

School Outcomes of Children With Special Health Care Needs

AUTHORS: Christopher B. Forrest, MD, PhD,^{a,b} Katherine B. Bevans, PhD,^{a,b} Anne W. Riley, PhD,^c Richard Crespo, PhD,^d and Thomas A. Louis, PhD^e

^aThe Children's Hospital of Philadelphia, Philadelphia, Pennsylvania; ^bDepartment of Pediatrics, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania; ^cDepartment of Population and Family Health Sciences and ^dDepartment of Biostatistics, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland; and ^eDepartment of Family and Community Medicine, Marshall University School of Medicine, Huntington, West Virginia

KEY WORDS

children with special health care needs, student engagement, academic achievement, bullying, school performance, middle childhood, adolescence, school outcomes

ABBREVIATIONS

SHCN—special health care need

CSHCN—Children With Special Health Care Needs

www.pediatrics.org/cgi/doi/10.1542/peds.2010-3347

doi:10.1542/peds.2010-3347

Accepted for publication Apr 14, 2011

Address correspondence to Christopher B. Forrest, MD, PhD, Professor, Children's Hospital of Philadelphia, 34th St and Civic Center Blvd, Philadelphia, PA 19104. E-mail: forrestc@email.chop.edu

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

Copyright © 2011 by the American Academy of Pediatrics

FINANCIAL DISCLOSURE: *The authors have indicated that they have no personal financial relationships relevant to this article to disclose.*



WHAT'S KNOWN ON THIS SUBJECT: Using a noncategorical approach to identifying children with special health care needs, previous research has shown that these individuals are at increased risk for poor health and high health care resource use.



WHAT THIS STUDY ADDS: Children who screen positive for a special health care need because of functional limitations or behavioral health problems are at risk for low student engagement, disruptive behaviors, poor grades, and below-average performance on standardized achievement tests.

abstract

FREE

OBJECTIVE: To examine the associations between having a special health care need and school outcomes measured as attendance, student engagement, behavioral threats to achievement, and academic achievement.

PARTICIPANTS AND METHODS: A total of 1457 children in the fourth through sixth grades from 34 schools in 3 school districts and their parents provided survey data; parents completed the Children With Special Health Care Needs Screener. School records were abstracted for attendance, grades, and standardized achievement test scores.

RESULTS: Across 34 schools, 33% of children screened positive for special health care needs. After adjusting for sociodemographic and school effects, children with special health care needs had lower motivation to do well in school, more disruptive behaviors, and more frequent experiences as a bully victim. They experienced significantly lower academic achievement, as measured by grades, standardized testing, and parental-assessed academic performance. These findings were observed for children who qualified as having a special health care need because they had functional limitations attributed to a chronic illness or a behavioral health problem but not for those who qualified only because they took prescription medications.

CONCLUSIONS: Specific subgroups of children with special health care needs are at increased risk for poor school outcomes. Health and school professionals will need to collaborate to identify these children early, intervene with appropriate medical and educational services, and monitor long-term outcomes. *Pediatrics* 2011;128:303–312

There is little dispute among education¹ and health care^{2,3} leaders that the health of children and their school performance are dynamically intertwined. Common wisdom holds that good health is a prerequisite for optimal learning, and successful students experience better health. Health may directly affect children's cognitive and socioemotional learning capabilities, their engagement in the learning process, and their desire to learn.⁴

However, the pathways linking child health with academic performance are not well established. Research has found weak effects between chronic disease and lower reading and math achievement among children aged 5 to 9 years.⁵ Asthma⁶⁻⁹ and obesity^{10,11} seem not to be associated with academic performance. On the other hand, children with attention deficit/hyperactivity disorder perform more poorly on standardized testing and receive lower grades than those without attention deficit/hyperactivity disorder.^{12,13}

Because there are thousands of different pediatric chronic conditions, most of which are rare diseases, it is unlikely that there will ever be enough research to characterize the links between specific long-term disorders and children's school outcomes. An alternate approach uses a noncategorical method for identifying a child as having a special health care need (SHCN). These children include those with long-term physical, emotional, behavioral, and developmental disorders that require prescription medications and medical or educational services or affect a child's functional status.¹⁴ Data from the 2003 National Survey of Children's Health indicates that 20% of children aged 6 to 17 years have an SHCN.¹⁵ Although much is known about the medical care service needs and use of children with SHCNs, there is scant information on their school outcomes.

Conventional school outcomes include attendance, grades, and standardized achievement test scores. However, the quality of a child's school experience depends on far more than test scores and grades. Schools address children's need for mastery, competence, control, and belongingness, which contribute to academic engagement and learning motivation.¹⁶ Engaged and motivated students are interested in learning and experience a sense of security and belongingness in school. They are more likely to exhibit achievement-oriented behaviors (ie, effort, attention, participation) and less likely to behave in ways that compromise their school success (ie, aggression, rule breaking).¹⁷⁻¹⁹

Children with SHCNs can face significant barriers to obtaining high-quality school experiences. They may have learning challenges or behaviors that are difficult for teachers and peers to understand. They often require substantial medical, instructional, and behavioral support and may have individualized education programs.²⁰⁻²² If these needs are unmet, children with long-term disorders may feel that they lack the capacity to control their scholastic performance, lose interest in academic work, perceive schoolwork as having little immediate or long-term value, and feel socially isolated within the school community.¹⁶ Over time, these conditions coalesce with many other challenges associated with having a chronic disorder, thereby increasing the risk for skills deficits and student disengagement.²³

This article presents results from Project Healthy Pathways on the association between having an SHCN and school outcomes among fourth-through sixth-grade students in 3 school districts. The goal of Project Healthy Pathways is to elucidate the effects of child health on school outcomes as children enter adolescence

and transition from elementary to middle school. We conceptualized school outcomes as comprising attendance, engagement in schoolwork, behavioral threats to achievement, and academic achievement.

