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From Morbidity & Mortality Weekly Report Increasing Prevalence of Parent-reported Attention-deficit/Hyperactivity Disorder Among Children — United States, 2003 and 2007

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Abstract and Introduction

Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a neurobehavioral disorder that typically begins in childhood and often persists into adulthood. ADHD is characterized by developmentally inappropriate levels of inattention and hyperactivity resulting in functional impairment in academic, family, and social settings.^[1] ADHD is the most commonly diagnosed neurobehavioral disorder of childhood, with previous reports documenting increasing trends in prevalence during the past decade and increases in ADHD medication use.^[2,3] National estimates of the number of children reported by their parents to have ever been diagnosed with ADHD and the percentage of children with ADHD currently taking ADHD medications were published in 2005 using data from the 2003 National Survey of Children's Health (NSCH).^[4,5] This report describes results from the second administration of NSCH in 2007,^[6] which indicated that the percentage of children aged 4–17 years with a parent-reported ADHD diagnosis (ever) increased from 7.8% to 9.5% during 2003–2007, representing a 21.8% increase in 4 years. The findings in this report help to further characterize the substantial impact of ADHD on families.

The 2003 and 2007 NSCH were national, cross-sectional, random-digit-dialed landline telephone surveys used to estimate the prevalence of health and well-being indicators among children aged <18 years in the United States.^[5,6]

* One child was selected randomly from each household to be the focus of the parent or guardian interview. Information about the design and response rates of the 2003 NSCH have been published.^[5] The design of the 2003 and 2007 surveys were similar. During April 2007–July 2008, a total of 91,642 interviews were completed for the 2007 NSCH (overall response rate = 46.7%; cooperation rate = 66.0%).[†] In 2007, data, including complete information on ADHD and sex, were obtained for 73,123 children aged 4–17 years. Data were weighted to account for unequal probabilities of selection of households and children, nonresponse, and households without landline telephones, and to reflect the demographic distribution of noninstitutionalized children in the United States.[§]

In both 2003 and 2007, parents were asked whether or not a doctor or other health-care provider had ever told them that their child had "attention deficit disorder or attention deficit hyperactive disorder, that is, ADD or ADHD." In 2007, parents who reported an ADHD diagnosis (ever) also were asked whether the child currently had ADHD and to describe its severity (mild, moderate, or severe). The question about medication use in the 2003 survey differed from that in the 2007 survey. Current medication treatment for ADHD was asked about children who ever had ADHD in 2003 and about children with current ADHD in 2007. Estimates of parent-reported ADHD (ever and current) among children aged 4–17 years, current medication use, and ADHD severity were calculated overall and by

sociodemographic characteristics (Table 1) using 2007 data and NSCH survey weights. Rates of ADHD by sociodemographic characteristics using the 2003 survey data have been published^[4] and were compared with 2007 data for the present analysis (Table 2). Estimated rates of children medicated for ADHD were calculated by dividing the weighted estimate of the number of children with current ADHD who were being medicated for the disorder by the total weighted estimate of the number of children aged 4–17 years. Prevalence ratios and 95% confidence intervals were calculated to compare ADHD prevalence (ever diagnosed, current ADHD diagnosis, and currently taking medications for ADHD) of sociodemographic subgroups to referent subgroups (Table 1), and across the two surveys (ever diagnosed; Tables 2 and 3).

Table 1. Weighted prevalence estimates of parent-reported attention-deficit/hyperactivity disorder (ADHD) among children aged 4–17 years,* by sociodemographic characteristics — National Survey of Children's Health, United States, 2007

Characteristic	Ever diagnosed with ADHD			Current ADHD diagnosis			Current ADHD diagnosis and medicated for ADHD		
	%	(95% CI)	PR	%	(95% CI)	PR	%	(95% CI)	PR
Overall	9.5	(9.0–10.0)	NC	7.2	(6.8–7.7)	NC	4.8	(4.4–5.1)	NC
Sex									
Male	13.2	(12.4–14.0)	2.33	10.3	(9.5–11.1)	2.57	6.9	(6.3–7.5)	2.76
Female	5.6	(5.1–6.3)	Referent	4.0	(3.6,4.5)	Referent	2.5	(2.2–2.8)	Referent
Age group (yrs)									
4–10	6.6	(6.1–7.3)	Referent	5.5	(4.9,6.1)	Referent	3.7	(3.3–4.1)	Referent
11–14	11.2	(10.3–12.2)	1.69	8.6	(7.8,9.5)	1.57	6.3	(5.6–7.0)	1.71
15–17	13.6	(12.3–15.1)	2.05	9.3	(8.2,10.5)	1.70	5.2	(4.5–6.0)	1.42
Highest education in household									
Less than high school	8.4	(7.0–10.0)	0.96 [†]	6.5	(5.2–8.0)	0.96 [†]	4.0	(3.0–5.2)	0.88 [†]
High school graduate	12.2	(10.9–13.7)	1.40	9.0	(8.0–10.2)	1.34	5.9	(5.1–6.8)	1.31
More than high school	8.7	(8.2–9.3)	Referent	6.7	(6.2–7.3)	Referent	4.5	(4.1–4.9)	Referent
Race									
White	9.9	(9.3–10.5)	Referent	7.5	(7.0–8.0)	Referent	5.1	(4.7–5.6)	Referent
Black	10.1	(8.9–11.5)	1.02 [†]	7.8	(6.7–9.1)	1.04 [†]	5.1	(4.2–6.2)	0.99 [†]
Multiracial	14.2	(11.5–17.4)	1.44	11.3	(8.9–14.1)	1.51	7.5	(5.6–10.0)	1.46

