Unmet Need and Financial Impact Disparities for US Children with ADHD

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ABSTRACT

OBJECTIVE: The 5.1 million US children with attention-deficit/hyperactivity disorder (ADHD) have pronounced needs in education, occupational and speech therapy, and medical and behavioral treatments. Given known associations of ADHD diagnosis with race/ethnicity and parent education, this study aimed to assess how measures of socioeconomic status correlate with both adverse family financial impact of ADHD and disparities in unmet treatment need for ADHD.

METHODS: Secondary analysis of children ages 8 to 17 years whose households participated in the 2014 National Survey of the Diagnosis and Treatment of Attention-Deficit/Hyperactivity Disorder and Tourette Syndrome. Using bivariate testing, we examined associations among measures of socioeconomic status with unmet ADHD treatment need and family financial impact. Logistic regression models estimated the odds of having unmet treatment need, adjusting for demographic factors and family financial impact.

RESULTS: Among US school-aged children with a current ADHD diagnosis, 44.3% experienced an adverse family financial impact from ADHD, and 11.6% had unmet need for ADHD treatment. Children with younger age at first ADHD diagnosis were more likely to experience adverse family financial impact. Children from non-English-speaking households were less likely to report unmet need compared to those from primarily English-speaking households. The adjusted odds of unmet need were twice as great among those who reported adverse family financial impact.

CONCLUSION: Deeper understanding of the influence of the household language is important in ADHD needs assessments. Considering overall family financial circumstances may also be pertinent, particularly as children age, because earlier diagnosis was associated with adverse financial outcomes. These findings could shape future clinic policies for targeting community resources.

KEYWORDS: attention deficit disorder; needs assessment; social determinants of health

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WHAT'S NEW

Among US children with attention-deficit/hyperactivity disorder (ADHD), those with an adverse family financial impact of ADHD have greater odds of unmet need for ADHD treatment. Assessing individual need requires a greater understanding of associations between financial impact with age at first ADHD diagnosis and unmet need with household language.

BACKGROUND

ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD) IS characterized by symptoms of inattention and hyperactivity that impair function in multiple settings, typically home and school, for at least 6 months and before age 7 years.[1,2] The estimated lifetime prevalence of ADHD in US children ages 4 to 17 years is 11%,[2,3] resulting in financial and emotional costs to families and society.[4] The 5.1 million US children with ADHD have pronounced needs in education and health care. Challenges in disorder management have led to children falling behind academically[4] and to such adulthood concerns as loss of work productivity and decreased likelihood to take preventive health measures.[4] ADHD impairs quality of life and function[1,5] and is also associated with other impairing conditions such as conduct disorder and oppositional defiant disorder.[6] Consequently, compared with their typically developing peers, children with ADHD have more challenges with school,

the juvenile justice system, and maintaining relationships with peers and family.

Disparities in ADHD diagnosis due to race, ethnicity, health insurance, or parental education are established.[7–9] ADHD tends to be diagnosed less among black and Hispanic patients.[8–10] Non-Hispanic white children and those with higher parental educational attainment are more likely than their counterparts to receive comprehensive neurodevelopmental evaluations for ADHD.[11] In ethnically diverse families, differences in cultural practice, knowledge, and beliefs shape familiarity with ADHD, how to seek diagnosis, and misunderstandings due to language and stigma surrounding ADHD.[10] Treatment utilization shows similar disparities: black and Hispanic patients with ADHD have lower odds of medication use and decreased receipt of school-based services[9] compared with non-Hispanic white children.[8]

Previous studies have not examined how adverse financial experiences from ADHD (hereinafter "ADHD financial impact") relate to unmet need for ADHD treatment. The literature indicates higher annual medical costs among children with ADHD compared to controls,[12] and given the known association between financial burden and racial/ethnic and educational disparities ADHD financial impact may underlie disparities in receiving ADHD treatment. Families with fewer financial resources overall may also have more difficulty accessing the ADHD care that their children need.

This study aimed to show how measures of socioeconomic status correlate with both ADHD financial impact and unmet need for ADHD treatment. Our study's conceptual framework (Figure 1) was informed by Andersen and Aday's behavioral model of health care utilization.[13] The conceptual framework shows how predisposing pre-illness factors (eg, age, sex) and enabling means-to-service factors (eg, income, insurance) interrelate with one another, with elements of need or illness level, and with psychosocial factors to impact both ADHD financial impact and unmet need.[13,14] Based on this conceptual framework, we predicted that, among US children with ADHD, those who were non-white or Hispanic, had a household language other than English, and/or had low parent education would experience significantly greater ADHD financial impact and unmet need. We also hypothesized that greater ADHD severity and comorbidity would affect the relationship between ADHD financial impact and unmet need. Finally, we refined our focus on unmet need to assess if ADHD financial impact influences the relationship with predisposing and enabling measures of socioeconomic status.

