

Healthier Students Are Better Learners: A Missing Link in School Reforms to Close the Achievement Gap

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to Close the Achievement Gap**

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This essay is dedicated to the urban minority youth of America.

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EXECUTIVE SUMMARY

No matter how well teachers are prepared to teach, no matter what accountability measures are put in place, no matter what governing structures are established for schools, educational progress will be profoundly limited if students are not *motivated and able to learn*. Health-related problems play a major role in limiting the motivation and ability to learn of urban minority youth, and interventions to address those problems can improve educational as well as health outcomes. Healthier students are better learners. Recent research in fields ranging from neurosciences and child development to epidemiology and public health provide compelling evidence for the causal role that *educationally relevant health disparities* play in the educational achievement gap that plagues urban minority youth. This is why reducing these health disparities must be a fundamental part of school reform.

School leaders must prioritize how to use scarce resources to address the critical health problems affecting youth. In this essay, three criteria were used for establishing priorities: prevalence and extent of health disparities negatively affecting urban minority youth; evidence of causal effects on educational outcomes; and feasibility of implementing proven or promising school-based programs and policies to address the health problem. Based on these criteria, seven educationally relevant health disparities were selected as strategic priorities: (1) *vision*, (2) *asthma*, (3) *teen pregnancy*, (4) *aggression and violence*, (5) *physical activity*, (6) *breakfast*, and (7) *inattention and hyperactivity*. Many other health problems affecting youth are also important, and the particular health problems deemed most important in a given school or school district will vary.

The health factors specified in this essay affect a large proportion of American youth. Visual problems have been estimated to affect 20% of youth. Asthma affects an estimated 14% or 9.9 million youth under 18 years old. An

estimated 8.4% of school-aged youth, 4.6 million, have received a diagnosis of attention-deficit/hyperactivity disorder (ADHD), with millions more exhibiting symptoms that are below established diagnostic criteria but nonetheless adversely affect teaching and learning. One in three American female adolescents is expected to become pregnant. Aggression and violence are a pervasive part of daily life for American youth, including at school. The majority of school-aged youth do not meet recommended levels of daily physical activity. Millions of youth do not eat breakfast on any given day. Urban minority youth from low-income families are disproportionately affected by all of these problems. If these factors are not addressed, the benefits of other educational innovations will be jeopardized.

Educationally relevant health disparities impede motivation and ability to learn through at least five causal pathways: *sensory perceptions*; *cognition*; *connectedness and engagement with school*; *absenteeism*; and *dropping out*. The causal pathways themselves are interrelated: for example, the student who is struggling cognitively is likely to feel less connected and less inclined to attend, which will further undermine educational progress. The causal connections between *multiple* health factors and motivation and ability to learn will be greater than the effects of individual factors. This is based on the expectation that at least some variance would be additive. However, it is reasonable to believe that the functional effects of reducing multiple impediments to motivation and ability to learn would be not only additive but also synergistic; therefore, school health programs must focus on multiple educationally relevant health disparities to maximize the educational yield from investments.

Schools cannot address all of the conditions that cause educational or health disparities, but proven and promising approaches exist and must

be applied to help close the achievement gap. Children should receive corrective care to enable them to see well enough to acquire basic academic skills. Children with poorly controlled asthma deserve in-school monitoring to help ensure that they receive high quality health care; a school that identifies and ameliorates allergens, irritants, and pollutants that trigger symptoms; and multiple opportunities for daily physical activity. Children need to learn and practice communication and social skills, such as resisting social pressures and negotiating to minimize interpersonal conflict and maximize cooperation, which can reduce risk for various health-compromising outcomes, including unintended pregnancy. For youth who are sexually active, contraceptive services should be available. For youth who become pregnant, targeted health and social services are essential if there is to be any hope of interrupting the intergenerational transmission of poverty.

Children have the right to attend a school that is safe. Progress in achieving this goal will be greatly influenced by the school climate and school connectedness. Measures of school climate and school connectedness should become a norm within measures of accountability—if the school climate is poor, connectedness and engagement in school will be less likely, which in turn will adversely affect educational as well as health outcomes. Youth who exhibit disruptive or aggressive behavior need attention during the early stages of development of these behaviors. Youth have the right to multiple daily opportunities for physical activity and to daily breakfast. Youth with attention and hyperactivity problems need help in learning ways to improve their mental and behavioral performance and, when parents and pediatricians agree, pharmacological treatment.

Most schools are already devoting some attention and resources to addressing important health barriers to learning, but these efforts are too often poor quality, not strategically planned to influence educational outcomes, and not effectively

coordinated to maximize linkages between different school health components. Despite compelling evidence linking health and academic achievement, there is no U.S. Department of Education initiative to reduce educationally relevant health disparities as part of a national strategy to close the achievement gap. For the nation's schools to address educationally relevant health disparities in a strategic and coordinated way, there must be fundamental change in the goals of schools, the way schools are financed, the personnel and services available, and the amount of time devoted to help youth learn social-emotional skills. Such change will not occur without leadership from the U.S. Department of Education. Now is an opportune time for such leadership.

National, state, and local strategies for helping schools implement high quality, strategically planned, and effectively coordinated school health programs are presented. These include policy development; guidance, technical assistance, and professional development; accountability supported by data and software systems; and priorities for a national research agenda. Even if health factors had no effect on educational outcomes, they clearly influence the quality of life for youth and their ability to contribute and live productively in a democratic society. Improving the health of youth is a worthy goal for elementary and secondary education. Indeed, pursuing this goal is a moral imperative.

INTRODUCTION

Low levels of academic achievement and educational attainment among low-income and minority youth, particularly in urban areas, undermine the quality of individual, family, and community life, threatening the very integrity of American society. Educationally relevant health disparities exert a powerful, but generally overlooked, influence on the achievement gap. Disparities in this context are health problems that disproportionately affect low-income urban minority youth as measured by incidence, prevalence and educationally relevant consequences. Health factors have direct and indirect effects on educational outcomes, including standardized test scores. To date, school reform efforts to close the achievement gap have not targeted reduction of educationally relevant health disparities.

