Poverty and Trends in Three Common Chronic Disorders

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abstract

OBJECTIVES: For asthma, attention-deficit/hyperactivity disorder (ADHD), and autism spectrum disorder (ASD), the objectives were to (1) describe the percent increases in prevalence and comorbidity and how these vary by poverty status, and (2) examine the extent to which poverty status is a predictor of higher than average comorbid conditions.

METHODS: Secondary analyses of the National Survey of Children's Health for years 2003, 2007, and 2011–2012 were conducted to identify trends in parent reported lifetime prevalence and comorbidity among children with asthma, ADHD, and ASD and examine variation by sociodemographic characteristics, poverty status, and insurance coverage. Using 2011–2012 data, multivariable regression was used to examine whether poverty status predicted higher than average comorbid conditions after adjusting for other sociodemographic characteristics.

RESULTS: Parent-reported lifetime prevalence of asthma and ADHD rose 18% and 44%, respectively, whereas the lifetime prevalence of ASD rose almost 400% (from 0.5% to 2%). For asthma, the rise was most prominent among the poor at 25.8%. For ADHD, the percent change by poverty status was similar (<100% federal poverty level [FPL]: 43.20%, 100% to 199% FPL: 52.38%, 200% to 399% FPL: 43.67%), although rise in ASD was associated with being nonpoor (200% to 399% FPL: 43.6%, ≥400% FPL: 36.0%). Publicly insured children with asthma, ADHD, and ASD also had significantly higher odds (1.9×, 1.6×, 3.0×, respectively) of having higher than average comorbidities.

CONCLUSIONS: Poverty status differentially influenced parent-reported lifetime prevalence and comorbidities of these target disorders. Future research is needed to examine parent and system-level characteristics that may further explain poverty's variable impact.

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WHAT'S KNOWN ON THIS SUBJECT: Children in poverty with chronic conditions are more likely to have higher rates of comorbid disorders and worse outcomes than those not in poverty.

WHAT THIS STUDY ADDS: The increases in parent-reported prevalence of asthma, attention-deficit/hyperactivity disorder, and autism and comorbid chronic conditions are differentially affected by poverty status.

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Poverty negatively affects the development and well-being of children and adolescents in a variety of ways. Poor children are often exposed to violence, environmental toxins, and inadequate nutrition, among other risk factors.[1] Children in poverty with chronic conditions also are more likely to have higher rates of comorbid disorders and worse outcomes.[2–4] Nevertheless, it is less clear whether the rate of chronic comorbidities among children living in poverty is rising and whether these trends are differentially influenced by poverty status.

These questions are of significance because the overall expenditure in the Supplemental Security Income (SSI) program for children in 2015 was $10.5 billion.[5] Established in the 1970s, the SSI program for children was created to provide income support to families living under or near the federal poverty level (FPL). The program recently experienced controversy due to its large growth, especially among children with mental disorders. This controversy resulted in a Government Accountability Office report[6] and a National Academies of Sciences, Engineering, and Medicine[7] report that recognized the challenges in identifying comorbidities among children receiving SSI benefits.[8] However, no data to our knowledge have been published using national data sets to estimate the prevalence of common chronic health conditions and comorbidities among those in poverty using income data as a potential proxy for SSI recipient status.

In addition, the prevalence rates of asthma, attention-deficit/hyperactivity disorder (ADHD), and autism spectrum disorder (ASD) have significantly increased for more than a decade, mirroring trends in overall chronic health conditions in children and in the SSI program.[6,9–11] Children with chronic diseases, such as these target conditions, are also at higher risk for comorbid chronic medical and psychiatric conditions,[12–15] which are often associated with the substantial rise in their hospital costs.[16–24] Additionally, the well-established relationship between childhood poverty and greater risk for chronic conditions[2,25–29] may place children living in low-income families in double jeopardy of greater need for care and poorer access to care.[30,31] This rise in disease risk is coupled with an overall increase in childhood poverty within this time period.[32]

Although of high public health significance, there is a paucity of information regarding the prevalence trends of comorbid disorders among US children with asthma, ADHD, and ASD and the extent poverty influences their rates of comorbid chronic conditions. To address this knowledge gap, we conducted a data analysis using the 3 waves of the National Survey of Children's Health (NSCH) from 2003 through 2012. For these 3 target conditions, the study objectives were to (1) describe the percent increases in prevalence and comorbidity and how these vary by poverty status, and (2) examine the extent to which poverty status is a predictor of higher than average comorbid conditions.