METHODS

DATA SOURCE AND STUDY POPULATION

We conducted a secondary analysis of the 2014 National Survey of the Diagnosis and Treatment of Attention-Deficit/Hyperactivity Disorder and Tourette Syndrome (NS-DATA), a cross-sectional survey of US children sponsored by the Centers for Disease Control and Prevention, the National Center on Birth Defects and Developmental Disabilities, and the National Center for Health Statistics.[15] NS-DATA followed the 2011–2012 National Survey of Children's Health (NSCH), and both surveys were nationally representative for non-institutionalized US children through a cross-sectional, random-digit-dial survey of US households, with weighting to account for sampling bias in certain groups. If the household's survey-eligible child had ever been diagnosed with ADHD or Tourette syndrome by the time of the NSCH, per parent report, NS-DATA re-contacted the household 2 to 3 years after the NSCH. NS-DATA shares the NSCH design of clustered children within households and stratification by state and sample by landline or cellphone.[15]

NS-DATA completed interviews for 2966 US children with ADHD who had been diagnosed at time of the NSCH. Families were eligible for NS-DATA if their child was still under 18 years old, the child continued to live in the

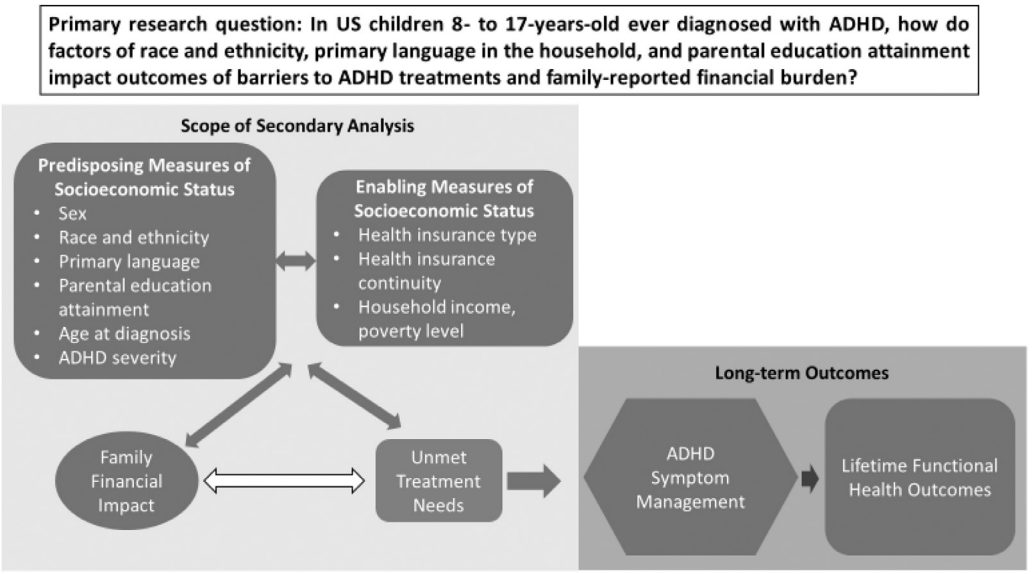

Figure 1. *Conceptual framework of study objectives.*

household, and respondents confirmed that the child had ever been diagnosed with ADHD.[15] The survey was administered in English and Spanish, although the administered language was suppressed for confidentiality. The response rate for the 2011–2012 NSCH was 23%. The NS-DATA completion rate was 47.2%, a product of re-contact rate and interview completion among those re-contacted. Respondents were the parent or guardian (hereinafter "parent") most familiar with the health care of the child with ADHD.[15] The authors' institutional review board determined this study to be exempt as nonhuman subjects research.

Defining the Analytic Sample

This analytic sample (Figure 2) was US non-institutionalized children ever diagnosed with ADHD at the time of the NSCH who had a current ADHD diagnosis at NS-DATA. NS-DATA grouped together all children 7 years old and younger at time of follow-up; thus, we limited our analytic sample to children ages 8 to 17, as an ADHD diagnosis is not stable in preschool-aged children.[5] We proceeded with our analytic sample, aware that the limitations of the NS-DATA completion rate, the parent respondents, and age may not accurately represent the national distribution of children with ADHD, similar to other national surveys such as the National Survey of Children with Special Health Care Needs.[16] The final sample size of US children ages 8 to 17 years with a current diagnosis of ADHD captured by NS-DATA was 2406.

Measures of Interest

Dependent Variable of Interest: Unmet Need for ADHD Treatment

The primary dependent variable of interest was "unmet need for ADHD treatment." This was characterized by the NS-DATA survey item: "In the past 12 months, did your child need an ADHD treatment that he/she was unable to get?"[15] If the response was "yes," this child was considered to have an unmet need in our analysis. NS-DATA follow-up questions to a "yes" response clarified if the treatment that the child needed was medication, school-based behavioral therapy, behavioral treatment outside of school, or some other treatment outside of school. Although not incorporated in the scope of our primary analysis, respondents could also cite reasons why the child could not obtain said treatment, including cost, availability, or lack of information (Appendix A).

Primary Independent Variable of Interest: ADHD Financial Impact

NS-DATA included a survey section entitled Family Impact, in which parents described the financial impact of the child's ADHD. Section items asked:

- Has the child's ADHD caused financial problems for your family?
- Have you or other family members stopped working because of the child's ADHD?

