EQUITY MATTERS: Research Review No. 6

Healthier Students Are Better Learners:

A Missing Link in School Reforms to Close the Achievement Gap

Charles E. Basch

A Research Initiative of the Campaign for Educational Equity

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A Research Initiative of the Campaign for Educational Equity
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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 heath 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; Paloni, 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.

Vision

Overview and Disparities

Childhood and adolescent vision problems are diverse in nature and severity, ranging from mild refractive errors to permanent vision impairment and blindness. Many vision problems entail a variety of symptoms that greatly affect skills and systems related to learning. Low-income minority youth appear to suffer from a disproportionately high prevalence of educationally relevant vision problems, and are clearly at high risk for inadequate treatment of vision problems. Left untreated, vision problems can have severe adverse effects on educational achievement through several causal pathways.

The most common vision problems are refractive errors that impair visual acuity at far distance (myopia/nearsightedness) or at near distance (hyperopia/farsightedness); these are often correctable with eyeglasses. Other important vision problems include astigmatism (irregular curvature of the cornea), strabismus (crossed or misaligned eyes), amblyopia (lazy eye), problems with binocular coordination of eye movements, and problems with the integration of visual sensory perception and the brain. These problems can typically be addressed with eyeglasses, medication, or vision therapy (Cotter et al., 2007; Harvey, Dobson, Clifford-Donaldson, & Miller, 2007; Harvey, Dobson, Miller, & Clifford-Donaldson, 2008; Hertle et al., 2007; Hunter, 2005; Krumholtz, 2000; Pediatric Eye Disease Investigator Group, 2005, 2008; Wallace et al., 2007).

It has been estimated that more than one in five school-aged youth has some kind of vision problem (Ferebee, 2004). Recent estimates of visual impairment in a nationally representative sample of 12-19 year olds in the United States are available from the National Health and Nutrition Examination Survey—NHANES, 1999-2002 (Vitale, Cotch, & Spreduto, 2006). The rate of visual impairment (distance visual acuity of 20/50 or worse in the better-seeing eye) among 12-19 year-olds (9.7%) was significantly higher than among adults aged 20-39 (5.6%) or 40-59 (4.3%); but not significantly different from adults aged 60 and older (8.8%).

Over 90% of the visual impairment among 12-19 year-olds was due to uncorrected refractive error. In the total sample (all age groups), rates of visual impairment were significantly higher for blacks (8.4%) and Hispanics (10.7%) compared with whites (5.0%), and almost three times as high for individuals with income below the poverty level (12.0%) versus two times the poverty level or greater. A recent analysis of the same data set indicated that almost one-third of youth aged 12-18 reported wearing corrective lenses; rates were higher among females and those with private insurance (Kemper, Gurney, Eibschitz-Tsimhoni, & Del Monte, 2007). Compared with whites, blacks and Hispanics were less likely to have had their corrective lenses available at the time of the study. The authors concluded that variance in use of corrective lenses may be due to a combination of under- and over-treatment and consistency of use of glasses. No current, nationally representative estimates of refractive errors and vision-related learning problems were found for 5-11 year olds, but data from school-based vision screening programs and local studies indicate that a substantial portion of children and adolescents are affected.

Severe visual impairment and blindness among children is not common. According to the Centers for Disease Control and Prevention, 1.4 per 1000 8 year olds (around 1 in 715) have vision impairment and approximately 7 in 10,000 10 year olds are legally blind (Centers for Disease Control and Prevention, 2008; Drews, Yeargin-Allsopp, Murphy, & Decoufle, 1992). Approximately 25 per 1000 youth under age 18 are blind or visually impaired (Cotch, Janiszewski, Klein, Turczyn, Brett, & Ryskulova, 2005).

Recent estimates in children 6-72 months of age indicate that amblyopia is more common in Hispanic

than in African American children (2.6% versus 1.5%). Rates of strabismus were 2.4% and 2.5%, respectively. Rates for white children were not reported (Multi-ethnic Pediatric Eye Disease Study, 2008). Nationally representative estimates of amblyopia and strabismus among school-aged children are not available, but some local estimates (outlined below) are even higher.

In Kentucky, between July 2000 and April 2001, 5,316 eye exams were conducted among children entering school. As a result, 13.4% received a prescription for glasses, 3.4% were diagnosed with amblyopia, 2.3% with strabismus, and 0.8% received other diagnoses; thus approximately 1 in 5 children entering school had a vision problem (Zaba, Johnson, & Reynolds, 2003). In a multi-center study of refractive error among 2,523 youth aged 5-17, 9.2% were myopic, and 12.8% were hyperoptic (Kleinstein et al., 2003). In Baltimore, vision screening and examination of 285 elementary school children resulted in diagnoses of amblyopia (5.3%), strabismus (3.2%), and refractive errors (7.4%) (Preslan & Novak, 1998). In northern Manhattan, screening of 5,851 students in four intermediate schools determined that 28% had vision of 20/40 or worse in at least one eye. In the majority of cases, follow-up eye examinations confirmed the presence of refractive errors, most of which could be corrected with glasses (Pizzarello, Tilp, Tiezzi, Vaughn, & McCarthy, 1998). Another study in three New York City public elementary schools screened 1,365 students; 29% were referred for further evaluation (Krumholtz, 2000). Different methods and operational definitions account for some of the variation in findings.

Some data suggest that low-income children and children experiencing problems in school are disproportionately affected by vision problems (Grisham, Powers, & Riles, 2007; Johnson, Blair, & Zaba, 2000; Johnson & Zaba, 1999; Krumholtz, 2000; Maples, 2001, 2003; Mozlin, 2001; Pizzarello et al., 1998; Powers, Grisham, & Riles, 2008; Vision in Preschoolers Study Group, 2005; Zaba, 2001). The association may be due, at least in part, to increased risk of being born prematurely and at low birth weight (Reichman, 2005), both of which adversely affect eye health and processes associated with the development of vision (Chawla, Agarwal, Deorari, & Paul, 2008; Cosgrave, Scott, & Goble, 2008; Hellgren et al., 2007; Holmstrom & Larsson, 2008; Mozlin, 2001; O'Connor, Wilson, & Fielder, 2007; Salt & Redshaw, 2006; Solan & Mozlin, 1997).

Empirical evidence also documents that low-income and minority youth are at greater risk of underdiagnosis and undertreatment of vision problems, and unmet need for vision care services. In a nationally representative sample of 48,000+ youth under age 18 (Medical Expenditure Panel Surveys, 1996-2001), those from lower income families were less likely to have diagnosed eye conditions than white children and children living in higher income families, perhaps reflecting inequities in access to eye care services (Ganz, Zuan, & Hunter, 2006). The authors also found that, when diagnosed with eye care problems, black youth living in poverty received fewer and less intensive health care services (Ganz et al., 2006). These analyses indicate that poor minority youth are both under-diagnosed and under-treated for eye care problems (Ganz et al., 2006, 2007). Local studies (Mark & Mark, 1999; Preslan & Novak, 1998; Yawn, Lydick, Epstein, & Jacobsen, 1996) support these conclusions. In another national sample of 14,000+ (representing almost 200,000) children with special health care needs, black, Hispanic and multi-racial children were two to three times more likely than white children to have unmet vision care needs (8.9%, 10.0%, and 14.3%, respectively, versus 4.1%) (Heslin, Casey, Shaheen, Cardenas, & Baker, 2006). The proportion affected by unrecognized or untreated vision problems may also be higher among youth with academic and behavioral risks; sequelae include intellectual disabilities and dyslexia, (Grisham et al., 2007; Johnson & Zaba, 1999; Pellicano & Gibson, 2008; Powers et al., 2008; Schuett, Heywood, Kentridge, & Zihl, 2008; Trachtman, 2008; Zaba, 2001).

Additional data are needed to describe the nature and extent of vision problems affecting youth in general, and urban minority youth in particular. Data are

lacking on the prevalence of problems with binocular coordination of eye movements and problems with the integration of visual sensory perception and the brain. Research is warranted to improve understanding of optimal ways to define and treat learning-related vision problems. In the meantime, ample evidence indicates that a substantial proportion of youth are affected by vision problems, and common sense indicates that untreated vision problems can hamper the learning of essential academic skills and adversely influence educational outcomes.

Causal Pathways Affecting Educational Outcomes

Considerable evidence supports the associations between vision-related learning problems and educationally relevant outcomes, and both theoretical and empirical evidence suggests that some of the associations may be causal. Critical vision skills specifically related to learning include tracking (i.e., ability to move across a line of text when reading), teaming or binocularity (i.e., communication between the eyes and the brain) and focusing (i.e., ability to focus accurately at various distances, to change focus quickly, and to maintain focus as long as necessary) (Harris, 2002). Symptoms of visual problems that threaten educational achievement include frequent eye rubbing or blinking, short attention span, avoidance of reading and other close activities, frequent headaches, covering of one eye, tilting the head to one side, holding reading materials close to the face, eyes turning in or out, seeing double, losing place when reading, and difficulty remembering what has been read (American Optometric Association, 2008). Because visual sensory perceptions and cognition are so strongly interrelated, these topics are combined below.

Sensory Perceptions and Cognition

While all of the senses are important for growth and development, a preponderance of learning occurs through visual systems. Good eyesight facilitates learning in school and development in general. To the extent that sensory input—the ability to see clearly—is less than optimal, youth may be more likely to become demoralized, fatigued, and avoid learning tasks that require good eyesight. It is axiomatic that academic success will be more difficult for a child who cannot see well in school. But even if a child can see well, vision-related learning problems may still impede learning.

In elementary-level children, hyperopia (inability to see clearly at near distance) has been adversely associated with standardized measures of literacy (Williams, Latif, Hannington, & Watkins, 2005), standardized reading test scores (Krumholtz, 2000), and percentile ranking on the Iowa Test of Basic Skills (Rosner & Rosner, 1997). Uncorrected hyperopia in 4-7 year olds has been adversely associated with emergent literacy skills, including letter and word recognition, receptive vocabulary, and orthography (use of letters in words) (Shankar, Evans, & Bobier, 2007). The studies cited are cross-sectional, but the relationship between hyperopia and lowered reading ability has also been demonstrated longitudinally among children aged 7-11 (Williams, Sanderson, Share, & Silva, 1988). Complementing these results are those showing the opposite: that compared with children (aged 10-12 years) who did not have myopia, children with myopia read more and have higher levels of academic achievement (Saw et al., 2007). One plausible explanation (of several) for the contradictory findings is that children with uncorrected hyperopia, who struggle to see at close distance, are more likely to avoid tasks such as reading, that depend on close vision.

Another aspect of visual processing that plays a role in acquiring basic academic skills, cognition, and learning (e.g., reading) is binocular coordination of eye movements. Binocular coordination is essential for tracking skills (e.g., the ability to move across a line of text when reading). In children, the stability of binocular control has been associated with reading and with spelling skills (Cornelissen, Bradley, Fowler, & Stein, 1991, 1994). In adolescents, saccadic tracking skill deficits, such as those required for following

letters and words across a line of text, have been suggested as a risk factor for low levels of reading ability (Powers et al., 2008). Data suggest that there are systematic changes in binocular control in reading (and nonreading) tasks for children (and adults) that are not driven by cognitive development (Kirkby, Webster, Blythe, & Liversedge, 2008). While a causal relationship between ocular control and academic achievement in areas such as reading has not been unequivocally established, evidence suggests that deficits in ocular control may contribute to learning problems.

Sensory problems (obstacles to seeing well) can impair learning, but so can obstacles to integration between visual sensory perception and the brain. Various aspects of this integration process have been associated with educationally relevant outcomes. Associations have been reported between visual motor integration and both teachers' ratings of children's ability in reading, math, spelling and writing, and standardized reading test scores (Kulp, 1999); between visual memory and standardized measures of word decoding and math and Stanford total battery score (Kulp, Edwards, & Mitchell, 2002); between visual information processing skills and reading ability (Goldstand, Koslowe, & Parush, 2005); between accommodative facility (focusing at various distances) and stereoacuity (depth perception) and standardized measures of reading performance (Kulp & Schmidt, 1996, 1997); between visual-spatial short-term memory and standardized math test scores (Bull, Espy, & Wiebe, 2008); and between symptoms of visual problems and standardized tests scores (Vaughn, Maples, & Hoenes, 2006). Most research on vision skills has been conducted in elementary children, but tracking skills have also been associated with low levels of reading achievement among adolescents (Powers et al., 2008).

Connectedness

It is not unreasonable to assume that the child who struggles with vision problems will tend to avoid certain kinds of work because of fatigue, strain, and demoralization. Vision problems cannot be overcome by simply trying harder, but need to be addressed with timely and appropriate treatment. A likely outcome for children demoralized by ongoing struggle coupled with lack of academic success is disengagement from school. A child with an undetected or untreated vision problem is more likely to develop social or emotional problems. Thus, a child's vision problems can affect not only their own learning, but that of their peers. (Johnson, Nottingham, Stratton, & Zaba, 1996; Zaba, 2001).

What Can Schools Do to Address Vision Problems?

Despite controversy surrounding choice of screening method (Arnold & Donahue, 2006; Donahue, Johnson, Ottar, & Scott, 2002; Donahue & Leonard-Martin, 2000; Kemper, Margolis, Downs, & Bordley, 1999; Logan & Gilmartin, 2004; Poterio et al., 2000; Robinson, Bobier, Martin, & Bryant, 1999; Vision in Preschoolers Study Group, 2004, 2005; Zaba, Reynolds, Mozlin, Costich, & Slovona, 2007) there is no doubt that school based vision screening can help identify vision problems that adversely affect educational outcomes. The initial goal of screening is to identify youth who warrant further evaluation via a comprehensive eye exam conducted by an eye care specialist (ophthalmologist or optometrist).

Many states (71%) require school-based vision screening programs, as do the majority of school districts (93%) (Brener, Wheeler, Wolfe, Vernon-Smiley, & Caldart-Olsen, 2007). More elementary schools (91%) than middle (82%) or high schools (64%) require vision screening. Among states that require vision screening almost all require parental notification of results. Less than half (41%) require teacher notification. Teachers are obviously well placed not only to help identify children with learning-related vision problems, but also to encourage children to follow recommended actions (e.g., wear their glasses as needed). This is, of course, yet another responsibility placed on teachers, which may or may not be reasonable to expect.

There are few data available describing the nature, scope, quality or yield (i.e., amount of previously unrecognized vision problems that are detected and effectively treated) of school-based vision screening programs. There is no evidence that these programs ensure timely follow-up exams and indicated treatment, an issue known to be especially problematic among low-income families (Harris, 2002; Mark & Mark, 1999; Mozlin, 2001; Preslan & Novak, 1998; Yawn et al., 1996).

Once identified, vision problems need to be corrected. This will not happen without deliberate emphasis on follow-up to receive a comprehensive eye examination and recommended follow-up care (Harris, 2002; Mozlin, 2001; Preslan & Novak, 1998; Zaba et al., 2003). There is an ethical standard that guides against conducting screening programs unless follow-up care is available (American Academy of Pediatrics, 2004), but this appears to be commonly violated with respect to school-based children's vision screening programs. Typically, a positive screening test results in a note being sent home to parents recommending that their child receive an eye examination by an optometrist or ophthalmologist; no further action may be taken. In some contexts, this approach suffices, but this is generally not the case in low-income families (Ethan, Basch, Platt, Bogen, & Zybert, in press; Harris, 2002; Mark & Mark, 1999; Mozlin, 2001; Preslan & Novak, 1998; Yawn et al., 1996).

At least two broad approaches can help increase the chances that referred youth will receive an examination and recommended care. One is intensified outreach to parents to motivate, enable, and support them to use existing community-based eye care services. Interpersonal interaction is more likely to be effective than a one-way written communication. Parents should be informed about the nature of their children's vision problem(s), about the potential importance, and about strategies to minimize adverse educational and health effects. Telephone outreach has proven effective in a variety of related applications and warrants consideration here (Soet & Basch, 1997). A second approach is direct provision of services on-site within schools. Several examples of such school-based services have been reported and results are promising (Ethan et al., in press; Harris, 2002; Krumholtz, 2000).

In one recent study in New York City, four of eight elementary schools were assigned randomly to receive a follow up program in which all students who "failed" the routine vision screening received a professional optometric screening and, where appropriate, two pairs of eyeglasses (one for classroom use and an extra one to be kept by the teacher). In addition, teachers encouraged eyeglass use as prescribed. Eyeglass use by children was assessed by direct observation prior to and after the optometric screening. At baseline, mean rates of eyeglass use for students in intervention and control groups at baseline were 22% and 19%, respectively ($p > .10$). At follow-up, eyeglass use rose to 47% in the intervention group whereas the control group's rate remained consistent at 19% ($p < .001$). Significant differences persisted for boys and girls. These results demonstrate both the lack of follow up that can be expected subsequent to routine screening as well as the feasibility of increasing use of eyeglasses in a elementary school setting.

Vision screening programs limited to identifying and correcting visual acuity do not address the full range of vision-related learning problems affecting youth. However, correcting visual acuities through use of glasses is cost-effective (Baltussen, Naus, & Limburg, 2008) and can have significant clinical benefits (Cotter et al., 2007; Harvey et al., 2008; Wallace et al., 2007). Observational (Shankar et al. , 2007; Williams et al., 2005; Williams, Sanderson, Share, & Silva, 1988) and limited intervention research (Krumholtz, 2000) suggests that identifying and correcting visual acuity due to refractive errors can favorably affect academic achievement. Ensuring that children who need glasses receive them is an important first step. Ensuring that children who have glasses wear them is another. Improving vision by correcting significant refractive errors will make it easier for children to learn.

