



Research Brief

Chronic Health Conditions and Academic Achievement

Introduction

This brief describes the relationship between certain chronic health conditions and academic achievement, based on a review of the scientific literature. These include seizure disorders/epilepsy, asthma, diabetes, poor oral health conditions, and food allergies. These are examples of chronic health conditions that are commonly observed among school-aged youth, possibly affect academic achievement, or use significant resources when addressed at school. Academic achievement refers to academic performance, educational behaviors, and cognitive skills. This brief also makes recommendations for future research.

Students and Chronic Health Conditions

About 25% of children in the United States aged 2 to 8 years have a chronic health condition such as asthma, obesity, other physical conditions, and behavior/learning problems.¹ Although it is difficult to estimate and there is not one single source of information for chronic conditions in school aged children, various studies state that for children aged less than 18 years, about 16% have poor oral health, 7% to 10% have asthma, 4% have food allergies, 0.7% have seizure disorders, and 0.3% have diabetes (Table 1). Students with chronic health conditions may face lower academic achievement, increased disability, fewer job opportunities and limited community interactions as they enter adulthood.² Because these youth spend a significant amount of their time in schools, it is important to understand the relationship between chronic health conditions and academic achievement. Previous reports show that students who are able to manage their chronic health conditions tend to have better academic outcomes.³

Studies show that some students with chronic health conditions have lower academic achievement than students who do not have such conditions, although this relationship varies by condition and can be influenced by additional factors. In this brief, “academic achievement” refers to academic performance, education-related behavior, and cognitive skills. “Academic performance” refers to class grades, grade point average (GPA), standardized test scores, and graduation rates. “Education-related behavior” includes attendance, dropout rate, and behavior problems. “Cognitive skills” include students’ concentration, language ability, and short-term and long-term memory.

Sources for Information in This Brief

We searched PubMed and Medline for peer-reviewed research on academic achievement and chronic health conditions. This brief summarizes studies published from 1990 through 2014 that focused on school-aged youth (i.e., grades K–12, age 5–19 years), included at least one of the five chronic health conditions (seizure disorders/

epilepsy, asthma, diabetes, poor oral health, and food allergies), and included at least one measure of academic achievement. The following types of study designs were included: experimental studies, if they tested impact or outcomes related to academic performance; and analytic and correlational studies, if they examined the relationship between academic performance and chronic health conditions. Of 3,798 abstracts, 111 articles met initial screening criteria. After detailed review, 54 articles met criteria for this research brief. The following sections report current knowledge about the associations between these five chronic health conditions and academic achievement.

What the Research Shows

Most of the studies (47 of the 54) focused on asthma or seizure disorders/epilepsy, and their relationship to academic achievement (Table 2). Seven studies covered more than one condition or chronic health conditions in general. Many studies noted that students with chronic health conditions miss more school (absenteeism) than students who do not have such conditions. Absenteeism, in turn, is associated with lower academic achievement.

Epilepsy/Seizure Disorders

Epilepsy/seizure disorders were the focus of 24 studies. Of these, 20 reported significant associations, usually negative, with academic measures such as cognitive ability, scores on intelligence tests, and school performance. Measures of students' performance and cognitive ability came from reports by teachers or parents and from tests administered to students. The following sections highlight results from the studies.

Cognitive Skills

Most studies found that children and teens with epilepsy also had impaired cognitive function.⁴⁻⁷ Childhood absence epilepsy (one type of seizure disorder) affects the development of brain regions associated with behavior, cognition, and language, which could partly explain below-average scores among these children.⁸ Other types of epilepsy were also implicated—children with complex partial seizures had significant impairment in six cognitive areas: nonverbal memory, language, academic achievement, problem solving, motor skills, and mental efficiency.⁷ Epilepsy was also associated with lower adaptive functioning and IQ and with neurobehavioral problems.^{5,9}

One study reported that parents noted that children with epilepsy had more language disorders and were “slower learners” than their brothers or sisters.⁴

For some children with epilepsy/seizure disorders, medications to control seizures can affect academic achievement. According to Moreland et al., a significant percentage of side effects attributed to one epilepsy drug affected the central nervous system, causing behavior problems and decreased cognition.¹⁰ Over half of the children in the study had one or more of these side effects, any of which could affect learning at a critical age.