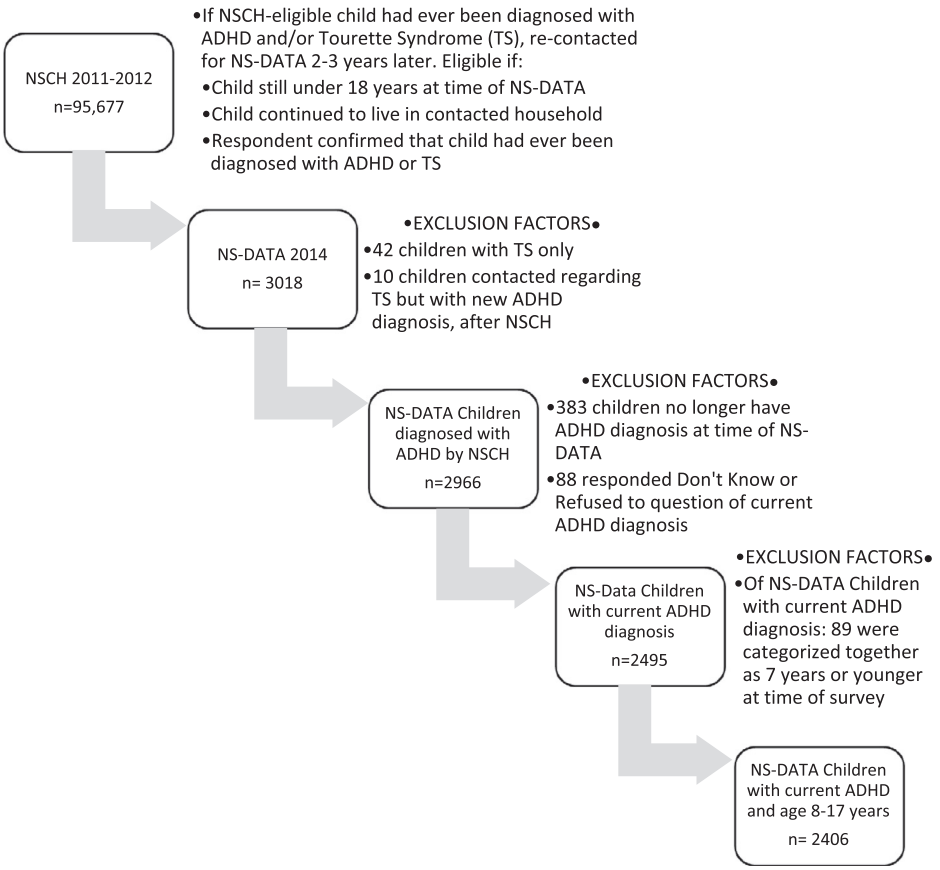

Figure 2. *Flow chart describing the analytic sample.*

- Not including family members who stopped working, have you or other family members cut down on the hours you work because of the child's ADHD?
- Have you or other family members avoided changing jobs because of concerns about maintaining health insurance for the child?

Each item included the options to respond with a "yes," "no," "don't know," or refusal.[15] In our analysis, a family was considered to have reported ADHD financial impact by answering "yes" to any of these section items.

Model Covariates: Predisposing and Enabling Measures

We characterized the children with current ADHD diagnosis and their families by several measures of socioeconomic status and controlled for these in our multivariable analyses. Per our conceptual framework (Figure 1), predisposing measures included the child's sex, race/ethnicity, primary household language, US Census region, highest level of parent education, age at NS-DATA interview, and age at first ADHD diagnosis. Enabling measures included insurance type (public, private, or uninsured), insurance continuity in the past year, and household income based on Department of Health and Human Services poverty guidelines.[15]

We included parent-reported severity of the child's ADHD in our multivariable analyses, as a confounding variable for the dependent variable of interest. In NS-DATA, ADHD severity was assessed by the question, "Would you describe the child's ADHD as mild, moderate, or severe?"[15] Parent-reported severity has been shown to be a valid monitoring measure of ADHD severity, as compared with professionally reported ADHD severity in health plan medical records.[17]

The presence of other conditions was included in multivariable analyses due to the high rate of comorbidity in ADHD.[6,11] NS-DATA assessed the presence of co-occurring disorders by asking whether or not the child currently had any of 13 co-occurring conditions.[15] NS-DATA's list of 13 comorbidities included oppositional defiant disorder, autism spectrum disorder, sleep disorder, learning and language disorders, mood disorders, and a suppressed category of other disorders including intermittent explosive disorder, eating disorder, and substance use disorder. If a parent responded "yes" to any of these co-occurring disorders, the child was categorized as having any comorbidity.