Other	5.0	(3.7–6.7)	0.51	3.7	(2.6–5.3)	0.50	1.7	(1.2–2.3)	0.33
Ethnicity									
Hispanic/Latino	5.6	(4.6–7.0)	0.54	4.1	(3.3–5.2)	0.52	2.4	(1.7–3.2)	0.44
Non-Hispanic/Latino	10.5	(9.9–11.0)	Referent	8.0	(7.5–8.5)	Referent	5.4	(5.0–5.8)	Referent
Primary language in home									
English	10.5	(9.9–11.1)	Referent	8.0	(7.5–8.5)	Referent	5.3	(4.9–5.7)	Referent
Any other language	2.3	(1.6–3.2)	0.22	1.8	(1.2–2.7)	0.23	0.9 [§]	(0.5–1.6)	0.16
Poverty level [¶]									
≤100%	11.6	(10.3–13.0)	1.35 [†]	9.2	(8.1–10.5)	1.42 [†]	6.3	(5.3–7.4)	1.45 [†]
>100% to ≤200%	10.3	(9.1–11.7)	1.20 [†]	7.7	(6.6–8.9)	1.19 [†]	4.7	(4.0–5.5)	1.08 [†]
>200%	8.6	(8.0–9.2)	Referent	6.5	(6.0–7.0)	Referent	4.4	(4.0–4.8)	Referent
Any health-care coverage									
Yes	9.8	(9.3–10.3)		7.6	(7.1–8.1)		5.1	(4.7–5.5)	
Medicaid	13.6	(12.5–14.8)	1.68	10.9	(9.8–12.0)	1.77	7.5	(6.7–8.4)	1.84
Non-Medicaid	8.1	(7.5–8.7)	Referent	6.1	(5.6–6.7)	Referent	4.1	(3.7–4.5)	Referent
No	6.7	(5.2–8.6)	0.83 [†]	3.7	(2.9–4.7)	0.60	1.7	(1.2–2.5)	0.42
Region									
Northeast	9.4	(8.3–10.6)	1.35	7.4	(6.5–8.6)	1.45	4.5	(3.8–5.4)	1.60
Midwest	9.9	(9.2–10.7)	1.43	7.6	(6.9–8.3)	1.47	5.3	(4.7–5.8)	1.85
South	10.9	(10.1–11.8)	1.57	8.3	(7.6–9.0)	1.61	5.8	(5.2–6.5)	2.05
West	7.0	(5.7–8.4)	Referent	5.1	(4.1–6.4)	Referent	2.8	(2.2–3.7)	Referent

Abbreviations: CI = confidence interval; NC = not calculated; PR = prevalence ratio (the ratio of the percentage of children with ADHD among the sociodemographic group to the percentage of children with ADHD among the referent sociodemographic group).

* Estimates do not include children aged 2–3 years with reported ADHD diagnosis because small sample size yields substantial (>30%) relative standard errors.

[†] PR is not significant at the $\alpha = 0.05$ level.

[§] Relative standard error >30%.

[¶] Federal poverty level, imputed using multiple imputation for 8.9% of the sample for which reported household income was missing.

Table 2. Weighted prevalence estimates and prevalence ratios of parent-reported attention-deficit/hyperactivity disorder (ADHD) among children 4–17 years,* by sociodemographic characteristics — National Survey of Children's Health, United States, 2003 and 2007

Characteristic	Ever diagnosed with ADHD [†]				
	2003	2007			
	%	%	PR	(95% CI)	p value
Overall	7.8	9.5	1.22	(1.14–1.31)	<0.001
Sex					
Male	11.0	13.2	1.20	(1.11–1.30)	<0.001
Female	4.4	5.6	1.28	(1.12–1.46)	<0.001
Age group (yrs) [§]					
4–10	5.7	6.6	1.16	(1.03–1.30)	0.013
11–14	9.8	11.2	1.14	(1.03–1.27)	0.016
15–17	9.6	13.6	1.42	(1.25–1.61)	<0.001
Highest education in household					
Less than high school	6.5	8.4	1.30	(0.99–1.69)	0.055
High school graduate	8.6	12.2	1.42	(1.24–1.63)	<0.001
More than high school	7.6	8.7	1.15	(1.06–1.25)	<0.001
Race					
White	8.6	9.9	1.15	(1.06–1.24)	<0.001
Black	7.7	10.1	1.31	(1.09–1.57)	0.004
Multiracial	9.7	14.2	1.46	(1.07–2.00)	0.017
Other	4.5	5.0	1.11	(0.72–1.71)	NS
Ethnicity					
Hispanic/Latino	3.7	5.6	1.53	(1.16–2.02)	0.002
Non-Hispanic/Latino	8.6	10.5	1.22	(1.14–1.31)	<0.001
Primary language in home					
English	8.6	10.5	1.22	(1.14–1.30)	<0.001
Any other language	1.3	2.3	1.82	(1.15–2.90)	0.011
Poverty level [¶]					
≤100%	9.3	11.6	1.25	(1.06–1.47)	0.007
>100% to ≤200%	7.9	10.3	1.31	(1.11–1.54)	0.001
>200%	7.3	8.6	1.18	(1.08–1.29)	<0.001
Any health-care coverage					

Yes	8.1	9.8	1.21	(1.13–1.30)	<0.001
Medicaid	10.8	13.6	1.26	(1.12–1.41)	<0.001
Non-Medicaid	7.0	8.1	1.16	(1.06–1.27)	0.001
No	4.9	6.7	1.38	(1.00–1.90)	0.050
Region					
Northeast	7.4	9.4	1.27	(1.09–1.49)	0.003
Midwest	7.9	9.9	1.25	(1.13–1.39)	<0.001
South	9.1	10.9	1.20	(1.09–1.32)	<0.001
West	5.8	7.0	1.20	(0.96–1.51)	NS

Abbreviations: CI = confidence interval; NS = not statistically significant ($p \geq 0.1$); PR = prevalence ratio (the ratio of the percentage of children with ADHD among the sociodemographic group in 2007 to the percentage of children with ADHD among the sociodemographic group in 2003).

* Estimates do not include children aged 2–3 years with reported ADHD diagnosis because small sample sizes yield substantial (>30%) relative standard errors in the 2003 survey sample.