PARTICIPANTS AND METHODS

Setting and Subject Recruitment

The study took place in 2 school districts located on the Eastern Shore of Maryland (Dorchester and Caroline Counties) and 1 school district in the southern portion of West Virginia (Wayne County). School districts were rural, with a high proportion of low-income families. The 3 districts included a total of 34 schools, 10 of which were middle schools, 23 elementary schools, and 1 kindergarten-through-eighth-grade school.

Study procedures were approved by the school districts and the institutional review boards of the Children's Hospital of Philadelphia, the Johns Hopkins Bloomberg School of Public Health, and Marshall University. Consent forms were distributed to the parents of students in regular fourth-, fifth-, and sixth-grade classrooms. Although children in self-contained special-education classrooms were excluded, those within an individualized education program in a regular classroom were potentially included in the sample. Special-education categories were unknown because, in accordance with the Family Education Rights and Privacy Act, parental consent permitted access to students' cumulative files but not to separately maintained special-education records. Nonresponders to the initial consent distribution received a duplicate form and a follow-up telephone call. The parents of 74% of eligible students provided consent to participate (Dorchester County: 74%; Caroline County: 76%; and Wayne County: 71%).

TABLE 1 Data Collection Methodology and Study Variables by Data Source and School District

School District	Data Source		
	Student Survey	Parent Survey	School Record Review
Dorchester, MD	Fourth and fifth grade: Interviewer read questions to a class and students recorded responses on paper forms Sixth grade: Self-administered questionnaire completed at school	Self-administered questionnaire completed at home	Manual review of school records
Caroline, MD	Audio computer-assisted self-interview completed at school	Self-administered questionnaire completed at home	Electronic query of school's student database
Wayne, WV	Audio computer-assisted self-interview completed at school	Self-administered questionnaire completed at home	Electronic query of school's student database
Variables and Measures			
CSHCN screener		X	
Chronic conditions		X	
Grade	X		X
Gender	X	X	
School district			X
Race		X	
Maternal education		X	
Attendance			X
Student engagement, effort	X		
Student engagement, interest	X		
Student engagement, security	X		
Student engagement, attention	X		
Student engagement, motivation	X		
Disruptive behaviors	X		
Bullying	X		
Bully victim	X		
Standardized achievement test scores			X
Grade-point average			X
Parent-assessed academic performance		X	

Data Collection

Table 1 summarizes the data-collection methodology and study variables by data source and school district. Students in 25 of 34 participating schools (2 school districts) completed a Web-based, audio, computer-assisted, self-administered interview. In each of the remaining 9 schools, the school system's computer network security was unable to support Web-based data collection; therefore, children in the fourth and fifth grades completed a paper-and-pencil questionnaire as a survey administrator read the questions aloud, whereas sixth-grade students completed a self-administered paper-and-pencil questionnaire. Psychometric evaluation of the Healthy Pathways Child Report items and scales using the same study sample revealed no differential item functioning by administration modality.²⁴ There were no differences in achievement and atten-

dance data completeness across the 3 school districts.

On completion of their survey, students delivered questionnaire packets to their parents or guardians. The packets contained a cover letter, signed by the school district superintendent and the principal investigator; the questionnaire itself; and a stamped return envelope. Parents who did not return their questionnaires were sent a postcard reminder. After 6 weeks, local school staff contacted nonrespondents and sent duplicate questionnaires as needed. Parents were mailed a \$10 gift card once their questionnaire was received.

Measures

Children With Special Health Care Needs

Parents were administered the Children With Special Health Care Needs

(CSHCN) Screener, a noncategorical measure of long-term health problems that require health services or cause functional limitations.^{25,26} The results of the CSHCN Screener are positive if the child has a condition lasting at least 12 months and the parent reports that the child has any 1 of the following qualifying indicators: (1) needs or uses more medical care, mental health, or educational services than is usual for most children of the same age; (2) currently needs or uses medicine prescribed by a doctor, other than vitamins; (3) is limited in his or her ability to do the things most children of the same age can do; (4) needs or gets special therapy, such as physical, occupational, or speech therapy; or (5) has any kind of emotional, developmental, or behavioral problem for which he or she needs treatment or counseling.

Using the CSHCN Screener, we developed 4 variables: (1) the presence of

an SHCN (yes or no), which assessed whether a child screened positive to at least 1 of 5 qualifying indicators; (2) the number of SHCN-qualifying indicators a child screened positive to (range: 0–5), which has been associated with increasing medical costs, poorer health status, and greater use of services²⁷; (3) the specific qualifying indicators a child screened positive to (5 separate yes or no variables); and (4) a newly developed measure we termed “SHCN profile types.” The SHCN profile types group children into 5 mutually exclusive categories: (1) functional limitations alone or with any other qualifying indicators; (2) prescription medications only; (3) emotional, developmental, or behavioral problems (any combination except co-occurrence with functional limitations); (4) other; and (5) a “none” category.

