

**Department of Health and Human Services
Division of Public Health
School and Child Health Program**

Exploring the Evidence Base for the Relationship between Health and Learning

PREFACE

This document describes the results of a literature search undertaken for the purpose of identifying existing, credible, scientific evidence for an array of eleven hypotheses concerning the relationship between health and learning.

Each hypothesis gave rise to a formula question, from which key words and phrases were extracted for an electronic search of PubMed and the Cumulative Index of Nursing and Allied Health Literature (CINAHL). Bibliographies and abstracts were reviewed for relevant citations corresponding to the hypotheses which met the search parameters of: English language, published 1998 or later, and contained intervention or comparison data. Articles that were descriptive in nature (only) or literature reviews were not used as primary citations (unless they also included original data), though several particularly comprehensive or useful articles of this nature are included as “worthy mentions”.

The document is presented in two parts. The first, a table, is intended to portray for the reader the initial hypothesis, the search questions, and the eventual evidence-based statement related to the original hypothesis. The table is also intended to give an overview of the volume of material retrieved in the electronic search, followed by the volume of citations “saved” for review, the volume of citations “reviewed” by the author, and the number of citations listed as relevant to the statement. The second portion of the document contains the bibliographies supporting each evidence-based statement.

The evidence search has several limitations, not the least of which is the limited number of qualifying studies and noncomparable outcomes. Many health studies do not contain measures of academic progress of school children; many academic studies do not contain health measures. Other limitations include issues related to children as research subjects; variations and inconsistencies in use of terms; and finally limitations inadvertently set by the search keywords themselves.

The author wishes to gratefully acknowledge the assistance of Teresa Hartman, MLS of the McGoogan Medical Library of the University of Nebraska Medical Center for her invaluable contributions as a reference librarian to the search. Also noteworthy is the use of RefWorks®, an online research management tool. For more information about RefWorks®, please see www.RefWorks.com.

The interpretations and conclusions expressed in this document are entirely the responsibility of the author, Kathy Karsting, RN, MPH. For more information, please contact the author.

Exploring the Evidence Base for the Relationship between Health and Learning

Kathy Karsting RN, MPH

No.	Hypothesis <i>PICO Questions</i> (<i>PICO = Population, Intervention, Comparison, Outcome</i>) <u>EVIDENCE-BASED STATEMENTS</u>	Index	Key Words		Ret.	Sav.	Rev. (total)	Used (total)	Notes on Literature Review
1	<p>Hypothesis #1: School performance improves through the implementation of school health screening and referral services for vision, hearing, and oral health.</p> <p><i>PICO #1:</i> <i>In children and youth aged 5-17 years, what is the effect of school health screening and referral services for vision, hearing, and oral health on learning performance, compared with groups of children where screening services are not performed?</i></p> <p><u>EVIDENCE-BASED STATEMENT #1:</u> <i>Evidence supports mental health screening of adolescents.</i></p> <ul style="list-style-type: none"> • <i>Mental disorders are strongly associated with school drop out.</i> • <i>(Quality) Intervention is effective.</i> • <i>Mental health in adulthood relates to mental health in adolescence.</i> 	PubMed	Educational Status	School Health Performance	124	46	33	10+	<p>Three citations total related to hearing. None vision. One dental</p> <p>7 to PICO 4 chronic illness – 3 ADHD 4 Asthma 7 to PICO 5 SN case mgmt. 1 to PICO 8 CSHP 1 to PICO 9 Staff H Prom Numerous citations related to obesity/BMI moved to Question 4.</p>
		CINAHL	Health Screening	Academic Performance	5	3			<p>Citations used include retrievals using PICOs 1, 4, 10, and 11.</p> <p>Revise PICO: Hearing and vision defects and learning. Dental health and absenteeism. Explore relationship between attendance and achievement.</p>
2	<p>Hypothesis #2: Physical activity stimulates learning.</p> <p><i>PICO #2:</i> <i>In children and youth aged 5-17 years, what is the effect of regular and frequent physical activity at school on measures of learning performance or absenteeism, compared with children and adolescents who do not participate in regular or frequent physical activity.</i></p> <p><u>EVIDENCE-BASED STATEMENT #2:</u> <i>Physical activity stimulates learning.</i></p> <ul style="list-style-type: none"> • <i>Physical fitness is significantly related to school achievement.</i> • <i>Vigorous physical activity boosts performance.</i> • <i>No negative impact of physical education.</i> 	PubMed	Physical Activity OR Physical Education and Training	Academic Performance	32+	32	20	6	
		CINAHL	Physical Activity OR Physical Education and Training	Academic Performance Limits: age groups 6-12 and 13-18 yo.	7	5			
3	<p>Hypothesis #3: Nutrition impacts learning and behavior.</p> <p><i>PICO #3:</i> <i>In children and youth aged 5-17 years, what is the effect of improved nutrition on learning performance or absenteeism, compared with children and youth who do not receive improved nutrition.</i></p> <p><u>EVIDENCE-BASED STATEMENT #3:</u></p>	PubMed	Absenteeism	Nutritional Status OR Nutrition Assessment AND Schools or Students	4	3	38	17	A rich and international evidence base dating back to the 1970's, readily available.
	<u>EVIDENCE-BASED STATEMENT #3:</u>	PubMed	Absenteeism	Child or	16	35			