METHODS

Data Source

The data source was the NSCH, which includes data from the survey administration for the years 2003, 2007, and 2011–2012.[1–3] The NSCH was designed to provide cross-sectional national prevalence estimates of a large number of health indicators for children and uses the State and Local Area Integrated Telephone Survey Program.[33] Although data from each survey administration are generally comparable, important methodological differences in how the questions were asked for children with ASD limited examining trends between the 2007 and 2011–2012 administrations. More specifically, in 2003 parents/guardians were asked to report if a doctor ever told them that their child had autism, whereas in 2007 and 2011-2012, the question allowed for specification of whether the child currently or previously had autism or other ASD. Additionally, cell phone sampling methods were newly employed in 2011–2012. The completion rate was 65.8% in 2003, 66.0% in 2007, and 54.1% for the landline sample and 41.2% for the cell phone sample in 2011–2012.[3] Of the 95 677 completed interviews in 2011–2012, 31 972 were conducted with respondents' cell phones, with no concern of nonresponse bias from cell versus land line.[34,35]

Study Variable Construction

Sociodemographic characteristics of the child were identified by parent report. Child age was classified into 3 groups: (1) 0 to 5 years, (2) 6 to 11 years, and (3) 12 to 17 years; race/ethnicity was categorized as (1) white non-Hispanic, (2) black non-Hispanic, (3) Hispanic, and (4) other.[36] Poverty levels were categorized using FPL standards: (1) < 100 FPL (poor), (2) 100% to 199% FPL (near poor), (3) 200% to 399% FPL, and (4) ≥400% FPL. Insurance coverage categories were private, public, and uninsured.

Children were identified as having asthma, ADHD, or ASD if their primary caregiver reported that their child had ever been diagnosed with the condition. In addition, children were classified as having at least 1 comorbid condition if their primary caregiver reported an additional chronic condition. A chronic condition was defined as any condition identified in the survey by a parent/guardian that lasted or was expected to last >3 months and included a level of impairment or medical need greater than expected for an individual of that age. The

list of comorbid conditions a parent could identify in total included epilepsy/seizure disorder; Tourette syndrome; bone, joint, or muscle problem; and uncorrectable vision; chronic mental health conditions included ADHD, depression or anxiety, behavioral or conduct problems, learning disability, ASD, developmental delay, speech and language problems.

Data Analysis

Survey weights and multiple imputation files provided by the National Center for Health Statistics were used.[37] For each target condition, weighted prevalence was calculated in each survey year by age, sex, race/ethnicity, poverty status, and insurance coverage. Least squares means estimate were used for test of trend across the survey years, and χ^2 tests were used for within group differences. For each target condition, the rates of comorbid conditions were compared for children living above and below 200% of the FPL. Using the 2011–2012 sample, multivariate regression analysis was conducted to identify associations of greater than the average number of comorbidities with each target condition. This study was deemed exempt by the University of Pittsburgh Institutional Review Board.

RESULTS

National Prevalence Trends by Poverty Status

Within this study's time period, there was a rise in parent-reported lifetime prevalence of all 3 target disorders (Fig 1). The lifetime prevalence of asthma rose 18%, from 12.5% in 2003 to 14.6% in 2011–2012. For ADHD, the lifetime prevalence increased by 44%, from 6.9% in 2003 to 9.9% in 2011–2012, and for ASD the percent rise was almost 400%, from a prevalence of 0.5% in 2003 to 2.3% in 2011–2012 (Supplemental Tables 4–6).