† The analytic sample included totals of 79,264 children aged 4–17 years in 2003 and 73,123 children aged 4–17 years in 2007.

§ A statistically significant interaction was noted ($p=0.013$) with the magnitude, but not direction, of change across time differing significantly by age group.

¶ Federal poverty level; multiple imputations were used for the 10.0% of the sample in 2003 and 8.9% in 2007 for which reported household income was missing.

Table 1. Weighted prevalence estimates of parent-reported attention-deficit/hyperactivity disorder (ADHD) among children aged 4–17 years,* by sociodemographic characteristics — National Survey of Children's Health, United States, 2007

Characteristic	Ever diagnosed with ADHD			Current ADHD diagnosis			Current ADHD diagnosis and medicated for ADHD		
	%	(95% CI)	PR	%	(95% CI)	PR	%	(95% CI)	PR
Overall	9.5	(9.0–10.0)	NC	7.2	(6.8–7.7)	NC	4.8	(4.4–5.1)	NC
Sex									
Male	13.2	(12.4–14.0)	2.33	10.3	(9.5–11.1)	2.57	6.9	(6.3–7.5)	2.76
Female	5.6	(5.1–6.3)	Referent	4.0	(3.6,4.5)	Referent	2.5	(2.2–2.8)	Referent
Age group (yrs)									
4–10	6.6	(6.1–7.3)	Referent	5.5	(4.9,6.1)	Referent	3.7	(3.3–4.1)	Referent
11–14	11.2	(10.3–12.2)	1.69	8.6	(7.8,9.5)	1.57	6.3	(5.6–7.0)	1.71
15–17	13.6	(12.3–15.1)	2.05	9.3	(8.2,10.5)	1.70	5.2	(4.5–6.0)	1.42

Highest education in household									
Less than high school	8.4	(7.0–10.0)	0.96 [†]	6.5	(5.2–8.0)	0.96 [†]	4.0	(3.0–5.2)	0.88 [†]
High school graduate	12.2	(10.9–13.7)	1.40	9.0	(8.0–10.2)	1.34	5.9	(5.1–6.8)	1.31
More than high school	8.7	(8.2–9.3)	Referent	6.7	(6.2–7.3)	Referent	4.5	(4.1–4.9)	Referent
Race									
White	9.9	(9.3–10.5)	Referent	7.5	(7.0–8.0)	Referent	5.1	(4.7–5.6)	Referent
Black	10.1	(8.9–11.5)	1.02 [†]	7.8	(6.7–9.1)	1.04 [†]	5.1	(4.2–6.2)	0.99 [†]
Multiracial	14.2	(11.5–17.4)	1.44	11.3	(8.9–14.1)	1.51	7.5	(5.6–10.0)	1.46
Other	5.0	(3.7–6.7)	0.51	3.7	(2.6–5.3)	0.50	1.7	(1.2–2.3)	0.33
Ethnicity									
Hispanic/Latino	5.6	(4.6–7.0)	0.54	4.1	(3.3–5.2)	0.52	2.4	(1.7–3.2)	0.44
Non-Hispanic/Latino	10.5	(9.9–11.0)	Referent	8.0	(7.5–8.5)	Referent	5.4	(5.0–5.8)	Referent
Primary language in home									
English	10.5	(9.9–11.1)	Referent	8.0	(7.5–8.5)	Referent	5.3	(4.9–5.7)	Referent
Any other language	2.3	(1.6–3.2)	0.22	1.8	(1.2–2.7)	0.23	0.9 [§]	(0.5–1.6)	0.16
Poverty level [¶]									
≤100%	11.6	(10.3–13.0)	1.35 [†]	9.2	(8.1–10.5)	1.42 [†]	6.3	(5.3–7.4)	1.45 [†]
>100% to ≤200%	10.3	(9.1–11.7)	1.20 [†]	7.7	(6.6–8.9)	1.19 [†]	4.7	(4.0–5.5)	1.08 [†]
>200%	8.6	(8.0–9.2)	Referent	6.5	(6.0–7.0)	Referent	4.4	(4.0–4.8)	Referent
Any health-care coverage									
Yes	9.8	(9.3–10.3)		7.6	(7.1–8.1)		5.1	(4.7–5.5)	
Medicaid	13.6	(12.5–14.8)	1.68	10.9	(9.8–12.0)	1.77	7.5	(6.7–8.4)	1.84
Non-Medicaid	8.1	(7.5–8.7)	Referent	6.1	(5.6–6.7)	Referent	4.1	(3.7–4.5)	Referent
No	6.7	(5.2–8.6)	0.83 [†]	3.7	(2.9–4.7)	0.60	1.7	(1.2–2.5)	0.42
Region									

Northeast	9.4	(8.3–10.6)	1.35	7.4	(6.5–8.6)	1.45	4.5	(3.8–5.4)	1.60
Midwest	9.9	(9.2–10.7)	1.43	7.6	(6.9–8.3)	1.47	5.3	(4.7–5.8)	1.85
South	10.9	(10.1–11.8)	1.57	8.3	(7.6–9.0)	1.61	5.8	(5.2–6.5)	2.05
West	7.0	(5.7–8.4)	Referent	5.1	(4.1–6.4)	Referent	2.8	(2.2–3.7)	Referent

Abbreviations: CI = confidence interval; NC = not calculated; PR = prevalence ratio (the ratio of the percentage of children with ADHD among the sociodemographic group to the percentage of children with ADHD among the referent sociodemographic group).

* Estimates do not include children aged 2–3 years with reported ADHD diagnosis because small sample size yields substantial (>30%) relative standard errors.

† PR is not significant at the $\alpha = 0.05$ level.

§ Relative standard error >30%.

¶ Federal poverty level, imputed using multiple imputation for 8.9% of the sample for which reported household income was missing.