Vision screening, even if the focus is on visual acuity, is also likely to identify children with more significant visual problems, such as amblyopia and strabismus (Zaba et al., 2003). These conditions are ideally treated before age three or four (Hunter, 2005). Effective programmatic efforts must help ensure that children with these vision impairments receive appropriate treatment in a timely way. For vision problems involving eye-brain or eye-motor system integration the indicated treatment is often vision therapy. While current data may not support widespread implementation of vision therapy to improve tracking ability, smaller-scale demonstration studies warrant consideration. Availability and accessibility to such services, and efforts to help ensure high rates of utilization through school-based services or referrals, would be an important innovation. One role of a nurse, other school health service practitioner, or school health program coordinator should be to establish a referral network of vision care services in the community, particularly those serving low-income children.

Ideally, school-based vision screening and service programs would address a full range of ocular factors including binocularity, visual-motor functioning, and other aspects of functional vision skills (listed above), which have been associated with the acquisition of reading, written and spoken language, math, and other academically relevant skills. Multi-factorial screening and follow-up would, of course, require more time and more highly trained personnel, and thus more funding. Realization of the benefits of multi-factorial school-based vision screening would also require a more complex and intensive follow-up strategy to ensure that the full spectrum of recommended actions and indicated treatment are received. The ultimate value of such services on educational outcomes remains to be documented in rigorous studies, but warrants testing.

Proven or Promising Approaches

First, observational studies have consistently found an association between various kinds of vision problems and academic skills and measures of academic performance. Second, school-based programs can identify many (Zaba et al., 2003), though not all, youth with undetected and untreated vision problems that disproportionately affect youth with lower levels of academic achievement. Third, effective and feasible treatments for vision problems exist: eyeglass use can correct refractive errors that impede visual acuity and a strong base of biomedical and clinical research demonstrates the efficacy of interventions to prevent or minimize other eye diseases that affect youth, including amblyopia, strabismus and astigmatism (Cotter et al., 2007; Harvey et al., 2007, 2008; Hertle et al., 2007; Hunter, 2005; Pediatric Eye Disease Investigator Group, 2005, 2008; Wallace et al., 2007). Evidence also supports the value of vision therapy as a means to reduce learning problems and improve educational outcomes (Harris, 2002; Krumholtz, 2000). Fourth, although very few intervention studies have been conducted, two small studies provide preliminary evidence that correcting acuity problems, such as hyperopia, and functional vision problems, such as difficulties with tracking, can favorably influence educational outcomes, including standardized tests scores (Harris, 2002; Krumholtz, 2000). Additional intervention studies are clearly warranted.

Summary

There are large gaps in current knowledge regarding the number and percentage of school-aged youth who participate in different kinds of vision screening programs, the incidence and prevalence of various vision problems among youth, and the kinds of vision services that are, and more importantly are not, being delivered. It is, however, known that urban minority youth are less likely to receive appropriate and timely treatment for vision problems. Despite scant research on the magnitude of educational consequences of vision problems, evidence suggests that vision problems among urban minority youth may have very substantial adverse affects on educational outcomes.

Because of schools' unparalleled and consistent access to youth, school-based vision screening

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 decent (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 sequealae (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 (Guenedelman & 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, Kercsmar, 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, Breysse, 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 co-morbidity 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 (Halterman, 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) (Halterman, 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 & Caskadon, 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 (Halterman 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, McQuad & Canino, 2006; Ortega, McQuaid, Canino, Goodwin, & Fritz, 2004) and anxiety (Feldman et al., 2006; Halterman 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 Ghurka (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 (Akinbani 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.

Teen Pregnancy

Overview and Disparities

Approximately one-third of teenaged females in the United States become pregnant (Hamilton, Martin, & Ventura, 2007) and, once pregnant, are at increased risk of becoming pregnant again. Teenaged pregnancy and birth rates in the United States are high in comparison with other Western countries (Singh, Darroch, & Frost, 2001). Births to teens, particularly unintended nonmarital births, have far-reaching effects on both mothers and, perhaps even more dramatically, on their children. Minority youth (including black and Hispanic adolescents) have much higher teen birth rates than white youth, a trend that has persisted for decades. The significance of nonmarital teen births in the United States lies in the numbers of teens affected and in the educational, health, economic and social consequences for the teens and their children.

Teen pregnancy is associated with adverse educational, health, and economic outcomes for both mothers and children (Amato & Maynard, 2007; Hofferth & Reid, 2002; Hoffman, 2006; Kirby, 2007; Maynard, 1996). Teens who become pregnant are less likely to complete high school or college (Hofferth, Reid, & Mott, 2001; Hoffman, 2006; Levine & Painter, 2003; Maynard, 1996); many are on a trajectory for these educational outcomes even before becoming pregnant (Levine & Painter, 2003; Manlove, 1998). For those who manage to stay in school, pregnancy raises major obstacles to academic achievement and substantially exacerbates the challenge of completing high school and going to college (Hofferth et al., 2001; Hoffman, 2006; Levine & Painter, 2003; Maynard, 1996). Children born to teen mothers are more likely to become teen mothers themselves. A recent analysis of the National Longitudinal Survey of Youth indicated that, after adjusting for other risks, daughters of teen mothers were 66% more likely to become teen mothers (Meade, Kershaw, & Ickovics, 2008). In all likelihood, an unmarried teen mother and her child will live in poverty (Amato & Maynard, 2007), further perpetuating a cycle of poverty and subsequent non-marital teen births (Meade et al., 2008).

Both teen pregnancy and dropout may be, to a great degree, the consequence of poverty and its associated social context (Geronimus, 2003, 2004; Levine, Painter, 2003; Manlove, 1998). More and less affluent teens differ in access to health care, housing, employment, and social support. It may be these variables, not maternal age per se, that are largely responsible for the noxious outcomes associated with teen pregnancy (Finer & Henshaw, 2006; Geronimus, 2003, 2004; Turley, 2003).

In 2006, the birth rate among 15-17-year-old non-Hispanic blacks (36.1 per 1000) was more than three times as high, and the birth rate among Hispanics (47.9 per 1000) more than four times as high, as the birth rate among non-Hispanic whites (11.8 per 1000) (Martin et al., 2008). There were a total of 435,427 births to 15-19 year olds in 2006 (Hamilton et al., 2007), and the large majority were births to unmarried mothers (Amato & Maynard, 2007). Approximately one in four of the 1,470,189 nonmarital births in 2004 occurred among teens (Amato & Maynard, 2007).

Teen birth rates among 15-19 year olds declined by 34% between 1991 and 2005, but increased by 3% from 2005 to 2006 (Martin et al., 2008). Declines in teen birth rates have been attributed primarily to increased access to education, increased use of contraceptives, and delayed initiation of sexual intercourse (Brindis, 2006; Santelli, Lindberg, & Finer, 2007; Santelli, Morrow, Anderson, & Lindberg, 2006). A decline among older African American teens may have been influenced by macro-level expanded labor market opportunities (Colen, Geronimus, & Phipps, 2006).

Though the disparity in birth rates between non-Hispanic black teens and non-Hispanic white teens narrowed between 1991 with 2006 from a ratio of 3.6:1

(86.1 versus 23.6 per 1000) to 3.1:1(36.1 versus 11.8 per 1000), the disparity remains sizeable (Martin et al., 2008). The disparity in birth rates between Hispanic teens and non-Hispanic white teens increased from a ratio of 2.9:1 (69.2 versus 23.6 per 1000) to 4.1:1 (47.9 versus 11.8 per 1000) (Martin et al., 2008). The significance of this increasing disparity is magnified by the growing size of the Hispanic population.

By current estimates, 48% of high school students have had sexual intercourse (Eaton et al., 2008). Rates for non-Hispanic white and Hispanic females were similar (43.7% versus 45.8%, respectively). The rate among non-Hispanic black females was approximately 40% higher (60.9%). The percentage of female students who have had sexual intercourse increased across grade level from 27.4% in grade 9, to 41.9% in grade 10, 53.6% in grade 11 and 66.2% in grade 12. The greatest proportional increase (52%) occurred between grades 9 and 10. For males, the corresponding rates were 38.1% in grade 9, 45.6% in grade 10, 57.3% in grade 11 and 62.8% in grade 12. The greatest absolute (11.7%) and proportional (25.7%) increase occurred between grades 10 and 11. Most adolescents who ever had sexual intercourse remained sexually active (i.e., had sexual intercourse at least once in the past three months). For males and females combined, race/ethnicity-specific rates of being currently sexually active were higher for blacks (48.7%) than for whites (32.9%) and Hispanics (37.4%). There were also disparities in the percentage of youth who have had sexual intercourse with four or more persons during their life; non-Hispanic blacks (27.6%), Hispanics (17.3%) and non-Hispanic whites (11.5%). The percentage of currently sexually active high school students increases consistently with grade: 20.1% in grade 9, 30.6% in grade 10, 41.8% in grade 11 and 52.6% in grade 12, with the greatest proportional (52.2%) increase between grades 9 and 10.

Among the sexually active, condom use at last intercourse differed significantly for blacks (67.3%) versus whites (59.7%). Condom use among Hispanic youth (61.4%) did not differ significantly from use by blacks or whites. Condom use declined across grades from 69.3% in grade 9 to 54.2% in grade 12. Among sexually active adolescents, white female students were about twice as likely as black females and more than 2.5 times as likely as Hispanic females to report using birth control pills before last sexual intercourse (24% versus 12.1% and 9.1%, respectively). In contrast to condom use, use of birth control pills increased across grades, more than doubling, from 9.2% in grade 9 to 25.6% in grade 12. Thus, while blacks were more likely to use condoms than whites, white females were much more likely than black or Hispanic females to use birth control pills, and this disparity appears to grow over time from 9th to 12th grade.

Sexually transmitted disease and teen pregnancy share many of the same underlying behavioral risk factors. Teen sexual behavior, through its effects on both, assumes great educational, health, economic, and social significance. Available data for sexually transmitted disease are reported for 15-19 year olds and, so, do not apply exclusively to school-aged youth. Nevertheless, given the rates of sexual activity reported above, it is reasonable to conclude that a substantial portion of the 19 million new sexually transmitted disease infections that occur each year (Weinstock, Berman, & Cates, 2004) occur among school-aged youth. The highest rates of chlamydia, the most commonly reported infectious disease in the United States (~ 2.8 million annual cases) (Weinstock et al., 2004), occur among females aged 15-19 years (Centers for Disease Control and Prevention, 2006.). Minority youth are disproportionately affected by all sexually transmitted disease (Centers for Disease Control and Prevention, 2006).

High incidence and prevalence of teen sexual activity, coupled with high rates of nonmarital teen births and sexually transmitted disease, have important educational, health, economic and social consequences.

Causal Pathways Affecting Educational Outcomes

Increased risk of dropping out of school is perhaps the main path by which teen pregnancy influences

educational outcomes. The data outlined below address this issue. The drop-out problem is, of course, influenced by many factors and must be addressed not only by schools, but by families and communities, and with multiple approaches. The problem needs to be addressed before children begin school, in elementary school, and straight through high school. Youth at greatest risk need to be identified and supported. Youth who have already dropped out need to be encouraged and enabled to return.

Dropping Out of School

The association between nonmarital teen births and educational attainment is well documented (Amato & Maynard, 2007; Fielding & Williams, 1991; Hofferth & Reid, 2002; Hofferth et al., 2001; Hoffman, 2006; Kirby, 2007; Levine & Painter, 2003; Manlove, 1998; Maynard, 1996; Mott & Marsiglio, 1985). Compared with women who delay childbearing until age 30, teen mothers' education is estimated to be approximately two years shorter. Teen mothers are 10-12% less likely to complete high school and have 14-29% lower odds of attending college. Even small changes in the rate of nonmarital teen births would have substantial effects on the numbers of children living in poverty (Amato & Maynard, 2007).

Much debate in the literature centers on the extent to which nonmarital teen births versus conditions existing *prior* to pregnancy are the cause of reduced educational attainment. There are likely to be reciprocal causal relationships between environments (e.g., poverty), education, and health; therefore, some proportion of high school dropouts is attributable to causes other than nonmarital teen births. In their review of the National Education Longitudinal Study (1988 cohort), Levine and Painter (2003) found that about one-half of the observed effect of pregnancy on drop-out remained after statistical adjustment of numerous environmental disadvantages. Similar results were obtained by Manlove (1998). Given that there were 435,000 births to teens (in 2006) (Hamilton et al., Ventura, 2007) and that the majority were among unmarried teens (Amato & Maynard, 2007), if only one-half of the school dropouts associated with pregnancy were attributable to pregnancy, it would remain a very important contributor to reduced levels of educational attainment.

The discussion has focused on the educational consequences to teen mothers, but the children of teen mothers (who themselves also tend to be children of teen mothers) are also at increased risk of adverse educational outcomes (as well as other adverse health, economic, and social outcomes). This cycle of poverty could be influenced, to some degree, by reducing nonmarital teen births (Amato & Maynard, 2007). At the same time, the need to reduce environmental causes of poor educational outcomes remains.

What Can Schools Do to Reduce Nonmarital Teen Births?

Even as researchers, educators, and advocates continue the debate over what exactly should be taught (Bleakley, Hennessy, & Fishbein, 2006; Brindis, 2006; Constantine, 2008; Constantine, Jerman, & Huang, 2007; Darroch, Landry, & Singh, 2000; Eisenberg, Bernat, Bearinger, & Resnick, 2008; Harris Interactive, 2006; Kirby, 2007; Ito et al., 2006), and as medical and public health authorities (American Academy of Pediatrics, 2001; American Medical Association, n.d.; American Public Health Association, 2005) produce position statements, sex education programs are being implemented in the majority of the nation's middle and high schools (Kann, Telljohann, & Wooley, 2006, 2007). Most students receive some kind of sex education (Eaton et al., 2007), although students with the greatest needs are least likely to do so (Scher, Maynard, & Stagner, 2006). Comprehensive data describing the extent and quality of sex education programs do not exist, but one thing is clear: federal policies and legislation have increased the prevalence of the abstinence-only-until-marriage approach. This is disappointing considering the lack of evidence that this approach is effective (Kirby, 2007; Manlove, Papillio, & Ikramullah, 2004; Scher et al., 2006),

notwithstanding a recent supportive study (Jemmott, Jemmott, & Fong, 2010).

The topic of sex education is value-laden, and local educational leaders and parents are the appropriate people to decide what will be taught in their own schools. These decisions should be informed by empirical data indicating the magnitude and consequences of teen births and sexual activity among youth. Among many controversial topics is education about correct use of condoms, currently covered in around 20% of all middle schools and 40% of all high schools (Kann et al., 2007). Condom distribution is another potentially controversial point, currently occurring in fewer than 1% of all middle schools and fewer than 5% of all high schools (Kann, , 2007). Once general content is outlined, there are many resources available to assist local educators in selecting appropriate curricula and associated resources (Centers for Disease Control and Prevention, 2008, n.d.; Kirby, 2007; Philliber & Nolte, 2008).

An important component of school-based sex education programs deals not with sexuality, but with aspirations. An emphasis needs to be placed on the development of future aspirations such as completing high school, attending and completing college, and contributing to community and society. The point needs to be made that pregnancy (among many health related choices) has important effects on the likelihood of attaining these aspirations. Indeed, the underlying cause of teen pregnancy (and other health factors) is the lack of opportunity to realize aspirations in the context of poverty and racism (Colen, Geronimus, & Phipps, 2006; Geronimus, 2003, 2004).

Some of the most promising programs for reducing teen pregnancy focus on youth development rather than sex education, per se. One such program, initiated in early childhood, focused on parent and teacher training to facilitate children's connectedness with school and family and on helping elementary-level children learn social skills (Lonczak, Abbott, Hawkins, Kosterman, & Catalano, 2002). Another program, aimed at adolescents during nonschool hours, involved extensive contact, comprehensive education and training, and provision of health and dental care services (Philliber, Kaye, Herrling, & West, 2002). Given the cost of these approaches, the short-term feasibility of widespread implementation seems slim.

In addition to primary prevention programs aimed at delaying initiation of sex and reducing unsafe sexual behaviors, schools need to consider policies and programs for teens who become pregnant. These teens need help to succeed academically, to complete high school, and to prevent repeated pregnancy. Programs delivered through school-based health clinics (Barnet, Arroyo, Devoe, & Duggan, 2004; Barnet, Duggan, & Devoe, 2003; Key, Gebregziabher, Marsh, & O'Rourke, 2008; Meadows, Sadler, & Reitmeyer, 2000; Sadler et al., 2007; Smithbattle, 2006; Strunk 2008) have reported success in helping pregnant teens stay in school and other educational outcomes. These programs warrant serious consideration, given the documented unmet health care needs often faced by urban minority youth (Newacheck, Stoddard, Hughes, & Pearl, 1998; Olsen, Tang, & Newacheck, 2005).

While the nature and scope of school-based programs to prevent teen pregnancies and assist youth who become pregnant are likely to vary depending on school and community resources and values, among other factors, the following components warrant serious consideration:

- state of the art, evidence-based sex education that gives students knowledge, attitudes, skills, and motivation to avoid teen pregnancy
- youth development activities that build on student assets and enhance their self-identities and future aspirations
- enhancement of school connectedness
- linking students to reproductive health services, either in school clinics or in community
- linking students to mental health and social services
- providing parents education, helping them to

develop skills to share their values with their children and teach them to avoid pregnancy

- meeting physical health, mental health, and social service needs of teens who become pregnant to help them graduate from high school and continue their education

Proven or Promising Approaches

Over the past 15 years, there have been more than 20 reviews of research on the effectiveness of school- and community-based programs to prevent teen pregnancy. Conclusions have been inconsistent (Scher et al., 2006). Most recently, Kirby (2007) reported that, while no single program approach would dramatically reduce teen pregnancy, guidelines existed that, if followed by local educators, would ensure program effectiveness. He concluded that, collectively, the studies provide compelling evidence that comprehensive sex education (i.e., including education about both abstinence and contraception) resulted in delayed initiation of and frequency of sex, reduced number of partners and increased contraception use. Scher, Maynard, and Stagner (2006), in their review of randomized trials, were less sanguine about the findings, but also concluded that more intensive, multicomponent youth development programs serving high-risk populations showed the most promising results.