To great extent, the educational achievement gap and health disparities affect the same population subgroups of American youth and are caused by a common set of social-environmental factors; it is increasingly clear that both education and health can also exert strong, reciprocal effects. The familial, social, physical, and economic environment in which youth live (Evans, 2004) is strongly associated with academic achievement and educational attainment (Evans & Schamberg, 2009; Murname, 2007; Rouse & Barrow, 2006), with childhood and adolescent health (Chen, Martin, & Matthews, 2007; Evans, 2006; Evans, Gonnella, Marcynszyn, Gentile, & Salpekar, 2005; Evans & Kim, 2007; Geronimus, 2000; Link, Phelan, Miech, & Westin, 2008; Lynch, Kaplan, & Shema, 1997; Marmot, 2002; Melchior, Moffitt, Milne, Poulton, & Caspi, 2007; Poulton et al., 2002), and with social mobility (Case, Fertig, & Paxson, 2005; Case & Paxson, 2006; Geronimus, 2000; Hass, 2006). The strong association between social class and health persists throughout the lifespan (Case & Paxson, 2006; Koivusilta, Arja, & Andres, 2003; Link & Phelan, 1995; Melchior et al., 2007; Palloni, 2006; Poulton et al., 2002).

An important emerging literature implicates children's health factors as causal mechanisms through which low socioeconomic status influences academic achievement and educational attainment (Case & Paxson, 2006; Crosnoe, 2006; Hass, 2006; Hass & Fosse, 2008; Heckman, 2008; Koivusilta et al., 2003; Palloni, 2006). The direction of causality, effect sizes, and hypothesized causal mechanisms mediating relationships among social-environmental factors (e.g., poverty), education, and health has been explored from multiple perspectives. It seems likely that these three factors—(1) familial, social, physical, and economic environment, (2) academic achievement and educational attainment, and (3) health—are causally related in reciprocal ways. The focus of this essay is the influence of selected health factors on educational outcomes.

The Role of Schools

It is neither reasonable nor realistic to expect that, on their own, schools can close the gaps in education or eliminate health disparities among the nation's youth. Schools should not be solely responsible for addressing these complex and recalcitrant problems. There are essential roles to be played by families, communities, health care systems, legislators, media, and by economic policy. All of these (and other) social institutions should, and must, contribute to solving these problems. There are no simple solutions.

However, with more than 50 million students spending a significant portion of their daily lives in school, this social context is surely one of the most powerful social institutions shaping the next generation of youth. By systematically addressing educationally relevant health disparities, schools can reduce both educational and health disparities. But this will not occur efficiently with the current strategy of investment in school health programs.

School health programs have a long history in the

United States (Mann, 1891) but have never been fully embraced. To date, reducing health disparities as a strategy to help close the achievement gap has lacked financial investment, has not had a prominent role in school reform movements, and has not occupied a central place within the educational mission of American schools. Consequently, high quality, strategically planned, and effectively coordinated school health programs and policies have not been widely implemented, and leaders and educators in urban public schools, serving minority youth from low-income families who are disproportionately affected by both educational and health disparities, face particular challenges contexts for developing, implementing and sustaining such school health programs.

Recently, the important role of schools in addressing health issues has been recognized by leading educational professional organizations, policy making, and interstitial groups. For example, policies or guidelines have been identified or proposed by the National Association of State Boards of Education (n.d.), National School Boards Association (n.d.), Council of Chief State School Officers (2008), Association for Supervision and Curriculum Development (n.d.) and their “New Compact to Educate the Whole Child,” American Academy of Pediatrics and National Association of School Nurses (n.d.), and A Broader, Bolder Approach to Education (n.d.), and by leading governmental agencies such as the Centers for Disease Control and Prevention (n.d.a, b, c).

An Opportune Time for Change

In the past, the U.S. Department of Education has provided resources to assist schools in addressing some health topics such as safety and drug use prevention, but it has not provided leadership for integrating school health into the fundamental mission of schools and supporting the widespread development and implementation of high quality, strategically planned, and effectively coordinated approaches that address a variety of health-related barriers to teaching and learning. Now is an opportune time for change.

Many schools in the United States provide some health programs or services; however, the quality of school health programs and services vary greatly. Most schools implement some programs or policies that address health (Kann, Telljohann, & Wooley, 2007) through activities such as physical education, breakfast and lunch meals, health services to provide acute care and administration of medications, health-related counseling, and curricula addressing tobacco, alcohol and drugs, nutrition, teen pregnancy and sexually transmitted disease (including HIV/AIDS), and violence. In addition, most schools offer some health care services, and some schools offer more extensive on-site health care services provided by nurses and school-based clinics. Some also offer a variety of health-related after-school programs. Community and full service schools offer in-school programs and services, including health and mental health programs and services to support youth before and after school and during the summer as well as during the typical school day (Coalition for Community Schools, 2008). While published data do not as yet exist, school health programs and services are likely inequitably distributed as are most other school resources—that is, there are both fewer and lower quality resources available in schools that serve low-income minority youth.

Despite the widespread and substantial investment in school health programs and services, current investments are likely to yield only limited educational benefits to students for several reasons. First, current financial investments are not sufficient to address the magnitude and severity of health problems affecting urban minority youth. Second, in too many cases the programs being implemented are not high quality. Third, existing efforts are not strategically planned to influence educational outcomes. Fourth, existing efforts are not effectively coordinated to capitalize on potential linkages between efforts. Though rhetorical support is increasing, school health is currently not a central part of the fundamental mission of schools in America nor has it been well integrated into the broader national strategy to reduce the gaps in educational opportunity and outcomes.