Table 2. Weighted prevalence estimates and prevalence ratios of parent-reported attention-deficit/hyperactivity disorder (ADHD) among children 4–17 years,* by sociodemographic characteristics — National Survey of Children's Health, United States, 2003 and 2007

Characteristic	Ever diagnosed with ADHD†				
	2003	2007	PR	(95% CI)	p value
	%	%			
Overall	7.8	9.5	1.22	(1.14–1.31)	<0.001
Sex					
Male	11.0	13.2	1.20	(1.11–1.30)	<0.001
Female	4.4	5.6	1.28	(1.12–1.46)	<0.001
Age group (yrs) §					
4–10	5.7	6.6	1.16	(1.03–1.30)	0.013
11–14	9.8	11.2	1.14	(1.03–1.27)	0.016
15–17	9.6	13.6	1.42	(1.25–1.61)	<0.001
Highest education in household					
Less than high school	6.5	8.4	1.30	(0.99–1.69)	0.055
High school graduate	8.6	12.2	1.42	(1.24–1.63)	<0.001
More than high school	7.6	8.7	1.15	(1.06–1.25)	<0.001
Race					
White	8.6	9.9	1.15	(1.06–1.24)	<0.001
Black	7.7	10.1	1.31	(1.09–1.57)	0.004

Multiracial	9.7	14.2	1.46	(1.07–2.00)	0.017
Other	4.5	5.0	1.11	(0.72–1.71)	NS
Ethnicity					
Hispanic/Latino	3.7	5.6	1.53	(1.16–2.02)	0.002
Non-Hispanic/Latino	8.6	10.5	1.22	(1.14–1.31)	<0.001
Primary language in home					
English	8.6	10.5	1.22	(1.14–1.30)	<0.001
Any other language	1.3	2.3	1.82	(1.15–2.90)	0.011
Poverty level [†]					
≤100%	9.3	11.6	1.25	(1.06–1.47)	0.007
>100% to ≤200%	7.9	10.3	1.31	(1.11–1.54)	0.001
>200%	7.3	8.6	1.18	(1.08–1.29)	<0.001
Any health-care coverage					
Yes	8.1	9.8	1.21	(1.13–1.30)	<0.001
Medicaid	10.8	13.6	1.26	(1.12–1.41)	<0.001
Non-Medicaid	7.0	8.1	1.16	(1.06–1.27)	0.001
No	4.9	6.7	1.38	(1.00–1.90)	0.050
Region					
Northeast	7.4	9.4	1.27	(1.09–1.49)	0.003
Midwest	7.9	9.9	1.25	(1.13–1.39)	<0.001
South	9.1	10.9	1.20	(1.09–1.32)	<0.001
West	5.8	7.0	1.20	(0.96–1.51)	NS

Abbreviations: CI = confidence interval; NS = not statistically significant ($p \geq 0.1$); PR = prevalence ratio (the ratio of the percentage of children with ADHD among the sociodemographic group in 2007 to the percentage of children with ADHD among the sociodemographic group in 2003).

* Estimates do not include children aged 2–3 years with reported ADHD diagnosis because small sample sizes yield substantial (>30%) relative standard errors in the 2003 survey sample.

[†] The analytic sample included totals of 79,264 children aged 4–17 years in 2003 and 73,123 children aged 4–17 years in 2007.

[§] A statistically significant interaction was noted ($p=0.013$) with the magnitude, but not direction, of change across time differing significantly by age group.

[¶] Federal poverty level; multiple imputations were used for the 10.0% of the sample in 2003 and 8.9% in 2007 for which reported household income was missing.

Table 3. Weighted percentage of children aged 4–17 years with parent-reported attention-deficit/hyperactivity disorder (ADHD), by state — United States, 2003 and 2007

	Ever diagnosed with ADHD	
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State/Area	2003		2007		Difference* (%)
	%	(95% CI)	%	(95% CI)	
Alabama	11.1	(9.3–13.2)	14.3	(11.8–17.2)	NS
Alaska	7.1	(5.8–8.7)	9.2	(7.2–11.6)	NS
Arizona	5.9	(4.6–7.5)	7.6	(5.9–9.7)	NS
Arkansas	9.9	(8.3–11.8)	13.1	(11.0–15.6)	32.3
California	5.3	(4.2–6.7)	6.2	(4.1–9.1)	NS
Colorado	5.0	(3.8–6.4)	7.6	(5.8–9.8)	52.0
Connecticut	7.3	(6.0–9.0)	7.8	(6.3–9.6)	NS
Delaware	9.8	(8.1–11.7)	14.1	(11.8–16.8)	43.9
District of Columbia	6.7	(5.3–8.6)	7.7	(6.1–9.7)	NS
Florida	9.2	(7.6–11.2)	11.6	(8.8–15.1)	NS
Georgia	9.4	(7.7–11.4)	9.2	(7.3–11.4)	NS
Hawaii	6.2	(4.8–7.8)	6.3	(4.9–8.1)	NS
Idaho	6.4	(5.1–8.0)	8.3	(6.6–10.3)	NS
Illinois	6.3	(5.0–7.9)	6.2	(4.9–7.9)	NS
Indiana	7.9	(6.5–9.7)	13.2	(10.7–16.1)	67.1
Iowa	8.4	(6.8–10.2)	9.7	(7.4–12.7)	NS
Kansas	8.1	(6.6–10.0)	10.0	(8.2–12.1)	NS
Kentucky	10.1	(8.4–12.2)	12.4	(10.5–14.7)	NS
Louisiana	10.3	(8.7–12.2)	14.2	(11.6–17.3)	37.9
Maine	7.9	(6.5–9.7)	9.6	(7.8–11.7)	NS
Maryland	9.1	(7.7–10.8)	11.9	(9.8–14.5)	NS
Massachusetts	8.5	(7.1–10.2)	9.8	(7.8–12.3)	NS
Michigan	9.2	(7.7–11.0)	9.9	(8.0–12.2)	NS
Minnesota	7.5	(6.1–9.2)	7.8	(6.2–9.8)	NS
Mississippi	9.6	(7.9–11.6)	9.9	(8.1–11.9)	NS
Missouri	7.7	(6.3–9.3)	10.8	(9.0–12.9)	40.3
Montana	7.1	(5.8–8.8)	8.5	(6.9–10.4)	NS
Nebraska	6.4	(5.0–8.2)	9.0	(7.0–11.7)	NS
Nevada	7.2	(5.9–8.8)	5.6	(4.0–7.8)	NS
New Hampshire	9.2	(7.7–10.9)	8.5	(6.9–10.4)	NS
New Jersey	7.2	(5.8–9.0)	9.0	(7.0–11.5)	NS
New Mexico	6.1	(4.7–7.9)	7.1	(5.5–9.1)	NS