We collected information from all parents on whether their child had been diagnosed by a physician to have attention deficit/hyperactivity disorder, learning disabilities, speech problems, an emotional or behavioral problem, and asthma. The results for these condition-specific variables were positive only if parents indicated that their child had problems in the past 12 months with the condition. Using height and weight data obtained from parental report, we calculated the BMI of each child and dichotomized children into obese (≥ 95 th BMI percentile) and nonobese categories.

Attendance

We summed the number of unexcused and excused absences to measure attendance.

Student Engagement

We conceptualized student engagement as comprising behavioral and affective-cognitive indicators of the investments that children make in school at both classroom and school

levels.^{28–30} Our measurement of student engagement included behaviors (level of effort applied to schoolwork and attention) and affective-cognitive responses (interest in schoolwork, physical and emotional security, and motivation to succeed in school) that have been previously identified as engagement outcomes.^{28,29,31}

Behavioral Threats to Achievement

Using items from previously developed Healthy Pathways instruments,²⁴ we obtained information from children on their reports of engaging in disruptive behaviors at school, school bullying, and experiences of being bullied at school. For sixth-grade children only, we asked if they carried a weapon to school.

Academic Achievement

Children’s standardized test scores in language arts and math were averaged and transformed to a county-grade-specific mean of 100 with an SD of 20. Quarterly grades were coded on a 4-point scale (4 = A, 3 = B, 2 = C, 1 = D, and 0 = F) and averaged for language arts and math. The average of these 2 scores was a child’s grade-point average. Parent-assessed academic performance was obtained from a previously developed and validated 6-item scale (range for the item-level mean: 1–5).²⁹ The content of the scale included performance in math, reading, homework, and school work and remembering what was learned.²⁴

Data Analysis

The primary hypothesis we tested in this article is that both the presence and type of SHCN affect school outcomes for children in fourth through sixth grade. Thus, all hypothesis-testing analyses were conducted for the presence of an SHCN and the 5-category SHCN profile types.

Bivariate associations for proportions were estimated using the χ^2 statistic.

Analysis of variance was used to compare mean values on the school outcomes between SHCN profile types. We used a conservative α value of 0.01 to address the possibility of finding a significant result by chance alone because of multiple comparisons.

Multivariable regression using the generalized estimating equation to adjust SE estimates for clustering of students within schools was conducted for each of the school outcomes. The presence of SHCNs and SHCN profile types were used as independent variables in separate regressions. Analyses controlled for the effects of grade, gender, school, race, maternal educational attainment, and annual family income. We present only those school outcomes significantly associated ($P < .01$) with either of the SHCN-independent variables.

RESULTS

Of 2124 children whose parents consented to their participation, 98.5% ($n = 2091$) completed the student questionnaire, 71.9% of the parents completed their questionnaire ($n = 1527$), and school records were abstracted for 96.0% ($n = 2040$). There were 1457 children (68.6% of total) with all 3 data sources; this group served as the study sample. There were no significant differences in sociodemographics between the children whose parents completed the parent questionnaire and those who did not.

Table 2 shows the proportions of the total sample ($n = 1457$) by sociodemographic characteristics and SHCN variables. Overall, 33.3% had an SHCN, approximately one-half of whom (16.1% of all children) were positive on a single SHCN-qualifying indicator.

There were no significant differences in the presence of an SHCN or the SHCN profile types distribution by grade, school district, race, maternal educa-

TABLE 2 Children in Fourth Through Sixth Grade by Sociodemographics and SHCN Variables

	Total Sample, %, <i>n</i> = 1457
Grade	
Fourth	34.2
Fifth	33.5
Sixth	32.3
Gender	
Male	49.0
Female	51.0
School district, %	
Dorchester County, MD	28.2
Caroline County, MD	38.9
Wayne County, WV	32.9
Race, %	
White	77.5
Nonwhite	22.5
Maternal educational attainment, %	
Did not graduate college	36.2
Graduated college	63.8
Annual family income, %	
<\$20 000	19.1
\$20 000 to \$39 999	24.6
\$40 000 to \$79 999	38.5
≥\$80 000	17.7
Presence of an SHCN	33.3
Type of SHCN-qualifying indicator ^b	
Use of prescription medications	27.3
Above-average use of medical, mental health, or educational services	13.3 ^a
Functional limitations	6.6
Use of physical, occupational, or speech therapy	2.9
Use of emotional, behavioral, or developmental treatment or counseling services	13.3 ^a
Number of SHCN-qualifying indicators	
0 qualifying indicator	66.7
1 qualifying indicator	16.1
2 qualifying indicators	7.4
3 qualifying indicators	6.8
4 qualifying indicators	2.5
5 qualifying indicators	0.4
CSHCN profile types	
None	66.7
Functional limitation (alone or in combination with others)	6.6
Prescription medications only	12.8
Emotional, developmental, or behavioral services (any combination except co-occurrence with functional limitations)	10.6
Other	3.4
Chronic conditions ^b	
Attention deficit/hyperactivity disorder	11.9
Learning disability	6.7
Speech problem	2.7
Asthma	11.3
Obesity	24.9

^a Although these 2 proportions are the same, the groups comprising them are different.

