

Family Employment Disruption and Unmet Health Care Need Among U.S. Children With Current ADHD With and Without Co-occurring Tourette Syndrome

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Research Article

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Abstract

Background: Attention-deficit/hyperactivity disorder (ADHD) and Tourette syndrome frequently co-occur. Although prior national research has compared broad impairment across diagnostic groups, contemporary estimates of family employment disruption and unmet health care need among children who already have current ADHD remain limited. We aimed to estimate the association of parent-reported current co-occurring Tourette syndrome with functional difficulty, family employment disruption, and unmet health care need among US children with current ADHD.

Methods: We pooled seven independent cross-sectional waves of the National Survey of Children's Health (2018–2024) and included children aged 6–17 years with parent-reported current ADHD. Children were classified as having ADHD alone or ADHD with current Tourette syndrome. Primary outcomes were difficulty staying calm or in control, family reduction in work hours because of the child's health, and unmet health care need. Survey-weighted modified Poisson regression with a log link estimated adjusted prevalence ratios (aPRs), controlling for age, sex, race/ethnicity, and survey year. False discovery rate correction was applied across the three primary outcomes. Extended adjustment, analyses across six multiply imputed family-income imputates, and period-stratified analyses evaluated robustness.

Results: The analysis included 28,777 children with current ADHD, of whom 383 also had Tourette syndrome. Weighted prevalence was 60.8% versus 65.9% for difficulty staying calm, 13.1% versus 28.9% for family work-hour reduction, and 8.9% versus 21.8% for unmet health care need in the ADHD-alone and ADHD-plus-Tourette groups, respectively. ADHD with co-occurring Tourette syndrome was associated with family work-hour reduction (aPR, 2.32; 95% CI, 1.71–3.14; false discovery rate $q < 0.001$) and unmet health care need (aPR, 2.44; 95% CI, 1.69–3.53; $q < 0.001$), but not conclusively with difficulty staying calm (aPR, 1.10; 95% CI, 0.95–1.28; $q = 0.201$). Estimates were similar after extended socioeconomic adjustment and family-income multiple-imputation analyses. There was no evidence that associations differed between 2018–2021 and 2022–2024.

Conclusions: In this repeated cross-sectional analysis of US children with current ADHD, parent-reported co-occurring Tourette syndrome was associated with higher prevalence of family employment disruption and unmet health care need. The findings support attention to family support and care coordination; the study design does not establish causality.

Introduction

Attention-deficit/hyperactivity disorder (ADHD) is one of the most common neurodevelopmental conditions in childhood. Recent U.S. estimates indicate that approximately 1 in 9 children aged 3–17 years have ever received an ADHD diagnosis, with most diagnosed children having current ADHD [1]. ADHD is therefore a prominent concern for child and family health services.

Tourette syndrome is characterized by motor and vocal tics and frequently co-occurs with other neurodevelopmental and psychiatric conditions; ADHD is among its most common co-occurring

diagnoses [2]. Contemporary guidance therefore recommends assessment of the child's functional and psychosocial profile rather than tic severity alone [2]. National and clinical research has documented health-care needs, functional impairment, and family burden among children with tic disorders, including comparative analyses across ADHD and Tourette diagnostic groups [2–5].

The joint presence of ADHD and Tourette syndrome may create challenges that are not captured by studying either condition in isolation. A national parent-report study using 2014 data compared impairment across children with ADHD, Tourette syndrome, and both conditions, and found higher mean overall impairment in the comorbid group than in either single-diagnosis group [3]. Earlier national work also documented elevated health-care needs among children with Tourette syndrome [4], and recent NSCH analyses have described its prevalence and comorbidity pattern [6]. Thus, a direct diagnostic comparison exists, but key questions remain regarding contemporary family employment and access-to-care outcomes in children with current ADHD.

Specifically, it remains unclear whether, among U.S. children with current ADHD, parent-reported current co-occurring Tourette syndrome is associated with family reduction in work hours and unmet general health-care need in recent NSCH data. These outcomes are not interchangeable with broader impairment indices: they capture practical family employment consequences and failure to obtain needed care. Restricting the comparator to children with current ADHD focuses the analysis on differences associated with co-occurring Tourette syndrome within an already high-need clinical population.