New York	6.3	(4.9–8.0)	9.2	(7.1–11.7)	46.0
North Carolina	9.6	(8.0–11.4)	15.6	(13.0–18.5)	62.5
North Dakota	9.4	(7.7–11.4)	10.0	(8.2–12.0)	NS
Ohio	8.9	(7.5–10.5)	13.3	(10.6–16.4)	49.4
Oklahoma	8.1	(6.5–9.9)	11.0	(8.9–13.4)	35.8
Oregon	7.2	(5.8–8.8)	8.8	(6.8–11.2)	NS
Pennsylvania	8.2	(6.8–9.9)	10.2	(7.6–13.4)	NS
Rhode Island	9.8	(8.1–11.8)	11.1	(9.0–13.5)	NS
South Carolina	10.0	(8.4–11.8)	12.0	(9.9–14.5)	NS
South Dakota	6.5	(5.0–8.3)	8.1	(6.6–10.1)	NS
Tennessee	9.9	(8.1–12.0)	11.3	(9.2–13.8)	NS
Texas	7.7	(6.3–9.3)	7.7	(5.7–10.4)	NS
Utah	5.5	(4.2–7.1)	6.7	(5.1–8.7)	NS
Vermont	6.9	(5.5–8.6)	9.9	(7.8–12.4)	43.5
Virginia	9.3	(7.7–11.1)	10.2	(8.4–12.3)	NS
Washington	7.2	(5.8–8.9)	9.5	(7.3–12.2)	NS
West Virginia	10.1	(8.4–12.1)	13.3	(11.1–15.8)	31.7
Wisconsin	8.1	(6.5–10.0)	9.9	(8.1–12.1)	NS
Wyoming	7.1	(5.8–8.7)	9.1	(7.3–11.3)	NS

Abbreviations: CI = confidence interval; NS = difference in rate of parent-reported ADHD (ever) was not statistically significant ($p \geq 0.05$).

* The percentage change (relative difference) between 2003 and 2007 for states with a statistically significant difference ($p < 0.05$).

Prevalence of ADHD diagnosis (ever) was compared between the two surveys using weighted logistic regression, predicting ADHD from survey year, while controlling for sociodemographics. Statistical interactions of survey year by sociodemographics were tested. The average annual percentage difference was calculated by dividing the 2003 to 2007 percentage difference by 4.[¶]

In 2007, the estimated prevalence of parent-reported ADHD (ever) among children aged 4–17 years was 9.5%, representing 5.4 million children (Table 1). Of those with a history of ADHD, 78% (4.1 million, or 7.2% of all children aged 4–17 years) were reported to currently have the condition. Of those with current ADHD, nearly half (46.7%) had mild ADHD, with the remainder having moderate (39.5%) or severe (13.8%) ADHD. ADHD (ever) was more than twice as common among boys as girls (13.2% versus 5.6%). High rates of ADHD (ever) were noted among multiracial children (14.2%) and children covered by Medicaid (13.6%).

Table 1. Weighted prevalence estimates of parent-reported attention-deficit/hyperactivity disorder (ADHD) among children aged 4–17 years,* by sociodemographic characteristics — National Survey of Children's Health, United States, 2007

	Ever diagnosed with	Current ADHD	Current ADHD diagnosis and
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Characteristic	ADHD			diagnosis			medicated for ADHD		
	%	(95% CI)	PR	%	(95% CI)	PR	%	(95% CI)	PR
Overall	9.5	(9.0–10.0)	NC	7.2	(6.8–7.7)	NC	4.8	(4.4–5.1)	NC
Sex									
Male	13.2	(12.4–14.0)	2.33	10.3	(9.5–11.1)	2.57	6.9	(6.3–7.5)	2.76
Female	5.6	(5.1–6.3)	Referent	4.0	(3.6,4.5)	Referent	2.5	(2.2–2.8)	Referent
Age group (yrs)									
4–10	6.6	(6.1–7.3)	Referent	5.5	(4.9,6.1)	Referent	3.7	(3.3–4.1)	Referent
11–14	11.2	(10.3–12.2)	1.69	8.6	(7.8,9.5)	1.57	6.3	(5.6–7.0)	1.71
15–17	13.6	(12.3–15.1)	2.05	9.3	(8.2,10.5)	1.70	5.2	(4.5–6.0)	1.42
Highest education in household									
Less than high school	8.4	(7.0–10.0)	0.96 [†]	6.5	(5.2–8.0)	0.96 [†]	4.0	(3.0–5.2)	0.88 [†]
High school graduate	12.2	(10.9–13.7)	1.40	9.0	(8.0–10.2)	1.34	5.9	(5.1–6.8)	1.31
More than high school	8.7	(8.2–9.3)	Referent	6.7	(6.2–7.3)	Referent	4.5	(4.1–4.9)	Referent
Race									
White	9.9	(9.3–10.5)	Referent	7.5	(7.0–8.0)	Referent	5.1	(4.7–5.6)	Referent
Black	10.1	(8.9–11.5)	1.02 [†]	7.8	(6.7–9.1)	1.04 [†]	5.1	(4.2–6.2)	0.99 [†]
Multiracial	14.2	(11.5–17.4)	1.44	11.3	(8.9–14.1)	1.51	7.5	(5.6–10.0)	1.46
Other	5.0	(3.7–6.7)	0.51	3.7	(2.6–5.3)	0.50	1.7	(1.2–2.3)	0.33
Ethnicity									
Hispanic/Latino	5.6	(4.6–7.0)	0.54	4.1	(3.3–5.2)	0.52	2.4	(1.7–3.2)	0.44
Non-Hispanic/Latino	10.5	(9.9–11.0)	Referent	8.0	(7.5–8.5)	Referent	5.4	(5.0–5.8)	Referent
Primary language in home									
English	10.5	(9.9–11.1)	Referent	8.0	(7.5–8.5)	Referent	5.3	(4.9–5.7)	Referent
Any other language	2.3	(1.6–3.2)	0.22	1.8	(1.2–2.7)	0.23	0.9 [§]	(0.5–1.6)	0.16