^b Categories are not mutually exclusive.

tional attainment, or obesity (Table 3). Boys were twice as likely to have an SHCN as girls. Children in families with annual incomes of <\$20 000 were significantly more likely than those with incomes of \$80 000 or more to have an SHCN and 4 times as likely to have an emotional or behavioral SHCN.

In bivariate analyses, the presence of an SHCN was associated with more days absent, poorer student engagement, more behavioral threats to achievement, and lower academic achievement (Table 4). Children with the functional limitation CSHCN profile type missed 4 more school days per

year than counterparts without an SHCN. Individuals in the emotional and behavioral services CSHCN profile type experienced a greater diversity of poor school outcomes than other children with an SHCN. Obesity was not significantly associated with any of the school outcomes, whereas only attendance was associated with asthma (11.6 days missed for children with asthma versus 8.8 days missed for others; $P < .001$).

In multivariable analyses, there were no statistically significant differences associated with the presence of SHCNs or SHCN profile types in attendance, doing extra schoolwork, feeling excited by schoolwork, interest in schoolwork, getting in trouble at school, breaking a rule at school, destroying something at school, or telling someone that you would hurt them by presence of SHCNs or SHCN profile types. The functional limitations and emotional and behavioral services CSHCN profile types had the largest number of associations and the biggest effect sizes in multivariable regression analyses, whereas children in the medication-only profile type had similar outcomes to those without an SHCN (Table 5).

DISCUSSION

Children in the fourth through sixth grades (aged 9–11 years) who screened positive for an SHCN because of functional limitations attributed to chronic illness or behavioral health problems are at increased risk for less student engagement, more exposure to bullying, more disruptive behaviors that threaten social competence, and lower academic achievement. These problems threaten both their well-being as youth and their future flourishing as adults. It is important to note that children who qualified only because they take prescription medications generally had similar school outcomes as those without an SHCN, as

TABLE 3 CSHCNs in Fourth Through Sixth Grade by Sociodemographics and Disorders^a

Characteristic	Presence of an SHCN, %	SHCN Profile Types, %				
		None	Medication Only	Functional Limitation, Any Combination	Emotional or Behavioral Services	Other
Grade						
Fourth	33.4	66.6	12.9	6.7	10.2	3.6
Fifth	34.0	66.0	12.4	6.2	12.4	3.0
Sixth	32.4	67.6	12.9	6.8	9.2	3.5
Gender						
Male	41.0	59.0	15.6	7.0	13.6	4.8
Female	25.9 ^b	74.1	10.0 ^b	6.1	7.8 ^b	2.0 ^b
School district, %						
Dorchester County, MD	32.2	67.8	12.5	6.7	10.5	2.6
Caroline County, MD	33.3	66.7	12.0	6.1	10.9	4.4
Wayne County, WV	34.1	65.9	13.9	7.0	10.5	2.8
Race, %						
White	34.0	66.0	13.9	6.3	10.5	3.4
Nonwhite	31.1	68.9	8.5	7.8	11.5	3.3
Maternal educational attainment, %						
Did not graduate college	33.9	66.1	10.3	7.7	13.5	2.4
Graduated college	33.1	66.9	14.6	5.8	8.8	3.9
Annual family income, %						
<\$20 000	42.3	57.7	10.9	8.3	20.4	2.6
\$20 000 to \$39 999	37.7	62.3	14.8	10.4	8.6	3.9
\$40 000 to \$79 999	28.5	71.5	11.7	4.6	9.5	2.7
≥\$80 000	28.2^b	71.8	14.1	3.9^b	5.5^b	4.7
Physician-diagnosed disorders expected to last longer than 12 months						
Attention deficit/hyperactivity disorder	91.6^b	8.4	21.7^b	15.7^b	47.0^b	7.2^b
Learning disability	80.0^b	20.0	11.1^c	30.0^b	31.1^b	7.8^b
Speech problem	63.2^b	36.8	7.9	26.3^b	18.4^c	10.5^b
Asthma	76.7^b	23.3	32.7^b	22.0^b	12.0^b	10.1^b
Obesity	35.8	64.2	14.3	7.2	10.9	3.4

^a Significance testing was done using the χ^2 statistic. For the CSHCN profile type analyses, the "none" category was the reference group. Statistically significant associations at ^b $P < .001$ and ^c $P < .01$ are shown in bold.

did children with obesity and asthma. Thus, long-term disorders do not necessarily affect school performance. Our findings suggest that functional limitations attributed to chronic disease and behavioral health problems comprise the key SHCN subgroups that are at risk for poor school outcomes. This article extends the literature on the effects of chronic disease on school outcomes by using a noncategorical definition of SHCNs that is based on impact rather than diagnosis.^{15,25,26} The advantages of the noncategorical approach are its simplicity and practicality, enabling screening to be done in virtually any setting, such as the primary medical home and even schools, while obviating the need for parents to recall specific diagnostic labels.

In the 34 schools in this study, 33% of fourth- through sixth-grade students screened positive for an SHCN. Other studies that have used noncategorical SHCN-screening approaches estimated between 15% and 36%^{26,32–34} of school-aged children with an SHCN, variation that is partially a result of the methodology used to characterize the presence of an SHCN.¹⁵ Another reason that our estimate is on the high end of this range is that the study sample included a large share of low-income families, who, in this and other research,¹⁵ have children with an increased risk of SHCNs. Similar research conducted with more socioeconomically diverse or urban school districts may find different point estimates for the presence of an SHCN and could find different associations

between having an SHCN and school outcomes.