Using seven annual waves of the nationally representative National Survey of Children's Health (NSCH; 2018–2024), we estimated adjusted prevalence ratios for difficulty staying calm or in control, family reduction in work hours because of the child's health, and unmet health-care need. The study's contribution is a contemporary pooled national estimate within a current-ADHD reference population, with an uncommon comorbid subgroup large enough for reliability assessment and sensitivity analyses. We hypothesized that children with current ADHD and Tourette syndrome would have higher prevalence of each outcome than children with current ADHD alone. Pooling 2018–2024 improved precision while retaining the survey's repeated cross-sectional design.

Methods

Study design and data source

We conducted a secondary analysis of the 2018–2024 enhanced public-use topical files from the NSCH. The NSCH is an annual, address-based household survey funded and directed by the U.S. Health Resources and Services Administration Maternal and Child Health Bureau and conducted by the U.S. Census Bureau. It provides national and state-level estimates of child health, development, family context, and health-service needs [7,8]. Each annual wave is an independent cross-sectional sample; the

pooled file therefore represents repeated cross-sections rather than longitudinal follow-up of the same children.

We used the historically enhanced files for 2018–2020, consistent with federal guidance that revised files should be used when combining or comparing recent NSCH years [7]. Questionnaire content, variable availability, and response coding for all study variables were audited across the seven waves before pooling.

Study population

The eligible population comprised children aged 6–17 years with parent-reported current ADHD. Current ADHD required an affirmative report that a health professional had ever diagnosed ADHD or attention-deficit disorder and that the child currently had the condition. Children were classified as having co-occurring Tourette syndrome when the parent also reported both a professional diagnosis of Tourette syndrome and that the condition was current. The analytic comparison was restricted to two mutually exclusive groups: current ADHD without current Tourette syndrome (ADHD alone) and current ADHD with current Tourette syndrome (ADHD plus Tourette). Children without current ADHD and children with current Tourette syndrome but not current ADHD were excluded from the regression analysis.

Outcomes

Three binary outcomes were assessed. First, difficulty staying calm or in control was defined from the response to the NSCH item on how often the child stays calm and in control when facing a challenge; responses of sometimes or never were classified as difficulty, and always or usually as no difficulty. Second, family employment disruption was defined as an affirmative response that a family member had cut down on work hours because of the child's health or health conditions during the preceding 12 months. Third, unmet health care need was defined as an affirmative response that, during the preceding 12 months, the child needed health care but did not receive it. Recoding was verified against the original variables and annual response distributions before analysis.

Covariates

The primary adjustment set was chosen to control demographic composition and secular variation without overadjusting for potential mediators of family burden. It included child age in years, sex, race/ethnicity (non-Hispanic White, non-Hispanic Black, non-Hispanic other, or Hispanic), and survey year. Extended models additionally included caregiver education (high school or less versus more than high school) and family structure (two-parent, single-parent, or grandparent/other). Family income was evaluated separately because the NSCH provides six multiply imputed federal poverty level (FPL) implicates; income was categorized as below 200% versus at least 200% of the FPL in each implicate.

Statistical analysis

We accounted for the complex sampling design using final child weights, state-by-sampling-stratum combinations, and unique household identifiers nested within survey year. To produce average annual population estimates from the seven pooled waves, each annual final child weight was divided by seven, as recommended for multi-year NSCH analyses [8]. Variances were estimated with Taylor-series linearization.

We first estimated unweighted sample counts and survey-weighted prevalence with 95% confidence intervals (CIs). Reliability was assessed using the unweighted denominator, event count, relative standard error, and CI width. For adjusted comparisons, we used survey-weighted Poisson regression with a log link and robust survey-based variance to estimate prevalence ratios directly [9]. The exponentiated coefficient for ADHD plus Tourette versus ADHD alone is reported as the adjusted prevalence ratio (aPR). Primary models included age, sex, race/ethnicity, and survey year and used complete cases for each outcome. Benjamini–Hochberg false discovery rate (FDR) correction was applied jointly to the three primary exposure coefficients [10].

We conducted three robustness checks. First, extended models added caregiver education and family structure. Second, six income-adjusted models were fit using the six NSCH FPL implicates and combined with Rubin's rules. Third, estimates were repeated for 2018–2021 and 2022–2024, and a group-by-period interaction tested whether associations differed across periods. All tests were two-sided. Analyses were performed in R using the survey framework. Because the analysis used publicly available, de-identified data and involved no direct contact with participants, it did not constitute enrollment of human participants by the study team.