	<p><i>Nutrition affects learning and behavior.</i></p> <ul style="list-style-type: none"> <i>Breakfast improves attention, memory, test performance, attendance, weight control.</i> <i>Food insufficiency relates to poor behavioral and academic function in low income children</i> <i>Food quality and frequency may relate to positive effects.</i> 			Adolescent Nutritional Physiological Phenomena					
		CINAHL	Nutrition	academic performance	57	13			
4	<p>Hypothesis #4: Obesity, chronic illness, and dental health status are all related to school absenteeism.</p> <p><i>PICO #4:</i> <i>Are children and youth who have chronic illness/poor dental health/obesity at higher risk for absenteeism from school compared to children who do not have chronic illness/poor dental health/obesity?</i></p> <p><u>EVIDENCE-BASED STATEMENT #4:</u> <i>Chronic illness affects attendance and performance.</i></p> <ul style="list-style-type: none"> <i><u>Asthma</u>...attendance. Performance effect is related to asthma severity. Management improves with education.</i> <i><u>ADHD</u>...attendance, performance, and persistent problems</i> <i><u>Chronic pain or illness</u>...attendance, effects on performance when absenteeism is extreme; relationship between chronic pain, depression, and absenteeism</i> <i><u>Obesity</u>... closely related to: socioeconomic status and stress of poverty, low levels of physical activity, associated with poorer attendance and performance (effects are muted in the gen'l population).</i> 	PubMed	Child or Adolescent	Chronic Disease OR Oral Health OR Obesity AND Absenteeism	110	20	23	27+	<p>Citations used include retrievals using PICO's 1,4, 8, 10, 11.</p> <p>4 – asthma 3+ – ADHD 9+– chronic illness, chronic pain 12 – obesity</p>
		CINAHL	Absenteeism	Child and Adolescent	62	62			
5	<p>Hypothesis #5: Chronic illness management by the school nurse reduces absenteeism and improves performance.</p> <p><i>PICO #6:</i> <i>Among children with chronic health conditions, what is the effect of school nurse case management on absenteeism or performance compared to children with chronic health conditions who receive no case management services from school nurses?</i></p> <p><u>EVIDENCE-BASED STATEMENT #5:</u> <i>Chronic illness management by the school nurse reduces absenteeism.</i></p> <ul style="list-style-type: none"> <i>Improvements in parent knowledge and management.</i> <i>Improvements in student knowledge and management.</i> <i>Greater likelihood of asthma meds at school.</i> <i>Strong evidence relates to asthma, some general studies of chronic illness.</i> 	PubMed	School Nursing	Case Management Chronic Disease Absenteeism	27	16	12	7+	Citations include retrievals from PICO 1.
		CINAHL	School Health Nursing	Case Management	24	24			