Summary

Teen pregnancy exerts an important influence on educational outcomes among teens. The causes of disproportionately high rates of teen pregnancy among urban minority youth are complex and multi-dimensional. Nevertheless, school-based programs have the potential to help teens acquire the knowledge and skills needed to postpone sex, practice safer sex, avoid unintended pregnancy, and, if pregnant, to complete high school and pursue post-secondary education. A secondary benefit of comprehensive sex education is that it will serve to protect youth from HIV and other sexually transmitted infections, which also disproportionately affect urban minority youth.

Aggression and Violence

Overview and Disparities

Exposure to aggression and violence has extreme noxious effects on development and quality of life for U.S. youth. Exposure is pervasive through audio and visual media. Direct exposure can occur within the community, school, peer groups and family. Many factors underlie the problem of societal aggression and violence, including unequal access to education, health care and social services, housing and employment, and policies and actions exemplifying discrimination based on race, sex, sexual orientation, and disabilities. Cumulative exposure to aggression and violence, from early childhood to adolescence and adulthood, adversely affects youth in every segment of American society, but consequences are especially harmful for urban minority youth. The present focus is on implications for educational outcomes in urban minority youth.

When it comes to youth aggression and violence, the education and public health systems clearly share mutual goals. Educators recognize that disruptive behavior by some students (in and out of the classroom) severely hampers effective teaching and learning for all students. Public health specialists recognize that aggression and violence can result in injury, disability, or death, and adversely affects mental and emotional well-being. Both fields have identified prevention as a central and high priority goal. Descriptive statistics, while dramatic and disturbing, can only begin to communicate the magnitude, severity, and urgency of this problem.

Homicide rates among youth are much higher in the United States than in other countries with similar economies (Krug, Dahlberg, Mercy, Zwi, & Lozano, 2002). In 2006, homicide was the fourth leading cause of death among 5-9 year olds, the third leading cause among 10-14 year olds, and the second leading cause among 15-19 year olds among (National Center for Injury Prevention and Control, n.d.). For male teens, blacks are over ten times more likely to die from homicide than whites (Centers for Disease Control and Prevention, 2009).

Homicide remains a rare event in school settings. Less than 1% of homicides among 5-18 year olds occur in school (Centers for Disease Control and Prevention, 2008). Nationwide, a total of 14 homicides occurred at school between July 1, 2005, and June 30, 2006. School-associated violent deaths are more likely to occur among males (versus females), high school students (versus those in earlier grades), and students in urban areas (Centers for Disease Control and Prevention, 2008).

Alternative indicators of aggression and violence include threats, attacks, and injuries to teachers and students, violent and nonviolent crimes, discipline problems, gang activity, bullying, physical fighting, weapon carrying, perceived safety, and school avoidance due to fear. Data on these indices are available from the National Center for Education Statistics' *Indicators of School Crime and Safety: 2007* (National Center for Education Statistics, 2007).

In 2005, among students aged 12-18, there were 628,200 violent crimes and 868,100 thefts at school; 8% of 9th through 12th graders reported being threatened or injured with a weapon in the preceding 12 months; 28% reported being bullied at school in the past six months. Among those being bullied, 53% were bullied once or twice in the past six months, 25% once or twice a month, 11% once or twice a week, and 8% almost daily.

In 2005-06, 24% of public school principals reported daily or weekly bullying as a problem; 18% reported student acts of disrespect for teachers and 9% reported verbal abuse of teachers as a problem. Seventeen percent of principals (and 24% of students) reported gang activity at their schools.

Verbal aggression is an insidious and harmful aspect of the problem. In 2005, among students aged

12-18, 11% reported that hate words were directed to them (i.e., words about race, ethnicity, religion, gender, sexual orientation and/or disability). Almost 40% reported the presence of hate-related graffiti at their schools. Black and Hispanic students were more likely to report having had race-related hate words used against them than white students (7% and 6%, respectively, versus 3%). Urban students were more likely than suburban students to report being called hate words (12% versus 9%). Students in public schools were almost twice as likely to report being called hate words (12% versus 7%) and seeing hateful graffiti (39% versus 18%) as private school students.

Another source of data is the Youth Risk Behavior Survey, coordinated by the Centers for Disease Control and Prevention, which collects data from a nationally representative sample of high school students. These data further illustrate the large proportion of all youth, and especially minority youth, who are adversely affected (Eaton et al., 2008). As an example, almost one in ten students (7.8%) reported being forced to have sexual intercourse (an outcome more than twice as likely for females).

From the same source: *In the past year*, 35.5% reported being in at least one physical fight, a more common experience among blacks and Hispanics than whites (44.7% and 40.4%, respectively, versus 31.7%); 27.1% reported having their property deliberatively damaged or stolen on school property (more common among males); and 10% reported dating violence in the form of being hit, slapped, or physically hurt by their partner (Eaton et al., 2008). In this age group, theft is more likely to occur within rather than away from school (National Center for Education Statistics, 2007). *In the past month*, 18% reported carrying a weapon, 9% of males and 2.7% of females doing so on school property; 5.2% reported carrying a gun; 5.5% had missed one or more of the past 30 school days because of feeling unsafe at school or while traveling to or from school. The experience was more commonly reported by Hispanics and blacks than whites (9.6% and 6.6%, respectively, versus 4.0%)).

More males than females reported being in at least one physical fight in the past year; this was true within every race/ethnicity group. Physical fights were more prevalent among 9th than 12th graders (40.9% versus 28%). Racial/ethnic disparities were greater among female than male students; Hispanic females were 56% more likely and black females 83% more likely to have been in a physical fight in the past year than white females. For both sexes, blacks were more likely to report dating violence than whites (females: 13.2 % versus 7.4%; males: 9.3% versus 5.2%). Black females were more likely to report being threatened or injured with a weapon on school property within the past year than white female students (8.1% versus 4.6%) (Eaton et al., 2008). These data demonstrate an alarming magnitude of direct exposure to physical violence and aggression, particularly among high school students.

Aggressive behaviors in school disrupt both teaching and learning. In the school year 2003-04, one in ten teachers in the nation's urban schools was threatened with injury or physically attacked (National Center for Education Statistics, 2007). In-school threats and injuries are almost twice as prevalent in cities as in suburbs and towns or rural areas (10% versus 6% and 5%, respectively). Public school teachers in cities were six times more likely to be threatened with injury (12% versus 2%) and five times more likely to be physically attacked (5% versus 1%) than private school teachers in cities.

Nationally representative data for elementary school children in the United States are not available (Brown & Bzostek, 2003), but local data strongly suggest that aggressive experiences in school are commonplace (Brown, Birch, & Kancherla, 2005; Dake, Price, & Tellijohann, 2003; Glew, Fan, Katon, & Rivera, 2008; Juvonen, Graham, & Schuster, 2003; Stockdale, Hangaduambo, Larson, & Sarvela, 2002). Experience as a bully, victim, or both has been associated with adverse physical and mental health consequences in the United States and elsewhere (Arseneault, Walsh, Trzesniewski, Newcombe, Caspi, & Moffit, 2006;

Fekkes, Pijpers, Fredriks, Vogels, & Verloove-Vanhorick, 2006; Glew et al., 2008; Juvonen et al., 2003; Perren & Alsaker, 2006). Being a victim of bullying has not only been associated with concurrent and future mental and emotional well-being (Kumpulainen, 2008), but also with educationally relevant outcomes, including lower achievement, feeling unsafe at school, and lower connectedness with school (Glew, Fan, Katon, Rivara, & Kernic, 2005).

Causal Pathways Affecting Educational Outcomes

Associations between exposure to and exhibition of aggression and violence, in school and out, and unfavorable educational outcomes are well-documented (Glew et al., 2005, 2008; Juvonen, Nishina, &Graham, 2000; Nishina, Juvonen, & Wirkow, 2005). Three relevant causal pathways are cognition, connectedness with school, and absenteeism. It should also be noted that aggressive behavior can exert adverse effects on those who observe it by influencing them to act in similarly harmful ways (Bingenheimer, Brennan, & Earls, 2005; Patternson, Dishion, & Yoeger, 2000). This, in turn, can encourage initiation or maintenance of aggressive or violent behavior, thus perpetuating a vicious cycle.

Cognition

Exposure to aggressive experiences, in school and out, can profoundly affect mental health (Fekkes et al., 2006; Glew et al., 2008; Juvonen et al., 2003; Kochenderfer & Ladd, 1996), including adjustment at school (Glew et al., 2008). In a recent study of more than 42,000 11-17 year olds, school violence was associated with internalizing behaviors (e.g., depression, anxiety, sadness, withdrawal) and externalizing behaviors (e.g., problems with conduct, getting along with others, bullying) (Youngblade et al., 2007). Schwartz and Gorman (2003) suggest that exposure to community violence influences academic failure via two causal pathways: (1) symptoms of depression (i.e., intrusive thoughts, low energy and motivation, and poor concentration) and (2) disruptive behavior (i.e., aggression, impulsiveness, hyperactivity, and off-task behavior). In a cross-sectional study of community violence among 237 3rd to 5th graders from low-income families in Los Angeles, a link between violence exposure and academic difficulty was postulated to be caused, in part, by depressive symptoms and by low self-regulation abilities, exemplified by disruptive behavior. It is reasonable to conclude that both depressive symptoms and disruptive behaviors can interfere with cognitive processes that facilitate academic (and social) success.

Connectedness

Even as early as kindergarten, participation appears to be a prerequisite to achievement (Ladd, Birch, & Buhs, 1999). The social and psychological climate and physical environment at school play a pivotal role in ensuring that youth like and are engaged in school. Several studies have documented an (expected) association between exposure to aggression and violence in school and connectedness (Eisenberg, Neumark-Sztainer, & Perry, 2003; Glew et al., 2005; Ladd, Kochenderfer, & Coleman, 1997). In their study of more than 3500 3rd to 5th graders, Glew and colleagues found that victims of violence and bullying were much more likely to report feeling they did not belong at school (Glew et al., 2005). A smaller-scale, repeated measures study of kindergarteners (n = 200) reported an obvious finding: children who were less victimized liked school more (Ladd et al., 1997). While the link between school aggression and violence and school connectedness is clear, the direction of causality is less so. Indeed, a central premise underlying prevention programs is that increasing the extent of connectedness will result in reducing aggression and violence in schools (Brookmeyer, Fanti, & Henrich, 2006). It seems likely that there are reciprocal relationships between the psychological climate and safety of schools and students' feelings of connectedness.

Absenteeism

It is not surprising that students who perceive school as dangerous (physically or emotionally) might

choose to avoid school. As noted above, 5.5% of a nationally representative sample of high school students reported being absent at least one day in the past month because of feeling unsafe at school or traveling to or from school. The experience was reported more frequently by Hispanic and black students than by whites (9.6% and 6.6%, respectively versus 4.0%). Younger children who were less victimized were more likely to attend (Ladd et al., 1997).

What Can Schools Do to Reduce Aggression and Violence?

Given the pervasiveness of physically and verbally aggressive behaviors within U.S. society (e.g., within families, among peers, as portrayed in visual and audio media), school policies and programs cannot be expected to solve the problem. School health policies and programs can and must, however, directly address aggressive behaviors that occur within the school grounds. By doing so, they can favorably affect pro-social behaviors in and out of school. For youth, schools are one of the key social contexts in which aggressive behaviors occur. By the same token, schools can also be one of the key social contexts in which youth can learn and practice respect, tolerance of differences, and skills for minimizing and avoiding aggressive interpersonal interactions.

Distinct policies and programs are needed for early- and late-onset aggressive behaviors. Different solutions are more likely to succeed for each (Brown & Bzostek, 2003). Disruptive classroom behavior is a well recognized and significant impediment to teaching and learning, and numerous policies and practices have been developed to address the issue. Some focus on establishing disciplinary codes and sanctions, and instituting safety and security measures. Those most likely to be effective, however, are more comprehensive in scope. Universal school violence prevention programs have been implemented at all grade levels, from kindergarten through high school. These programs are directed to all students in the target grade(s), not just to specific high risk students. As with most health-related issues, prevention is preferable to after-the-fact remedial action.

The most current school health guidelines for the prevention of unintentional injuries and violence were published in 2001 by the Centers for Disease Control and Prevention (Centers for Disease Control and Prevention, 2001). Recommendations cover eight aspects of school-based programs and policies related to preventing unintentional injuries, violence, and suicide. Some relevant dimensions of the recommendations are outlined below. Much of the material is excerpted directly from the document.

Establish a Social Environment That Promotes Safety and Prevents Violence

Creating a culture within the school that supports pro-social values and norms (Jagers, Snydor, Mouttapa, & Flay, 2007) should be a priority. To the extent that the school's social climate is characterized by respect, empathy, cooperation, and tolerance of differences and different opinions, students will be more likely to feel connected and to succeed academically and socially. The climate should create expectations for high academic standards, establish acceptable norms and rules of conduct that do not tolerate harassment, bullying, undesirable gang activity or other aggressive behavior, and create and enforce fair policies for dealing with aggression if and when it occurs. The climate should also stress the importance of and exemplify empathy and caring in interpersonal interactions between and among students and school staff.

Provide a Physical Environment, Inside and Outside School Buildings, That Promotes Safety and Prevents Violence

There is increasing understanding about the ways in which the physical environment of school may affect the chances for aggression and violence (Centers for Disease Control and Prevention, n.d.; Culley, Conkling, Emshoff, Blakely, & Gorman, 2006; Mair & Mair, 2003). One important aspect of the physical environment is the level of adult supervision. Another is the policies

and practices that reduce the presence of weapons in school. Certain times, before and after school and during transitions within the school day, may pose particular risk for aggression. Special attention needs to be given to the physical environment during these times (Anderson et al., 2001). Travel routes to and from school are also important, as evidenced by the extent to which students miss school because they are afraid of traveling to and from school. While school officials cannot deal with this directly, they can work with local law enforcement officials to help ensure the physical safety of travel within the community, especially during key times before and after school.

Implement Curricula and Instruction That Help Students Learn and Apply Knowledge and Skills to Adopt and Maintain Healthful Choices

Strong evidence supports the effectiveness of some violence prevention programs. It is essential that educational leaders adopt curricula from worthwhile programs (i.e., those of demonstrated effectiveness). These programs are identifiable through existing resources (e.g., Centers for Disease Control and Prevention, 2009). One of the most important aspects of the violence and aggression component of a comprehensive school health program is to foster developmentally appropriate skills that will help youth learn, value, and practice pro-social behavior. These skills, which largely address issues of self-awareness and self-regulation, include, but are not limited to, communication and assertiveness, conflict resolution, impulse control and anger management, resisting social pressures, decision making, and problem solving. The acquisition and maintenance of these skills requires time and practice. Without an adequate time commitment, youth cannot be expected to learn and use these skills in or out of school.

Provide Safe Physical Education and Extracurricular Physical Activity Programs

Physical education and physical activity provide a context in which youth may learn pro-social behavior. The cooperation and teamwork learned in these contexts can be applied in others. The approach is illustrated in a recent paper describing efforts to integrate school-based activities that simultaneously increase physical activity and reduce bullying (Bowes, Marquis, Holoway, & Isaac 2009).

Provide Health, Counseling, Psychological, and Social Services to Meet the Physical, Mental, Emotional, and Social Needs of Students

Given the complex etiology of aggression and violence in American society, it seems clear that, despite all efforts, some aggression and violence will continue to occur. Primary prevention—preventing the problem before it occurs—should be an emphasis. Nevertheless, dealing with aggressive events and their physical, emotional, and academic sequelae, after the fact, will remain a necessity. On-site services provided in schools or through linkages with existing community resources are needed.

Establish Mechanisms for Short- and Long-Term Crisis Response

Policies and plans must be in place to deal with crises if, and when, they occur. A written plan should address both short- and long-term responses and services. Crisis plans need not be limited to violence, but should also address other precipitating factors (e.g., environmental disasters, weather).

Integrate School, Family, and Community Efforts to Prevent Violence

While schools can play an important role, family and community involvement is also essential. Their involvement will greatly enhance the effectiveness of school-based efforts. One of the most impressive long-term programs demonstrating benefits to youth relied on working with parents, as well as teachers and students. Clearly, increased parental involvement in schools and in the lives of youth will have tremendous benefits for all concerned. Fostering such involvement can be a challenge given the work and associated demands on parents, especially those struggling economically.

Provide Staff Development for School Personnel

As with any program, successful benefits will not accrue unless teachers, administrators, and other school personnel are knowledgeable, skilled, and motivated. Adults within the school setting have an important effect on youth through the behaviors they model. One dimension of a school's commitment to addressing the issue of aggression and violence is the extent to which time for relevant training and staff development is provided.

Proven or Promising Approaches

School-based programs of demonstrated effectiveness in addressing in-school violence and aggressive behaviors already exist (Hahn, Crosby, Moscicki, Stone, & Dahlberg, 2007; Hahn, Faqua-Whitley, et al., 2007; Mytton, DiGuiseppi, Gough, Taylor, & Logan, 2006; National Institutes of Health, 2004; Wilson & Lipsey, 2007). The strongest evidence for the value of such programs comes from two recent independently conducted reviews of current evaluative research. One was conducted by the U.S. Task Force on Community Preventive Services, the other by Wilson and Lipsey (2007). These independent reviews, while differing in methods, reach similar conclusions, namely that school-based violence prevention programs can work to reduce violent and aggressive behaviors by students.