For public schools serving urban minority youth, a strategic approach is essential. Schools facing the greatest and most urgent challenges also have the least human and other resources, even before they attempt to deal with health factors. To make best use of scarce resources, priorities for dealing with health factors must be established. A public-health oriented strategic plan would focus on key health risk behaviors (those linked to leading causes of death in childhood and adolescence and those that are established in youth and contribute to the leading causes of death in adulthood), including unintentional injuries and violence, alcohol and drug use, sexual risk behavior, tobacco use, physical inactivity, and poor eating habits (Kolbe, Kann, & Collins, 1993).

Strategic Priorities

The current analysis establishes strategic priorities based on their relevance to educational outcomes and to closing the achievement gap. Three criteria were considered: (1) prevalence and extent of health disparities, (2) evidence of causal effects on educational outcomes, and (3) feasibility of implementing proven or promising school-based programs and policies. Prevalence and extent of health disparities was used based on the premise that, if a health problem is the cause of an educational disparity, the health problem must affect a large proportion of youth and be more prevalent or have more deleterious effects on urban minority youth. Disparities are described in terms of descriptive epidemiology indices (e.g., prevalence estimates) using data describing nationally representative samples, when available. Local data were used to highlight geographical variation.

If a health problem is the cause of an educational disparity, the health problem must be statistically and temporally associated with the unfavorable educational outcomes. Beyond a temporal statistical association, the case for causation is strengthened by a plausible explanation for why a particular health problem would cause a negative educational outcome: “What are the causal pathways?” Prioritizing health factors in terms

of causal links to educational outcomes may enhance their perceived importance and acceptability to policy makers, school leaders and teachers, and other educational stakeholders. The specific health factors selected by a given school or school system are less important than the fact that multiple educationally relevant health factors are prioritized and addressed collectively through a single set of high quality, strategically planned, and effectively coordinated programs and policies.

The third criterion used in the current analysis was feasibility of implementing proven or promising school health approaches. This criterion focuses on two issues, feasibility and effectiveness. Feasibility is based, in part, on the observation that some health programs and services are already being implemented in many schools and that guidelines and recommendations summarizing what schools can do to address the respective health problems are already available from credible sources. Effectiveness is based the availability of proven or promising approaches from a large body of evaluative research demonstrating that particular approaches can influence the acquisition and practice of various health-related behaviors.¹

Based on these criteria, the following educationally relevant health disparities were selected as priorities: (1) vision, (2) asthma, (3) teen pregnancy, (4) aggression and violence, (5) physical activity, (6) breakfast, and (7) inattention and hyperactivity. The omission of other

¹ There are different degrees of evidence concerning the likelihood of influencing particular health behaviors and health status indices. The overwhelming majority of evaluative research on disease prevention and health promotion for children and adolescents has not, however, measured educational outcomes. Another weakness in our current knowledge is that evaluative research has focused on the effects of interventions on individual health problems rather than efforts to address multiple health problems. Several national databases describing school health approaches with proven or promising results are available but apparently not used by many schools in their decision making about which school health programs to adopt and implement.

health topics should not be taken to suggest that they are unimportant. Tobacco, alcohol and drug use, dental problems, ear infections, obesity, accidental injuries, among others, are pervasive problems affecting youth and depending on the local context also warrant consideration. Indeed, all of these problems are rightly priorities of the U.S. Public Health Service. The seven specified priorities are intended to illustrate the effect that addressing particular health disparities can have on educational opportunity and the achievement gap. They illustrate a reasonable set of “starting points” through which school policies and programs might influence the achievement gap among urban minority youth. Schools in different social and economic contexts will have lesser or greater propensity to include various health factors as a priority; this is not problematic as long as problems are addressed with proven or promising approaches, are selected strategically, and are addressed through an effectively coordinated effort.

Causal Pathways

One or more of five causal pathways—the mechanisms by which health factors influence motivation and ability to learn—are identified and described for each health factor: (1) sensory perceptions, (2) cognition, (3) school connectedness and engagement, (4) absenteeism, and (5) temporary or permanent dropping out. It is axiomatic that sensory perception (e.g., seeing and hearing well) and cognition (executive functioning, memory, maintaining attention) have powerful effects on learning opportunities; that student absenteeism adversely affects opportunities to learn academically and to grow socially; and that dropping out adversely affects life course trajectories.

Until recently, what has been less clear, or at least less well documented empirically, is the importance of connectedness and engagement with school. Connectedness is essentially about interpersonal relationships, both with peers and school staff. It is the extent to which students perceive that adults and peers in the school community care about them as students and as individuals. A compelling body

of research demonstrates that connectedness and engagement with school is a key determinant of academic achievement and educational attainment (Battlin-Pearson et al., 2000; Bond et al., 2007; Fleming, Haggerty, Catalano, Harachi, Mazza, & Gruman, 2005; Ladd, Birch, & Buhs, 1999; Klem & Connell, 2004; Nelson, 2004; Rosenfeld, Richman, & Bowen, 1998;) as well as child and adolescent health (e.g., reduced risk of substance use, teen pregnancy, aggressive behaviors, and mental/emotional health problems) (Bond et al. 2007; Bonny, Britto, Klostermann, Hornung, & Slap, 2000; Eccles, Early, Fraser, Belansky, & McCarthy, 1997; Manlove, 1998; Mansour et al., 2003; McNeely & Falci, 2004; Resnick et al., 1997; Resnick, Harris, & Blum, 1993; Shochet, Dadds, Ham, & Montague, 2006). There is general consensus that connectedness and engagement in learning are important for success in school (Klem & Connell, 2004).

Because educational outcomes are influenced by many forces differentially across various contexts, each health factor, addressed separately, should not be expected to have large or consistent effects on educational outcomes. For example, the effects of diet on the brain are integrated with effects of other factors such as exercise and sleep (Gomez-Pinilla, 2008). The child who is well nourished, physically active, and well rested is likely to have advantages regarding cognition compared with the child with deficits in any of these areas. The child who has difficulty seeing, difficulty paying attention, or is bullied at school will struggle to succeed academically and will feel less connected and engaged with school. In turn, the child who is less connected and engaged with school will be less motivated to attend. Thus, beyond their individual effects, educationally relevant health disparities, collectively, can have an influential role in shaping the educational and social lives of the nation’s urban minority youth. Further, there are synergistic effects of acquiring skills at earlier stages in life whereby capabilities beget capabilities and influence long-term health (Heckman, 2007).