Statistical Analyses

We described the sample in terms of their socioeconomic status, per the predisposing and enabling factors in the conceptual framework (Figure 1), ADHD severity, and comorbidities (Tables 1 and 2). We also computed descriptive statistics to assess the overall prevalence of unmet need and adverse financial impact (Table 3). We then computed chi-square tests to determine bivariate associations among unmet need, adverse financial impact, and the covariates of interest (Table 4). A logistic regression model was fit to examine the adjusted odds of unmet need in relationship to family financial impact and the covariates (Table 5). Given our conceptual framework and literature supporting race- and ethnicity-based disparities in ADHD diagnosis,[3,7–11] we included all covariates of interest in the model. To check for bias due to multicollinearity, we computed variance inflation factors, which were all <2, suggesting limited bias. All analyses were weighted per guidance from the National Center for Health Statistics to account for the complex survey sampling design.[15] Stata 14.2 was utilized for this analysis.[18]

Results

Sample Characteristics

Table 1 displays the characteristics of the analytic sample, representing non-institutionalized US children ages 8 to 17 years who have ever been diagnosed with ADHD and those with a current diagnosis.[3] Most of the children had English as their primary household language (91.3%), were male (70.1%), identified as non-Hispanic white (63.4%), and had a parent with more than high school education (52.3%). Only 15 of the 190 who had a primary household language other than English also identified as Hispanic (1.2%). A majority of the children had at least one comorbidity (88.0%) and were first diagnosed with ADHD between the ages of 5 and 9 years old (70.5%) (Tables 1 and 2). A plurality had moderate ADHD severity (49.4%), had continuous private insurance in the past year (47.9%), lived in the South (39.2%), and had a household income at 400% or greater of the federal poverty level (36.2%).

Unmet Need and ADHD Financial Impact

Table 3 shows the prevalence of any unmet need for ADHD treatment, as well as any ADHD financial impact among US children with ADHD. In the year prior to NS-DATA, 11.6% of children had unmet need. The most common unmet need was medication, which was reported by 53.2% of those with unmet need; 50.8% had unmet need for school-based behavioral therapy; 38.2% had unmet need for other types of treatment; and 36.1% had unmet need for therapy outside of school. Provider issues, cost, and availability tended to be the most common reasons for unmet ADHD treatment need (Appendix A).

Among US children with ADHD, approximately 44.3% experienced one or more ADHD financial impacts. The most common impact experienced was ADHD causing financial problems for the family, as reported by 22.4%. Additionally, for 21.3%, family members cut down work hours; for 15.8%, family members avoided changing jobs to maintain insurance for the child with ADHD; and for 14.4%, family members stopped work due to the child's ADHD.

Table 1. Predisposing and Enabling Measures of Socioeconomic Status, US Children with ADHD, 8 to 17 Years Old (N = 2406)

Characteristic (Subgroup n)	Frequency, Unweighted	% of Subgroup, Weighted
Predisposing Measures of Socioeconomic Status		
Sex (n = 2406)		
Male	1692	70.1
Female	714	29.9
Race (n = 2392)		
White, non-Hispanic	1767	63.4
Black, non-Hispanic	201	14.4
Hispanic	198	15.4
Other	226	6.9
Primary language in household (n = 2403)		
English	2213	91.3
Language other than English	190	8.7
Language other than English, Hispanic*	15	1.2
Language other than English, non-Hispanic and other race/ethnicity*	173	7.4
US Census regions (n = 2406)		
South	934	39.2
West	624	24.9
Midwest	459	19.3
Northeast	389	16.7
Highest level of education attained by either parent or guardian (n = 2262)		
Less than high school	288	13.4
High school graduate	771	34.3
More than high school	1203	52.3
Age at NS-DATA interview (n = 2406)		
8–9 y	227	10.5
10–13 y	1009	44.1
14–17 y	1170	45.4
Age at first ADHD diagnosis (n = 2373) (continuous variable in meaningful categories)		
1–4 y	277	14.3
5–9 y	1703	70.5
10–14+ y	393	15.3
Enabling Measures of Socioeconomic Status		
Insurance by type and continuity over last year (n = 2366)		
Continuous private	1397	47.9
Continuous public	822	44.1
Noncontinuous public	69	4.2
Noncontinuous private	42	2.2
Currently uninsured	36	1.7
Household income based on DHHS poverty guidelines, imputed (n = 2406)		
0–99% FPL	359	15.2
100–199% FPL	400	18.1
200–399% FPL	769	30.5
≥ 400% FPL	878	36.2

ADHD indicates attention-deficit/hyperactivity disorder; NS-DATA, 2014 National Survey of the Diagnosis and Treatment of Attention-Deficit/Hyperactivity Disorder and Tourette Syndrome; DHHS, Department of Health and Human Services; FPL, federal poverty level.

Subgroup n describes the number of participants who answered and did not skip the survey question from the total 2406.

*Although 190 reported speaking a household language other than English, there were 2 missing responses when further categorized by race/ethnicity.

Source: 2014 National Survey of the Diagnosis and Treatment of Attention-Deficit/Hyperactivity Disorder and Tourette Syndrome.

MEASURES OF SOCIOECONOMIC STATUS ASSOCIATED WITH UNMET NEED AND ADHD FINANCIAL IMPACT

Results from chi-square tests of association between the sociodemographic determinants of health with unmet need and ADHD financial impact are presented in Table 4.