The systematic review of published scientific evidence by the U.S. Task Force on Community Preventive Services highlights compelling evidence that universal school-based programs (i.e., those directed to all youth in a school or specific grade, as opposed to high risk youth) reduce violent and aggressive behaviors. Favorable effects extended to students with low socioeconomic status or living in high crime areas (Hahn, Crosby, et al., 2007; Hahn, Faqua-Whitley, et al., 2007). The programs addressed a wide range of hypothesized mediating outcomes: knowledge, emotional self-awareness and control, empathy, social skills related to conflict resolution, problem solving, impulse control, and team work (Hahn, Crosby, et al., 2007; Hahn, Faqua-Whitley, et al., 2007). Some emphasized modeling by teachers, parental support and involvement, and the entire school environment. Program value was assessed at each of four grade levels: pre-kindergarten and kindergarten, elementary, middle, and high school. All programs included a classroom component. Characterization of the different programs is complicated by variations in type and amount of information included in evaluation reports. Some general observations follow. Elementary and middle school programs tended to focus on disruptive and antisocial behavior, were usually implemented by teachers, and took a cognitive/affective approach. Middle school and high school programs tended to focus on general and specific forms of violence (e.g., dating, bullying), were usually implemented by both teachers and others (peers, other adults), and emphasized behavioral and social skills. Programs differed substantially in frequency and duration. It is noteworthy that all program strategies (i.e., cognitive/affective and behavioral/social skills) and foci (i.e., disruptive behavior, antisocial behavior, bullying, dating) were found to reduce violent behavior at all grade levels (Hahn, Faqua-Whitley, et al., 2007).

Wilson and Lipsey's 2007 meta-analysis of 249 school-based programs includes both universal and targeted programs, comprehensive multi-component programs, and programs for special schools or classrooms. Program modalities included behavioral strategies (e.g., rewards, contingencies), cognitive strategies (e.g., changing thinking and attributions, cognitive skills, problem solving), social skills (e.g., communication and conflict management), counseling/therapy, peer mediation, and parent training. Program evaluations varied considerably with respect to outcome measures: aggression, school performance, social skills, personal adjustment, social relations, internalizing behaviors, problem behavior, anger/hostility/rebelliousness, school participation, and knowledge. Compelling results were found for both universal and targeted programs. Programs were most effective for students with low socioeconomic status. Effective targeted programs tended to use

behavioral strategies and be characterized by higher levels of program implementation. The authors conclude that, overall, both universal and targeted programs have statistically and practically significant effects. Based on their finding that different universal and targeted program had such similar effects, they suggest that the best choice for a specific school may be that program that has the greatest chances for a high level of implementation. They note the existence of resources cataloguing programs with demonstrated effectiveness exist, including the National Registry for Evidence Based Programs and Practices (*www.nrepp.samhsa.gov*), Blueprints for Violence Prevention (*www.colorado.edu/cspv/blueprints*), and Collaborative for Academic, Social and Emotional Learning (*http://www.casel.org*).

Summary

Violence and aggressive behavior, once considered a criminal justice problem, is now recognized as an appropriate and important focus of the education and public health systems. The nation's schools cannot singlehandedly solve the problem, or even address all of its dimensions, but there is a need, particularly among urban minority youth, to address the noxious effects of violence and aggressive behavior on academic achievement and educational attainment. Compelling research has shown that school-based programs can significantly reduce the nature and extent of these behaviors. Implementing these programs in schools serving urban minority youth must be a high priority to help close the achievement gap.

Physical Activity

Overview and Disparities

Physical activity has dramatic effects on individuals' physical and mental health and on population-wide health status. Unacceptably low levels of physical fitness and physical activity have contributed to increasing prevalence, in the past decades, of overweight and obesity among youth (Gordon-Larsen, Adair, Nelson, & Popkin, 2004; Kimm et al., 2001, 2002; Ogden, Carroll, & Flegal, 2008; Ogden et al., 2006; Ogden, Flegal, Carroll, & Johnson, 2002). Prevalence of overweight and obesity is highest among minority female children and adolescents (Kimm et al., 2001, 2002; Ogden et al., 2002) and among Mexican-American boys (Flegal, Ogden, & Carroll, 2004; Freedman, Khan, Serdula, Ogden, & Dietz, 2007; Hedley et al., 2004; Ogden et al., 2006, 2008). While levels of physical activity are unacceptably low for most adolescents, they are particularly low for black and Hispanic females. The beneficial effects of physical activity and physical fitness on physical health are very well established, and there is increasing evidence of effects on mental health. An emerging literature documents the ways in which physical activity, fitness, and school-based physical activity programs, such as physical education, favorably affect educational outcomes.

Physical activity and resulting fitness affect physical health via the cardiovascular, musculoskeletal, endocrine, and neurological body systems. In adults, physical activity or physical fitness has been associated with reduced risk of cardiovascular disease (Brown, Burton, & Rowan, 2007; Mora et al., 2003; Myers et al., 2002; Stamatakis, Hamer, & Primatesta, 2008), cerebrovascular disease (Bassuk & Manson, 2005; Oczkowski, 2005 Wendel-Vos et al., 2004), various cancers (Brown et al., 2007; Chang et al., 2006; Dallal et al., 2007; Mai et al., 2007; Sprague et al., 2007; Wolin et al., 2007), diabetes (Bassuk & Manson, 2005; Brown et al.,2007; LaMonte et al., 2005), depression and anxiety (Brown, Ford, Burton, Marshall, & Dobson, 2005; Teychenne, Ball, & Salmon, 2008; Wise, Adams-Campbell, Palmer, & Rosenberg, 2006), all-cause mortality and survival (Blair et al., 1989; Landi et al., 2008; Manini et al., 2006; Mora et al., 2003), and with enhanced cognitive functioning (Angevaren, Aufdemkampe, Verhaar, Aleman, & Vanhees, 2008; Bixby et al., 2007; Hillman et al., 2006). The causal effects of physical activity and fitness on health status are most apparent in adults since, in adults, they have the opportunity to accrue over decades.

Physical activity and fitness are also powerful markers of child and adolescent health (Ortega, Ruiz, Castillo, & Sjostrom, 2008). Physical activity and/or aerobic fitness has been associated with reduced fatness (Denckner et al., 2008; Eisenmann, Bartee, Schmidt, Welk, & Fu, 2008; Gutin et al., 1990; Katzmarzyk et al., 2008; Lohman et al., 2008; Ness et al., 2007; Ortega et al., 2007; Pate, Wang, Dowda, Farrell, & O'Neill, 2006; Treuth et al., 2007) and blood pressure (Gidding et al., 2006; Gutin et al., 1990; Leary et al., 2008), and improved bone health (Janz et al., 2007; Sardinha, Baptista, & Ekelund, 2008; Tobias, Steer, Mattocks, Riddoch, & Ness, 2007). Relatively strong (observational) evidence indicates the positive effects of physical activity and fitness on mental and emotional health of youth (Bonhauser et al., 2005; Dishman et al., 2006; Larun, Nordheim, Ekeland, Hagen, & Heian, 2006; Nelson & Gordon-Larsen, 2006; Ortega et al., 2008; Schmalz, Deane, Birch, & Davidson, 2007; Strauss, Rodzilsky, Burack. & Colin, 2001).

Physical fitness and aerobic fitness decline as youth transition from childhood and middle school to adolescence and high school (Duncan, Duncan, Strycker, & Chaumeton, 2007; Eaton et al., 2008; Kahn et al., 2008; McMurray, Harrell, Creighton, Wang, & Bangdiwala, 2008;) and this may be especially true for females, in general (Hardy, Bass, & Booth 2007; Nader, Bradley, Houts, McRichie, & O'Brien, 2008; Nelson, Neumark-Stzainer Hannan, Sirad, & Story, 2006; Pate, Dowda, O'Neill, & Ward, 2007; Pfeiffer, Dowda,

Dishman, Sirard, & Pate, 2007; Sirard, Pfeiffer, Dowda, & Pate, 2008), females who mature early (Baker, Birch, Trost, & Davison, 2007; Davidson, Werder, Trost, Baker, & Birch, 2007) and youth who are overweight (McMurray et al., 2008; Trueth et al., 2007). Males have higher levels of typical physical activity than females; for both, activity tends to decline over the progression from elementary and middle school through grade 12 (Eaton et al., 2008). Estimates of population-wide levels of physical activity indicate that black and Hispanic youth are less physically active than white youth, with disparities particularly evident for females (Eaton et al., 2008).

Almost two-thirds of the nation's high school students do not meet one recommended level of participation in physical activity: being physically active enough to raise heart rate and breathe hard some of the time at least 60 minutes per day on five days of the prior week. About 20% more of white high school students met this criterion than black or Hispanic high school students (37.0% versus 31.1% and 30.0%, respectively). About 25% more of white female high school students met the criterion than black or Hispanic females (27.9% versus 21.0% and 21.9%). The rates among high school males were 46.1% for whites, 41.3% for blacks and 38.6% for Hispanics.

Another criterion is *not* being physically active for at least 60 minutes on any of the prior seven days. By this measure, prevalence among Hispanic females was approximately twice as high and, prevalence among black females more than 150% as high, as prevalence among white females (35.2% and 42.1% versus 16.7%). In summary, a large proportion of youth is insufficiently physically active or inactive. This is especially true for females and immigrant children and adolescents (Singh, Yu, Siahpush, & Kogan, 2008). Due to the magnitude of the problem, this behavior confers a large population-attributable risk with respect to a variety of health and educationally relevant outcomes.

Those population segments of youth experiencing disparities in level of physical activity and fitness also have disparities in access to school-based physical activity opportunities and resources. Opportunities for physical activity have been associated with access to school sports facilities and equipment storage space (Barnett, O'Loughlin, Gauvin, Paradis, & Hanley, 2006). Subjective and objective measures of recreational opportunities have been associated with physical activity levels among youth, including adolescent girls (Motl, Dishman, Saunders, Dowda, & Pate, 2007; Pate et al., 2008; Tucker et al., 2009). Recreational facilities are not equally distributed. Poor urban minority youth have less access to safe recreational facilities (Gordon-Larsen, Nelson, Page, & Popkin, 2006; Moore, Diez Roux, Evenson, McGinn, & Brines, 2008). The low level of physical activity among black and Hispanic adolescent girls is largely attributable to the nature of the schools they attend (Richmond, Hayward, Gahagan, Field, & Heisler, 2006). Not surprisingly, there is an inverse relationship between school's median household income and average body mass index (Richmond & Subramanian, 2008). Adequate investment of financial and human resources is associated with greater opportunities for physical activity (Barnett, O'Loughlin, Gauvin, Paradis, & Hanley, 2006).

Causal Pathways Affecting Educational Outcomes

Recent advances in molecular biology detailing the causal mechanisms through which physical activity influences brain chemistry and cognitive function have explained what the Greeks knew, intuitively, thousands of years ago--a strong mind and body are intimately related. Physical activity affects metabolism and all major body systems, exerting powerful positive influences on the brain and spinal cord and, consequently, on emotional stability, physical health, and ability to learn. This section reviews causal pathways by which physical activity and fitness may affect educational outcomes. The strongest evidence supports direct effects of physical activity on cognition. Other plausible, albeit speculative, pathways mentioned are connectedness with school, absenteeism, and dropping out.

Cognition

An emerging body of knowledge documents beneficial cognitive effects of physical activity among animals (Ding, Vayman, Akhavan, & Gomez-Pinilla, 2006) and among human adults of different ages (Angevaren et al., 2008; Bixby et al., 2007; Coles & Tomporowski, 2008; Deary, Whalley, Batty, & Starr, 2006; Kramer, Erickson, & Colcombe, 2006; Sibley & Beilock, 2007; Tomporowski, 2003). Exercise may favorably affect learning and memory ability associated with aging (Aufdemkampe et al., 2008; Bixby et al., 2007; Deary et al., 2006; Kramer & Erickson, 2007; Vaynmann & Gomez-Pinilla, 2005), and recovery from brain or spinal cord injury (Vaynman & Gomez-Pinilla, 2005); it also may help to minimize adverse effects from chronic neurogenerative disease (White & Castellano, 2008a,b). The greatest cognitive benefits of physical activity may be for those with the lowest cognitive ability (Mahar et al., 2006; Sibley & Beilock, 2007). Studies conceptualize and define physical activity and fitness and cognition in different ways, complicating the task of delineating which specific aspects of physical activity or fitness (e.g., cardio-respiratory, strength, flexibility, balance, speed agility) are causally related to which specific aspects of cognition (e.g., executive function, verbal, auditory and visual memory, inhibition, attention, response speed). Nevertheless, current knowledge strongly indicates that physical activity can benefit aspects of cognition, thereby favorably affecting educational outcomes. Recent literature reviews on physical activity or physical fitness and cognition (Angevaren et al., 2008; Etnier, Nowell, Landers, & Sibley, 2006; Hillman, Erickson, & Kramer, 2008; Kramer & Erickson, 2007; Kramer Erickson, & Colcombe, 2006; Vaynman & Gomez-Pinilla, 2006) have all reached the same conclusion: physical activity (or aspects of physical fitness) favorably affects cognitive functioning.

Ploughman (2008) provides a concise summary of how exercise may affect executive functioning: (1) increasing oxygen saturation and angiogenesis, (2) increasing brain neurotransmitters (e.g., increasing serotonin), and (3) increasing brain-derived neurotrophins that support neuronal differentiation and survival in the developing brain. Diverse research on exercise and energy metabolism, exercise and molecular causal pathways affecting the brain, and exercise and memory and learning (e.g., brain derived neurotrophin factors and resultant increased neuronal plasticity) provides a compelling rationale for ascribing a role in cognition to physical activity. It is likely that the effects of physical activity on cognition would be particularly important in the highly plastic developing brains of youth (Ploughman, 2008).

Among children, physical activity, physical fitness, and cognition have been investigated, from a variety of educationally relevant perspectives beyond the cellular level. Interpretation of this literature is complicated by several factors, most notably, variations in educational outcome measures. Some intervention studies analyzed on-task behavior during instruction (Mahar et al., 2006) or concentration (Caterino & Polak, 1999); others used standardized achievement tests (Ahamed et al., 2007; Coe, Pivarnik, Womack, Reeves, & Malina, 2006; Sallis et al., 1999). Some observational studies used standardized test scores (Carlson et al., 2008; Castelli, Hillman, Buck, & Erwin, 2007); others used grades (Nelson & Gordon-Larsen, 2006) or other measures of cognitive function (e.g., neuroelectrical indices of memory, attention and response speed) (Hillman, Castelli, & Buck, 2005), or interference control (a component of executive control) (Buck, Hillman, & Castelli, 2008). Some consider physical activity (Carlson et al., 2008; Nelson & Gordon-Larsen, 2006), others consider physical fitness (Castelli et al., 2007; Hillman et al., 2005; Buck et al., 2008). Three recent literature reviews conclude that school-based physical activity programs may result in short-term cognitive benefits (Taras, 2005), improve cognitive functioning among children (Sibley & Etnier, 2003), and do not hinder academic achievement (Trudeau & Shepard, 2008). These different kinds of evidence support the case for favorable effects of physical activity or physical fitness on cognitive functioning of youth.

Connectedness

No studies have specifically evaluated the relation between school-based physical activity programs and connectedness, but such programs would seem a natural context in which youth might engage and cooperate with peers, learn teamwork, and excel physically. These behaviors would be expected to foster engagement in school. Connectedness might also be enhanced via decreased overweight and obesity.

The transition from childhood to adolescence is a time when mental and emotional problems increase (Ge, Conger, & Elder, 2001; Kessler, Avenevoli, & Ries Merikangas, 2001; Patton et al., 2007; Patton & Viner, 2007). Problems such as anxiety and depression, among others, and resultant internalizing and externalizing behaviors, can have powerful adverse effects on school success, both academic and social. Physical activity favorably affecting indices of mental and emotional health can promote improved overall well-being, and, indirectly, connectedness with peers and teachers at school (Bond et al., 2007; Rice, Kang, Weaver, & Howell, 2008; Shochet, Dadds, Ham, & Montague, 2006).

Absenteeism

School-based physical activity programs may improve attendance by reducing obesity, which has been associated with absenteeism (Geier et al., 2007; Shore et al., 2008), by increasing connectedness, and by favorably affecting the health status of children with asthma. A consistent finding is that physical activity can improve cardiopulmonary fitness among youth with asthma (Fitch, Morton, & Blanksby, 1976; Matsumoto et al., 1999; Ram, Robinson, Black, & Picot, 2005; Welsh, Kemp, & Roberts, 2005). Physical activity has also been reported to have favorable effects on physiological indices other than fitness (Bonsignore et al., 2008; Fanelli, Cabral, Neder, Martins, & Cavalho, 2007) and to improve quality of life (Basaran, Guler-Uysal, Ergen, Seydaoglu, Bingol-Karakoç, & Ufuk Altintas, 2006; Fanelli et al., 2007). Exercise induced asthma should be addressed, not by avoiding exercise, but by increasing physical fitness (Williams, Powell, Hoskins, & Neville, 2008). School-based physical activity programs can help youth with asthma to learn and maintain healthy physical activity habits.

Dropping Out

One study investigated the relation between participation in school-based physical activity programs and drop-out. Findings were based on repeated measures collected as part of the National Educational Longitudinal Study. Drop-out rates were lower for youth who consistently participated in interscholastic sports (Yin & Moore, 2004). This is not meant to imply that school-based physical activity programs are a panacea for the drop-out problem. However, to the extent such programs are enjoyable for youth and foster teamwork, cooperation, and physical fitness, youth who participate may be more connected with and engaged in school, and more likely to attend and remain in school.

What Can Schools Do to Increase Levels of Physical Activity and Fitness?

School administrators, trying to raise standardized test scores, may mistakenly believe that physical education curricular time should be sacrificed and reallocated to reading, mathematics, and science. There is currently no evidence indicating that this strategy is, in fact, effective in increasing standardized test scores; in fact, a growing body of evidence shows that increased time for physical education and other school-based physical activity programs is associated with either a neutral or positive impact on academic outcomes. A variety of consensus recommendations are available to guide the conceptualization of school-based physical activity/education programs (Centers for Disease Control and Prevention, 1997; National Association for Sport and Physical Education, 2004; Pate et al., 2006; Pate & O'Neill, 2008; Strong et al., 2005).

