit hyperactivity disorder and learning disability.

*Contact with health care provider*—Consultation with a physician, nurse, or other person acting under a physician’s supervision. The consultation may be either in person or by phone and for the purpose of examination, diagnosis, treatment, or advice.

*Developmental delay*—Significant delay in one of several areas: physical development, cognitive (mental) development, social or emotional development, or adaptive development.

*DSM—The Diagnostic and Statistical Manual of Mental Disorders* is the standard manual for diagnosis of mental disorders in the United States.

*DSM-IV*—Fourth edition of *The Diagnostic and Statistical Manual of Mental Disorders*.

*Family*—All people within a household related to one another by blood, marriage, or adoption. Mother and father refer to biological, adoptive, step, or foster parents.

*Health care visit*—Visits to a health care professional; does not include overnight hospitalization, emergency room visits, home visits, or telephone calls.

*LD*—Parent report of a diagnosis of learning disability by a representative from a school or a health professional.

*LD without ADHD*—Parent report of a diagnosis of learning disability without a diagnosis of attention deficit hyperactivity disorder.

*Medicaid*—Health insurance at the time of interview reported as Medicaid or coverage under a state-sponsored health program.

*Mental retardation*—Intellectual functioning that is significantly below average and results in problems with adaptive behavior.

*Neither*—Parent report of a diagnosis of neither attention deficit hyperactivity disorder nor learning disability.

*NHANES*—National Health and Nutrition Examination Survey.

*NHIS*—National Health Interview Survey.

*NSCH*—National Survey of Children’s Health.

*Special education*—Special education refers to special education services paid for by the public school system that may take place at a regular school, special school, private school, home, or hospital.

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