Poverty level ¶									
≤100%	11.6	(10.3–13.0)	1.35 [†]	9.2	(8.1–10.5)	1.42 [†]	6.3	(5.3–7.4)	1.45 [†]
>100% to ≤200%	10.3	(9.1–11.7)	1.20 [†]	7.7	(6.6–8.9)	1.19 [†]	4.7	(4.0–5.5)	1.08 [†]
>200%	8.6	(8.0–9.2)	Referent	6.5	(6.0–7.0)	Referent	4.4	(4.0–4.8)	Referent
Any health-care coverage									
Yes	9.8	(9.3–10.3)		7.6	(7.1–8.1)		5.1	(4.7–5.5)	
Medicaid	13.6	(12.5–14.8)	1.68	10.9	(9.8–12.0)	1.77	7.5	(6.7–8.4)	1.84
Non-Medicaid	8.1	(7.5–8.7)	Referent	6.1	(5.6–6.7)	Referent	4.1	(3.7–4.5)	Referent
No	6.7	(5.2–8.6)	0.83 [†]	3.7	(2.9–4.7)	0.60	1.7	(1.2–2.5)	0.42
Region									
Northeast	9.4	(8.3–10.6)	1.35	7.4	(6.5–8.6)	1.45	4.5	(3.8–5.4)	1.60
Midwest	9.9	(9.2–10.7)	1.43	7.6	(6.9–8.3)	1.47	5.3	(4.7–5.8)	1.85
South	10.9	(10.1–11.8)	1.57	8.3	(7.6–9.0)	1.61	5.8	(5.2–6.5)	2.05
West	7.0	(5.7–8.4)	Referent	5.1	(4.1–6.4)	Referent	2.8	(2.2–3.7)	Referent

Abbreviations: CI = confidence interval; NC = not calculated; PR = prevalence ratio (the ratio of the percentage of children with ADHD among the sociodemographic group to the percentage of children with ADHD among the referent sociodemographic group).

* Estimates do not include children aged 2–3 years with reported ADHD diagnosis because small sample size yields substantial (>30%) relative standard errors.

† PR is not significant at the $\alpha = 0.05$ level.

§ Relative standard error >30%.

¶ Federal poverty level, imputed using multiple imputation for 8.9% of the sample for which reported household income was missing.

Among children with current ADHD, 66.3% were taking medication for the disorder. In total, 4.8% of all children aged 4–17 years (2.7 million) were taking medication for ADHD. Among boys, the prevalence of medicated ADHD (current) was highest for boys 11–14 years. The rates of medicated ADHD (current) increased with age among girls. The proportion of children taking medication for ADHD increased with severity, from 56.4% among children with mild ADHD, to 71.6% among children with moderate ADHD and 85.9% among children with severe ADHD ($p < 0.0001$). The national prevalence of ADHD (ever) increased significantly between the two surveys (from 7.8% to 9.5%; Table 2), even after adjustment for sociodemographics, equating to a 21.8% increase in 4 years, or an average annual increase of 5.5%. The national estimate of children aged 4–17 years with parent-reported ADHD (ever) increased from 4.4 million in 2003 to 5.4 million in 2007, an increase of approximately 1 million children. Compared with 2003, the 2007 rates were significantly higher for each subgroup, with three exceptions: among households with less than a high school education, "other" (not white or black) races, and those living in the western United States. The magnitude of increase was largest among older teens, multiracial and Hispanic children, and children with a primary

language other than English. A significant interaction was identified for age and survey year, with the rate of ADHD diagnosis (ever) increasing more for those in the oldest age group (15–17 years). The national increase in ADHD (ever) was reflected in significant increases within 12 states (Table 3).

Table 2. Weighted prevalence estimates and prevalence ratios of parent-reported attention-deficit/hyperactivity disorder (ADHD) among children 4–17 years,* by sociodemographic characteristics — National Survey of Children's Health, United States, 2003 and 2007

Characteristic	Ever diagnosed with ADHD [†]				
	2003	2007			
	%	%	PR	(95% CI)	p value
Overall	7.8	9.5	1.22	(1.14–1.31)	<0.001
Sex					
Male	11.0	13.2	1.20	(1.11–1.30)	<0.001
Female	4.4	5.6	1.28	(1.12–1.46)	<0.001
Age group (yrs) [§]					
4–10	5.7	6.6	1.16	(1.03–1.30)	0.013
11–14	9.8	11.2	1.14	(1.03–1.27)	0.016
15–17	9.6	13.6	1.42	(1.25–1.61)	<0.001
Highest education in household					
Less than high school	6.5	8.4	1.30	(0.99–1.69)	0.055
High school graduate	8.6	12.2	1.42	(1.24–1.63)	<0.001
More than high school	7.6	8.7	1.15	(1.06–1.25)	<0.001
Race					
White	8.6	9.9	1.15	(1.06–1.24)	<0.001
Black	7.7	10.1	1.31	(1.09–1.57)	0.004
Multiracial	9.7	14.2	1.46	(1.07–2.00)	0.017
Other	4.5	5.0	1.11	(0.72–1.71)	NS
Ethnicity					
Hispanic/Latino	3.7	5.6	1.53	(1.16–2.02)	0.002
Non-Hispanic/Latino	8.6	10.5	1.22	(1.14–1.31)	<0.001
Primary language in home					
English	8.6	10.5	1.22	(1.14–1.30)	<0.001
Any other language	1.3	2.3	1.82	(1.15–2.90)	0.011
Poverty level [¶]					
≤100%	9.3	11.6	1.25	(1.06–1.47)	0.007
>100% to ≤200%	7.9	10.3	1.31	(1.11–1.54)	0.001