Increased student physical activity and physical fitness can best be achieved through a comprehensive approach (Centers for Disease Control and Prevention,

1997) that includes physical education, wise use of recess and after school times, co-curricular physical activity opportunities, and bicycling or walking to and from school. The nature and scope of school-based physical activity/education programs will vary with the resources available (e.g., human, physical, and social environmental) and with the level of commitment by school administrators. Community linkages can ease access to community recreational facilities. Cooperation of the local police can help ensure safety as students walk to and from school. In some localities, schools may represent the main recreational resources within the community.

The cornerstone of school-based physical activity programs should be a high quality physical education program based on national standards. Such programs are strongly recommended by the Task Force on Community Preventive Services as a way to increase physical activity and physical fitness among youth (Centers for Disease Control and Prevention, 2001). National Standards for Physical Education published by the *National Association for Sport and Physical Education* (2004) posit that a physically educated person:

- Demonstrates competency in motor skills and movement patterns needed to perform a variety of physical activities
- Demonstrates understanding of movement concepts, principles, strategies, and tactics as they apply to the learning and performance of physical activities
- Participates regularly in physical activity
- Achieves and maintains a health-enhancing level of physical fitness
- Exhibits responsible personal and social behavior that respects self and others in physical activity settings
- Values physical activity for health, enjoyment, challenge, self-expression, and/or interaction

Physical education class is an important opportunity for youth to be active and to learn self-awareness, self-regulation, and other social-emotional skills, such as teamwork and cooperation. As with any school subject, quality is greatly influenced by teacher preparedness and enthusiasm. Opportunities for professional development can facilitate both. Another critical factor is the use of a sound physical education curriculum, consistent with the national physical education standards and the evidence-based characteristics of effective curricula. The CDC's "Physical Education Curriculum Analysis Tool" can help school districts select or develop such a curriculum.

Increasing participation by students least inclined to be active may require a new approach to physical education. Many youth really enjoy school physical activity/education programs. This can be true for many more. Opportunities for enjoyable play at school can dramatically affect youth development (Ginsburg, American Academy of Pediatrics Committee on Communications, & American Academy of Pediatrics Committee on Psychosocial Aspects of Child and Family Health, 2007) and foster school connectedness and engagement. Identifying and implementing physical activities that youth enjoy, particularly those who are less inclined to participate, is a key strategy in conceptualizing an effective physical education program. Research (Barr-Anderson et al., 2007, 2008; Dishman et al., 2005), as well as common sense, dictates that if students enjoy physical education, they will be more inclined to participate actively and to be engaged.

A school environment that motivates and enables youth to be physically active can serve to promote physical activity. Such an environment is determined in great part by the availability of space, equipment, and supplies. A safe environment is essential. Safety is achieved through design and maintenance of facilities, use of appropriate protective equipment, and adequate supervision. There is a well-documented inverse relationship between environmental safety and physical activity (Gordon-Larsen, McMurray, & Popkin, 2000; Molnar, Gortmaker, Bull, & Buka, 2004; Richmond, Field, & Rich, 2007; Ries et al., 2008).

The psychological environment is also important. If recreational time is characterized by negative social interactions, benefits will be limited. Some youth (e.g., overweight girls) may choose to avoid physical activities altogether. A psychological environment characterized by encouragement to be active and minimization of teasing and other aggressive behaviors will have benefits beyond physical activity, and is considered a national standard for physical education (National Association for Sport and Physical Education, 2004). Social support has been positively associated with level of physical activity among adolescent girls (Motl et al., 2007).

While emphasizing increased physical activity and fitness, schools can also help youth to learn, value and practice respectful and cooperative behaviors, and provide attentive social support for development of physical self-efficacy (Dishman, Saunders, Motl, Dowda, & Pate, 2009). The interpersonal interactions characteristic of many physical activities and learned in the context of a physical activity program can have important spillover effects on school climate. Like all school programs, physical activity programs require insight and leadership (Barnett, O'Loughlin, Gauvin, Paradis, & Hanley, 2006).

Extracurricular activities, before and after school and in the summer, can greatly contribute to the acquisition of regular physical activity habits. For many youth, participation in sports teams is an important context for physical activity and a powerful element of connectedness with school. As a matter of course, competitive sports tend to limit themselves to those with the greatest athletic abilities. Sports teams are not the answer for all students. Encouragement to be physically active needs to be intentionally directed toward those who need it most: the overweight and those with the least athletic abilities. Alternatives to competitive sports include dance, martial arts, walking, and physical activity games.

Recess, a time for play, may be an appropriate time to promote physical activity. Some data suggest that school-day recess playtime can contribute significantly to children's overall levels of moderate to vigorous physical activity (Ridgers, Stratton, & Fairclough, 2006). Students, however are not all equally likely to be physically active during recess (Stratton, Ridgers, Fairclough, & Richardson, 2007). For some, free time for relaxation may be advantageous.

Children who walk or bike to school have higher levels of physical fitness and physical activity than those who do not (Davidson, Werder, & Lawson, 2008). Walking to and from school may be an option for some students, particularly in urban areas, but the majority of children in the United States do not walk to school (Centers for Disease Control and Prevention, 2002, 2005; Ham, Martin, & Kohl, 2008; McDonald, 2007) and the percentage of children who do has declined sharply over the past decades (Ham et al., 2008; McDonald, 2007). Longer distances and safety concerns have been identified as barriers to walking to school (Centers for Disease Control and Prevention, 2002, 2005). Active transportation to school has been identified as a potentially important strategy to increase physical activity among low-income minority youth (McDonald, 2008). The Centers for Disease Control and Prevention (2007) and the National Center for Safe Routes to Schools (n.d.) have developed programs and resources to encourage walking and biking to school.

Academic classroom time can be beneficially relieved with brief breaks for stretching or other activity associated with physical well-being. A classroom physical activity program integrating academic and physical activity curriculum—"TAKE 10!"—was found to increase levels of moderate physical activity among elementary level students (Stewart, Dennison, Kohl, & Doyle, 2004). Another intervention, comprising two ten minute lessons per day taught by classroom teachers, was found to yield increased levels of energy expenditure (Honas, Washburn, Smith, Greene, & Donnelly, 2008). Both interventions achieved beneficial physical activity goals without undermining academic goals.

Proven or Promising Approaches

Most evaluation studies focus on the extent to which school based physical activity/education programs increase physical activity and physical fitness. An ample number of studies document that well-conceived programs, implemented by skilled staff, can increase levels of both physical activity and physical fitness among youth (Pate, Saunders, et al., 2007; Pate, Ward, et al., 2007; Pate et al., 2005; Pfeiffer et al., 2006; Saunders, Ward, Felton, Dowda, & Pate, 2006; Ward et al., 2006). Based on synthesis of the scientific literature on evaluations of school based physical education programs, the Task Force on Community Preventive Services (2008) strongly recommends longer physical education classes and increased time engaged in moderate to vigorous activity as a strategy for increasing physical fitness.

An emerging body of evidence suggests that school based physical activity programs, such as physical education, have either a neutral or a positive impact on educational outcomes; there appears to be no evidence to support the notion that reducing time for physical education is a sound strategy for increasing academic achievement (Taras, 2005; Sibley & Etnier, 2003; Trudeau & Shepard, 2008). In the most recent and comprehensive review, Trudeau and Shepard (2008) concluded, based on a review of seven quasi-experimental and nine cross-sectional studies, that allocating more curricular time to physical activity programs, and less time to other academic subjects, does not affect the academic performance of elementary school students negatively and that an additional curricular emphasis on physical education may result in small absolute gains in academic achievement. A recent cross-sectional study not included in the Shepard review examined the association between time spent in physical education and academic achievement among a nationally representative sample of more than 5,000 students in the U.S. Department of Education's Early Childhood Longitudinal Study, Kindergarten Class of 1998 to 1999. Carlson and colleagues (2008) found a small but significant benefit for academic achievement in mathematics and reading for girls enrolled in higher amounts of physical education, while higher amounts of physical education were not positively or negatively associated with academic achievement among boys.

Useful standards for implementing high quality, school- based physical activity programs are available from credible sources (National Association for Sport and Physical Education, 2004). The nation's public schools are well-positioned in their communities to have a dramatic influence on the physical activity and social behavior of youth. Students who have the greatest need to increase physical activity, namely urban minority children and adolescents, have the scantest resources and supports to do so (Barnett et al., 2006; Gordon-Larsen et al., 2006; Moore et al., 2008; Richmond et al., 2006).

Summary

Strong evidence supports the ability of school-based physical education programs to improve population-wide rates of physical activity and fitness. Benefits of such programs include facilitating physical activity and physical fitness, and favorably affecting weight control and overall health. It seems likely that mental and emotional health may benefit as well. Because physical activity affects the brain and cognition, there are likely to be favorable effects on ability to learn. Further, school-based physical activity programs provide an opportune time to help youth learn and practice social behaviors associated with teamwork, cooperation and respect for others, which in turn can favorably influence school climate, connectedness with school, and educational outcomes.

Breakfast

Overview and Disparities

Diet has a pervasive and profound impact on human health. Specific nutrient inadequacies during childhood can affect brain development and have lifelong health consequences, including cognitive effects. A full outline of diet and dietary intake disparities in relation to health and educational outcomes is far beyond the current scope. The current focus is breakfast. This is not to say that the total dietary pattern is less important. Indeed, among the tens of thousands of published studies on diet and health, one of the most robust findings, reflected in current national dietary recommendations, is the value of eating a balanced diet rich in fruits, vegetables, and whole grains. Breakfast alone is addressed here because of its importance to educational outcomes and because it can be addressed at school.

The nature and extent of hunger in the United States compares favorably with that in developing countries, yet food insecurity affects millions of American households, especially those with incomes near or below the federal poverty level. A nationally representative survey conducted by the U.S. Department of Agriculture found approximately 11% of U.S. households (12.6 million) to be "food-insecure" (i.e., having difficulty providing enough food for household members due to lack of resources); about one-third of these (4.6 million) were characterized as very low food security (i.e., having reduced intakes and disrupted eating patterns by some household members) (Nord, Andrews, & Carlson, 2007). Reportedly, most children in households so classified were shielded from both reduced intakes and disrupted eating patterns, but children and adults in 221,000 U.S. households did experience one or both consequences at some time during the year preceding the survey. On any given day, 600,000 to 877,000 households experienced the consequences of very low food security, including 29,000 to 33,000 where children were directly affected. Some research suggests that families exposed to winter climate variations may spend less and eat less during sudden periods of extreme weather due to extra costs of household heat (Bhattacharya, DeLeire, Haider, & Currie, 2003).

In children, food insecurity has been associated with a wide range of adverse effects on growth and development (Cook & Frank, 2008). Inadequate intake of iron increases susceptibility to toxic effects of lead (Eden, 2005; Skalicky et al., 2006). Specific nutrient intake deficits have been linked to physical and mental health problems (Alaimo, Olsen, & Frongillo, 2001; Cook et al., 2004; Weinreb et al., 2002), emotional and behavioral problems (Alaimo et al., 2001), learning deficiencies (Rose-Jacobs et al., 2008), poor access to health care (e.g., no usual source of care, postponed medications and well-care visits, increased emergency department use) (Ma, Gee, & Kushel, 2008), lower arithmetic grades and repeating a grade (Alaimo et al., 2001), and worse quality of life (Casey et al., 2005). One strategy for addressing hunger and food insecurity among youth is through food assistance programs, including the school breakfast program.

Touted as the most important meal of the day, breakfast differs qualitatively from other eating occasions by virtue of being consumed (typically) after a short fast during sleep. This timing has implications for how the body, most particularly the brain, responds to (1) further delay in eating and (2) what is eaten. A considerable body of research, summarized below, suggests that breakfast has direct and indirect effects on educational outcomes. Despite the well-accepted benefits of eating breakfast, many youth, and especially low-income, urban minority youth, attend school on an empty stomach.

Several data sources indicate that a substantial proportion of American youth do not eat breakfast on any given day. Among 18,000+ adolescents participating in the National Longitudinal Study of

Adolescent Health, approximately 20% did not eat breakfast on the day preceding the interview (Videon & Manning, 2003). Among 1,166 white and 1,213 African-American girls participating in the National Heart, Lung, and Blood Institute's Longitudinal Growth and Health Study, breakfast consumption declined with age. Seventy-seven percent of white girls and 57% of African-American girls consumed breakfast on all three days assessed at age nine; by age 19 years, the figures dropped to 32% and 22%, respectively (Affenito et al., 2005). Note that while the absolute racial disparities decreased over time, the relative disparities increased.

In a study of 1,151 low-income African-American 2nd to 5th graders in New Jersey, 12% to 26% attended school on any given day without having eaten anything (Sampson, Dixit, Meyers, & Houser, 1995). In a study of 846 inner-city high school students in San Diego, 57% had not eaten breakfast on the day of the survey; girls were more likely than boys to have skipped breakfast (61% versus 54%) (Sweeney & Horishita, 2005). Among more than 500 4th grade students in urban, suburban, and rural public schools in Maryland, approximately 20% skipped breakfast and/or lunch at least three times per week; urban students were twice as likely to report skipping breakfast (Gross, Bronner, Welch, Dewberry-Moore, & Paige, 2004). Among more than 3,500 middle school students in central Kentucky, approximately 13% did not consume breakfast in the seven days preceding the survey; under half (45%) consumed breakfast every day. Disparities in breakfast consumption among urban minority youth may be influenced, in part, by lack of time and appetite in the morning (Sweeney & Horishita, 2005), as well as by economic factors that affect household food security.

An analysis of data from more than 18,000 adolescents participating in the National Longitudinal Study of Adolescent Health (first interview) indicated that, compared with males and younger adolescents, females and older adolescents were more likely to not eat anything in the morning (Videon & Manning, 2003). Youth in families with parents having higher levels of education were less likely to have skipped breakfast (Videon & Manning, 2003). Adolescents who report being overweight were less likely to eat breakfast (Videon & Manning, 2003), perhaps based on the false impression that skipping breakfast is a good way to not gain or to lose weight (Barton, Eldridge, Thompson, et al., 2005; Cho, Dietrich, Brown, Clark, & Block, 2003; Croezen, Visscher, Ter Bogt, Veling, & Haveman-Nies, 2009; Dubois, Girard, Potvin Kent, Farmer, & Tatone-Tokuda, 2009).

Causal Pathways Affecting Educational Outcomes

The influence of breakfast on various learning outcomes has been investigated for decades and the quantity and quality of research documenting such effects are improving. Neurosciences research has identified the molecular and cellular processes by which dietary behavior influences neuronal activity and synaptic plasticity, both of which influence cognitive functions. Research specifically linking breakfast and connectedness has not been conducted, but several plausible links have been identified. The two strongest and most consistently reported mechanisms by which breakfast may influence learning outcomes are via increased school attendance and decreased tardiness. It's axiomatic that learning in school will be compromised if youth are absent or late.

Cognition

Until recently, reviews of published studies on the relationship between breakfast and cognitive performance in children have only yielded suggestive results, particularly among the malnourished. But study limitations precluded more definitive conclusions. Recent advances in neuroscience indicate that specific nutrients act on molecular systems or cellular processes that are essential for cognition (Gomez-Pinilla, 2008). An emerging body of research is documenting the adverse effects of skipped breakfast on various aspects of cognitive performance: alertness (Widenhorn-Muller, Hille, Klenk, & Weiland, 2008), attention (Benton & Jarvis, 2007; Gajre, Fernandez, Balakrishna, & Vazir, 2008; Wesnes, Pincock, Richardson, Hem, &

Hails, 2003), memory (Gajre et al., 2008; Rampersaud, Pereira, Girard, Abrams, & Metzl, 2005; Vaisman, Voet, Akivis, & Vakil, 1996; Wesnes et al., 2003; Widenhorn-Muller et al., 2008), processing of complex visual display (Mahoney, Taylor, Kanarek, & Samuel, 2005), problem solving (Pollitt, Lewis, Garza, & Shulman, 1982-1983), and mathematics (Kristjansson et al., 2007; Murphy et al., 1998).

Connectedness

No published studies have specifically examined the relationship between breakfast consumption and connectedness with school. However, research documenting the relationship between breakfast and mental health suggests a variety of avenues by which skipping breakfast may undermine connectedness with teachers and peers. At the extreme, severe hunger in school-aged children is associated with anxiety and depression (Weinreb et al., 2002.). Short of the extreme, children in food insufficient households have been found to be more likely to have seen a psychologist and to have more difficulty getting along with other children (Alaimo et al., 2001). Some data suggest an association between skipping breakfast and mental distress (Lien, 2007), while consuming a high quality breakfast (judged by number of core food groups consumed) was associated with better mental health (O'Sullivan et al., 2009). Participation in school breakfast programs has been associated with fewer psychosocial problems (Kleinman et al., 2002). It is not suggested that participation in school breakfast programs alone can address the mental or emotional needs of youth. However, to the extent that skipping breakfast adversely affects emotional well-being, eating breakfast can be expected to improve connectedness at school.

Absenteeism

In recent domestic and international research, some of which controlled for socioeconomic status, participation in school breakfast programs was associated with reduced absenteeism (Pollitt & Mathews, 1998; Rampersaud et al., 2005; Taras, 2005). Similar findings have been found for inner-city children in the United States (Meyers, Sampson, Weitzman, Rogers, & Kayne, 1989; Murphy et al., 1998). The opportunity to eat a no-cost nourishing breakfast may provide motivation for parents and their children to attend school and arrive on time. It is reasonable to expect that this would be especially true for families with lower income levels.

What Can Schools Do to Increase Breakfast Consumption?