ASSOCIATIONS WITH UNMET NEED

Among our predisposing measures of socioeconomic status, bivariate results showed that among children with ADHD a significantly higher percentage of those with English as the primary household language experienced one or more unmet needs compared to those with other primary household languages ($P = .004$). Additionally, increased parent-reported ADHD severity was significantly associated with any unmet need ($P = .01$). Having any comorbidities was positively correlated with unmet need, although this association was not statistically significant ($P = .07$). Associations of all other measures with unmet need were non-significant (Table 4).

ASSOCIATIONS WITH ADHD FINANCIAL IMPACT

Among our predisposing measures of socioeconomic status, bivariate testing showed that among children with ADHD a significantly higher percentage of those with a

Table 2. ADHD Severity Characteristics (N = 2406)

Characteristic (Subgroup n)	Frequency, Unweighted	% of n Responses, Weighted
Would you describe the child's ADHD as mild, moderate, or severe? (n = 2388)		
Mild	800	31.0
Moderate	1201	49.4
Severe	387	19.6
Of children with a current diagnosis of ADHD:		
The number of children who reported any of the 13 listed comorbidities (n = 1635)	1400	88.0

ADHD indicates attention-deficit/hyperactivity disorder.
Subgroup n describes the number of participants who answered and did not skip the question from the total 2406.
Source: 2014 National Survey of the Diagnosis and Treatment of Attention-Deficit/Hyperactivity Disorder and Tourette Syndrome

younger age at first ADHD diagnosis were more likely to experience an ADHD financial impact than those diagnosed at older ages ($P = .008$). Further, higher parent-reported ADHD severity ($P < .001$) and having any reported comorbidities ($P = .002$) were significantly associated with ADHD financial impact. Associations of all other measures with ADHD financial impact were non-significant (Table 4).

Relationship Between Unmet Need and ADHD Financial Impact

On bivariate testing, there was a statistically significant positive association between family financial impact and unmet need.

Logistic Regression to Examine the Adjusted Odds of Unmet Need

Table 5 summarizes logistic regression model results for unmet need. The association of primary language in the household with any unmet need remained statistically significant. Specifically, compared to children with ADHD whose primary household language was English, the adjusted odds of reporting any unmet need were approximately 72% less for children with ADHD whose primary household language was not English, adjusting for all other measures of socioeconomic status. Adjusting for all other measures of socioeconomic status, odds of unmet need were more than twice as great in families who reported ADHD financial impact compared to families who did not ($P < .001$).

Discussion

Through results from a national study of US children with ADHD, we examined associations among enabling and predisposing measures of socioeconomic status, ADHD severity and comorbidities, and ADHD financial impact on our dependent variable of interest: unmet need for ADHD treatment.

Among US children with unmet need for ADHD treatment, primary language stood out as a strongly statistically significant association, even after adjusting for ADHD severity, race, and ethnicity. The adjusted odds of reporting any unmet need were significantly increased in households where English was the primary language compared to households where another primary language was spoken, countering our hypothesis.

Table 3. Unmet Need and ADHD Financial Impact (N = 2406)

Variables of Interest (Subgroup n)	Frequency, Unweighted	% of n Responses, Weighted
In the past 12 months, did your child need an ADHD treatment that s/he could not get? (n = 2391)		
Yes	218	11.6
Of above, the child needed *medication* for treatment but could not get it.	84	53.2
Of above, the child needed *school-based behavioral therapy* but could not get it.	115	50.8
Of above, the child needed *other treatment* but could not get it.	76	38.2
Of above, the child needed *outside school therapy* but could not get it.	81	36.1
Family Impact (n = 2390)		
Responded yes to any of the family impact questions below:	971	44.3
Child's ADHD has caused financial problems for family (n = 2382).	454	22.4
You or other family members cut down on hours you work because of child's ADHD (excluding family members who have stopped working) (n = 2387).	459	21.3
You or other family members avoided changing jobs because of concerns about maintaining health insurance for child (n = 2388).	390	15.8
You or other family members have stopped working because of child's ADHD (n = 2387).	267	14.4

ADHD indicates attention-deficit/hyperactivity disorder.
Subgroup n describes the number of participants who answered and did not skip the question from the total 2406.
Source: 2014 National Survey of the Diagnosis and Treatment of Attention-Deficit/Hyperactivity Disorder and Tourette Syndrome

Table 4. Associations of Measures of Socioeconomic Status with Unmet Need and ADHD Family Impact Among US Children Ages 8 to 17 with a Current Diagnosis of ADHD (N = 2406)