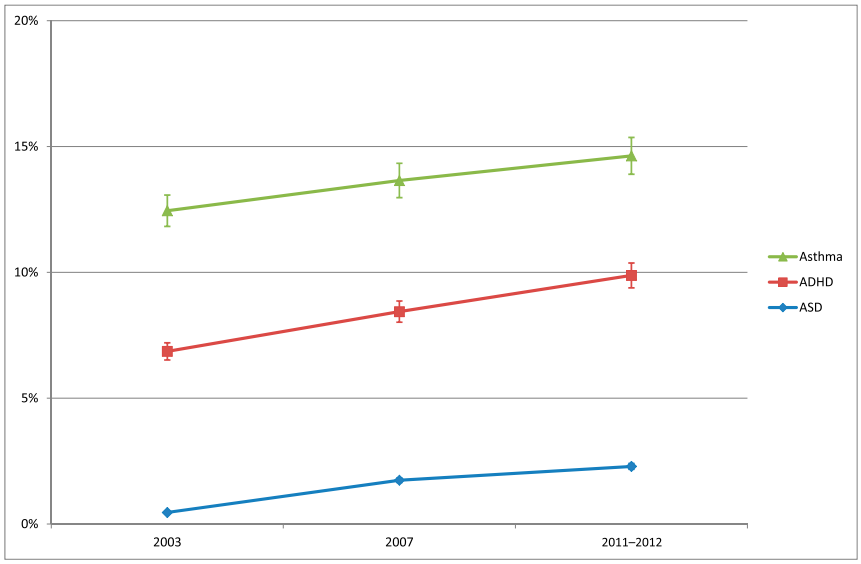

FIGURE 1
Percent change in asthma, ADHD, and ASD among US children aged 0 to 17 years between 2003 and 2011–2012.

In addition, the increases in lifetime prevalence of these disorders were differentially influenced by poverty status (Fig 2). The rise in lifetime prevalence of asthma was most prominent among poor children (FPL <100%) at 25.8% and for uninsured children at 57.9% (Table 1). For ADHD, the increase in lifetime prevalence was prominent among all groups compared with the highest income group (<100% FPL: 43.20%; 100% to 199% FPL: 52.38%; 200% to 399% FPL: 43.67%) and the uninsured (42.7%). For these disorders, the rise in lifetime prevalence also varied by sociodemographic characteristics, with 2 exceptions (asthma: ages 0–5 years, other race/ethnicity). In contrast, increases in the lifetime prevalence of ASD were more prominent among the groups with more financial resources (200% to 399% FPL: 43.6%; ≥400% FPL: 36.0%) and those with private insurance (50.0%). The rise was also significantly greater among adolescents, boys, and white non-Hispanics.

National Prevalence Trends of Comorbid Conditions by Poverty Status

The rise in the extent of parent-reported comorbid conditions for these target conditions also was differentially influenced by poverty status (Table 2). For children identified as having asthma and poor or near poor, the percent increase in 1 parent-reported comorbid condition was 23%, and 27.8% for ≥2 comorbid conditions. On average, children with asthma had 1 parent-reported comorbid condition in 2011–2012, and among very poor or poor children, the most common comorbid conditions were learning disability (21%), ADHD (20.3%), and speech and language impairments (15%) (Supplemental Table 7).

For children identified as having ADHD, the rise in parent-reported ≥2 comorbid conditions significantly increased for poor (32.4%) and near poor children (48.7%), with the percent increase 1.5 times higher among the near poor children. On average, children with ADHD in 2011–2012 had 2.2 reported comorbid conditions, and among the very poor and poor children, the