Academic Performance

The majority of studies reported that epilepsy/seizure disorders were associated with poorer academic performance.^{7,11-17} In individual studies, different percentages of children with epilepsy had poor academic achievement. Among a group of children with recent-onset epilepsy, 25% scored below average on the teachers' rating of performance, although the majority had average academic achievement.¹⁶ Another study found that half of a sample of children with epilepsy had learning disabilities.¹⁴

Children with epilepsy had lower scores on measures of language and reading than matched controls.^{11,12,17} However, one study found no relationship between severity or duration of seizure disorder or total exposure to anti-seizure medications and achievement.¹⁷ Caplan et al. found that the ability to use language to form and organize thoughts were impaired in children with epilepsy, and these problems were, in turn, associated with lower academic achievement.¹²

Some studies, in contrast, reported no association between epilepsy and academic achievement, especially if symptoms were controlled.^{15,18,19} A longitudinal study found that children with epilepsy and normal cognitive development when the study began also had normal achievement 2 years later, unless they had also been diagnosed with attention deficit hyperactivity disorder.⁹

Variations in Academic Achievement by Age

There is some evidence that students in middle and high school with epilepsy are more likely to have lower academic achievement than younger children, although study results are mixed.¹⁷ One study found that children and teens with epilepsy had lower scores on measures of language and reading than matched controls.¹³ Linguistic impairment was higher in the teen group, which might suggest that language-related deficits increased over time. Another study found that children with seizures were more likely than their siblings to have a decline in their processing speed over 3 years.²⁰ However, a longitudinal study over 6 years found no changes in math ability, attention, or psychomotor speed among children with epilepsy.²¹

Younger age at first seizure was associated with lower achievement in some children.^{7,14} However, another study found that although a group of children with epilepsy had lower-than-normal mean scores in language and visual-spatial skills, their age when they had a first seizure was not associated with their scores.¹¹

Additional Factors

Intellectual disabilities may occur in 15% - 50% of children with epilepsy and can contribute to poorer achievement, but other abilities can compensate for these deficits.⁵ Higher scores on adaptive functioning, such as communication and socialization, were associated with better reading and spelling scores.^{5,22} Three studies of attention deficits and epilepsy found that children with both conditions had lower cognitive achievement than children with epilepsy alone.^{9,14,23}

Asthma

Asthma is one of the most prevalent chronic health conditions among children and adolescents. Of the five chronic health conditions in this review, asthma was most frequently associated with school days missed. Having asthma alone, however, was not related to academic risk. As reported in the included studies, both asthma education programs and having a full-time school nurse led to improved symptom management and fewer school absences.

Education-Related Behavior

Eight studies reported that having asthma was significantly associated with increased school absences, but the increases averaged only one half-day to one and one-half days per year.²⁴⁻³¹ However, Millard and colleagues found no relationship between attendance and asthma, and another study found that although children with asthma missed more days of school, their academic achievement was similar to that of children without asthma.^{31,32}

School-based asthma education programs reduced absenteeism, emergency department visits, and asthma-related use of community health services by students and parents.³³ Students in the Kickin' Asthma program reported one-half day fewer absences over 3 months.³⁴ Other studies found that academic achievement among children in a structured asthma treatment program generally appeared to be unaffected by asthma.³⁵ The presence of a full-time nurse in the school also reduced asthma-related absences.^{36,37}

Additional Factors

Certain factors increased the risk that asthma was associated with absenteeism. Meng and colleagues concluded that students who attended schools with the highest concentrations of low-income students were more likely to miss school because of asthma than those at schools with a smaller percentage of low-income students.³⁸ Possible explanations include exposure to indoor and outdoor allergens from living in disadvantaged areas with poor building conditions or living near busy roads. Children with asthma from an urban African-American school district had lower standardized test scores and tended to be absent more frequently than other students, but performed the same academically as their peers who did not have asthma.³⁹ National data suggested a modest increase in risk of academic problems among children with asthma compared with other children; among children from lower-income families, children with asthma were twice as likely to fail a grade as children who were well.⁴⁰ Children who lived with an adult smoker also had more absences; children with higher levels of self-esteem had fewer absences because of their asthma.^{24,28}

Diabetes

Three studies focused on diabetes and academic performance and showed that most students with diabetes achieve at least as well as their siblings and classmates in test scores, verbal performance, and academic behavior.

Academic Performance

McCarthy and colleagues noted that for most children, type 1 diabetes was not associated with lower academic performance compared with two control groups.⁴¹ Children who needed intensive therapy for diabetes might have more frequent low blood sugar episodes, which could affect academic performance.⁴¹ However, more research is needed on changes in blood sugar levels for these children and the challenges of controlling blood sugar during school. A later paper concluded that for most children with diabetes, socioeconomic status and behavioral factors had a stronger effect on academic achievement than health status; however, poor control of diabetes was associated with lower reading scores and GPA.⁴²

In an older study, Kovacs and colleagues found that children with type 1 diabetes generally had average scores on verbal and nonverbal intellectual tests.⁴³ In the year before diagnosis, the group's grade-point average was in the "B" range, but after type 1 diabetes onset, children's verbal intellectual performance and grades declined, while nonverbal intellectual measures improved. Both socioeconomic status and sex strongly affected scores.