	Any Unmet Need (n = 2391)			Any Family-Reported Impact (n = 2390)			
	Yes (n = 218)			No (n = 971)			
Overall %	11.6%			44.3%			
Measure	*P* Value	%	95% CI	Measure	*P* Value	%	95% CI
Predisposing Measure of Socioeconomic Status							
Sex (n = 2391)	.12			Sex (n = 2390)	.09		
Female		8.8%	(5.8, 13.1%)	Female		39.6%	(33.5, 46.0%)
Male		12.8%	(10.0, 16.2%)	Male		46.3%	(42.0, 50.6%)
Race and ethnicity (n = 2383)	.07			Race and ethnicity (n = 2377)	.98		
White, non-Hispanic		9.0%	(6.8, 11.8%)	White, non-Hispanic		44.2%	(40.0, 48.5%)
Black, non-Hispanic		16.4%	(9.7, 26.3%)	Black, non-Hispanic		45.5%	(35.4, 56.1%)
White, non-Hispanic		16.5%	(9.9, 26.3%)	White, non-Hispanic		43.2%	(33.0, 54.0%)
Black, non-Hispanic		11.8%	(5.5, 23.8%)	Black, non-Hispanic		46.3%	(34.7, 58.4%)
Primary language in household (n = 2388)	.004			Primary language in household (n = 2387)	.49		
English		12.3%	(9.9, 15.1%)	English		44.6%	(40.9, 48.4%)
Other language		4.4%	(2.1, 8.9%)	Other language		40.1%	(28.8, 52.6%)
US Census region (n = 2391)	.23			US Census region (n = 2390)	.60		
South		10.6%	(7.5, 14.7%)	South		46.9%	(41.3, 52.6%)
West		10.8%	(6.9, 16.4%)	West		44.2%	(37.2, 51.4%)
Midwest		9.7%	(5.9, 15.5%)	Midwest		40.4%	(32.6, 48.7%)
Northeast		17.2%	(10.8, 26.2%)	Northeast		42.4%	(33.9, 51.3%)
Highest level of education attained by parent or guardian (n = 2248)	.60			Highest level of education attained by parent or guardian (n = 2246)	.99		
Less than high school		10.8%	(5.8, 19.4%)	Less than high school		43.5%	(33.8, 53.6%)
High school graduate		13.4%	(9.4, 18.8%)	High school graduate		43.2%	(37.2, 49.4%)
More than high school		10.7%	(7.8, 14.4%)	More than high school		43.8%	(38.7, 49.0%)
Age at first NS-DATA interview (n = 2391)	.71			Age at first NS-DATA interview (n = 2390)	.50		
8–9 y		14.5%	(8.2, 24.4%)	8–9 y		50.3%	(39.3, 61.3%)
10–13 y		11.2%	(8.1, 15.3%)	10–13 y		44.0%	(38.6, 49.6%)
14–17 y		11.3%	(8.2, 15.4%)	14–17 y		43.1%	(38.0, 48.3%)
Age at first ADHD diagnosis (n = 2358)	.72			Age at first ADHD diagnosis (n = 2357)	.008		
1–4 y		13.6%	(8.1, 21.8%)	1–4 y		58.1%	(48.2, 67.5%)
5–9 y		11.6%	(9.0, 14.9%)	5–9 y		41.9%	(37.7, 46.2%)
10+ y		9.9%	(5.5, 17.3%)	10+ y		43.0%	(34.6, 51.8%)
Enabling Measures of Socioeconomic Status							
Insurance by type and continuity over last year (n = 2353)	.54			Insurance by type and continuity over last year (n = 2365)	.10		
Continuous private		10.1%	(7.4, 13.6%)	Continuous private		39.7%	(35.3, 44.3%)
Continuous public		12.1%	(8.6, 16.7%)	Continuous public		47.7%	(41.8, 53.6%)
Noncontinuous public		19.2%	(8.1, 38.8%)	Noncontinuous public		57.9%	(38.6, 75.1%)
Noncontinuous private		17.5%	(4.3, 50.2%)	Noncontinuous private		53.5%	(27.1, 78.1%)
Currently uninsured		13.2%	(5.1, 30.0%)	Currently uninsured		30.4%	(13.6, 54.9%)
Household poverty level (n = 2391)	.26			Household poverty level (n = 2390)	.73		
0–99% FPL		15.9%	(10.0, 24.2%)	0–99% FPL		47.6%	(38.6, 56.8%)
100–199% FPL		7.8%	(3.9, 15.0%)	100–199% FPL		40.7%	(32.6, 49.4%)
200–399% FPL		13.1%	(9.2, 18.2%)	200–399% FPL		45.1%	(38.9, 51.5%)
≥ 400% FPL		10.5%	(7.2, 15.0%)	≥ 400% FPL		43.9%	(38.0, 50.0%)

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Table 4 (*Continued*)