A Coordinated Approach

A coordinated approach is characterized by programs and services involving different groups of people, playing different roles, but forming a team and working toward a common set of priority goals, namely improving students' motivation and ability to learn. Once school health priorities are established, limited resources are used to support integrated efforts to achieve them. This helps to optimize the value of existing resources.

Linkages between teachers and health service personnel are essential in helping to ensure that identified problems (for example, with vision, asthma, or ADHD) receive indicated follow-up care. Linkages between categorical health curricula (for example, dealing with violence and teen pregnancy prevention) can optimize the use of curricular time by recognizing that reducing susceptibility to these different problems requires learning and practicing the same set of mental and social-emotional skills (e.g., self-regulation, dealing with social pressures, communicating assertively but not aggressively). Effective coordination requires a school health coordinator who is cognizant of the different programs, services, and policies and how they can be linked together to use limited resources effectively and efficiently.

Selection of program components can, at least in part, be based on the ability of distinct program or service components to influence the same set of priority outcomes. Thus coordination applies to planning as well as implementing school health efforts. Programs intended to ensure that youth eat breakfast, have daily physical activity, and arrive at school well rested would be addressed through different school health efforts, but could collectively affect cognition to a greater extent than any of the individual efforts.

Delimitations and Overall Intent

Several delimitations narrow the scope of this essay. First, the emphasis is on urban minority youth. Urban minority youth represent a large and growing

segment of the U.S. population. The percentage of students comprising all public school students enrolled in kindergarten through 12th grade who were white declined from 77.8% in 1972 to 56.9% in 2006 (Planty et al., 2008). Improved health status for all children is a worthy goal, but need is particularly urgent among urban minority youth who, as with adults, have great intergenerational educational and health disparities. There are, of course, other subpopulations (e.g., Native American and poor rural youth) facing extremely challenging educational and health contexts, which can and should be addressed. Second, though health may influence educational outcomes across the lifespan, attention is limited to health factors that influence school-aged youth. Again, this is in no way intended to minimize the important causal role of intrauterine, neonatal, infant and toddler health on motivation and ability to learn. Indeed, programs aimed at reducing health disparities among infants, toddlers, and children under five should be a top priority. A third delimitation is that health factors were selected based, in part, on feasibility of implementing proven or promising school-based programs and services. Clearly, the achievement gap cannot be closed without extensive involvement from other social institutions, but, at the same time, school health efforts that are high quality, strategically planned, and effectively coordinated are one of the best investments for influencing the health, as well as the minds, of the nation's youth.

This essay fills a significant gap in the current literature. In the following sections, each of the educationally relevant health disparities is described with respect to nature and scope of the problem, prevalence and disparities affecting urban minority youth, causal pathways by which the respective health disparity adversely affects motivation or ability to learn, ways that school programs and policies can address the problem, and evidence supporting proven or promising approaches.

The overall intent of this essay is to make the case for high quality, strategically planned, and effectively coordinated school health initiatives as part of a

national strategy to close the achievement gap by presenting the evidence regarding four main points: (1) urban minority youth are disproportionately affected by both educational and health disparities, (2) healthier students are better learners, (3) school programs and policies can favorably influence educationally relevant health disparities affecting youth, and (4) now is an opportune time for change. Initiatives to move this agenda forward at the national, state, and local levels are proposed.

programs are a logical approach by which to identify educationally relevant visual health disparities affecting urban minority youth. Without appropriate follow-up, the full educational benefits of vision screening cannot be realized. Screening programs can encourage receipt of indicated follow-up services by improved communication with parents, facilitation of access, and use of existing community resources and/or direct provision of services on-site. Accomplishing these objectives will require not only financial investment, but investment of effort by parents and teachers to monitor and encourage youth to follow recommended actions, whether that be using glasses, taking medications, or practicing vision therapy.

Asthma

Overview and Disparities

Asthma is a chronic respiratory disease causing transient episodic attacks of wheezing, coughing, and shortness of breath. Mild asthma has minimal functional consequences to daily life and activity, but severe asthma is characterized by frequent attacks and symptoms that can cause sleep disruption, necessitate urgent medical care, lead to hospitalization, and, in rare cases, death. Poor urban minority youth experience disproportionately high rates of severe asthma and are dramatically harmed by this disease. Asthma adversely affects quality of life for youth and their families and is associated with inefficient and ineffective use of health care resources. Asthma undermines the mental-emotional and physical health of youth and has harmful effects on educational outcomes through multiple pathways.

Asthma is thought to be the result of complex interactions between genetic and environmental factors (Martinez, 2003; Panettieri, Covar, Grant, Hillyer, & Bacharier, 2008; Reed, 2006, 2008; Sly et al., 2008). Its etiology is not clearly understood, thus population-wide approaches to primary prevention are not yet feasible (Moorman et al., 2007). Many cases of mild or moderate asthma resolve with age, but, to the extent that the disease persists and is severe, more harmful long-term consequences accrue (Martinez, 2003; Panettieri et al., 2008; Reed, 2006; Sly et al., 2008). This fact underscores the importance of minimizing poorly controlled disease among youth. Effective educational and public health approaches include controlling symptoms through medications that reduce susceptibility to asthma attacks and minimization of exposure to environmental allergens and irritants that may cause and exacerbate symptoms (Moorman et al., 2007).