Results

Study population

The pooled analytic sample included 28,777 children aged 6–17 years with current ADHD: 28,394 with ADHD alone and 383 with ADHD plus Tourette syndrome. These samples represented average annual populations of approximately 5,651,665 and 67,389 children, respectively. Children with ADHD plus Tourette syndrome were older on average (weighted mean age, 12.55 vs 12.03 years) and more often male (82.3% vs 66.4%). The racial/ethnic distributions were broadly similar, although the comorbid group was small and estimates for subgroup characteristics should be interpreted descriptively (Table 1).

Weighted outcome prevalence

Difficulty staying calm or in control was common in both groups: 60.8% (95% CI, 59.6%–61.9%) among children with ADHD alone and 65.9% (95% CI, 56.3%–75.5%) among children with ADHD plus Tourette syndrome. Family reduction in work hours was reported for 13.1% (95% CI, 12.3%–13.9%) and 28.9%

(95% CI, 20.3%–37.5%), respectively. Unmet health care need was reported for 8.9% (95% CI, 8.2%–9.6%) and 21.8% (95% CI, 13.5%–30.1%), respectively (Table 2). All three pooled comorbid-group estimates had relative standard errors below 20%; the family-employment and unmet-care estimates nevertheless had relatively wide CIs, reflecting the small subgroup.

Adjusted associations

After adjustment for age, sex, race/ethnicity, and survey year, co-occurring Tourette syndrome was associated with more than twice the prevalence of family reduction in work hours (aPR, 2.32; 95% CI, 1.71–3.14; FDR $q < 0.001$) and unmet health care need (aPR, 2.44; 95% CI, 1.69–3.53; $q < 0.001$). The adjusted association with difficulty staying calm or in control was smaller and not statistically conclusive (aPR, 1.10; 95% CI, 0.95–1.28; $q = 0.201$) (Table 3). The primary complete-case sample sizes ranged from 28,422 to 28,671; between 378 and 380 children with ADHD plus Tourette syndrome contributed to each model.

Sensitivity and period analyses

Results were materially unchanged after adding caregiver education and family structure: aPRs were 1.11 (95% CI, 0.95–1.29) for difficulty staying calm, 2.36 (95% CI, 1.71–3.26) for family work-hour reduction, and 2.40 (95% CI, 1.63–3.53) for unmet health care need. Income-adjusted estimates pooled across the six FPL implicates were similarly stable: 1.10 (95% CI, 0.95–1.28), 2.33 (95% CI, 1.69–3.21), and 2.35 (95% CI, 1.61–3.44), respectively (Table S1).

For family work-hour reduction, the aPR was 2.24 (95% CI, 1.40–3.60) in 2018–2021 and 2.40 (95% CI, 1.64–3.53) in 2022–2024; the group-by-period interaction was not significant ($P = 0.831$). For unmet health care need, corresponding aPRs were 2.00 (95% CI, 1.11–3.61) and 2.96 (95% CI, 1.83–4.77), with no evidence of interaction ($P = 0.292$). Difficulty staying calm had aPRs of 1.00 (95% CI, 0.77–1.29) and 1.22 (95% CI, 1.07–1.39), respectively, but the interaction was not significant ($P = 0.201$); therefore, the apparent recent-period difference should not be interpreted as evidence of temporal change (Table S2).

Discussion

In this nationally representative pooled analysis of US children with current ADHD, parent-reported co-occurring Tourette syndrome was associated with higher prevalence of family employment disruption and unmet health care need. After demographic and survey-year adjustment, the prevalence of family work-hour reduction and unmet health care need was more than twice as high in the ADHD-plus-Tourette group as in the ADHD-alone group. By contrast, the difference in difficulty staying calm or in control was modest and statistically inconclusive. The pattern was stable across extended socioeconomic adjustment, income multiple-imputation analyses, and early versus recent survey periods.

The comparator is central to the interpretation. Prior studies have shown that children with Tourette syndrome experience substantial comorbidity, functional impairment, and health-service need [2–5]. Comparisons with children without neurodevelopmental conditions, however, mix the burden of Tourette syndrome with the burden of common co-occurring conditions such as ADHD. By restricting both groups to children with current ADHD, our analysis estimates the additional population-level burden associated with co-occurring Tourette syndrome within an already high-need clinical population. This design strengthens the relevance of the results for ADHD services, where tic symptoms and Tourette syndrome may be encountered but not always integrated into care planning.