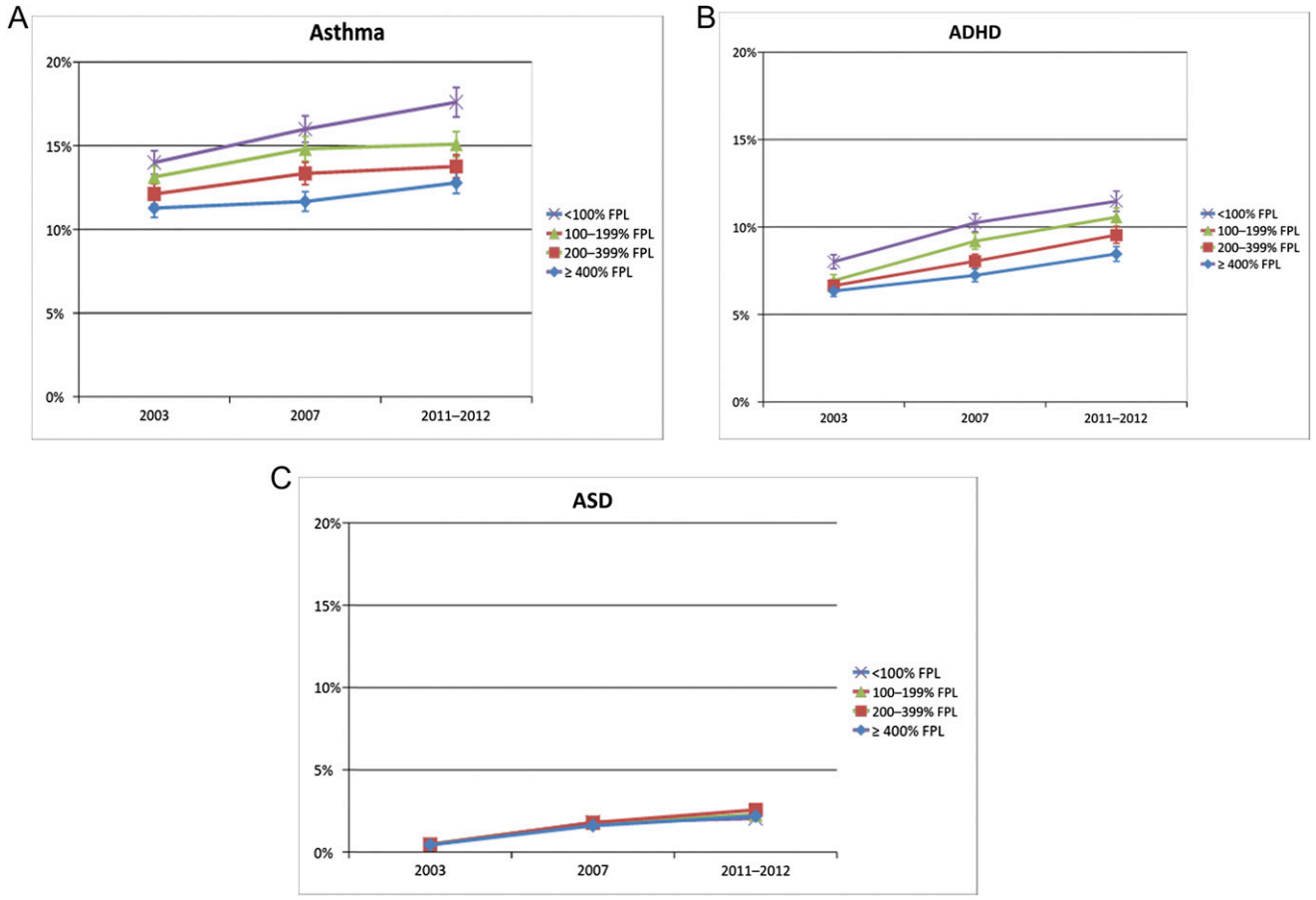

FIGURE 2
Percent change in asthma, ADHD, and ASD by poverty status aged 0 to 17 years between 2003 and 2011–2012.

most common comorbid conditions were learning disability (51%), behavioral or conduct problems (38%), and depression or anxiety (37%) (Supplemental Table 8).

The majority of the children with ASD had ≥2 comorbid conditions reported by parents consistently across the 3 time periods as reported. On average, children with ASD in 2011–2012 had 4 parent-reported comorbid conditions, and for poor or near poor children, the most common comorbid conditions were learning disability (75%), developmental delay (73%), and speech and language problems (69%) (Supplemental Table 9).

Further, the percent increase in type of parent-reported comorbid disorder for each target disorder was differentially influenced by poverty status both positively and negatively (Supplemental Fig 3). Among children identified as having asthma, parent-reported ASD rose 425% among the poor or near poor and 376.6% among those living above 400% FPL (Supplemental Table 7). Among the poor or near poor, ADHD rose 98%, while parent-reported behavior or conduct problems declined 25.8% among the poor or near poor and declined 35.5% among children living above 400% FPL. Among children identified as having ADHD, parent-reported ASD rose 164.7% among the poor or near poor, and 306.2% among those living above 400% FPL (Supplemental Table 8). Among the poor or near poor, parent-reported asthma rose 30.4%, while depression or anxiety rose 23.5% among children living above 400% FPL, and behavior or conduct problems declined by 28.8% among the poor or near poor and 37.7% among those living above 400% FPL. For children identified as having ASD, parent-reported speech and language problems rose 29.9% among poor and near poor children, and 43.5% among children living above 400% FPL (Supplemental Table 9).