The 2006 National Health Interview Survey indicated that 9.9 million youth under 18 years old (14%) had ever been diagnosed with asthma and 6.8

million (9%) still had asthma (Bloom & Cohen, 2007). Compared with girls, boys were more than 45% more likely to have ever been diagnosed with asthma (11% versus 16%) and more than 35% more likely to still have asthma (8% versus 11%) (Bloom & Cohen, 2007). Both lifetime and current asthma prevalence disproportionately affect non-Hispanic black youth, particularly those from poor families. Compared with youth under 18 years old not in poor families, youth in poor families had prevalence rates that were almost 40% higher for ever having asthma (13% versus 18%) and almost 45% higher for current asthma (9% versus 13%) (Bloom & Cohen, 2007). Urban minority youth not only experience higher prevalence of lifetime and current asthma, but also worse health-related consequences, both of which adversely affect educational outcomes.

The following data describe average annual numbers and/or rates of asthma during 2001-2003 for youth between the ages of 5 and 14 (Moorman et al., 2007). There were 3,878,000 youth with current reported asthma and 111 deaths. Average annual prevalence estimates were approximately 45% higher for black versus white children (12.8% versus 8.8%), as were average annual estimates of asthma attacks (8.4% versus 5.8%). The estimated annual rate of emergency department visits with asthma as the primary diagnosis was three times greater for black versus white children (18.3% versus 6.1%). Average annual prevalence estimates for children of Puerto Rican descent were 21.5%, compared with 5.4% for children of Mexican descent. Reasons for higher prevalence of asthma among children of Puerto Rican versus Mexican descent (Cohen et al., 2007; Lara, Akinbami, Flores, & Morgenstern, 2006; Moorman et al., 2007) are not well understood (Canino et al., 2006), but the discrepancy has implications for directing limited resources to the populations with the greatest needs.

The most recent estimates from a nationwide

probability sample of high school students (Eaton et al., 2008) indicate that 20.3% had ever been told they had asthma. Lifetime asthma prevalence estimates were more than 22% higher for black (24.0%) than white (19.6%) students. Lifetime asthma prevalence for Hispanic students (18.5%) must be interpreted with caution due to the extreme heterogeneity of asthma among Hispanic students (Cohen et al, 2007; Lara et al., 2006; Moorman et al., 2007). Almost 11% of high school students reported current asthma, and the prevalence rates of current asthma were 40% higher for black (14.7%) than white (10.5%) students. The rate for Hispanic students was 9.5%.

If national prevalence estimates indicate a very substantial magnitude of asthma, statewide and local prevalence estimates among urban minority youth have been even higher. The most recent data indicate that lifetime asthma prevalence among high school students across 34 participating states ranged from 15.4% to 28.7%. Estimates of current asthma ranged from 8.4% to 14.2%. Surveys in selected local areas demonstrate considerable variation in current asthma prevalence: from 6.8% in Houston, to 19.9% in Baltimore (Eaton et al., 2008). In Detroit, one study in 14 elementary schools identified approximately 25% of children from approximately 4600 participating families as having asthma (Anderson et al., 2005), another conducted with 35 Head Start centers found probable asthma reported by 30% of parents responding (Nelson et al., 2006). A study of children of Puerto Rican descent from samples collected in two urban areas of Puerto Rico and in the South Bronx estimated that 38.6% and 35.3%, respectively, had current asthma (Cohen et al., 2007). A statewide surveillance project conducted in Massachusetts, which included one-half of K-8 schools ($n = 958$ schools), found that prevalence based on nurse reports was, on average, 9.2% across all participating schools, but as high as 30.8% in individual schools (Knorr, Condon, Dwyer, & Hoffman, 2004). A survey of more than 8,000 middle school students in Oakland, CA, indicated that 17.5% had active asthma (Davis, Brown, Edelstein, & Tager, 2008). Additional studies could be outlined. The evidence that poor

urban minority children are disproportionately harmed by uncontrolled asthma is not controversial.

Poor urban minority youth not only have higher rates of asthma and more severe forms of the disease, but are much less likely to receive contiguous high quality medical care and to consistently use appropriate, efficacious medications. They are also more likely to be exposed to noxious environmental “triggers.” Consequently, they are more likely to experience severe asthma that adversely affects their quality of life, including their motivation and ability to learn in school.

Current knowledge exists to control asthma effectively and to minimize its harmful consequences. The three main asthma control methods are (1) access to contiguous high quality medical care, (2) medications to control clinical sequelae (e.g., asthma attacks), and (3) avoidance or minimization of environmental triggers. Poor urban minority youth experience extreme and consequential disparities with respect to all three of these highly effective secondary prevention methods.

Emergency department visits for asthma increased dramatically from 1980 (79.1/10,000) to 2004 (155.1/10,000), with a more than four-fold disparity in emergency department use between black (195.0/10,000) and white (43.6/10,000) children (Moorman et al., 2007). Conversely, in 2001-2003, the estimated average rate (per 100 persons with current asthma) of physician office visits was almost 150% higher for white (74.9) than black (30.2) children (Moorman et al., 2007). Intervention programs have sought to reduce asthma-related emergency department visits because of cost and because, while emergency care addresses the acute problem (i.e., an asthma attack), it does not tend to foster continuity of medical care or effective disease management.

Gaps in health insurance coverage affect a significant proportion of children in the United States and limit their access to quality medical care (Newacheck, Stoddard, Hughes, & Pearl, 1998; Olsen,

Tang, & Newacheck, 2005). This is particularly a problem for poor urban minority youth, in general (Guedelman & Pearl, 2001; Halterman, Montes, Shone, & Szilagyi, 2008; Satchell & Pati, 2005; Szilagyi et al., 2004), and youth with asthma, in particular (Akinbani, Lafleur, & Schoendorf, 2002; Crain, Kerckmar, Weiss, Mitchell, & Lynn, 1998; Eggleston et al., 1998; Halterman et al., 2008; Szilagyi et al., 2006). Given that access to consistent and high quality medical care can help prevent morbidity from asthma (Halterman, Aligne, Auinger, McBride, & Szilagyi, 2000; Homer et al., 1996; Ordonez, Phelon, Olinsky, & Robertson, 1998; Shatz et al., 2005), disparities in access are likely to be one of several key factors accounting for disparities in asthma morbidity (Halterman et al., 2007, 2008; Olsen, Tang, & Newacheck, 2005). Medical access disparities are evidenced by greater dependence on emergency departments, as opposed to consistent primary care, (Camargo, Ramachandran, Ryskina, Lewis, & Legoretta, 2007), by more severe acute exacerbations (McConnochie et al., 1999), and by inappropriate overuse of medications (Eggleston et al., 1998).