	Any Unmet Need (n = 2391)			Any Family-Reported Impact (n = 2390)			
	Yes (n = 218)			No (n = 971)			
Overall %	11.6%			44.3%			
Measure	*P* Value	%	95% CI	Measure	*P* Value	%	95% CI
ADHD Severity Measures							
Reported ADHD severity (n = 2373)	.01			Reported ADHD severity (n = 2373)	<.001		
Mild		7.6%	(4.6, 12.3%)	Mild		31.7%	(26.3, 37.8%)
Moderate		11.6%	(8.6, 15.5%)	Moderate		47.6%	(42.5, 52.7%)
Severe		18.3%	(12.5, 25.9%)	Severe		54.8%	(46.0, 63.3%)
Any current comorbidities (n = 1624)	.07			Any current comorbidities (n = 1626)	.002		
No		5.2%	(1.9, 13.6%)	No		33.4%	(23.7, 44.8%)
Yes		12.6%	(9.8, 16.2%)	Yes		52.9%	(48.2, 57.5%)
Any family-reported impact (n = 2376)	<.001			Any unmet need (n = 2376)	<.001		
No		7.2%	(5.0, 10.3%)	No		41.5%	(37.8, 45.4%)
Yes		16.9%	(13.0, 21.6%)	Yes		65.1%	(53.7, 75.0%)

ADHD indicates attention-deficit/hyperactivity disorder; CI, confidence interval; NS-DATA, 2014 National Survey of the Diagnosis and Treatment of Attention-Deficit/Hyperactivity Disorder and Tourette Syndrome; FPL, federal poverty level.

Subgroup n describes the number of participants who answered and did not skip the survey question from the total 2406. Significance determined by chi-square association tests.

Source: 2014 National Survey of the Diagnosis and Treatment of Attention-Deficit/Hyperactivity Disorder and Tourette Syndrome.

A likely explanation of the findings regarding language differences in unmet need may relate to cultural differences in how parents perceive service needs. Aligned with research on service underutilization,[8,9] children from households with non-English primary language may have less unmet need because their families do not perceive as high a level of service need as their counterparts for whom English is the primary language. If parents do not identify treatment needs, they will not identify those needs as being unmet. An important element of any chronic condition is the recognition and communication of needs. A growing body of research encourages consideration of cultural diversity when managing ADHD and other developmental conditions,[19] examining families' perceptions of the myriad therapies that a child would need.[10] A lack of available resources and access for non-English-speaking families, as when therapies are not offered at all in an area, further feeds a lack of need recognition. As Andersen and Aday[13] discussed, disparities in patient access to treatment may be grounded in the conflict between how patients and professionals define need.[14] This conflict is reflected in the tendency of provider issues to contribute to unmet need (Appendix A). Throughout the child's lifetime, the provider profoundly impacts the continued recognition of therapy modality combinations that best support function at home and at school. Thus, an unmet treatment need may be less apparent to parents due to lack of familiarity with ADHD or with services that could be available to their child.[8] In this study, a majority of those who reported unmet need cited an inability to obtain school-based behavioral therapy. This echoes aforementioned concerns about the multiple settings in which children with ADHD identify their needs. Because our findings suggest that non-English-speaking households may be more likely to state that the child's needs are met even when using fewer services than other families with similar symptoms,[19] a detailed assessment of service need and receipt in the clinical setting may be necessary, including understanding specific services used in the school and home setting, medication use, perceived progress, and barriers to progress. This echoes previous data indicating that patient-centered medical care can decrease the risk of financial problems.[16]

Another interpretation is that there was less unmet need for ADHD treatment among non-English primary language households because children in non-English-primary language households have milder ADHD and thus need fewer services. Some literature shows decreased ADHD diagnosis rates among Spanish-speaking patients compared to English-speaking counterparts,[10] supporting this hypothesis. Despite literature on the "immigrant paradox"—that children from immigrant families have better than expected health, particularly pertaining to mental health[20]—differences in illness severity do not account for differences in treatment need. Other research in minority health shows that ADHD symptomatology is similar or higher among immigrant and minority groups compared

Table 5. Adjusted Odds Ratio (95% Confidence Interval) for Unmet Need

Measure	Odds Ratio (n = 1454)
Constant (intercept)	0.06 (0.003, 1.18)
ADHD Severity Measures	
Reported severity	
Mild	Referent
Moderate	1.56 (0.64, 3.74)
Severe	3.02 (1.19, 7.65)*
Any current comorbidities	
No	Referent
Yes	2.63 (0.89, 7.74)
Predisposing Measures of Socioeconomic Status	
Sex	
Male	Referent
Female	0.57 (0.29, 1.14)
Race and ethnicity	
White, non-Hispanic	Referent
Black, non-Hispanic	1.43 (0.49, 4.16)
Hispanic	2.09 (0.95, 4.58)
Other	1.19 (0.44, 3.22)
Primary language in household	
English	Referent
Other language	0.28 (0.09, 0.88)*
US Census regions	
Northeast	Referent
South	0.73 (0.30, 1.79)
Midwest	0.62 (0.21, 1.84)
West	0.52 (0.19, 1.46)
Highest level of education attained by either parent or guardian	
Less than high school	Referent
High school graduate	0.84 (0.29, 2.45)
More than high school	0.82 (0.28, 2.44)
Age at first NS-DATA interview	
8–9 y	Referent
10–13 y	1.05 (0.33, 3.23)
14–17 y	1.50 (0.43, 5.23)
Age at first ADHD diagnosis, continuous variable in years	
1–4 y	Referent
5–9 y	1.14 (0.46, 2.81)
10+ y	0.64 (0.22, 1.85)
Enabling Measures of Socioeconomic Status	
Current insurance and continuous insurance over the past year	
Noncontinuous public	Referent
Noncontinuous private	1.35 (0.17, 10.86)
Continuous public	0.34 (0.12, 0.998)*
Continuous private	0.50 (0.17, 1.46)
Currently uninsured	0.81 (0.13, 5.05)
Household poverty level	
0–99% FPL	Referent
100–199% FPL	0.68 (0.22, 2.07)
200–399% FPL	0.93 (0.35, 2.47)
≥400% FPL	0.67 (0.24, 1.86)
Any family impact	
No	Referent
Yes	2.81 (1.41, 5.60)*