Extent Poverty Status Is a Predictor of Higher Than Average Comorbid Conditions

Using 2011–2012 data, children identified as having asthma and being poor had 2 times the odds of having higher than average number of comorbid conditions than their counterparts in households with incomes above 400% FPL (Table 3). In addition, children with asthma who were near poor had 1.5 times the odds of having on average more

TABLE 1 Percent Change in Parent-Reported Lifetime Prevalence of Asthma, ADHD, and ASD Among US Children Aged 0 to 17 Years by Sociodemographic Characteristics

	Asthma		ADHD		ASD	
	% Change 2003 to 2011–2012	*P*	% Change 2003 to 2011–2012	*P*	% Change 2007 to 2011–2012[a]	*P*
Total % change	18	—	44	—	32	—
Age (y)						
0–5 (Reference)	−1.6	.77	117.1	<.001	19.4	.55
6–11	19.8	<.001	34.1	<.001	20.0	.22
12–17	26.6	<.001	46.0	<.001	53.6	.001
Sex						
Boy (Reference)	10.1	.001	39.2	<.001	35.6	.003
Girl	28.3	<.001	55.6	<.001	17.1	.43
Race						
White Non-Hispanic (Reference)	13.9	<.001	46.3	<.001	41.5	<.001
Black Non-Hispanic	27.2	<.001	54.5	<.001	15.5	.73
Hispanic	23.5	.002	95.9	<.001	37.9	.36
Other	7.7	.35	41.7	.002	56.7	.06
Poverty status						
<100% FPL	25.8	<.001	43.2	<.001	13.3	.68
100%–199% FPL	14.9	.008	52.4	<.001	28.1	.22
200%–399% FPL	13.6	.002	43.7	<.001	43.6	.03
≥400% FPL (Reference)	13.4	.002	33.4	<.001	36.0	.06
Insurance coverage						
Private (Reference)	9.4	.002	37.5	<.001	50.0	<.001
Public	14.1	<.001	35.9	<.001	6.6	.81
Uninsured	57.9	<.001	42.7	.04	.0	.99

All results are weighted to provide population estimates. Imputed files were used to address missing values for income.

[a] Change in prevalence restricted to 2007 to 2011–2012 because 2003 survey question was asked differently and cannot be compared.

comorbid conditions. Among children with ADHD, those who were very poor also had almost 2 times the odds of having a higher than average number of comorbid conditions. In contrast, poverty status was not a significant predictor of having parent-reported ASD. Nevertheless, across all 3 target conditions, public insurance was a significant predictor of higher than average comorbid conditions. For only asthma, older age and being male were also associated with higher odds of having greater than average number of comorbid conditions.

DISCUSSION

Although poverty is a well-established risk factor for chronic health problems,[2,38] our findings suggest that the national rise in parent-reported prevalence of asthma, ADHD, and ASD as well as comorbid disorders is differentially influenced by poverty status. In addition, being poor was predictive of higher than average comorbid conditions for children with asthma and ADHD, but not ASD, consistent with previous studies.[12,39–41] These findings underscore the importance of increased clinician awareness of higher risk for comorbid conditions when caring for children with asthma and ADHD who are living in impoverished households.

In contrast, parent-reported ASD and comorbidity were not associated with poverty. Past research has postulated that greater parent awareness, better detection, less stigma, change in diagnostic classification, more financial resources, and private insurance may help explain our findings.[39,40] Our data reinforce the importance of clinicians to remain steadfast in their evaluation of all children with ASD because comorbidities are exceedingly common in all income groups.[15,41,42]

In addition, the substantial proportion of comorbid conditions among children with these target disorders is consistent with the clinical characteristics of these disorders. For all target disorders, comorbid learning disabilities and speech and language disorders were common, consistent with prior studies.[43–47] For children with asthma and ADHD, both also shared relatively high rates of comorbidity across these target disorders.[4] For children with ADHD, the proportion of children with depression or anxiety or conduct problems is also consistent with previous clinical research.[48–51] Nevertheless, the percent change in parent-reported comorbid conditions during this study's time period was mixed and varied by type of comorbid condition and poverty status. Future research examining national trends should consider examining the interaction effects of poverty status with specific comorbid conditions and types of comorbid condition combinations to further refine identification of child target populations that

are particularly vulnerable to the influence of poverty.