The replication of study findings across 3 school districts, the large sample size, multiple data sources, and breadth of the statistical associations strengthen our conclusion that CSHCNs are at increased risk for poor school outcomes. Although the CSHCN Screener identifies children with limitations in their functional status, it does not measure variability in the impact of long-term conditions on symptoms and functioning. It is possible that there are thresholds of symptom burden and functional impact that heighten the risk for poor school outcomes. One approach to testing this hypothesis and potentially finding these cut points would be to combine the CSHCN Screener

TABLE 4 Bivariate Associations Between SHCNs and School Outcomes

School Outcome	Presence of SHCN		SHCN Profile Types				
	No	Yes	None	Medication Only	Functional Limitation, Any Combination	Emotional or Behavioral Services	Other
Attendance							
Days absent during school year	8.5	10.5^a	8.5	8.8	12.4^a	11.5^b	9.9
Student engagement effort							
Does extra schoolwork (1 = never; 5 = always)	2.6	2.6	2.6	2.5	2.6	2.5	2.6
Tries to do best at school (1 = never; 5 = always)	4.6	4.5^b	4.6	4.7	4.4	4.4^a	4.4
Prepared for class (1 = never; 5 = always)	4.3	4.2	4.3	4.4	4.1	4.1	4.1
Interest							
Excited by work in school (1 = never; 5 = always)	2.9	2.9	2.9	2.9	2.8	3.0	2.8
Interested in work at school (1 = never; 5 = always)	3.2	3.1	3.2	3.1	3.0	3.1	3.0
Look forward to school (1 = never; 5 = always)	3.3	3.1	3.3	3.0	3.0	3.2	3.1
Felt bored in school (1 = never; 5 = always)	3.3	3.5	3.3	3.3	3.6	3.7^b	3.4
Security							
Feel physically safe in school (1 = never; 5 = always)	4.2	4.0^b	4.2	4.1	3.9	4.0	4.1
Feel emotionally safe in school (1 = never; 5 = always)	3.9	3.8	3.9	4.0	3.7	3.8	3.6
Attention							
Trouble paying attention (1 never–5 always)	2.4	2.6^a	2.4	2.3	2.9^b	2.9^a	2.6
Motivation							
Getting good grades matters (1 = not at all; 5 = extremely)	4.7	4.5^a	4.7	4.6	4.5	4.4^a	4.5
Behavioral threats to achievement							
Disruptive behaviors							
Got in trouble at school (1 = never; 5 = past week)	2.9	3.0	2.9	2.8	3.0	3.4^b	2.8
Broke a rule at school (1 = never; 5 = past week)	2.5	2.6	2.5	2.4	2.7	2.8	2.8
Destroyed something belonging to someone else at school (1 = never; 5 = past week)	1.4	1.3	1.4	1.3	1.3	1.4	1.5
Lied or cheated at school (1 = never; 5 = past week)	1.6	1.7	1.6	1.5	1.6	1.9^b	1.9
Carried a weapon such as a gun, razor, or big knife, for protection at school (1 = never; 5 = past week), sixth graders only	1.0	1.1	1.0	1.2	1.0	1.2	1.1
Bullying							
Picked on other kids at school (1 = never; 5 = past week)	1.8	1.7	1.8	1.6	1.7	1.8	1.9
Told someone at school you would hurt them (1 = never; 5 = past week)	1.6	1.7	1.6	1.6	1.5	1.9	1.7
Physically attacked someone at school (1 = never; 5 = past week)	1.4	1.6	1.4	1.4	1.6	1.8^a	1.4
Bullying victim							
Afraid of other girls and boys (1 = never; 5 = always)	1.5	1.7	1.5	1.6	1.7	1.8	1.7
Other girls and boys made fun of you (1 = never; 5 = always)	2.0	2.3^b	2.0	2.0	2.3	2.6^a	2.2
Other girls and boys bullied you (1 = never; 5 = always)	1.5	1.7^b	1.5	1.5	2.0^a	1.9^a	1.5
Academic achievement							
Grade point average, verbal and math combined (range: 0–4)	3.1	2.9^a	3.1	3.1	3.0	2.5^a	2.7^b
Standardized achievement test, verbal and math combined (mean: 100, SD: 20)	103.9	98.7^a	103.9	105.0	95.7^a	93.9^a	96.0
Parental-assessed achievement scale (1 = low; 5 = high)	3.9	3.5^a	3.9	3.9	3.4^a	3.0^a	3.4^b

Significance testing was done using analysis of variance and the Tukey-Kramer test for multiple comparisons. Statistically significant associations at ^a $P < .001$ and ^b $P < .01$ are shown in bold.

with measures of children's self-reported health.²⁴ Because this research used a cross-sectional study design, we are unable to rule out reverse causation: children with poor school outcomes may be more likely to be labeled as having an SHCN. Future longitudinal research in Project Healthy Pathways will inform directionality of the associations between health and school outcomes.