School-based programs can greatly influence the extent to which youth eat breakfast. In 2007-08, the nationwide School Breakfast Program, which began as a pilot program in 1966 and became permanent in 1975, provided breakfast for approximately 8.5 million low-income children (Food Research and Action Center, 2009a). However, on an average day, less than half (~ 46%) of the children who participated in free or reduced price lunch also participated in the School Breakfast Program for which they were also eligible (Food Research and Action Center, 2009a). During these times of economic recession, it is particularly important for schools to implement strategies to help ensure that youth from low-income families eat breakfast.

In addition to educational and health benefits for youth, increased School Breakfast Program participation can increase federal funding of state budgets. In the school year 2007-08, if all states had reached a rate of 60 school breakfast participants for every 100 school lunch participants, the states would have received $561 million in additional federal child nutrition funding. In New York State alone the estimated loss of revenue was more than $53 million. In California the estimated loss was more than $94 million (Food Research and Action Center, 2009a). Thus, low participation in the School Breakfast Program reflects poorly on state-level public policy from an economic, as well as from educational and public health, perspectives.

Various barriers to participation in the School Breakfast Program have been identified, two of which

seem particularly relevant and amenable to change: (1) stigma associated with participation in a program intended for youth from low-income families and (2) having to arrive at school early enough to eat breakfast before classes begin. A universal school breakfast program would address the first issue. Allowing youth to eat breakfast in the classroom rather than the cafeteria would address the second.

Universal school breakfast programs, where free breakfast is offered to all students, have been shown to increase participation in school breakfast dramatically (Food Research and Action Center, 2009b). Four states, Illinois, Maryland, Massachusetts, and North Carolina, provide state-level funding for universal breakfast programs. Since increased participation generates revenue, there is often no additional cost or only minimal resultant cost to the school, particularly in schools where high proportions of students qualify for free or reduced priced meals (Food Research and Action Center, 2009b). The availability of a universal breakfast program alone, without efforts to increase participation, should not be expected to reduce rates of breakfast skipping or to substantively change overall dietary intakes (Crepinsek, Singh, Bernstein, & McLaughlin, 2006).

Allowing students to eat breakfast in the classroom in the morning, as opposed to in the cafeteria before school starts, has been found to be an acceptable and effective strategy for increasing participation in school breakfast. This alternative makes it easier for youth to participate (Food Research and Action Center, 2009b). In-class breakfast has been shown to be both feasible and acceptable (Hernadez, 2008).

The School Breakfast Program provides an opportunity to begin each school day on a positive note. Some programs use the time to allow students to read or be read to; others simply provide time for socializing. To the extent that participation is enjoyable, participation will be enhanced. Food preferences can be expected to exert an influence and these preferences will vary by age, gender, and cultural background, among other factors. Participation may be increased by offering foods that are not only within the scope of options stipulated by federal regulations, but that cater to students' likes.

Given the potential educational and health benefits for youth and the economic benefits for school budgets, schools should work to increase parents' motivation to have their children regularly participate in school breakfast programs. Educational outreach to parents could focus on communicating both the substantive educational and health benefits and the federal-funding implications of breakfast program participation. Various resources are available for school leaders who want to initiate or improve a school breakfast program (Committee on Nutrition Standards for Foods in Schools, Stallings, & Yaktine, 2007; Food Research and Action Center, 2009a; Marcason, 2008; Pilant & American Dietetic Association, 2006;).

Proven or Promising Approaches

To date, no large scale, rigorously controlled, randomized trial with the school as the unit of assignment and analysis has assessed the effects of breakfast on learning outcomes. Such a study is currently underway in the United Kindom (Moore et al., 2007). The U.S Department of Agriculture did conduct a study of universal free breakfast compared with the regular school breakfast program in six school districts, including 153 elementary schools, and they did not find differences between the schools with respect to academic achievement, attendance, or overall daily food or nutrient intakes. Since in this sample there were no differences between the groups in average food and nutrient intakes that may, in part, explain these findings. In contrast, using data from the National Health and Nutrition Examnation Study, Bhattacharya, Currie, and Haider (2006) found that availability of the School Breakfast Program (versus no program) improved children's nutritient intakes: children were less likely to be deficient in serum levels of vitamin C, vitamin E, and folate, more likely to meet recommendations for intakes of fiber, potassium, and

iron, have overall better dietary quality, and consume less calories from fat while not consuming and more overall calories.

Limitations to current knowledge preclude definitive conclusions regarding the effects of breakfast on learning. Numerous individual studies have reported findings suggesting that breakfast consumption favorably affects a variety of learning outcomes (Benton & Jarvis, 2007; Gajre et al., 2008; Kleinman et al., 2002; Mahoney et al., 2005; Meyers et al., 1989; Murphy et al, 1998; Wesnes et al., 2003; Widenhorn-Muller et al., 2008). Some recent reviewers concluded that, while not definitive, results are very promising, particularly for youth with nutritional deficiencies (Rampersaud et al., 2005). Some found the evidence for short- but not the long-term effects of breakfast on cognition compelling (Grantham-McGregor, 2005). Some concluded that the results are promising but not conclusive (Pollitt & Mathews, 1998) or that available evidence is not compelling (Ells et al., 2008). Further, the effects of breakfast may be mediated by the nature of the foods consumed (e.g., glycemic indices) (Bellisle, 2005; Mahoney et al., 2005), the time when breakfast is eaten relative to the cognitive ability assessment (Hewlett, Smith, & Lucas, 2009; Vaisman et al., 1996), and the particular cognitive abilities assessed. What appears less equivocal is that eating a high quality breakfast can improve school attendance (Pollitt & Mathews, 1998; Rampersaud et al., 2005; Taras, 2005).

The last decade has witnessed improved understanding about how and why eating breakfast can affect ability to learn. Research has explicated the effects of dietary intake on neuronal function and synaptic plasticity (Gomez-Pinella, 2008). Importantly, this new neurosciences research indicates that a particular cause (e.g., dietary intake) is likely to work synergistically in combination with other causes (e.g., physical activity and sleep) (Gomez-Pinella, 2008). It is, therefore, not surprising that results from evaluative research on breakfast have varied. Given this context, it is reasonable to infer that eating a nutritious breakfast on a regular basis, combined with other healthful habits, will increase the likelihood that students are ready and able to learn.

Summary

Skipping breakfast is a prevalent behavior among American youth and is one of various factors that can contribute to a poor quality diet. Despite wide availability of school breakfast programs, the majority of American youth do not participate. The wisdom of our elders instinctively recognized the importance of breakfast as the "most important meal of the day," epitomized by the now common practice of sending home a letter before standardized tests urging the student to have a good breakfast on the morning of test day. An emerging body of research is documenting how and, more importantly, why breakfast consumption influences cognitive functioning, quality of overall diet, risk of being overweight, and emotional well-being. The school breakfast and lunch programs and the availability of other "competitive" foods within schools (e.g., vending machine "junk food") provides a context in which the school is a central source of daily dietary intake for millions of American youth. Policies and programs within schools have the potential to favorably influence dietary behavior. Increased participation in school breakfast programs is one of several key strategies to improve the dietary status of youth and thereby influence their readiness to learn. High quality breakfast programs are especially needed for youth who are not likely to get good nutrition the rest of the day.

Inattention and Hyperactivity

Overview and Disparities

Problems with inattention and hyperactivity are the most common type of mental and behavioral health problems that affect youth: approximately 4.6 million (8.4%) of American youth aged 6-17 have received a diagnosis of attention-deficit/hyperactivity disorder and almost two-thirds of these youth are reportedly under treatment with prescription medications (Pastor & Reuben, 2008). Urban minority youth from low-income families are less likely to receive treatment with medication (Visser, Lesesne, & Perou, 2009). Concern has been raised about both under- and over-diagnosis and treatment (Parens & Johnson, 2009).

ADHD refers to a heterogeneous spectrum of behaviors usually observed initially in children between the ages of three and six concerning focusing attention, hyperactivity, or both that causes functional impairment in school, home, and other social contexts. Consequences of ADHD are often severe with respect to academic achievement and educational outcomes, including low reading and mathematics standardized test scores, grade retention, receipt of special education services, lower academic achievement and educational attainment (Barberesi, Katusi, Colligan, Weaver, & Jacobsen, 2007a; Currie, 2009; Currie & Stabile, 2006; Fletcher & Wolfe, 2008; Galera, Melcior, Chastang, Bouvard, & Fombonne, 2009; Loe & Feldman, 2007), and lower quality of life (Klassen, Miller, & Fine, 2004).

Most research examining associations between ADHD and educational outcomes does not control for variables that may be associated with ADHD and be the principal causes of the educational problems (e.g., home environment). This limitation was addressed, at least in part, by Currie and Stabile (2006) in their analysis of parent and/or teacher reports on the behaviors of nationally representative samples of children in the United States and Canada. They analyzed the relationship between a hyperactivity score and a variety of educational outcomes. Even after controlling for extraneous variables such as learning disabilities and using sibling fixed effects statistical models, they found that children with the highest levels of hyperactivity were at greater risk for lower reading and mathematics test scores, grade repetition, and placement in special education. Perhaps most importantly, they found that even children with lower levels of hyperactivity who are unlikely to be diagnosed nonetheless experience harmful educational consequences. This suggests that educational innovations for children with the highest levels of hyperactivity may also confer benefits to the much larger number of children with lower levels of hyperactivity.

While genes appear to play a role in the development of ADHD, the causes of ADHD are unknown and there is no known way to prevent this common mental disorder (National Institute of Mental Health, 2008). Sometimes, the symptoms attenuate in adolescence, but often the consequences are persistent. Secondary prevention—*early detection and treatment*—is, therefore, the best strategy for minimizing the devastating life consequences to youth affected. Other mental health problems are associated with ADHD. For example, conduct disorder, oppositional defiant disorder (Spencer, 2006), depression (Daviss, 2008; Herman, Lambert, Ialongo, & Ostrander, 2007), and learning disabilities (DuPaul & Volpe, 2009). This not only complicates understanding the effects of this disorder on different outcomes, but also on understanding the etiology of different manifestations and possible additive and synergistic effects on cognitive and social functioning.

Progress has been made in identifying promising intervention approaches, including both pharmacological treatment and behavioral and environmental interventions, but the diagnosis and treatment of ADHD is complex and is influenced

by limitations in current knowledge and by different values held by parents, teachers, pediatricians, and mental health professionals (Parens & Johnston, 2009). There is no single diagnostic test for ADHD. Typically, a licensed health professional such as a psychologist or psychiatrist will collect information about a child's behavior and environment. Detailed information about the frequency, duration, persistence, excessiveness and consequences of the child's behavior may be collected from parents, caregivers, teachers, and others who know the child well in different social contexts such as in school or at home. Consultation with a physician can help to assess other causes that may produce similar symptoms (e.g., vision or hearing problems, learning disabilities). Once data are collected, the health professional will make a judgment about whether the child meets criteria for a diagnosis of ADHD. Currently, five criteria are used for a diagnosis of ADHD.

A. Either (1) or (2):

(1) six (or more) of the following symptoms of inattention have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Inattention

(a) often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities

(b) often has difficulty sustaining attention in tasks or play activities

(c) often does not seem to listen when spoken to directly

(d) often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)

(e) often has difficulty organizing tasks and activities

(f) often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)

(g) often loses things necessary for tasks and activities (e.g., toys, school assignments, pencils, books, or tools)

(h) is often easily distracted by extraneous stimuli

(i) is often forgetful in daily activities

(2) six (or more) of the following symptoms of hyperactivity-impulsivity have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Hyperactivity

(a) often fidgets with hands or feet or squirms in seat

(b) often leaves seat in classroom or in other situations in which remaining seated is expected

(c) often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)

(d) often has difficulty playing or engaging in leisure activities quietly

(e) is often "on the go" or often acts as if "driven by a motor"

(f) often talks excessively

Impulsivity

(g) often blurts out answers before questions have been completed

(h) often has difficulty awaiting turn

(i) often interrupts or intrudes on others (e.g., butts into conversations or games)

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.

C. Some impairment from the symptoms is present in two or more settings (e.g., at school [or work] and at home).

D. There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

E. The symptoms do not occur exclusively during the course of a Pervasive Developmental Disorder,

Schizophrenia or other Psychotic disorder and are not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder). (American Psychiatric Association, 2000, pp. 92-93)

Given the heterogeneity of symptoms, reliance on reports of children's behavior from parents (caretakers) and teachers, and differences in interpretation of symptoms, it is not surprising that prevalence estimates vary substantially worldwide (Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007). ADHD is one of the most common mental disorders affecting youth (National Institute of Mental Health, 2008). One source of nationwide prevalence of ADHD is the Summary Health Statistics for U.S. Children: National Health Interview Survey, 2008, which estimated that 8% of children aged 3-17 had ADHD (Bloom, Cohen, & Freeman, 2009). According to this recent national survey, prevalence was greater for boys (11%) than girls (5%), white (10%) and black (9%) children than Hispanic children (4%), children in single-mother families (10%) than in two-parent families (7%), in families with income less than $35,000 (12%) than over $100,000 (6%), and in children aged 5-11 (7.3%) and aged 12-17 (11.1%) than in children aged 3-4 (1.9%) (Bloom et al., 2009).

A second source of prevalence estimates is the 2003 National Survey of Children's Health, which included reports for 79,264 youth; overall, 7.8% of youth aged 4-17 had ADHD (95% CI = 7.4% - 8.1%): ADHD was more frequently reported for boys (11%) than girls (4.4%), children aged 9-12 or 13-17 (9.7% for both) than children aged 4-8 (4.1%), children living in poverty (9.6%) than greater than 200% of the poverty level (7.4%); and rates were lowest for children living with two parents (biological or adopted) (Visser, Lesesne, & Perou, 2009). Another study estimating the prevalence of ADHD used data from the 2001 National Health Interview Survey Sample Child Component for 2001 (n = 10,367 children aged 4-17) (Cuffe, Moore, & McKeown, 2005). These data indicated that ADHD was more prevalent for males (4.2%) than females (1.8%), and for children living in families with income less than $20,000 (Cuffe et al., 2005).

Another large cross-sectional survey of a representative sample of the U.S. population (n = 3,082) found that 8.7% of youth aged 8-15 meet DSM-IV ADHD criteria (Froehlich et al., 2007). In this study, youth from the poorest families (in the lowest quintile of poverty to income ratio) were more than twice as likely as the wealthiest youth (in the highest quintile of poverty to income ratio) to meet DSM-IV criteria for ADHD. Not only were children from the poorest families more likely to meet ADHD diagnostic thresholds, compared with all of the other children in the sample, they were less likely to receive consistent pharmacological therapy.

These data unequivocally show that inattention and hyperactivity problems are widespread among American youth and disproportionately affect urban minority youth from poor families, who may not only be more likely to be affected but also less likely to receive accurate diagnosis and treatment. An important element of mental and social-emotional health related to youth is its developmental nature. By definition, youth is a period of change. All youth exhibit some signs or symptoms comprising the spectrum of behaviors characterizing ADHD. The frequency, duration, and persistence of these behavioral patterns and their functional consequences in school and at home define ADHD as a mental disorder. Over time, some problems may resolve on their own while others may present later in youth and cause serious lifelong problems. For some youth ADHD symptoms continue into adolescence and adulthood (National Institute of Mental Health, 2008). Periods of transition, for example, from childhood to adolescence and elementary to middle school, and middle school to high school, may be particularly stressful. Efforts to address mental health must be tailored appropriately to the developmental levels of youth, which themselves vary substantially within the population.

Mental health problems such as ADHD and

associated co-morbidities may be conceptualized, in part, as a lack of proficiency in noncognitive skills (Currie, 2009). Skills such as tenacity and perseverance have been identified as determinants of academic and lifelong success (Heckman, 2006, 2007; Heckman, Stixrud, & Urzua, 2006). The extent to which these kinds of skills are formed early in life influences the extent to which children can benefit from educational opportunity (capabilities beget capabilities) (Heckman, 2006, 2007; Heckman et al., 2006).

A growing body of research demonstrates that both pharmacological treatment and behavioral intervention can be effective, particularly in controlling symptoms. Pharmacological treatments have been shown to reduce symptoms and to confer some educational benefits. Behavioral and environmental approaches are focused on influencing a child's performance in various contexts, including in school. Some areas of performance are organizing tasks or completing schoolwork, self-monitoring, self-regulation, learning to wait for their turn and share with others, recognizing when to ask for help and doing so, increasing ability to interpret others' nonverbal communication (e.g., facial expression) and vocal inclinations correctly (National Institute of Mental Health, 2008). Teachers (and parents) give ongoing feedback to students (including low expectations) that can reinforce both the acquisition and maintenance of the heterogeneous syndrome of behaviors characterizing ADHD as well as the lack of self-regulation associated with this centrally important educationally relevant health problem.

Causal Pathways Affecting Educational Outcomes

Children with ADHD experience many problems in school. They have difficulty with sustained attention and are easily distracted, and they are often disruptive. Being easily distracted, having difficulty focusing sustained attention, becoming bored quickly, having difficulty completing homework and assignments, not listening to or following instruction well, and having difficulty processing information—all symptoms of *inattention*—have obvious implications for learning academic skills, for example, related to reading and mathematics. Inability to sit still and having difficulty doing quiet activities, waiting for their turn, acting impulsively, being impatient, making inappropriate comments, interrupting others' activities or conversations—all symptoms of hyperactivity or impulsivity –will cause further problems regarding getting along well with peers, teachers, and other adults. Given the prevalence, severity, and educational consequences of this mental disorder, it is one of the most (if not the most) important health problems affecting learning, social functioning, and educational outcomes (Currie, 2009). There is evidence that ADHD affects all five of the specified causal pathways.