Past studies indicate that comorbidities can influence a child's overall health and functioning in daily life, and children with complex health conditions have higher rates of unmet need than other children with special health care needs.[52,53] They also have higher rates of emotional and behavioral problems and mental health disorders than other children.[54,55] Unmet needs are higher for children with special health care needs living in or near poverty compared with those living 400% above the FPL,[53] and significant sociodemographic disparities exist.[56,57] Minority children have poorer access to care and have increased odds of suboptimal health.[58] This may explain why minority children have higher odds of having asthma but lower odds of being diagnosed with comorbid conditions. For children with ADHD, higher numbers of comorbidities was associated with poorer functioning, and disparities in the diagnosis of ASD and access to services have been identified.[12,59] Coexisting mental health disorders increased the cost of care for children with ADHD as well.[60] Similarly, the presence of comorbidities is associated with higher health care costs for children with asthma.[61] Further research is needed to examine how child- (ie, sociodemographics), parent- (ie, care burden, distress), and system-level characteristics (ie, access to mental health and special education resources if identified) are related to parent report of these target disorders and comorbidity.

Poverty status also differentially affected the type of comorbid condition reported by the parent, and the direction of these findings was mixed. These data are thus also important in evaluating support programs for children with disabilities, including the SSI program, because comorbidities are often not accurately recorded and may be an important facet of a child's function.[8] Of note, our findings are similar to those citing high rates of comorbidities among children with mental health disorders, including ADHD and ASD, in the Medicaid population identified by the National Academies of Sciences, Engineering, and Medicine's report.[7] In addition, some of the children with these target disorders may have also been receiving SSI for a mental health impairment. Public insurance was a significant predictor of higher than average comorbid disorders for all 3 target disorders, and in most states, SSI eligibility benefits trigger enrollment in Medicaid.

Although we could not discern the causal and temporal nature of the relationship of poverty to chronic medical conditions and comorbidities, it has been well established that having a family member with a disability increases one's likelihood of being poor.[62–65] Potential reasons for this include increased out-of-pocket health care expenses and time of away from work due to caretaking.[66–69] These associations have important implications on health care utilization and cost for children and families in poverty and suggest that many families are struggling financially to care of their children with chronic medical conditions.

The study has several limitations. Utilization of only 3 data points through time, and 2 for ASD over the period of a decade, limits our ability to identify definite trends over time. Other weaknesses include

TABLE 2 Percent Change in Chronic Comorbid Conditions by FPL Among US Children 0 to 17 Years With Asthma, ADHD, and ASD

Chronic Comorbid Conditions	2003	2007	2011–2012	2003 to 2011–2012
	% (SE)	% (SE)	% (SE)	% Change
Asthma				
None				
0%–199% FPL	66.8 (1.2)	59.7 (1.70)	58.2 (1.4)	−12.8**
≥200% FPL	75.0 (0.8)	69.0 (1.42)	67.2 (1.1)	−10.4**
1 comorbidity				
0%–199% FPL	13.9 (0.9)	16.8 (1.22)	17.2 (1.1)	23.0*
200% + FPL	10.4 (0.6)	15.6 (0.90)	18.3 (1.0)	75.1**
≥2 comorbidities				
0%–199% FPL	19.3 (1.0)	23.5 (1.48)	24.6 (1.1)	27.8**
≥200% FPL	14.6 (0.7)	15.4 (1.30)	14.5 (0.7)	−0.3
ADHD				
None				
0%–199% FPL	14.6 (1.3)	4.9 (0.8)	4.7 (0.6)	−67.6**
≥200% FPL	25.6 (1.2)	8.1 (0.9)	6.4 (0.9)	−75.0**
1 comorbidity				
0%–199% FPL	26.5 (1.6)	16.3 (1.8)	17.4 (1.2)	−34.6**
200% + FPL	29.9 (1.2)	22.8 (1.3)	27.5 (1.6)	−8.1
≥2 comorbidities				
0%–199% FPL	58.8 (1.8)	78.8 (1.9)	77.9 (1.3)	32.4**
≥200% FPL	44.4 (1.3)	69.1 (1.5)	66.1 (1.7)	48.7**
ASD[a]				
None				
0%–199% FPL	1.9 (1.2)	4.7 (3.16)	2.4 (0.1)	−48.9
≥200% FPL	2.8 (1.2)	4.5 (0.92)	2.1 (0.6)	−53.3
1 comorbidity				
0%–199% FPL	5.4 (1.9)	8.2 (3.8)	2.5 (0.6)	−69.5
200% + FPL	10.9 (2.3)	11.2 (2.7)	8.2 (1.5)	−26.8
≥2 comorbidities				
0%–199% FPL	92.7 (2.3)	87.1 (4.7)	95.1 (1.2)	9.2
≥200% FPL	86.4 (2.6)	84.3 (2.9)	89.8 (1.6)	6.5