Poor Oral Health

Three studies addressed the association of oral health and academic performance. All concluded that poor oral health was associated with more school absences and reductions in affected students' overall ability to learn.

Academic Performance

Blumenshine et al. found an increase in parents' reports of poor school performance when they also reported poor oral health.⁴⁴ However, the study did not show that poor oral health alone causes poor school performance. Two other studies found that pain from poor oral health led to school absence and could account for poorer academic performance. Neither study showed a causal relationship, however, and neither accounted for clinical, socioeconomic and cultural challenges.^{45,46}

Researchers stressed the need for further studies, especially those that include factors such as family income and access to dental care, to determine whether oral health alone has an effect on academic achievement.

Food Allergies

No studies met inclusion criteria for this brief, however, research has shown an association between having food allergies and experiencing bullying.^{47,48} Bullying, in turn, can lead to students' feeling less connected to their school and to lower grades.⁴⁹

Conclusion

Some chronic health conditions may compromise students' academic performance. However, many students with chronic health conditions can still achieve at a high level, especially when they have appropriate support at home, at school, and in their communities.

School Attendance

A common finding in many studies was that certain chronic health conditions are strongly linked to student absenteeism,^{24-31,38,45,46} which is associated with lower academic achievement.^{39,50,51} Therefore, absences might have a more direct effect on academic achievement than the health condition itself. It is important to recognize that a child with a chronic health condition may also be absent because of unrelated issues such as socioeconomic or environmental factors. These students' absences can potentially affect all students in schools whose funding is based on average daily attendance by resulting in a possible decrease in much-needed services and resources.

Implications for Monitoring and Early Intervention

Students with chronic health conditions can benefit from monitoring of academic progress and early intervention, if needed, at school. Children with certain health conditions, especially epilepsy, should be screened for problems with cognition, language, and behavior. Schools can also provide appropriate services to help students manage their conditions, especially asthma or diabetes, as well as education about their conditions.

Teacher training should include accurate expectations about the academic potential of children with chronic health conditions. Labels related to health conditions can lead teachers to underestimate a students' potential, which could affect students' self-concept and perceptions of their own academic ability.⁵²

Future Directions

The number of studies that met our inclusion criteria varied for the five conditions. For example, 24 studies examined the links between seizure disorders and academic achievement, while none did so for food allergies. There is a link, however, between absenteeism and several of the chronic health conditions reviewed, such as asthma, which can ultimately diminish academic success. Future studies should use multivariate models to examine chronic health conditions, absenteeism, academic outcomes, and covariates such as socioeconomic status, environmental conditions, age, and sex. Chronic health conditions that have not been widely studied for their potential effect on academic performance, such as diabetes, food allergies, and poor oral health, merit additional study.

Table 1. Estimated Prevalence of Selected Chronic Health Conditions Among U.S. Youth Ages 0 - 18 years*

Chronic health condition	Estimated percentage of U.S. students affected*
Seizure disorders ⁵³⁻⁵⁵	0.7%
Asthma ⁵⁵⁻⁵⁸	7.3%–9.5% of all children 18% of children living in poverty
Diabetes ^{55,59}	0.3% (includes type 1 and type 2 diabetes)
Poor oral health ⁶⁰	15.6% (untreated dental caries [cavities])
Food allergies ⁶¹	4.0%

**Estimates reflect populations from various studies—specific age groups may vary*

Table 2. Chronic Health Conditions and Their Association with Academic Achievement^a among U.S. School-Aged Children and Youth

Outcome variables in academic achievement studies (N = 47)	Total number of studies	Number of studies showing type of relationship between chronic health conditions and academic outcomes ^b		
		Positive	None	Negative
Epilepsy	24	-	-	-
Cognitive function	11	-	-	11
Language development	4	-	-	4
IQ	1	-	-	1
Non-verbal memory	1	-	-	1
Problem-solving	1	-	-	1
Mental efficiency	2	-	-	2
School attendance	24	-	24	-
Academic achievement	11	-	3	8
Asthma	17	-	-	-
School attendance	15	1	2	12
Academic achievement	2	-	1	1
Diabetes	3	-	-	-
School attendance	0	-	-	-
Academic achievement	3	-	3	1
Poor oral health	3	-	-	-
School attendance	3	-	-	3
Academic achievement	3	-	-	3
Food allergies	0	-	-	-
School attendance	0	-	-	-
Academic achievement	0	-	-	-

^a Includes grades, standardized test scores, graduation rates, dropout rates, and behavior problems.

^b Some papers reported outcomes for more than one variable; therefore, numbers in the last three columns may not equal the total number of papers for each of the chronic health conditions.

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