The strongest association concerned family employment. A requirement to reduce work hours is a concrete indicator of time burden and potential economic strain. Families managing both ADHD and Tourette syndrome may face more appointments, fragmented specialty care, school meetings, medication monitoring, behavioral interventions, and episodes of symptom exacerbation. These pathways are plausible but were not directly measured in the NSCH, so they should be tested rather than assumed. Nonetheless, the persistence of the association after adjustment for caregiver education, family structure, and income suggests that measured socioeconomic composition alone does not explain the observed difference.

The elevated prevalence of unmet health care needs is also clinically consequential. Children with ADHD plus Tourette syndrome may require coordinated access to pediatric, behavioral-health, neurologic, educational, and family-support services. Existing work has documented specialty-care needs and barriers among young people with tic disorders [4, 5]. Within children already identified as having ADHD, the observed association with co-occurring Tourette syndrome is consistent with greater difficulty obtaining needed care. The findings support care models that screen for unmet needs and navigation barriers when ADHD and Tourette syndrome co-occur.

The null primary result for difficulty staying calm is informative. Emotional and behavioral regulation problems were highly prevalent in both groups, leaving less room for an incremental difference associated with Tourette syndrome. The broad NSCH item is not a clinical measure of irritability, emotional dysregulation, tic suppressibility, or ADHD symptom severity. Accordingly, this result should not be interpreted as evidence that Tourette syndrome has no behavioral impact; it indicates only that the pooled data did not establish an additional difference on this specific parent-reported item after adjustment. The recent-period estimate was elevated, but the period interaction was not significant and does not support a claim of changing association over time.

Several practical implications follow. First, clinicians treating ADHD should ask about motor and vocal tics and determine whether families are navigating multiple care systems. Second, assessment should include family work disruption and unmet service needs, not only symptom counts. Third, care coordination and flexible service delivery—such as integrated visits, telehealth when appropriate, school-clinic communication, and family navigation support—may reduce logistical burden. These implications are hypothesis-generating because the present study did not test interventions.

Strengths and limitations

Strengths include the use of seven harmonized, nationally representative survey waves; a clinically relevant ADHD-only comparator; explicit incorporation of the complex sampling design; direct estimation of prevalence ratios; correction for multiple primary outcomes; reliability checks; and concordant estimates across socioeconomic and period sensitivity analyses. Pooling increased the comorbid sample from 26–81 children per annual wave to 383 overall, improving precision without presenting the data as longitudinal follow-up.

The study also has important limitations. Diagnoses and outcomes were parent reported and were not verified through clinical assessment or medical records. Tourette syndrome was rare, and although pooled estimates met the study's reliability criteria, CIs remained wide for family-employment and unmet-care outcomes. The NSCH did not provide the tic severity, ADHD symptom severity, treatment intensity, service configuration, or detailed barriers needed to explain mechanisms. Residual confounding by other co-occurring psychiatric, developmental, and medical conditions is likely. Some covariates and outcomes may influence one another bidirectionally; thus, extended models are robustness checks rather than causal models. Nonresponse and coverage error may remain despite weighting. Finally, the repeated cross-sectional design establishes association, not temporal order or causation.

Conclusions

Among U.S. children with current ADHD, co-occurring Tourette syndrome was associated with markedly higher prevalence of family work-hour reduction and unmet health care needs, whereas the difference in difficulty staying calm or in control was not statistically conclusive. These findings identify a subgroup for whom integrated clinical management, family-centered care coordination, and systematic assessment of access barriers may be especially important. Longitudinal and clinically characterized studies are needed to determine the pathways driving family employment disruption and unmet care and to test whether coordinated services reduce these burdens.

Abbreviations

ADHD, attention-deficit/hyperactivity disorder; aPR, adjusted prevalence ratio; CI, confidence interval; FDR, false discovery rate; FPL, federal poverty level; NSCH, National Survey of Children's Health; RSE, relative standard error.

Declarations

Ethics approval and consent to participate

This study used publicly available, de-identified data from the National Survey of Children's Health and involved no direct contact with human participants. Ethics approval and informed consent were not required because this study was a secondary analysis of publicly available, de-identified data.