Adherence to asthma medications (e.g., budesonide inhalation suspensions) can prevent asthma morbidity (Adams et al., 2001; Agertoft & Pedersen, 1994; Camargo et al., 2007; Fulbrigge et al., 2004; Homer et al., 1996; Laitnen, Laitnen, & Haahtela, 1992; McLaughlin, Liebman, Patel, & Camargo, 2007). Appropriate use of inhaled corticosteroids has been associated with improved chronic airway inflammation and course of the disease (Agertoft & Pedersen, 1994), decreased use of emergency departments (Adams et al., 2001; Camargo et al., 2007; Fulbrigge et al., 2004; McLaughlin et al., 2007), and decreased hospitalization (Adams et al., 2001; Camargo et al., 2007; Homer et al., 1996; McLaughlin et al., 2007). But adherence to effective medications has been found to be much lower among poor urban minority youth (Camargo et al., 2007; Eggleston et al., 1998; Finkelstein, Lozano, Farber, Miroshnik, & Lieu, 2002; Halterman et al., 2007; Warman, Silver, & Stein, 2001). Medication adherence problems have been found to affect both younger

(Halterman et al., 2000; Bauman et al., 2002) and older (McQuaid, Kopel, Klein, & Fritz, 2003) children, and to disproportionately affect black and Latino children, independent of income (Lieu et al., 2002). In some inner-city families, children rather than parents, are responsible for medication adherence (Warman, Silver, & Wood, 2006). Nonadherence to medication has been associated with more frequent asthma exacerbations, emergency department visits, and hospitalization (Bauman et al., 2002; Camargo et al., 2007).

Poor urban minority youth have high levels of exposure to indoor pollutants (e.g., environmental tobacco smoke) and allergens (e.g., in the northeast, cockroach allergens) (Kattan et al., 1997; Kitch et al., 2000). They also exhibit heightened sensitivity to these allergens (Sarpong, Hamilton, Eggleston, & Adkinson, 1996). The combination of exposure and sensitization is thought to be one of several key causes of asthma morbidity (Gilmour, Jaakkola, London, Nel, & Rogers, 2006). In the Inner City Asthma Study, compared with children who were not exposed or sensitized to cockroach allergen, children who were both exposed and sensitized experienced more days of symptoms and missed more school. Once sensitized, even low levels of exposure can trigger an allergic response (Rosenstreich et al., 1997), underscoring the value of preventing sensitization and avoiding exposure to allergens among those already sensitized. Outdoor pollutants in the inner-city (e.g., diesel exhaust particulates) may interact with allergens to exacerbate allergic reactions among susceptible youth, thereby increasing the extent of morbidity (Eggleston, 2007; Eggleston, Buckley, Breyse, Wills-Karp, & Kleeberger, 1999).

There are regional variations in the nature and extent of indoor allergen exposure in the United States. In northeastern inner cities (e.g., New York and Boston), cockroach allergen exposure appears to influence asthma morbidity more than pet allergens or dust mites. In the south and northwest, there are higher levels of exposure and sensitivity to dust mites. Inner-city communities are vulnerable to specific kinds

of exposures at high concentration levels (Matsui et al., 2008). Type of dwelling (e.g., public housing apartments) and specific features of the household have also been found to be associated with the presence of particular kinds of allergens (Peters, Levy, Rogers, Burge, & Spengler, 2007). These local variations in the kinds of allergen exposure and sensitivity have important implications for planning prevention programs. Tailoring interventions to the relevant allergens and pollutants of specific populations will likely have a strong influence on their effectiveness (Morgan et al., 2004).

The home is a primary exposure source of indoor allergens and pollutants (Eggleston, 2007; Morgan et al., 2004). For youth, the school environment is also important (Chew, Correa, & Perzanowski, 2005; Wallace, 1995). In a Minneapolis study of two elementary schools serving poor urban minority youth, the school environment was found to be an important source of fungi and cat allergen (Ramachandran et al., 2005). A southeast Texas study of 60 urban elementary schools (385 rooms) included extensive environmental assessment in 20 schools. Cockroach allergen was found in all of the schools and the observed levels were above recommended limits in 10% of the rooms. Mold spores exceeded recommended limits in more than half of the classrooms (Tortolero et al., 2002). In the most recent nation-wide School Health Policies and Programs Study, approximately one-third of districts and approximately one-half of schools had an indoor air quality program, approximately one-third had a bus idling reduction program, approximately one-quarter of the states required schools to adhere to a pest management program (Jones, Axelrad, & Wattigney, 2007). These data illustrate both positive current initiatives and the need for increased environmentally relevant policies and programs. (It should be noted that respiratory infections and exercise in cold weather may also trigger symptoms.)

In addition to the three risk factors outlined above, poor urban minority youth often have other risk factors that affect moderate to severe persistent asthma morbidity. These include household and

outdoor environmental exposures, behavioral or emotional concerns, lack of parental support regarding medication, poor medication adherence, and poor medical care (Warman et al., 2006) as well as multiple risks of a psychosocial or sociocultural nature (Koinis-Mitchell et al., 2007; Wright & Subramanian, 2007). In addition, lower levels of parental literacy have been associated with greater use of emergency departments, hospitalization, rescue medications and school absenteeism; parents had less knowledge about the disease and their children were more likely to have more severe persistent asthma (DeWalt et al., 2007). While the disproportionate prevalence of asthma among poor urban minority populations is of great concern, of even greater concern are the disparities in asthma severity, emergency department utilization and hospitalization, and behavioral and environmental factors (Gold & Wright, 2005). These disparities all have consequences for quality of life in general and educational outcomes in particular.