>200%	7.3	8.6	1.18	(1.08–1.29)	<0.001
Any health-care coverage					
Yes	8.1	9.8	1.21	(1.13–1.30)	<0.001
Medicaid	10.8	13.6	1.26	(1.12–1.41)	<0.001
Non-Medicaid	7.0	8.1	1.16	(1.06–1.27)	0.001
No	4.9	6.7	1.38	(1.00–1.90)	0.050
Region					
Northeast	7.4	9.4	1.27	(1.09–1.49)	0.003
Midwest	7.9	9.9	1.25	(1.13–1.39)	<0.001
South	9.1	10.9	1.20	(1.09–1.32)	<0.001
West	5.8	7.0	1.20	(0.96–1.51)	NS

Abbreviations: CI = confidence interval; NS = not statistically significant ($p \geq 0.1$); PR = prevalence ratio (the ratio of the percentage of children with ADHD among the sociodemographic group in 2007 to the percentage of children with ADHD among the sociodemographic group in 2003).

* Estimates do not include children aged 2–3 years with reported ADHD diagnosis because small sample sizes yield substantial (>30%) relative standard errors in the 2003 survey sample.

† The analytic sample included totals of 79,264 children aged 4–17 years in 2003 and 73,123 children aged 4–17 years in 2007.

§ A statistically significant interaction was noted ($p=0.013$) with the magnitude, but not direction, of change across time differing significantly by age group.

¶ Federal poverty level; multiple imputations were used for the 10.0% of the sample in 2003 and 8.9% in 2007 for which reported household income was missing.

Table 3. Weighted percentage of children aged 4–17 years with parent-reported attention-deficit/hyperactivity disorder (ADHD), by state — United States, 2003 and 2007

State/Area	Ever diagnosed with ADHD				Difference* (%)
	2003		2007		
	%	(95% CI)	%	(95% CI)	
Alabama	11.1	(9.3–13.2)	14.3	(11.8–17.2)	NS
Alaska	7.1	(5.8–8.7)	9.2	(7.2–11.6)	NS
Arizona	5.9	(4.6–7.5)	7.6	(5.9–9.7)	NS
Arkansas	9.9	(8.3–11.8)	13.1	(11.0–15.6)	32.3
California	5.3	(4.2–6.7)	6.2	(4.1–9.1)	NS
Colorado	5.0	(3.8–6.4)	7.6	(5.8–9.8)	52.0
Connecticut	7.3	(6.0–9.0)	7.8	(6.3–9.6)	NS
Delaware	9.8	(8.1–11.7)	14.1	(11.8–16.8)	43.9
District of Columbia	6.7	(5.3–8.6)	7.7	(6.1–9.7)	NS

Florida	9.2	(7.6–11.2)	11.6	(8.8–15.1)	NS
Georgia	9.4	(7.7–11.4)	9.2	(7.3–11.4)	NS
Hawaii	6.2	(4.8–7.8)	6.3	(4.9–8.1)	NS
Idaho	6.4	(5.1–8.0)	8.3	(6.6–10.3)	NS
Illinois	6.3	(5.0–7.9)	6.2	(4.9–7.9)	NS
Indiana	7.9	(6.5–9.7)	13.2	(10.7–16.1)	67.1
Iowa	8.4	(6.8–10.2)	9.7	(7.4–12.7)	NS
Kansas	8.1	(6.6–10.0)	10.0	(8.2–12.1)	NS
Kentucky	10.1	(8.4–12.2)	12.4	(10.5–14.7)	NS
Louisiana	10.3	(8.7–12.2)	14.2	(11.6–17.3)	37.9
Maine	7.9	(6.5–9.7)	9.6	(7.8–11.7)	NS
Maryland	9.1	(7.7–10.8)	11.9	(9.8–14.5)	NS
Massachusetts	8.5	(7.1–10.2)	9.8	(7.8–12.3)	NS
Michigan	9.2	(7.7–11.0)	9.9	(8.0–12.2)	NS
Minnesota	7.5	(6.1–9.2)	7.8	(6.2–9.8)	NS
Mississippi	9.6	(7.9–11.6)	9.9	(8.1–11.9)	NS
Missouri	7.7	(6.3–9.3)	10.8	(9.0–12.9)	40.3
Montana	7.1	(5.8–8.8)	8.5	(6.9–10.4)	NS
Nebraska	6.4	(5.0–8.2)	9.0	(7.0–11.7)	NS
Nevada	7.2	(5.9–8.8)	5.6	(4.0–7.8)	NS
New Hampshire	9.2	(7.7–10.9)	8.5	(6.9–10.4)	NS
New Jersey	7.2	(5.8–9.0)	9.0	(7.0–11.5)	NS
New Mexico	6.1	(4.7–7.9)	7.1	(5.5–9.1)	NS
New York	6.3	(4.9–8.0)	9.2	(7.1–11.7)	46.0
North Carolina	9.6	(8.0–11.4)	15.6	(13.0–18.5)	62.5
North Dakota	9.4	(7.7–11.4)	10.0	(8.2–12.0)	NS
Ohio	8.9	(7.5–10.5)	13.3	(10.6–16.4)	49.4
Oklahoma	8.1	(6.5–9.9)	11.0	(8.9–13.4)	35.8
Oregon	7.2	(5.8–8.8)	8.8	(6.8–11.2)	NS
Pennsylvania	8.2	(6.8–9.9)	10.2	(7.6–13.4)	NS
Rhode Island	9.8	(8.1–11.8)	11.1	(9.0–13.5)	NS
South Carolina	10.0	(8.4–11.8)	12.0	(9.9–14.5)	NS
South Dakota	6.5	(5.0–8.3)	8.1	(6.6–10.1)	NS
Tennessee	9.9	(8.1–12.0)	11.3	(9.2–13.8)	NS