Sensory Perceptions

Some data suggest that children with ADHD have a high frequency of ophthalmological problems, including disturbed development of the optic nerve and retinal vasculature (Gronlund, Aring, Landgren, & Hellstrom, 2007). Treatment with stimulant medication has been associated with improved visual acuity and visual field results (Martin, Aring, Landgren, Hellstrom, & Gronlund, 2008). Given the importance of visual information processing and integration of visual and motor coordination (e.g., taking notes from a board), such deficits may contribute to learning problems. Children with ADHD have also been shown to have more problems with balance, which tends to be more associated with the visual system than the somatosensory or vestibular systems (Shum & Pang, 2009).

Several studies have also investigated perception of time, which suggest that youth with ADHD have impairments in basic timing mechanisms (Toplak & Tannock, 2005; Toplak, Rucklidge, Hetherington, John, & Tannock, 2003; Yang et al., 2007). Time perception is a complex cognitive process involving different components of brain activity and facilitates one's ability to anticipate, predict, and respond to different situations, including organizing and planning sequenced

actions (Toplak et al., 2003). Time perception deficits have been observed in youth with ADHD concerning discriminating and estimating time duration, which are associated with different aspects of memory (Toplak et al., 2003; Yang et al., 2007). The implications of these observations for teaching and learning suggest one of many possible routes through which children with ADHD may be impeded in various learning tasks.

Cognition

There is an extensive literature on the symptoms and educational consequences of ADHD. But there is a paucity of prospective research on cognitive processing skills essential for higher order learning for boys and girls with different ADHD subtypes and co-morbidities, and at different developmental levels. Improved understanding about the cognitive processes that are impeded among children with ADHD is not only important for characterizing the disorder and its consequences, but also for conceptualizing interventions to improve educational outcomes.

Studies have reported an association between ADHD and executive functioning, but note that associations vary within the heterogeneous population with ADHD (Diamatopoulou, Rydell, Thomwell, & Bohlin, 2007; Doyle, 2006; Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005). Other studies have demonstrated an interaction effect between ADHD, memory, and context (i.e., level of distraction). These latter studies suggest that children with ADHD are capable of recalling important information, at least in certain learning contexts, but once distractions are introduced the ability to maintain engagement declines, which in turn is likely to affect adversely the child's comprehension as measured by questions testing causal relations (Bailey, Lorch, Milich, & Charnigo, 2009; Landau, Lorch, & Milich, 1992; Lorch et al., 2000, 2004).

A recent study investigated visual attention, recall of factual information, and story comprehension over 21 months among children aged 7-9 who had a diagnosis of ADHD and an age-matched comparison group (Bailey et al., 2009). Children watched a televised story under two conditions, with and without toys present. Children in the comparison group showed improvement in both recall of factual information and recall of causal relations whether or not toys were present. In contrast, children with ADHD showed no improvement in recall of factual information when toys were present and no improvement in recall of causal relations even when toys were not present.

Another recent study that provides developmental insight into the association between ADHD and cognitive functioning prospectively followed boys with persistent ADHD, remittent ADHD, and without ADHD over ten years, and collected data at three points in time about IQ, achievement scores in reading and mathematics, and measures of executive function (Biederman et al., 2009). No group by time interaction effects was observed. Compared with the boys who did not have ADHD, the boys with both persistent and remittent ADHD had consistently worse scores on all of the measures, leading the authors to conclude that the measured cognitive deficits were stable into young adulthood and were independent of the persistence of symptoms.

Disrupted sleep may be another cause of impaired cognitive function. Children with ADHD commonly experience sleep problems (Cortese, Konofal, Yateman, Mouren, & Lecendreux, 2006; Gau & Chiang, 2009; Gruber, 2009; Gruber et al., 2009; Owens, 2008; Sung, Hiscock, Sciberras, & Efron, 2008). The effect of sleep on cognitive function was discussed previously in the section on asthma and is not reiterated here. The association between ADHD and sleep problems is complex and not fully understood (Gruber, 2009; Owens, 2008). Sleep problems may be one of the side effects of stimulant medication (National Institute of Mental Health, 2008) and the majority of youth with ADHD are taking stimulant medication (Pastor & Reuben, 2008). Nonstimulant drugs are now available and have not been associated with sleep disturbances (Dopheide & Pliszka, 2009; Hammerness, McCarthy, Mancuso, Gendron, & Geller, 2009), but it is not clear

how widely these are used.

Connectedness

One important consequence of ADHD is its effects on social relationships, such as lack of friendships and rejection by peers (NijMeijer et al., 2008; Normand, Schneider, & Robaey, 2007). The range of socially problematic behaviors associated with ADHD includes excessive talking, not listening, not getting along well with others, interrupting others' activities and conversations, making inappropriate comments, not taking turns during games, and acting without regard for consequences (National Institute of Mental Health, 2008). Problematic relationships with peers and adults may be compounded in children with ADHD because of common co-morbidities that further impair social functioning, such as conduct disorder and oppositional defiant disorder (Spencer, 2006).

The majority of youth with ADHD experience rejection by peers (Hoza, 2007). McQuade and Hoza (2008) reviewed current literature on social behaviors of children and proposed that one of the reasons that children with ADHD have social impairment may be due to their inability to accurately observe and interpret social behavior such as cues from others. They point out that current treatment approaches have focused on increasing social skills and reducing symptomatic behavior (e.g., inappropriate social behavior), but have not been highly effective in normalizing the social status of affected youth.

The educational significance of peer rejection is illustrated even among youth who do not have ADHD. In a prospective study of 398 children followed between ages 5 and 12, peer rejection constrained classroom participation while cessation of rejection facilitated more cooperative and active classroom participation (Ladd, Herald-Brown, & Reiser, 2008). These data indicate both the educational significance of chronic peer rejection, which youth with ADHD are likely to experience, and how reducing such rejection can increase classroom participation and thereby increase school connectedness.

There is an association between children's exhibition of "problem" behaviors and quality of the teacher-child relationship (Birch & Ladd, 1998) It is easy to understand why relations between a child exhibiting ADHD symptoms would be very challenging for a teacher, particularly if they have not had sufficient training. Relationships with teachers are a key factor contributing of school connectedness. The importance of these relationships for educational outcomes is illustrated by an eight-year prospective study, which found that teacher-child relationships during first grade were associated with academic outcomes when the children were in eighth grade (Hamre & Pianta, 2001).

Absenteeism

ADHD has been associated with school absenteeism but the size of the effect is not clear. In one study the absolute differences in number of days absent between children with ADHD and comparison children was estimated to be only approximately one day in grade 6 and approximately 2.5 days in grades 9 and 12 (Barbaresi, Katusic, Colligan, Weaver, & Jacobsen, 2007a). Within a sample of Australian children with ADHD, those with reported sleep problems were more like to exhibit lateness and absenteeism (Sung, Hiscock, Sciberras, & Efrom, 2008).

Dropping Out

Youth with ADHD have lower levels of educational attainment (Currie & Sabile, 2006), and they are more likely to drop out of school. In one retrospective analysis over a follow up period of more than 18 years, compared with youth who did not have AHHD, youth with diagnosed ADHD were 2.7 times as likely drop out (10.0% versus 22.9%) (Barberesi et al., 2007a). A similar odds ratio for not graduating from high school was found in another prospective study, with an eight-year follow up period (odds ratio = 2.4) (Galera et al., 2009). Causal inferences are difficult to make because of the many factors that contribute to drop out that are associated with ADHD (e.g., lower reading ability, lower socioeconomic status) (Trampush, Miller, Newcorn, & Halperin, 2009); however, since youth

with ADHD are at greater risk for these other factors as well, the implications for educational attainment remain significant.

What Can Schools Do to Address Inattention and Hyperactivity Problems?

School health programs and policies are directly relevant to a national strategy to assist youth with ADHD in ways that minimize harmful educational, social, and life consequences. The school context is pivotal in identifying children who warrant further assessment to determine if they meet criteria for a diagnosis of ADHD, determining which children actually receive a diagnosis, monitoring the ways that a child may be responding to stimulant medication or other interventions, and implementing behavioral and environmental interventions to assist youth with ADHD to learn and practice performance skills to minimize the educational and social consequences of this complex behavioral syndrome.

Teachers are in an optimal position to recognize children who warrant further assessment and evaluation to determine if they may meet criteria for an ADHD diagnosis. Teachers may be the first to suspect that a child is affected by ADHD (Sax & Kautz, 2003). Teachers also play a role in forming a diagnosis since the observations and reports they provide are central to assessment and evaluation. Teachers are in perhaps the best position to judge if the behaviors exhibited are representative of patterns as well as if they exceed normative expectations. In addition to parents, they can provide assistance with answering key questions necessary for a specialist to make an accurate diagnosis (National Institute of Mental Health, 2008). Are the behaviors excessive and long-term? Do they happen more often in this child compared with the child's peers? Are the behaviors a continuous problem or a response to a temporary situation? Do the behaviors occur in several settings or only in one place, such as the playground or classroom?

The classroom environment can be organized in ways that are useful in minimizing distractions. For example, one strategy is moving children who are most easily distracted further away from the other children and close to the teacher's desk (Parens & Johnston, 2009). An observant teacher can recognize interpersonal problems among the children in the classroom, lunchroom, or play area, and be prepared to intervene early at the first sign of problems. The teacher can also work closely with a behavioral specialist to reinforce the learning and habituation of some behaviors while attempting to extinguish others. The teacher will also contribute to decisions regarding the kinds of other services that may be needed, including being educated in a different context.

The heterogeneous nature of ADHD complicates tailoring treatment effectively. Teachers can provide valuable insight about the extent to which pharmacological treatments are having their intended outcome(s) and whether the child is experiencing any side effects. The teacher can also observe the academic and social situations in which problems are most likely to occur, which may suggest the kinds of skills training or other behavioral and environmental interventions that may be useful. Indeed, the teacher may play a major role in interventions to assist the children with ADHD.

A wide range of school based intervention strategies applicable to youth with ADHD have been outlined and categorized as addressing attention and behavior, academic competence, and social competence. (Power, Tresco, & Cassano, 2009). Strategies for improving attention and behavior include improving the teacher-student relationship, presenting rules clearly, providing contingent reinforcement, strengthening the reinforcement system, using verbal correction strategically, improving the point system, engaging the school and family in a problem solving partnership, and implementing daily report cards. Strategies for promoting social competence include planning for an instructional match, providing novel tasks, setting appropriate goals, using peer-mediated strategies, using parent-mediated strategies, and incorporating computer-assisted strategies. Strategies addressing

social competence include providing social skills training, promoting sustained friendships, intervening in the lunchroom, and intervening on the playground.

Emphasis in treatment of ADHD has tended to focus on controlling symptoms associated with behavioral and social difficulties rather than focusing on remediation of academic problems (Jitendra, DuPaul, Someki, & Tresco, 2008; Raggi & Chronis, 2006). Promising school based academic interventions exist (DuPaul, Jitendra, & Volpe, 2006). For example, with respect to enhancing reading ability, promotion of phonological awareness and alphabetic principle, and collaborative strategic reading warrant consideration. With respect to mathematics, the cover, copy, and compare approach teaches children to correct incorrect responses before proceeding, while scheme-based instruction helps youth learn visual representations that are known to be useful for mathematical problem solving (Jitendra et al., 2008). Peer tutoring, computer assisted instruction, task/instructional modifications, self-monitoring, strategy modification, homework focused interventions, classroom-based functional assessment procedures, and combined approaches have all been shown to yield promising results (Raggi & Chronis, 2006). Helping youth learn organizational skills (Langberg, Epstein, & Graham, 2008), social skills (de Boo & Prins, 2007), and ways to focus attention (Tamm et al., 2009) are also promising approaches that may benefit some subgroups of children with ADHD.

Another school-based approach involves outreach and partnership with parents of children with ADHD. This may include evaluating each child to assess their need for special services that may be provided based on federal or state mandates. School personnel may also be helpful to parents in facilitating linkages with community resources and in providing feedback to parents about the extent to which treatment approaches being used at home may be working to benefit the child in school.

Proven or Promising Approaches

ADHD is controversial concerning conceptualization and treatment (Parens & Johnson, 2009). There are numerous symptoms that can be used to identify ADHD and different tools used for diagnosis, which results in a "zone of ambiguity" concerning what comprises accurate labeling of ADHD and corresponding controversy about who should be treated and what pharmacological and/or behavioral interventions should be recommended (Parens & Johnson, 2009). Further, there are a variety of other factors that may also influence the choice and effectiveness of different intervention strategies, including subtype of ADHD, separate versus co-occurrence of academic and behavior problems, nature and extent of co-morbidity, gender, developmental level, and family characteristics (Kaiser, Hoza, & Hurt, 2008; Reinke, Herman, Petras, & Ialongo, 2008).

What is increasingly clear is the extent to which various attention and hyperactivity problems severely impede learning for millions of American youth, and particularly for low-income urban minority youth. The majority of interventions for youth with ADHD have focused on controlling symptoms rather than emphasizing functional academic and social outcomes. Nevertheless, promising approaches are available and warrant consideration as a high priority within the nation's urban public schools.

Intervention strategies ranging from modifications to eating and sleeping patterns, behavioral therapy, classroom and other environmental modifications, and medications may be used to assist youth with ADHD (Parens & Johnston, 2009). There is evidence from a large randomized trial that carefully monitoring medication among children with ADHD can favorably influence symptoms, but the extent to which such treatments confer long-term benefits over usual care received in the community has not been demonstrated (Swanson et al., 2008a, b). For children in families receiving public assistance or with coexisting conditions, combining behavioral intervention with medication may yield statistically superior results than medication alone (Swanson et al., 2008a, b).

Data from a retrospective observational study showed that receiving treatment with stimulant medication (median duration = 30.4 months) was associated with decreased grade retention, decreased absenteeism, and increased reading achievement (Barbaresi et al., 2007b). In another population-based study of medication use by children with ADHD, medication was associated with higher mean scores on standardized measures of mathematics (2.9 points higher) and reading (5.4 points higher). The authors acknowledge that these effect sizes would not be sufficient to close the gaps in achievement between children with and without ADHD (Scheffler et al., 2009).

Nonpharmacologic treatments are also important because some children may not tolerate medication or may not take medication as prescribed, some parents may not find medication acceptable, and medication alone may be insufficient to address academic impairments and performance for some children (Reinke et al., 2008). Various individual approaches and multimodal approaches all have shown promising (Barbaresi et al., 2007b; de Boo & Prins, 2007; Jitendra et al., 2008; Kaiser et al., 2008; Langberg et al., 2008; Loe & Feldman, 2007; Scheffler, et al., 2009; Swanson et al., 2008a, b), albeit not long-term proven, results. Behavioral approaches are also a very important element within the repertoire of treatments for ADHD (Fabiano et al., 2009; Pelham & Fabiano, 2008). Stimulant medications have been shown to have a variety of side effects such as decreased appetite and sleep problems, less commonly the development of tics, and rarely more severe reactions (National Institute of Mental Health, 2008). Parens and Johnston (2009) point out that while stimulant medication may reduce symptoms of inattentiveness and hyperactivity, they do not help the child to develop control over attention and activity patterns.

Summary

The mental disorder ADHD is the most common mental health problem affecting American youth. Urban minority youth from low-income families may be both at greater risk for this problem and less likely to receive medication for its treatment. There are many gaps in current knowledge regarding the etiology and most effective treatments for different subgroups of children affected by ADHD. What is unequivocally clear is that this is a common problem that has serious adverse effects on millions of children, including reduced academic achievement and educational attainment. Despite incomplete understanding and controversies, which may be based on different values and interpretations of existing research, medication, behavioral, and environmental interventions have yielded promising results for reducing symptoms and some functional impairment caused by ADHD. The majority of intervention research has focused on reducing symptoms, and a greater investment in intervention research aimed at educational outcomes, social relations, and functional life consequences is needed.

While many children exhibit a spectrum of behavioral disorders (signs and symptoms) that meet diagnostic criteria for a diagnosis of ADHD, there are many other children who are clearly below the clinical diagnostic threshold, but who nonetheless exhibits some signs and symptoms that interfere with learning. While not sufficient to meet DSM criteria for diagnosis, these behaviors appear to impede motivation and ability to learn. Attention problems have been shown to predict academic achievement (Breslau et al., 2009). The association between *attention* and *internalizing* and *externalizing* problems collected from an ethnically diverse cohort of children at age six was examined in relation to standardized measures of mathematics and reading achievement collected from youth at age 17, controlling for indications of family socioeconomic status and child's IQ. Analysis of the three types of problem behaviors simultaneously indicated that, unlike internalizing and externalizing behaviors, the association between *attention* problems and academic achievement was not attenuated. It is very important to note that in this study data were collected from a cohort of children at school entry and the measures

were treated as continuous variables rather than using diagnostic thresholds to classify children into groups such as ADHD or no ADHD. The implications of this finding emphasizes that interventions directed to children with attention problems versus only those with a diagnosis of ADHD may enhance academic achievement. This is consistent with findings and recommendations of Currie and Sabile (2006) regarding hyperactivity as well.

DISCUSSION

Elementary and secondary education for American urban minority youth is in crisis. Levels of academic achievement are far too low. A large proportion of youth drop out before completing high school. Too few who do complete high school attend and complete college. The status quo does not bode well for the economic security and quality of life of future generations or for maintaining the vitality of American democracy.

Youth at greatest risk for adverse educational outcomes share many underlying risk factors with youth at greatest risk for adverse health outcomes and largely represent the same segments of the U.S. population. Both educational and health disparities are caused, to a great extent, by a common set of environmental factors. There is compelling evidence that the environment, educational outcomes, and health outcomes are causally related in reciprocal ways and that educational and health disparities independently affect each other. Children's health factors have been implicated as causal mechanisms in the link between low socioeconomic status and educational attainment.

Health disparities affecting youth are shaped by interrelated factors within the social environment. Attacking the underlying causes of educational and health disparities—poverty, noxious physical and social environments, inaccessibility of health care and social services, segregation and racism—is a moral necessity. There are no simple solutions to these complex and recalcitrant problems, and schools should not be solely responsible for addressing them.