Causal Pathways Affecting Educational Outcomes

The significance of asthma for closing the educational achievement gap lies in its functional consequences on multiple educational outcomes: cognition, connectedness with and engagement in school, and absenteeism, and the effects of comorbidity such as sleep disruption and multiple risk factors on ability to succeed in school.

Cognition

Children with asthma appear to be at a disadvantage for school readiness (Haltermann, Montes, Aligne, Kaczorowski, & Hightower, 2001), which may have great significance for perpetuating a continuing cycle of academic struggle (Heckman, 2007, 2008). Compared with children who do not have asthma, children who do have asthma have been shown to perform worse on some tests of concentration and memory (Stores, Ellis, Wiggs, Crawford & Thomson, 1998) and on task orientation (i.e., concentrating well) (Haltermann, Conn, Forbes-Jones, Fagnano & Hightower, 2006).

This may be explained, at least in part, by sleep disruption. Children with asthma are more likely than children who do not have asthma to have disturbed sleep (Stores et al., 1998). Underlying causal circadian factors, such as inflammation, bronchial hyper-responsiveness, and airway resistance at nighttime may exacerbate asthma symptoms and cause children with asthma to experience coughing, breathlessness, and wheezing that disturb sleep (Lo & Chiang, 2006). Children with asthma may have delayed and less consistent time falling asleep and total sleep time (Kieckhefer, Ward, Tsai, & Lentz, 2008). Wheezing, a common asthma symptom, has been associated with reduced quality of sleep due to nocturnal awakenings and restlessness (Desager, Nelen, Weyler, & De Backer, 2005). Nocturnal asthma is associated with severity of the disease, but even youth with “stable asthma” experience considerably more sleep problems than children who do not have asthma. These problems include wheezing, coughing, breathlessness, and difficulty maintaining sleep during the night. As a consequence, children with asthma may also experience more daytime sleepiness, tiredness, and other disturbances (Chugh, Khanna, & Shah, 2006). Nocturnal asthma is associated with difficulty falling and staying asleep, restlessness, daytime sleepiness and tiredness (Lo & Chiang, 2006).

An emerging literature supports the importance of sleep for cognitive functioning (Dahl, 1996; Gibson et al., 2006; Gomez-Pinilla, 2008; Taras & Potts-Datema, 2005b; Wolfson & Carskadon, 1998, 2003). Disturbed sleep is associated with decreased ability to learn and with educational outcomes (Dahl, 1996; Gibson et al., 2006; Taras & Potts-Datema, 2005b; Wolfson & Carskadon, 1998, 2003). Several recent studies in adolescents have observed associations between too little sleep and learning difficulties and compromised academic performance (Carskadon, Acebo, & Jenni, 2004; Hansen, Janssen, Schiff, Zee, & Dubocovich, 2005; Wolfson & Carskadon, 2003). Students with marginal academic performance reportedly experienced less sleep on school nights and greater daytime sleepiness than children with better academic performance (Chung & Cheung,

2008). Greater daytime sleepiness has been associated with lower mathematics and language grades (Perez-Chada et al., 2007).

Connectedness

There has been little research on asthma and connectedness with school, but several plausible relationships between the two warrant investigation. For example, adolescents with higher levels of sleepiness were reportedly less involved in extracurricular activities (Gibson et al., 2006). This lack of involvement may be indicative of less connectedness and engagement with school. In another study in inner-city children, youth with more severe (persistent) asthma had more problems with peers and more anxious and shy behaviors (Haltermann et al., 2006).

Connectedness with school may also be affected by emotional co-morbidity of asthma. Compared with children who do not have asthma, children who do have asthma, especially those with more severe asthma, are more likely to exhibit psychological problems (Blackman & Gurka, 2007; Macri, Rossi, Lambiase, Di Castebianco, & Frassanito, 2008; Stores et al., 1998), depression (Bender, 2007; Bender & Zhang, 2008; Blackman & Gurka, 2006; Feldman, Ortega, McQuaid & Canino, 2006; Ortega, McQuaid, Canino, Goodwin, & Fritz, 2004) and anxiety (Feldman et al., 2006; Haltermann et al., 2006; McQuaid, Kopel, & Nassau, 2001; Ortega et al., 2004). In a recent cross-sectional study of 102,353 randomly selected children under 18, Blackman and Gurka (2007) characterized the nature and extent of asthma co-morbidities. They report dose-response gradients between asthma severity and key developmental, behavioral and emotional outcomes that dramatically affect educational outcomes. These outcomes include absenteeism, depression, learning disabilities and behavioral disorders.

Absenteeism

Despite inconsistencies across studies in the operational definition of asthma, in the ages of the study populations, and in data collection methods, the

fact that children with asthma miss school because of the disease is well established (Blackman & Gurka, 2007; Moonie, Sterling, Figgs, & Castro, 2006; Taras & Potts-Datema, 2005a). Sleep disturbances associated with more severe and persistent symptomatic asthma, in particular, affect absenteeism (Diette et al., 2000). In a review of all 66 studies examining asthma and school attendance, Taras and Potts-Datema (2005a) reported that virtually every study found a positive association between the disease and school absenteeism. In 2003, youth with current asthma (experiencing at least one attack in the previous year) missed a total of 12.8 million school days directly attributable to asthma (Akinbami, 2006).

Asthma can result in absenteeism in numerous ways: as a result of symptoms, the need to attend doctor visits, hospitalization, the need to avoid environmental triggers at school, sleep deprivation due to nocturnal attacks, co-morbidity (e.g., respiratory illness) associated with increased susceptibility, among others. The extent to which each of these contributes to the overall rate of absenteeism is not well understood (Taras & Potts-Datema, 2005a). Youth with more severe and chronic symptoms (e.g. sleep disturbance and hospitalization) have higher rates of school absenteeism (Moonie et al., 2006, 2008; Diette et al., 2000). Nonadherence to medication is also associated with higher levels of morbidity and absenteeism among inner-city elementary level children (Bauman et al., 2002). Poor black children have higher levels of asthma morbidity (Akinbami et al., 2002), and poor children and black children have been shown to have high levels of disability and school absenteeism due to asthma (Newacheck & Halfon, 2000) and high levels of activity limitations (Newacheck & Halfon, 2000; Akinbami et al., 2002).