ADHD indicates attention-deficit/hyperactivity disorder; NS-DATA, 2014 National Survey of the Diagnosis and Treatment of Attention-Deficit/Hyperactivity Disorder and Tourette Syndrome; FPL, federal poverty level.

The logistic regression model examined the adjusted odds of association among the measures of socioeconomic status covariates of interest, family financial impact, and unmet need for ADHD treatment. The model began with all covariates present to examine the odds of unmet need, as in our conceptual framework. Subgroup n describes the number of participants who answered and did not skip the survey questions from the total 2406.

*$P < .05$.

Source: 2014 National Survey of the Diagnosis and Treatment of Attention-Deficit/Hyperactivity Disorder and Tourette Syndrome.

to white children.[8,21] A milder ADHD phenotype may not completely explain language differences in unmet need for ADHD treatment. It is also possible that non-English-speaking households are better able to access ADHD services. However, overall service access for mental health among immigrants is poor,[8,22] particularly for child mental health, and we controlled for parent-reported ADHD severity in our models, both of which make this hypothesis less likely.

Younger age of ADHD diagnosis was significantly associated with ADHD financial impact. We may interpret this to mean that the impact of ADHD is additive; that is, costs associated with the condition compound over years.[4,12] Similarly, a younger age at ADHD diagnosis reflects a longer period of time during which the family shares the condition's burden and is exposed to adverse outcomes.[12]

Finally, this study demonstrated a strong association between ADHD financial impact and unmet need for ADHD treatment. Statistical analysis saw over twice as great the adjusted odds of unmet need among those reporting any ADHD financial impact. Due to the cross-sectional design, we cannot say that ADHD financial impact predicts unmet need. Families with ADHD financial impact may have greater unmet need because they are less able to take advantage of ADHD services. Families who do not use services may have children with ADHD symptoms that are more difficult to manage, thus increasing financial adversity. Findings suggest that better elucidating how a family's overall financial and employment circumstances around ADHD might ameliorate long-term management of the condition. Clinic-based efforts such as social determinants of health screenings[23] or medical-legal partnerships[24] may particularly help reduce unmet need for ADHD treatment by improving ADHD financial impact. Likewise, study findings suggest that improved coverage of ADHD treatment, through such actions as mental health parity legislation[25] or Medicaid health and community-based service waivers,[26] may improve the overall financial stability of families of children with ADHD.

There were several limitations in the study design. We were limited by the cross-sectional design of NS-DATA; we cannot make any kind of causal inference in terms of temporal precedence. The survey did not ask specifically how high families perceived their need for services to be (ie, if they do or do not feel that as many treatment services are necessary) in contrast to which needs were unmet; thus, we could not distinguish whether differences in our dependent variable were due to disparate baseline levels of need. Further, the measures of socioeconomic status in our analytic sample do not match the US population of children with a current diagnosis of ADHD. A majority of our analytic sample were male, non-Hispanic, and white; spoke primarily English in the household; and had continuous private insurance. Another limitation was that health determinants from physical and environmental contexts were not included in the survey which represents an area

for future study. Although families could take the survey in English or Spanish, data on which households received which script were suppressed by the Maternal and Child Health Bureau to protect participant confidentiality. Survey items lacked details regarding other languages spoken in the household or other races and ethnicities with which the children identified. This factor became an increasing challenge during analyses, when a significant difference in unmet need was found between households whose primary language was English and households where English was not the primary language. Due to the low 11.6% prevalence of our dependent variable in the analytic sample, we could not calculate a continuous variable of number of unmet needs nor analyze reasons for unmet need without dramatically losing power.

ADHD prevalence is 11% among US school-aged children and has repercussions in education, health care, and the adult workforce. Disparities by race, ethnicity, and household language are already known in ADHD diagnosis and service use. This study suggests that considering the financial impact of ADHD may be important in assessing unmet need for ADHD treatment. This may be particularly important as children with ADHD age, as earlier diagnosis was associated with greater family financial adversity. Likewise, consideration of factors such as household language may be important in ADHD needs assessments. These study findings could shape future clinic policies for targeting resources toward communities, such as immigrant and multigenerational homes, that are prone to barriers of care. Further research may explore other interacting factors for unmet need besides financial impact, how reasons for unmet need correlate with non-English-speaking households, and disparities in treatment need among adults with ADHD.

Supplementary Data

Supplementary data related to this article can be found online at https://doi:10.1016/j.acap.2018.09.001.

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