[a] Percent changes restricted to 2007 to 2011–2012; unable to compare 2003 data because question was in a different form.
* $P < .05$; ** $P < .01$.

TABLE 3 Adjusted Odds of Having Higher Than Average Comorbid Conditions in 2011–2012 by Target Condition

	Asthma	ADHD	ASD
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Age (y)			
0–5 (Reference)			
6–11	2.2 (1.63–2.86)**	1.2 (0.70–1.94)	0.5 (0.19–1.29)
12–17	3.0 (2.30–3.92)**	1.1 (0.65–1.79)	0.8 (0.32–2.25)
Sex			
Boy (Reference)			
Girl	0.6 (0.48–0.69)	0.9 (0.72–1.14)	0.9 (0.41–2.11)
Race			
White Non-Hispanic (Reference)			
Black Non-Hispanic	0.5 (0.37–0.62)	0.9 (0.64–1.19)	1.4 (0.52–3.65)
Hispanic	0.4 (0.31–0.53)	1.1 (0.72–1.62)	0.9 (0.36–2.32)
Other	0.8 (0.58–0.99)	1.2 (0.81–1.61)	0.8 (0.39–1.70)
Poverty status			
<100% FPL	2.0 (1.48–2.63)**	1.9 (1.36–2.65)**	1.6 (0.65–3.70)
100%–199% FPL	1.5 (1.17–1.95)**	1.1 (0.80–1.46)	1.8 (0.84–3.75)
200%–399% FPL	1.0 (0.78–1.32)	1.1 (0.77–1.53)	1.7 (0.73–3.73)
≥400% FPL (Reference)			
Insurance coverage			
Private (Reference)			
Public	1.9 (1.53–2.42)**	1.6 (1.22–2.16)**	3.0 (1.64–5.63)**
Uninsured	0.9 (0.55–1.62)	1.0 (0.60–1.71)	0.3 (0.06–1.21)

ORs adjusted for age, sex, race/ethnicity, poverty status, and insurance coverage. CI, confidence interval; OR, odds ratio.
** $P < .01$.

the inability to compare these survey findings to other surveys, given the methodology of survey administration. Additionally, we do not know the impact on our results of adding cell phone methodology in 2011–2012 of the NSCH. However, current data suggest that there was no response bias between years of survey administration with this change.[34,35] The diagnosis of the target conditions and comorbid chronic conditions were based on primary caregiver report; this method has been supported in the literature as reliable.[70–72] Lastly, the list of chronic conditions included on the NSCH that a parent can report is limited and heavily favors mental health conditions, excluding rare conditions such as congenital heart disease and cystic fibrosis, for example, which may underestimate our findings in regard to comorbidity.

CONCLUSIONS

Poverty status differentially influenced parent-reported lifetime prevalence and comorbidities of children with asthma, ADHD, and ASD. For children with asthma or ADHD, poverty is associated with increasing prevalence and more comorbidity. Increases in both prevalence and comorbidities among children with ASD were similar among all income groups.

Understanding the impact of comorbid health conditions is an area for future research to develop best practices for health assessment and management. Attention to comorbidities can result in improved quality of life and optimal disease control.[73,74] Policies that support practitioners, promote medical homes, and support children and families in poverty or near poverty, including strengthening current programs such as SSI, should be considered to adequately address the complex medical needs of these children.

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ABBREVIATIONS

ADHD: attention-deficit/hyperactivity disorder
ASD: autism spectrum disorder
FPL: Federal Poverty Level
NSCH: National Survey of Children's Health
SSI: Supplemental Security Income

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