What Can Schools Do to Address Asthma Symptoms?

Leading experts in asthma control have developed a well-conceived and comprehensive policy action blueprint for improving childhood asthma control (Lara

et al., 2002). The nation's schools play a prominent role. The blueprint emphasizes a multifaceted approach encompassing both provision of contiguous quality medical care and control of the physical aspects of the environment that exacerbate symptoms. The overarching policy objective is to increase the extent to which communities are "asthma-friendly," as exemplified by early detection and treatment, and to minimize of environmental exposures to allergens and irritants (Lara et al., 2002). Schools throughout the nation have made strides with policies and programs to minimize the harm caused by asthma (Centers for Disease Control and Prevention, 2006a), but persistent disparities in poorly controlled asthma indicate the need for a greater emphasis on this widespread and educationally consequential chronic disease.

A large body of research informs the programmatic needs to control and prevent asthma symptoms within the nation's schools and in other community institutions. The emphasis is on better control among youth with known asthma as opposed to population-wide screening (Gerald et al., 2007; Yawn, 2006). Six strategies for addressing asthma within a coordinated approach to school health have been identified by the Centers for Disease Control and Prevention, 2006b). These, along with other consensus recommendations (e.g., National Asthma Education and Prevention Program, 2003), can be used by individual schools and school districts.

- Establish *management and support systems* for asthma-friendly schools
- Provide appropriate *school health and mental health services* for students with asthma
- Provide *asthma education* and awareness programs for students and school staff.
- Provide a safe and *healthy school environment* to reduce asthma triggers.
- Provide safe, enjoyable *physical education and activity opportunities* for students with asthma.
- Coordinate *school, family, and community efforts*

to better manage asthma symptoms and reduce school absences among students with asthma.

Specific actions that are recommended under these strategies include:

- have on file an asthma action plan for all students with known asthma
- use a variety of data sources to identify students with poorly controlled asthma
- provide intensive case management for students with poorly controlled asthma at school
- minimize asthma triggers in the school environment
- implement a policy to permit students to carry and self-administer asthma medications
- train school staff on recognizing and responding to severe asthma symptoms that require immediate action
- have a full-time registered school nurse on site during school hours to provide needed care
- provide parents and families of students with asthma information to increase their knowledge about asthma management

These school-based initiatives can apply current knowledge to control asthma effectively and minimize its harmful consequences by helping to ensure increased access to high quality medical care, increased adherence to effective medications, and decreased exposure to environmental triggers.

Proven or Promising Approaches

The quality of evaluative research assessing school-based asthma programs varies greatly across studies, as does the consistency of program effects on variables relevant to education outcomes. Collectively, however, these studies leave little doubt that well conceived and implemented programs can achieve beneficial health and educational outcomes for poor urban minority youth. Various approaches to asthma education and medical management have been conceptualized and demonstrated to have favorable effects on educational and health outcomes. These

outcomes include attendance (Guevara, Wolf, Grum, & Clark, 2003; Levy, Heffner, Stewart, & Beeman, 2006; Taras & Potts-Datema, 2005a; Webber et al., 2003; Wolf, Guevara, Grum, Clark, & Cates 2003), grades (Evans et al., 1987), medication use (Yawn, Wollan, Scanlon, & Kurland, 2003), physiological functioning and restricted activity days (Guevara et al., 2003; Taras & Potts-Datema, 2005a; Wolf et al., 2003), asthma management by caregivers (Evans, Clark, Levinson, Levin, & Mellins, 2001), daytime and nighttime symptoms (Clark, Brown, Joseph, Anderson, Liu, & Valerio, 2004), emergency department use (Coffman, Cabana, Halpin, & Yelin, 2008; Levy et al., 2006; Webber et al., 2005;) and hospitalization (Coffman et al., 2008; Levy et al., 2006).

Summary

To reduce the effects of asthma on learning, a multifaceted approach to asthma control and prevention, in which schools can and must play a central role, is essential. Coordinated school health programs can exert a dramatic influence on asthma morbidity and its educational and quality of life consequences among poor urban minority youth. Schools provide an effective context for engaging youth with asthma in asthma education and control programs. School-based programs can reach a large proportion of the at-risk population with tailored educational programs for groups and individuals and can provide social and emotional support and address mental and emotional needs that may be associated with persistent and severe asthma. Schools can assist with medications and provide an avenue to educate parents or caregivers in ways to support improved asthma outcomes. School staff must have the necessary knowledge and skills to respond appropriately if students with asthma have attacks during the school day or during after-school sports.

Among the many aspects of the physical environment that warrant attention are particulate air pollution and adequacy of ventilation systems, misuse of paints, pesticides and cleaning solutions, water leaks and associated molds, second hand smoke (many schools do not have policies prohibiting smoking on

school grounds), the availability of clean cold water and of good hand washing facilities (both of which are extremely important for communicable disease prevention and control). Aspects of the biological environment that warrant attention include the presence of cockroaches or rodents, and furry or feathered pets within the classroom. It is not surprising that many school-based programs have demonstrated effectiveness for improving educational and health outcomes associated with asthma. The priority now is to increase the extent to which these programs are implemented in the nation's schools serving urban minority youth.

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Basch's main scholarly interests are improving understanding about (1) health-related decision making, (2) dissemination and implementation of effective health-related programs and policies, and (3) the influence of health factors on educational outcomes in urban minority youth. He teaches courses related to epidemiology, planning and evaluation. During his 25 years at Teachers College, he has directed approximately \$15 million dollars of grant-funded research and program development (primarily supported by the National Institutes of Health), and he continues to do so. His work has yielded over 100 publications.



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