This work has important implications for the interactions between health and educational professionals when it comes to promoting children's health and learning. One approach for addressing the health and learning needs of the large number of children with emotional and behavioral problems is creating a continuum of mental health care in the school, while linking families, primary medical homes, com-

munities, and schools.^{34,35} This involves implementing, for example, a universal prevention initiative, such as antibullying programs^{36,37}; establishing in-school mental health counseling; and creating a referral system with community services for students who have needs that cannot be met in school. School services are augmented by collaboration with community mental health, primary care physicians, and

TABLE 5 Regression-Adjusted Effects of SHCNs on School Outcomes^a

	School Outcome			SHCN Profile Types				
	Presence of SHCNs		None	Medication Only	Functional Limitation, Any Combination	Emotional or Behavioral Services	Other	
	No	Yes						
Student engagement								
Effort								
Tries to do best at school (1 = never; 5 = always)	Reference	-0.11 (.002)	Reference	0.06 (.010)	-0.16 (.249)	-0.25 (<.001)	-0.25 (<.001)	-0.25 (<.001)
Prepared for class (1 = never; 5 = always)	Reference	-0.08 (.019)	Reference	0.05 (.003)	-0.22 (.098)	-0.12 (<.001)	-0.12 (<.001)	-0.15 (.315)
Interest								
Look forward to school (1 = never; 5 = always)	Reference	-0.13 (.087)	Reference	-0.18 (.001)	-0.28 (.003)	-0.01 (.903)	-0.01 (.903)	-0.05 (.709)
Felt bored in school (1 = never; 5 = always)	Reference	0.09 (.017)	Reference	-0.11 (.201)	0.25 (<.001)	0.25 (<.001)	0.25 (<.001)	0.00 (.982)
Security								
Feel physically safe in school (1 = not at all; 5 = extremely)	Reference	-0.14 (.127)	Reference	-0.06 (.592)	-0.26 (.029)	-0.19 (.010)	-0.19 (.010)	-0.05 (.766)
Feel emotionally safe in school (1 = not at all; 5 = extremely)	Reference	-0.05 (.273)	Reference	0.09 (.013)	-0.18 (.116)	-0.10 (.002)	-0.10 (.002)	-0.23 (<.001)
Attention								
Trouble paying attention (1 = never; 5 = always)	Reference	0.17 (.013)	Reference	-0.17 (.119)	0.42 (<.001)	0.45 (<.001)	0.45 (<.001)	0.23 (.218)
Motivation								
Getting good grades matters (1 = not at all; 5 = extremely)	Reference	-0.17 (<.001)	Reference	-0.08 (.304)	-0.20 (.007)	-0.25 (.012)	-0.25 (.012)	-0.17 (<.001)
Behavioral threats to achievement								
Disruptive behaviors								
Lied or cheated at school (1 = never; 5 = past week)	Reference	0.09 (.009)	Reference	-0.07 (.188)	-0.01 (.915)	0.31 (<.001)	0.31 (<.001)	0.16 (.028)
Carried a weapon such as a gun, razor, or big knife, for protection at school (1 = never; 5 = past week), sixth graders only	Reference	0.11 (<.001)	Reference	0.03 (.277)	-0.04 (.120)	0.18 (<.001)	0.18 (<.001)	0.11 (.054)
Bullying								
Picked on other kids at school (1 = never; 5 = past week)	Reference	-0.08 (.284)	Reference	-0.132 (.359)	-0.147 (<.001)	0.01 (.863)	0.01 (.863)	-0.05 (.787)
Physically attacked someone at school (1 = never; 5 = past week)	Reference	0.07 (.053)	Reference	-0.04 (.118)	0.09 (.500)	0.23 (<.001)	0.23 (<.001)	-0.08 (.496)
Bullying victim								
Afraid of other girls and boys (1 = never; 5 = always)	Reference	0.18 (<.001)	Reference	0.08 (<.001)	0.21 (.127)	0.29 (<.001)	0.29 (<.001)	0.22 (.006)
Other girls and boys made fun of you (1 = never; 5 = always)	Reference	0.23 (<.001)	Reference	0.02 (.661)	0.27 (.005)	0.52 (<.001)	0.52 (<.001)	0.14 (.567)
Other girls and boys bullied you (1 = never; 5 = always)	Reference	0.21 (<.001)	Reference	0.02 (.831)	0.44 (<.001)	0.37 (<.001)	0.37 (<.001)	0.02 (.850)
Academic achievement								
Grade-point average, verbal and math combined (range: 0–4)	Reference	-0.19 (<.001)	Reference	0.00 (.962)	-0.05 (.788)	-0.48 (<.001)	-0.48 (<.001)	-0.41 (<.001)
Standardized achievement test, verbal and math combined (mean: 100, SD: 20)	Reference	-3.73 (<.001)	Reference	1.07 (.152)	-5.72 (<.001)	-7.35 (<.001)	-7.35 (<.001)	-7.77 (<.001)
Parental-assessed achievement scale (1 = low; 5 = high)	Reference	-0.56 (<.001)	Reference	-0.02 (.858)	-0.39 (.012)	-0.72 (<.001)	-0.72 (<.001)	-0.48 (<.001)

^a Multivariable regression adjustment was conducted using the generalized estimating equation to account for clustering of students within schools. Values in the cells are β -coefficients and represent the change in the outcome associated with the independent variable; P values are presented in parentheses below the cell values. Only those outcomes that showed significant effects ($P < .01$) in multivariable analyses are shown in the table. Controlling variables included grade, gender, school, race, maternal education, and family income.

parent organizations with the goal of providing a full continuum of services for all children. Unfortunately, there are few examples of such comprehensive, coordinated, and linked school-community initiatives.