Clinical trial number: not applicable.

Consent for publication

Not applicable. No identifiable individual-level data or images are reported.

Availability of data and materials

The National Survey of Children's Health data analyzed in this study are publicly available from the Health Resources and Services Administration Maternal and Child Health Bureau and the U.S. Census Bureau through their official NSCH data portals. The analysis used only de-identified public-use files.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

YY conceived and designed the study, curated the data, performed the statistical analyses, interpreted the results, and drafted the manuscript. XS contributed to the literature review, interpretation of the findings, and critical revision of the manuscript. GZ supervised the study, contributed to methodological

and clinical interpretation, and critically revised the manuscript. YY, XS, and GZ approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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Tables

Table 1. Characteristics of children with current ADHD, NSCH 2018–2024

Characteristic	Category	ADHD alone n (%)	ADHD + Tourette n (%)
Study group	All	28,394; 5,651,665 weighted	383; 67,389 weighted
Age, years	Weighted mean (SE)	12.03 (0.04)	12.55 (0.26)
Sex	Male	18,598 (66.4)	307 (82.3)
	Female	9,796 (33.6)	76 (17.7)
Race/ethnicity	Non-Hispanic White	20,554 (57.1)	290 (59.4)
	Non-Hispanic Black	1,835 (14.4)	20 (11.1)
	Non-Hispanic other	2,786 (8.7)	30 (9.5)
	Hispanic	3,219 (19.8)	43 (20.0)
Caregiver education	More than high school	23,535 (71.7)	326 (79.1)
	High school or less	4,859 (28.3)	57 (20.9)
Family structure	Two-parent family	18,777 (60.8)	252 (65.5)
	Single-parent family	7,018 (28.2)	91 (21.2)
	Grandparent or other	1,985 (8.4)	30 (11.7)
	Missing	614 (2.7)	10 (1.6)
Survey year	2018	2,576 (12.7)	26 (6.5)
	2019	2,609 (12.3)	35 (15.8)
	2020	3,706 (13.2)	37 (10.0)
	2021	3,950 (14.1)	61 (21.0)
	2022	4,744 (15.4)	81 (13.7)
	2023	4,857 (15.3)	62 (16.8)
	2024	5,952 (17.0)	81 (16.1)

Note. Percentages and mean age are survey weighted. Weighted counts are average annual population estimates obtained using annual final child weights divided by seven. Percentages may not sum to 100 because of rounding.

Table 2. Weighted prevalence and reliability of primary outcomes

Outcome	Group	Valid n	Events	Weighted % (95% CI)	RSE, %
Difficulty staying calm	ADHD alone	28,056	16,959	60.8 (59.6–61.9)	—
	ADHD + Tourette	378	269	65.9 (56.3–75.5)	7.4
Family reduced work hours	ADHD alone	28,043	3,482	13.1 (12.3–13.9)	—
	ADHD + Tourette	379	94	28.9 (20.3–37.5)	15.1
Unmet health care need	ADHD alone	28,291	2,416	8.9 (8.2–9.6)	—
	ADHD + Tourette	380	65	21.8 (13.5–30.1)	19.4

Note. CI, confidence interval; RSE, relative standard error. RSE values shown for the smaller ADHD-plus-Tourette subgroup. No pooled subgroup estimate exceeded the 20% RSE threshold applied in this study.

Table 3. Primary adjusted prevalence ratios for ADHD plus Tourette syndrome versus ADHD alone

Outcome	Complete-case n	Comorbid n / events	aPR (95% CI)	P value	FDR q value
Difficulty staying calm	28,434	378 / 269	1.10 (0.95–1.28)	0.201	0.201
Family reduced work hours	28,422	379 / 94	2.32 (1.71–3.14)	7.61×10^{-8}	2.28×10^{-7}
Unmet health care need	28,671	380 / 65	2.44 (1.69–3.53)	2.24×10^{-6}	3.36×10^{-6}

Note. aPR, adjusted prevalence ratio; CI, confidence interval; FDR, false discovery rate. Survey-weighted modified Poisson models adjusted for child age, sex, race/ethnicity, and survey year. Reference: ADHD alone.

Supplementary Files

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- [TableS1ANDs2.docx](#)