6	Hypothesis #6: Performance is affected by indoor air quality.	PubMed	Air Pollution	Cognition Learning	49	48	16	6+	
	<i>PICO #6: Are adults or children exposed to poor air quality at increased risk for poor measures of performance compared to individuals not exposed to poor air quality?</i>	CINAHL	Air Pollution	Cognition Learning	7	7			
<u>EVIDENCE-BASED STATEMENT #6:</u> Poor air quality has profound effects on brain function.									
<ul style="list-style-type: none"> • Air contaminants (carbon monoxide, toluene, volatile organic compounds) affect memory, performance of complex tasks, and response time. • Persistent severe air pollution produces cognitive dysfunction. • Effects may be mediated by stress and cognition. 									
7	Hypothesis #7: Cognitive performance is affected by sleep.	PubMed	Learning or Cognition	Sleep Limits: Child and Adolescent, English	904	64	21	15	
	<i>PICO #7: In children and youth, what is the effect of sleep on learning performance compared with children and youth who do not receive adequate sleep?</i>	CINAHL	Sleep	Cognition or Learning					
<u>EVIDENCE-BASED STATEMENT #7:</u> Performance and learning are profoundly affected by sleep. Chronic sleep deprivation is linked with higher risk of obesity.									
8	Hypothesis #8: Coordinated school health programs (CSHP) show promising effects in improving student outcomes.	PubMed	Coordinated School Health Program		21		14	4+	Includes a citation from PICO 2 as well as 8.
	<i>PICO #8: In schools, what is the effect of CSHP on absenteeism or measures of performance, compared to schools without CSHP?</i>	CINAHL	Coordinated School Health Program		18				
<u>EVIDENCE-BASED STATEMENT #8:</u> Coordinated School Health Programs are considered promising because of evidence for effects in some domains, but the evidence for all components operating together to produce gains in student learning is weak.									
9	Hypothesis #9: Staff health promotion impacts student outcomes.	PubMed	Occupational Health Services Health Promotion Schools	Schools Workplace	31	78	10	1	There were no retrieved studies measuring academic outcomes for students where staff health promotion activities were implemented. The single citation noted provides a review of staff health promotion from the national School Health Policies and Practices study of 2006.
<i>PICO #9: Schools with staff health promotion activities have improved measures of student performance, compared with schools without health promotion activities for staff.</i>									

	<u>EVIDENCE-BASED STATEMENT #9:</u> <i>There is no evidence that staff health promotion produces positive impacts for student learning.</i>	CINAHL	Schools Health Promotion Staff (text word)	Occupational Health Schools					
10	<p>Hypothesis #10: Education is strongly related to health in populations. High school completion is a public health issue.</p> <p><i>PICO #10:</i> <i>In populations of children and youth with chronic health care needs, what is the effect of high school graduation on future health status compared with children with children who do not have special health care needs?</i></p> <p><i>Does high school graduation influence mortality or morbidity in children and youth with special health care needs?</i></p> <p><i>Does health status in childhood influence high school graduation in children and youth with special health care needs?</i></p> <p><u>EVIDENCE-BASED STATEMENT #10:</u> <i>Health and Education outcomes in populations are closely linked.</i></p> <ul style="list-style-type: none"> <i>Children with some chronic illnesses and mental illness experience lower educational attainment. (Match outcomes of peers: sarcoidosis, cancer. Do not match peers: ADHD, speech and language, mental disorders).</i> <i>Individuals who do not graduate from high school suffer more chronic health issues, disability, and health risks than those who do graduate.</i> <i>Health and educational outcomes are mediated by complex social, economic, interpersonal, and psychological factors.</i> 	PubMed	Chronic Disease	Graduation Educational Attainment Educational Status, High School Graduation. Limits: Adolescents and Adults, English	581	99	47	21	
		CINAHL	Chronic Disease	Educational Status	48	28			
11	<p>Hypothesis #11: Health status in childhood is predictive of adult health burden in populations.</p> <p><i>PICO #11:</i> <i>Does health status in childhood predict health status in adulthood?</i></p> <p><u>EVIDENCE-BASED STATEMENT #11</u> <i>Conditions of childhood, including some health conditions, are significantly related to poor health outcomes in adult populations.</i></p> <ul style="list-style-type: none"> <i>Conditions impacting the life course:</i> <ul style="list-style-type: none"> <i>Abuse and neglect in childhood, high stress</i> <i>Mental Illness in Adolescence</i> <i>ADHD</i> <i>Educational attainment</i> <i>Mediated by: poverty, cognition</i> <i>Most functional difficulties in children with special health</i> 	PubMed	Health Status Also text words childhood health status adulthood	Retrospective Studies	2570	61	26	14+	Additional data sources provided in “worthy mention” section.
		CINAHL			976	0			

care needs are respiratory or mental health in nature.

- *Asthma in the general population: higher among children under age 15 than among persons aged 15 – 34 years and 35 and over.*
- *Risk of diabetes increases steadily with age.*

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Exploring the Evidence Base for the Relationship between Health and Learning BIBLIOGRAPHIES

<p>Parameters of the literature search:</p> <p>Recent publication date (1998 or later) English only Comparison or intervention data. Excluded if descriptive only in nature</p>	<p>Worthy Mention:</p> <p>Useful source information Comprehensive review Literature search without new results Compelling info dated prior to 1998 Prevalence or trend data without comparison or intervention.</p>
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STATEMENT #1: Evidence supports mental health screening of adolescents.