CONCLUSIONS

Effective health care and educational practice require that children at risk for poor school outcomes be identified early to enable prevention and treatment.^{35–37} The current study suggests that the identification of SHCNs, particularly those that manifest themselves as functional limitations or behavioral health problems, should be an essential component of the early intervention process. The identification of children at risk for academic failure requires the coordination of services provided by educators and health professionals. Once identified, schools must provide appropriate educational accommodations and support to en-

sure that children with SHCNs meet their full potential in learning and scholastic achievement. These services may be provided in a special-education context if children qualify for such services. In addition to specific academic interventions, schools should provide abundant opportunities for children with an SHCN to develop confidence in their ability to learn and succeed in school, choose educational experiences that they value, and develop positive interpersonal relationships at school.¹⁶ The logical roles for the primary medical home are early identification of at-risk children, ensuring that chronic conditions and behavioral health problems are managed effectively, and monitoring of long-term outcomes including both health status and school outcomes.⁴¹ Health and school professionals will need to work together to identify these children much earlier, ensure that they

receive appropriate supports and services, and monitor the effectiveness of services on children's health and school outcomes.

ACKNOWLEDGMENTS

This study was supported by a grant from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (R01HD048850).

Dr Christina Bethell, an Associate Professor in the Department of Pediatrics, School of Medicine at Oregon Health Sciences University, assisted in the analysis of data from the children with special health care needs screener. Anna Brousell of the Children's Hospital of Philadelphia helped with manuscript preparation. We are grateful for the invaluable support and collaboration of our school district colleagues in Caroline County, MD; Dorchester County, MD; and Wayne County, WV. These education and health leaders made this study possible.

REFERENCES

- Dunkle M, Nash MA. *Beyond the Health Room*. Washington, DC: Council of Chief State School Officers, Resource Center on Educational Equity; 1991
- Novello AC, Degraw C, Kleinman DV. Healthy children ready to learn: an essential collaboration between health and education. *Public Health Rep*. 1992;107(1):3–15
- Woodward-Lopez G, Ikeda J, Crawford P. *Improving Children's Academic Performance, Health, and Quality of Life: A Top Policy Commitment in Response to Children's Obesity and Health Crisis in California*. Berkeley, CA: CEWAER (California Elected Women's Association for Education and Research) and University of California, Center for Weight and Health; 2000
- Currie J, Madrian B. Health, health insurance and the labor market. In: Ashenfelter O, Card D, eds. *Handbook of Labor Economics*. Vol 3. Amsterdam, Netherlands: North Holland; 1999, pp 3309–3407
- Corman H, Kaestner R. The effects of child health on marital status and family structure. *Demography*. 1992;29(3):389–408
- Forrest CB, Starfield B, Riley AW, Kang M. The impact of asthma on the health status of adolescents. *Pediatrics*. 1997;99(2). Available at: www.pediatrics.org/cgi/content/full/99/2/E1
- Moonie S, Sterling DA, Figgs LW, Castro M. The relationship between school absence, academic performance, and asthma status. *J Sch Health*. 2008;78(3):140–148
- Silverstein MD, Mair JE, Katusic SK, Wollan PC, O'Connell EJ, Yunginger JW. School attendance and school performance: a population-based study of children with asthma. *J Pediatr*. 2001;139(2):278–283
- Taras H, Potts-Datema W. Childhood asthma and student performance at school. *J Sch Health*. 2005;75(8):296–312
- Cottrell LA, Northrup K, Wittberg R. The extended relationship between child cardiovascular risks and academic performance measures. *Obesity*. 2007;15(12):3170–3177
- Huang TT-K, Goran MI, Spruijt-Metz D. Associations of adiposity with measured and self-reported academic performance in early adolescence. *Obesity (Silver Spring)*. 2006;14(10):1839–1845
- Loe IM, Feldman HM. Academic and educational outcomes of children with ADHD. *J Pediatr Psychol*. 2007;32(6):643–654
- Barbarese WJ, Katusic SK, Colligan RC, Weaver AL, Jacobsen SJ. Long-term school outcomes for children with attention-deficit/hyperactivity disorder: a population-based perspective. *J Dev Behav Pediatr*. 2007;28(4):265–273
- McPherson M, Arango P, Fox H, et al. A new definition of children with special health care needs. *Pediatrics*. 1998;102(1 pt 1):137–140
- Bethell CD, Read D, Blumberg SJ, Newacheck PW. What is the prevalence of children with special health care needs? Toward an understanding of variations in findings and methods across three national surveys. *Matern Child Health J*. 2008;12(1):1–14
- National Research Council, Institute of Medicine. *Engaging Schools: Fostering High School Students' Motivation to Learn. Committee on Increasing High School Students' Engagement and Motivation to Learn. Board on Children, Youth, and Families, Division of Behavioral and Social Sciences and Education*. Washington, DC: The National Academies Press; 2004
- Connell JP, Wellborn JG, Gunnar MR, Stroufe A. Competence, autonomy, and relatedness: a motivational analysis of self-system processes. In:

- Gunnar, M. R.; Sroufe, L. A. *Self-Process in Development: Minnesota Symposium on Child Psychology*. Hillsdale, NJ: Erlbaum; 1991, pp 43–77
18. Finn JD. Withdrawing from school. *Rev Educ Res*. 1989;1:117–142
 19. Johnson MK, Crosnoe R, Elder G. Students' attachment and academic engagement: the role of race and ethnicity. *Sociol Educ*. 2001; 74(4):318–340
 20. Savage RC, Pearson S, McDonald H, Potoczny-Gray A, Marchese N. After hospital: working with schools and families to support the long term needs of children with brain injuries. *NeuroRehabilitation*. 2001; 16(1):49–58
 21. King A, Herron S, McKinstry R, et al. A multi-disciplinary health care team's efforts to improve educational attainment in children with sickle-cell anemia and cerebral infarcts. *J Sch Health*. 2006;76(1):33–37
 22. Cartwright JD. Provision of educationally related services for children and adolescents with chronic diseases and disabling conditions. *Pediatrics*. 2007;119(6):1218–1223
 23. Power TJ, Phelps L. Collaborative practices for managing children's chronic health needs In: Phelps, L. *Chronic Health-Related Disorders in Children: Collaborative Medical and Psychoeducational Interventions*. Washington, DC: American Psychological Association; 2006, pp 7–26
 24. Bevans KB, Riley AW, Forrest CB. Development of the Healthy Pathways Child-Report Scales. *Qual Life Res*. 2010;19(8):1195–1214
 25. Bethell CD, Read D, Neff J, et al. Comparison of the children with special health care needs screener to the questionnaire for identifying children with chronic conditions: revised. *Ambul Pediatr*. 2002; 2(1):49–57
 26. Bethell CD, Read D, Stein REK, Blumberg SJ, Wells N, Newacheck PW. Identifying children with special health care needs: development and evaluation of a short screening instrument. *Ambul Pediatr*. 2002;2(1):38–48
 27. Bramlett MD, Read D, Bethell C, Blumberg SJ. Differentiating subgroups of children with special health care needs by health status and complexity of health care needs. *Matern Child Health J*. 2009;13(2):151–163
 28. Fredricks JA, Blumenfeld PC, Paris AH. School engagement: potential of the concept, state of the evidence. *Rev Educ Res*. 2004;74(1):59–109
 29. Jimerson SR, Campos E, Greif JL. Toward an understanding of definitions and measures of school engagement and related terms. *Calif Sch Psych*. 2003;8:7–27
 30. Perdue NH, Manzeske DP, Estell DB. Early predictors of school engagement: exploring the role of peer relationships. *Psychol School*. 2009;46(10):1084–1097
 31. Zyngier D. (Re)conceptualizing student engagement: doing education not doing time. *Teach Teach Educ*. 2008;24(7):1765–1776
 32. Kuhlthau KA, Beal AC, Ferris TG, Perrin JM. Comparing a diagnosis list with a survey method to identify children with chronic conditions in an urban health center. *Ambul Pediatr*. 2002;2(1):58–62
 33. Stein RE, Westbrook LE, Bauman LJ. The questionnaire for identifying children with chronic conditions: a measure based on a noncategorical approach. *Pediatrics*. 1997; 99(4):513–521
 34. Szilagyi PG, Shenkman E, Brach C, et al. Children with special health care needs enrolled in the State Children's Health Insurance Program (CHIP): patient characteristics and health care needs. *Pediatrics*. 2003;112(6 pt 2). Available at: www.pediatrics.org/cgi/content/full/112/6pt2/e50835
 35. Albers CA, Glover TA, Kratochwill TR. Introduction to the special issue: how can universal screening enhance educational and mental health outcomes? *J Sch Psychol*. 2007;45(2):113–116
 36. Kratochwill TR, Albers CA, Shernoff E. School-based interventions. *Child Adolesc Psychiatr Clin N Am*. 2004;13(4):885–903
 37. Walker HM, Shinn MR, Walker HR, Stoner G. Structuring school-based interventions to achieve integrated primary, secondary, and tertiary prevention goals for safe and effective schools In: Shinn, M. R.; Walker, H. M.; Stoner, G. *Interventions for Academic and Behavior Problems II: Preventative and Remedial Approaches*. Bethesda, MD: NASP; 2002, pp 1–25

School Outcomes of Children With Special Health Care Needs

Christopher B. Forrest, Katherine B. Bevans, Anne W. Riley, Richard Crespo and
Thomas A. Louis

Pediatrics; originally published online July 25, 2011;

DOI: 10.1542/peds.2010-3347

Updated Information & Services

including high resolution figures, can be found at:
</content/early/2011/07/21/peds.2010-3347>

Citations

This article has been cited by 3 HighWire-hosted articles:
</content/early/2011/07/21/peds.2010-3347#related-urls>

Permissions & Licensing

Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:
</site/misc/Permissions.xhtml>

Reprints

Information about ordering reprints can be found online:
</site/misc/reprints.xhtml>

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2011 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

School Outcomes of Children With Special Health Care Needs

Christopher B. Forrest, Katherine B. Bevans, Anne W. Riley, Richard Crespo and
Thomas A. Louis

Pediatrics; originally published online July 25, 2011;
DOI: 10.1542/peds.2010-3347

The online version of this article, along with updated information and services, is
located on the World Wide Web at:
[/content/early/2011/07/21/peds.2010-3347](http://content.early/2011/07/21/peds.2010-3347)

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2011 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