Texas	7.7	(6.3–9.3)	7.7	(5.7–10.4)	NS
Utah	5.5	(4.2–7.1)	6.7	(5.1–8.7)	NS
Vermont	6.9	(5.5–8.6)	9.9	(7.8–12.4)	43.5
Virginia	9.3	(7.7–11.1)	10.2	(8.4–12.3)	NS
Washington	7.2	(5.8–8.9)	9.5	(7.3–12.2)	NS
West Virginia	10.1	(8.4–12.1)	13.3	(11.1–15.8)	31.7
Wisconsin	8.1	(6.5–10.0)	9.9	(8.1–12.1)	NS
Wyoming	7.1	(5.8–8.7)	9.1	(7.3–11.3)	NS

Abbreviations: CI = confidence interval; NS = difference in rate of parent-reported ADHD (ever) was not statistically significant ($p \geq 0.05$).

* The percentage change (relative difference) between 2003 and 2007 for states with a statistically significant difference ($p < 0.05$).

* The 2003 and 2007 NSCH were directed by the Health Resources and Services Administration's Maternal Child Health Bureau and conducted by CDC's National Center for Health Statistics through the State and Local Area Integrated Telephone Survey. Additional information about NSCH is available at <http://www.cdc.gov/nchs/slait/nsch.htm>.

† The response rate represents the percentage of households that completed interviews among all eligible households, including those that were not successfully contacted. The cooperation rate is the percentage of households that completed interviews among all eligible households that were contacted. NSCH attempts to minimize nonresponse bias by incorporating nonresponse adjustments in the development of the sampling weights.

§ Demographic distributions were based on the 2007 American Community Survey of the U.S. Census Bureau.

¶ The time between the two surveys was calculated from the survey midpoints, which were September 2003 and August 2007.

Editorial Note

The findings in this report demonstrate a substantial increase in the percentage of children ever diagnosed with ADHD (according to parent report), with nearly one in 10 children aged 4–17 years diagnosed with ADHD by 2007. The overall estimate for the prevalence of children with a history of ADHD diagnosis in 2007 was higher than a recent estimate (8.4% of children aged 6–17 years) based on annual data from the 2004–2006 National Health Interview Survey (NHIS).^[2] The NHIS report documented an average annual increase in diagnosed ADHD (ever) of 3% from 1997 to 2006; this present report documents a greater average annual increase (5.5%) over a slightly later period (2003–2007). The differences might reflect the inclusion of more recent data in this present report or differences in survey methods.

The increase in ADHD diagnosis (ever) over time was seen among all sociodemographic groups studied. The increases among Hispanic children and older teens were of particular interest. Although rates among Hispanics remained lower than non-Hispanics, the prevalence of ever receiving an ADHD diagnosis among Hispanic children was 53% higher in 2007 than in 2003. This might indicate a shift in the cultural acceptance of ADHD or changes in access to care.^[7,8] The magnitude of change by age over time was greatest among the oldest children (ages 15–17 years). Additional studies are needed to explain why increases in the prevalence of ADHD among older children are outpacing those of younger children. Twelve states had significant increases in ADHD (ever diagnosed). Changes in the sociodemographic composition of states or state-based policy or practice changes, such as widespread behavioral health screening, might have contributed to the increasing rates.

The findings in this report are subject to at least five limitations. First, ADHD status was based on parental report, requiring that the parent correctly recall a past or current ADHD diagnosis and make a judgment as to the disorder's severity. Second, current ADHD, which might have incurred less recall bias, was not added to the survey until 2007, making it impossible to compare current ADHD prevalence across time using these data. Third, comparing estimates of ADHD medication treatment across time also is problematic, because questions about ADHD medication treatment were asked of different subgroups (ever diagnosed in 2003 versus only current ADHD in 2007) across the two surveys. Fourth, the survey sample did not include families without landline telephones or those who elected not to participate; however, noncoverage and nonresponse bias was reduced through sampling weight adjustments. Finally, the annual rate increases noted in this report represent an average for the 4-year period between surveys rather than observed annual rate increases because annual data were not available.

ADHD has a multidimensional effect on a person's daily life functioning, and can culminate in significant costs attributable to greater health-care needs, more frequent unintentional injury, co-occurring psychiatric conditions, and work loss.^[9] ADHD medications can reduce symptoms, but might be associated with side effects and might not completely address functional impairment. Earlier reports also have noted increases in ADHD prevalence;^[2] However, this study demonstrated an increase in parent-reported ADHD prevalence across time for every demographic group studied. The highest rates of ADHD diagnosis (ever) in 2007 were among multiracial children and those with Medicaid coverage. Increasing rates of estimated ADHD prevalence might indicate an actual increase in the number of cases of ADHD or changes in diagnostic practice over time, which might have been influenced by increased awareness of the disorder over the period of study. Additional studies are needed to understand other geographic or environmental risk factors associated with rates of ADHD diagnosis, such as state-based policy and health-care provider characteristics.^[10] Ongoing surveillance is critical to understanding the public health effect of ADHD and the needs of a growing number of families affected by this disorder.

Sidebar

What is Already Known on This Topic?

Attention-deficit/hyperactivity disorder (ADHD) is the most common neurobehavioral disorder of childhood and often persists into adulthood. A 2003 survey found an estimated 7.8% of children aged 4–17 years had ever been diagnosed with ADHD.

What is Added by This Report?

The prevalence of parent-reported ADHD among children aged 4–17 years increased 21.8% during 2003–2007, from 7.8% to 9.5%. Among older teens, the increase was 42%, and among Hispanic children the increase was 53%.

What Are the Implications for Public Health Practice?

Health practitioners should be aware of changes in the national, state, and demographic patterns of ADHD in the United States, and that an estimated 1 million more children were reported with ADHD in 2007 than in 2003.

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