- **Mental disorders are strongly associated with school drop out.**
- **(Quality) Intervention is effective.**
- **Mental health in adulthood relates to mental health in adolescence.**

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STATEMENT #2. Physical activity stimulates learning.

- **Physical fitness is significantly related to school achievement.**
- **Vigorous physical activity boosts performance.**
- **No negative impact of physical education.**

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STATEMENT #3. Nutrition affects learning and behavior.

- **Breakfast improves attention, memory, test performance, attendance, weight control.**
- **Food insufficiency relates to poor behavioral and academic function in low income children**
- **Food quality and frequency may relate to positive effects.**

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STATEMENT #4. Chronic illness affects attendance and performance.

- **Asthma...attendance. Performance effect is related to asthma severity. Management improves with education.**
- **ADHD...attendance, performance, and persistent problems**
- **Chronic pain or illness...attendance, effects on performance when absenteeism is extreme; relationship between chronic pain, depression, and absenteeism**
- **Obesity... closely related to: socioeconomic status and stress of poverty, low levels of physical activity, associated with poorer performance and attendance (effects are muted in the gen'l population).**

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STATEMENT #5. Chronic illness management by the school nurse reduces absenteeism.

- **Improvements in parent knowledge and management.**
- **Improvements in student knowledge and management.**
- **Greater likelihood of asthma meds at school.**
- **Strong evidence relates to asthma, some general studies of chronic illness.**

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STATEMENT #6. Poor air quality has profound effects on brain function.

- **Air contaminants (carbon monoxide, toluene, volatile organic compounds) affect memory, performance of complex tasks, and response time.**
- **Persistent severe air pollution produces cognitive dysfunction.**
- **Effects may be mediated by stress and cognition.**

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STATEMENT #7. Performance and learning are profoundly affected by sleep.

- **Chronic sleep deprivation is linked with higher risk of obesity.**

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STATEMENT #8: Coordinated School Health Programs are considered promising because of evidence for effects in some domains, but the evidence for all components operating together to produce gains in student learning is weak.

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STATEMENT #9: There is no evidence that staff health promotion produces positive impacts for student learning.

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STATEMENT #10: Health and Education outcomes in populations are closely linked.

- **Children with some chronic illnesses and mental illness experience lower educational attainment.**
- **Individuals who do not graduate from high school suffer more chronic health issues, disability, and health risks than those who do graduate.**
- **Health and educational outcomes are mediated by complex social, economic, interpersonal, and psychological factors.**

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STATEMENT #11: Conditions of childhood, including some health conditions, are significantly related to poor health outcomes in adult populations.

- **Conditions impacting the life course:**
 - Abuse and neglect in childhood, high stress
 - Mental Illness in Adolescence
 - ADHD
 - Educational attainment
 - Mediated by: poverty, cognition
- **Most functional difficulties in children with special health care needs are respiratory or mental health in nature.**
- **Asthma in the general population: higher in the among children age 15 than among persons aged 15 – 34 years and 35 and over.**
- **Risk of diabetes increases steadily with age.**

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RECOMMENDED RESOURCES

LIFECOURSE HEALTH DEVELOPMENT

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Wessel L and J Spain. The chronic care model: a collaborative approach to preventing and treating asthma in infants and young children. National Center for Infants, Toddlers and Families: Zero to Three. January 2005: 20 – 27.

YOUTH SUICIDE PREVENTION

American Association of Suicidology <http://www.suicidology.org/web/guest/certification-programs/school-professionals>

American Foundation for Suicide Prevention <http://www.afsp.org/>

Center for Health and Learning, University of Vermont www.healthandlearning.org

Griefnet www.griefnet.org

Hopeline <http://www.hopeline.com>

QPR Institute www.qprinstitute.com

Signs of Suicide Program www.MentalHealthScreening.org

Society for the Prevention of Teen Suicide <http://www.sptsnj.org>

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Suicide Prevention Resource Center Information for School Health and Mental Health Providers:
http://www.sprc.org/featured_resources/customized/school_mentalhealth.asp

TeenScreen National Center for Mental Health Checkups at Columbia University:
<http://www.teenscreen.org/teenscreen-schools-communities>