Nevertheless, investing social resources in schools is one of the most powerful ways to shape the lives of youth. School reform efforts during the past several decades have focused on a variety of strategies, for example, improving teachers' ability to teach, modifying curricula, increasing school financing, and, most recently, establishing academic standards that hold school personnel accountable for students attaining goals as measured by standardized tests. However, to the extent that school improvement efforts do not increase students' motivation and ability to learn, the yield on investments will be limited. Although reducing educationally relevant health disparities can powerfully enhance students' motivation and ability to learn, this strategy has not been explored as a missing link in school reform efforts.

Making Health a Fundamental Part of Elementary and Secondary Education

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. This is why reducing educationally relevant health disparities must be a fundamental part of school reform.

Healthier students are better learners. The average citizen would consider this common sense. 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.

School leaders must prioritize how to use scarce resources to address the critical health problems affecting youth. In this essay, three criteria used for establishing priorities were 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 ADHD, with millions more exhibiting symptoms of inattention and/or hyperactivity 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. The lowest "performing" schools have a particular need to address these health factors as a fundamental part of their mission. 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; and absenteeism and dropping out.* Some health factors influence primarily one pathway while others influence multiple pathways. 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 (e.g., breakfast, physical activity, sleep) 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 such as reading and mathematics. Children with poorly controlled asthma deserve in-school monitoring to help ensure that they receive health care consistent with current standards of care, including use of appropriate medications to control symptoms; the right to attend a school that strives to identify and ameliorate allergens, irritants, and pollutants that trigger symptoms; multiple opportunities for daily physical activity; and other aspects of an "asthma friendly" school. Children need to learn and practice communication and social skills, such as resisting social pressures, negotiating in ways to minimize interpersonal conflict and maximize teamwork and cooperation, and values such as individual- and mutual-level responsibility, which can reduce risk for various health-compromising outcomes, including unintended pregnancy, and HIV and other sexually transmitted infections. For youth who are sexually active, contraceptive services should be available. For youth who become pregnant, health and social services for unmarried teen mothers and their children 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, but data unequivocally demonstrate that this is not the case for most urban minority youth.

Correcting this is essential and warrants being a top priority in every school in the nation. Progress in this regard will be greatly influenced by the school climate. Measures of school climate 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 anti-social 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.

Creating Effective and Efficient School Health Programs

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. Social resources for schools should never be squandered on ineffective programs, but, in the context of the current U.S. economy, there is a particular need to ensure that scarce social resources are used effectively and efficiently to improve students' motivation and ability to learn.

High quality, strategically planned, and effectively coordinated school health programs would be expected to comprise health education curricula, physical education and physical activity programs, nutrition services, physical and mental health services, family and community involvement, and attention to maintain a safe and supportive environment. Many existing resources describe the evidence-based policies, guidelines, standards, and practices that are associated with high quality implementation of each of these program elements. What has been lacking is a set of strategies for motivating and enabling school leaders, teachers, and educational stakeholders to put high quality school health models into practice in their schools. After discussing the three elements necessary for effective and efficient school health programs—high quality, strategic planning, and effective coordination—national, state, and local strategies for helping schools implement such programs are presented.

High Quality

Decades of investment by the Department of Health and Human Services and other federal and nongovernmental organizations have produced school health programs with proven effectiveness or promising results. But progress in developing and rigorously evaluating school health approaches has been far greater than putting the new knowledge gained into practice to create high quality health programs in the nation's schools.

Guidelines for school health have been proposed by Division of Adolescent and School Health at the Centers for Disease Control and Prevention along with a model for coordinated school health, which includes eight components: health education; physical education; health services; nutrition services; counseling, psychological, and social services; healthy school environment; health promotion for staff; and family and community involvement (*www.cdc.gov/healthyyouth/sher/standards; www.cdc.gov/healthyyouth; www.cdc.gov/healthyyouth/CSHP*). The Association for Supervision and Curriculum Department has proposed a "New Compact for Learning," focusing on the whole child and emphasizing the importance of school health as a fundamental mission of schools *(www.ascd.org/ASCD/pdf/Whole%20Child/WCC%20Learning%20Compact.pdf*). With support from the Health Resources and Services Administration, a group of more than 30 national organizations led by the American Academy of Pediatrics and the National Association of School Nurses, has described health, mental health, and safety guidelines for schools, including guidelines for family and community involvement, health and safety education,

physical education, health and mental health services, nutrition and food services, physical environment and transportation, social environment, and staff health and safety (*www.nationalguidelines.org*).

The CDC's School Health Index, a self-assessment and planning guide, can help school leaders determine the extent to which schools are implementing evidence-based health policies and practices, identify weaknesses and develop plans for improvement while engaging stakeholders in the process (*www.cdc.gov/HealthyYouth/SHI/introduction.htm*). This tool would be even more useful if it was linked with a solutions database, especially if the software built in strengths and limitations of available resources. The Health Education Curriculum Analysis Tool (*www.cdc.gov/HealthyYouth/HECAT/index.htm*) and the Physical Education Curriculum Analysis Tool (*www.cdc.gov/healthyyouth/PECAT*) can be used to help ensure that curriculum are aligned with the characteristics of effective health promotion curricula and the national standards for each of these fields.

There are also several key federal agency repositories of proven or promising school health interventions. These resources can assist school leaders in adopting approaches that are most likely to have a substantial, positive impact on educationally relevant health disparities. The Substance Abuse and Mental Health Services Administration's National Registry of Evidence-Based Programs and Practices includes interventions to prevent as well as treat mental and substance use disorders (*http://nrepp.samhsa.gov*); the Office of Juvenile Justice and Delinquency Prevention reviews programs and services concerning aggression and violence, among other topics (e.g., delinquency, gang activity) (*www2.dsgonline.com/mpg*); Find Youth Info, an interagency U.S. government website (that appears to be under further development and expansion) provides guidance for creating, implementing, and maintaining effective programs for youth, including various proven or promising intervention approaches (*www.findyouthinfo.gov*); and the Centers for Disease Control and Prevention links to various registries of programs for reducing youth risk behavior (*www.cdc.gov/healthyyouth/AdolescentHealth/Registries.htm*). Despite the availability of consensus guidelines and on-line access to proven or promising school health approaches, it appears that high quality programs are not being implemented in the nation's public schools serving urban minority youth. For example, federal, state, and local agencies have been investing in school-based drug abuse prevention for decades, but a recent study demonstrated that the majority of schools in the United States were implementing drug prevention programs with no evidence of effectiveness (Cho, Hallfors, Iritani, & Hartment, 2009). This was never tenable and, in the current economic climate, squandering limited resources on ineffective programs should be strongly discouraged.

Strategic Planning

Debate about which health problems were prioritized in this essay and which were not discussed (e.g., tobacco, alcohol and drug use, obesity, ear infections, dental problems, speech impairment, immunizations, unintentional injuries) is a distraction and far less important than the underlying premise, namely that healthier students are better learners and that the most sensible approach to address educationally relevant health disparities through schools is through an ongoing process. The expectation is not that every urban public school should have the same priorities. Selection of the health factors to be focused upon in a given school system may vary based on geographic variation in distribution of health problems, local leadership priorities, existing school and community resources, and historical efforts and programs, among other factors.

An *ongoing process* is needed to *maximize the yield from investments*. The need for an ongoing process is not only to sustain efforts once initiated, but to adapt priorities as problems and opportunities change. The nature of this process may vary from one school system to another, but would entail ongoing assessment

of health problems affecting local youth to identify school health priorities; planning, implementing, and maintaining multiple efforts to address the specified school health problems coherently; and cultivating involvement and capacity for identifying and solving school health problems. The CDC's School Health Index can help schools engage in this process.

Descriptive epidemiological data (e.g., prevalence, severity, consequences) are needed to assess the kinds of health problems that are most important to address. Examples of data sources that school leaders can use to help identify the most important health problems affecting local youth include the Youth Risk Behavior Survey (*www.cdc.gov/HealthyYouth/yrbs/index.htm*) and the ChildTrends database (*www.childtrends.org*) maintained by the Annie E. Casey Foundation, as well as the Federal Interagency Forum on Child and Family Statistics (*www.childstats.gov*). Indices of crime and violence maintained in the Uniform Crime Reports maintained by the U.S. Department of Justice (*www.fbi.gov/ucr/ucr.htm*) are also applicable.

Once priorities are established, determining which school health approaches are planned and implemented must rely as much as possible on registries of effective programs, outlined above. In some areas (e.g., violence prevention), evidence and guidance concerning program development is stronger than for others (e.g., follow up for vision screening). For all of the educationally relevant health disparities proven or promising approaches exist and should be put into use.

One of the most important challenges for strategic planning is cultivating involvement and capacity for identifying and solving school health problems. An ongoing objective of the strategic planning process is, therefore, to provide opportunities and incentives for involvement and opportunities for professional development. A school health leadership team (or school health council) is a key vehicle to facilitate involvement of school board members, administrators, teachers, and community members to develop and implement school health programs that have local ownership. This will not only help ensure that the school health agenda is central to school improvement plans but that school health efforts are maintained even when there are personnel transitions (Brener, Kann, McManus, Stevenson, & Wooley, 2004).

Effective Coordination

In effectively coordinated school health efforts, different groups of people playing different roles are working toward the same goals. While programs and policies may be funded from different sources (e.g., agriculture, education, justice), and planned and implemented in ways that address the individual health priorities, these individual efforts should be conceptualized within the context of a larger school health mission established by schools or districts.

Effective coordination is intended to ensure that all of the different school health policies, programs, and services are collectively aimed at achieving a particular set of priorities. Coordination may focus on finding ways to reinforce efforts at the level of outcomes, mediators, implementation, or subgroups of students. For example, coordination focusing on increasing physical activity outcomes would reinforce learning objectives and opportunities for physical activity in multiple ways such as physical education, recess, brief in-class activity breaks, after school programs, sports and physical activity programs, and events involving physical activity. Coordination focusing on school climate as a mediator would identify all of the opportunities to influence school climate and ensure that these different efforts provided a consistent message to students, for example, that courtesy and respect should characterize all interaction between and among people in the school community.

Coordination is also needed at the level of the individual student. It is important for teachers and all of the other personnel providing services to particular students to be aware of all of the issues a particular student may be dealing with (within a context of respecting privacy). If a screening program

identifies a student who needs eyeglasses to learn to read, there must be follow up to ensure that the student receives an eye exam and eyeglasses, and that s/he wear the glasses while at home and school. Screening is most likely completed by health department personnel, but they are not responsible for follow up. Parents must ensure that an eye exam is received and corrective lenses are obtained (and replaced if lost or broken) and are used at home. And teachers must ensure that students use their glasses as recommended in the classroom. A disconnect at any of these levels can result in a child struggling to read because s/he cannot see well. Similar circumstances prevail in dealing with students who have a chronic disease such asthma or ADHD.

Leadership at the school and district level is needed to provide oversight and linkages to the different aspects of the school health program, and to form partnerships not only within schools but also between school personnel and family and community resources. Community partnerships will have to be formed, as will liaisons between teachers and health care personnel. Leadership must also facilitate processes to help ensure continuity of care and follow-up.

Given the diverse nature of activities comprising school health, *a school health coordinator* is needed to help ensure synergy resulting from different efforts. As a key member of the leadership team, the school health coordinator can help ensure coherence from the overall effort. The school health coordinator's mission is vitally supported by the work of a school health council (or committee), comprised of representatives of the staff implementing key school health program elements, school administration, parents, students, and community-based organizations. The school health council can provide technical expertise, links to community resources, and a vehicle for obtaining community buy-in for policies and activities designed to address educationally relevant health disparities. The existence of a school health council serves to institutionalize the integration of health promotion into the fundamental mission of the school and increases the chances of health program sustainability. Almost two-thirds of the nation's schools already have a school health council or some organized structure that provides guidance on school health program activities. Compared with schools that do not have such councils, schools with such a group are more likely to report having policies and programs related to health, mental health, and social services (Brener et al., 2004).

National, State, and Local Responsibilities for Supporting School Health

The decentralized nature of education in the United States provides a distinct social context for implementing reforms intended to improve teaching, learning, and educational outcomes. Addressing the educationally relevant health needs of youth through school can be accomplished best if there is alignment of federal, state, and local policies to form a coherent national agenda to close the achievement gap.

Federal policymakers have an increasingly large role in shaping educational reforms, with billions of new dollars and authority to establish accountability standards derived from the No Child Left Behind legislation. However, most educational policies and funding for schools in the United States still come from states and communities. Local involvement and investment (of time and effort as well as financial resources) will ultimately determine the value of school health efforts.

Shared Strategies for Supporting School-Level Efforts

The first, and most immediate, step that national, state, and local leaders need to take to support the efforts of urban schools to address educationally relevant health disparities is to communicate clearly and powerfully that these efforts are an essential part of educational reform. The importance of using the bully pulpit to influence school-level practices should not be underestimated.

Ultimately, integrating school health efforts into

policy mandates and the accountability structure are the most important ways to influence change. Federal and state policies and legislation strongly influence practices at the local level. State and federal policies need to identify the health needs that must be met to provide equal access to educational opportunity; the implementation of programs to address those needs can be supported through grants, technical assistance, and professional development. Health related measures such as school climate and students' school connectedness warrant inclusion into accountability structures that assess academic outcomes and provide insight about the kinds of school improvement efforts that are needed to affect students' motivation and ability to learn. In addition to financial support, federal, state, and local agencies can support the school health agenda through guidance and technical assistance, data collection, and sponsored research.

Incorporating high quality, strategically planned, and effectively coordinated programs into the lowest performing schools, where they are needed most, will be particularly challenging. Extra investments in school districts with the lowest local property tax base and the lowest levels of performance on national assessments are needed to help equalize opportunities for learning. Efforts to reduce disparities in educational outcomes cannot succeed without reducing disparities in educational opportunities for learning.

While nongovernmental organizations (NGOs) cannot establish policy mandates or equalize school funding, voluntary health organizations, professional associations, and foundations do provide instrumental support through program grants, guidance and technical assistance, and support for data collection and research. These NGOs make enormous investments in improving the health of youth but tend to be focused categorically. When multiple private funding sources pool their resources, the nature and scope of efforts that becomes possible expands greatly. Likewise, guidelines and recommendations developed collaboratively by multiple NGOs can help shape a coherent national school health agenda to help close the gap in education and health.

Colleges of education in the United States have a central role to play in preparing the next generation of teachers and school leaders. The knowledge and skills required to implement high quality, strategically planned, and effectively coordinated school health programs are diverse. Given the lack of attention this topic appears to receive in professional preparation programs for educational leaders and teachers, it is not surprising that many leaders and teachers are not motivated to become deeply involved with school health as a central part of their responsibility. Even those who recognize the significance of students' health as one of the important determinants of the success of teaching and learning may lack the skills to act on their motivation. With rare exception, there has not been any national level effort among colleges of education to develop consensus about school health programs and policies. This reflects the peripheral place occupied by school health in American colleges of education. As greater expectations are placed upon teachers and school leaders to address health-related needs of youth, professional preparation programs have a responsibility to increase integration of health topics into curricula.

Recommendations

In summary, to support high quality, strategically planned, and effectively coordinated school health programs, federal, state, and local governments can engage in the following types of activities:

- Have leaders communicate clearly and powerfully that school health programs are an essential component of school reform.
- Integrate school health efforts into policy mandates and accountability measures.
- Provide extra investments in schools with the lowest local property tax base.

To support the efforts listed above:

- NGOs can explore ways to pool their resources

and influence to expand the scope of the programs they support and the impact of the guidelines and recommendations they issue.

- Colleges of education should integrate health topics and skills in school health program management into their professional preparation programs for education leaders and teachers, and form school—university partnerships to facilitate implementation of programs and policies.

Leadership from the U.S. Department of Education

The U.S. Department of Education (USDOE) is in a pivotal role to influence the health of American youth and their motivation and ability to learn. The current emphasis on performance standards illustrates its power to influence the nature and scope of teaching and learning in the classrooms and schools across America. However, focusing exclusively on standardized test score outcomes without also emphasizing the kinds of school health (and other) improvements that will influence students' motivation and ability to learn does not provide sufficient guidance to state governmental agencies or to local districts and schools about proven and promising approaches for attaining higher academic achievement standards.

This is an opportune time for change in America's schools. President Barack Obama's investment in America's educational system is unprecedented and stresses consolidation of fragmented and inefficient funding streams that will allow USDOE to fund proven or promising practices while providing greater technical assistance and support to grantees. Major new funding streams include: Race to the Top, whose grants afford states substantial discretion in advancing reforms around four specific areas identified by USDOE (see below); School Turnaround Grants, which focuses on the 5,000 lowest performing schools, many of which serve urban minority youth; and Teacher and Leader Innovation Fund, and Teacher and Leader Pathways, which focus on fostering the development of human capital devoted to education. These funding streams will invest billions of dollars to address four priorities, each one of which warrants inclusion of school health initiatives: (1) distribution of highly effective teachers; (2) focusing on the 5,000 lowest performing schools; (3) improving longitudinal data systems that will link student-level data and be useful for planning and evaluating school improvement efforts; and (4) assessment and standards. Teacher effectiveness can be enhanced by awareness of health factors that adversely affect motivation and ability to learn, as well as by knowledge and skills that motivate and enable teachers to contribute to the overall school health initiative. The lowest performing schools are likely to have the highest prevalence of educationally relevant health disparities. To invest in school improvement efforts without addressing these problems fails to recognize some of the main impediments to teaching and learning that are amenable to change through implementation of existing proven and promising approaches.

Another new USDOE funding stream proposed by President Obama for fiscal year 2010 provides one vehicle for addressing educationally relevant health disparities. The Promise Neighborhoods program will support the development of comprehensive neighborhood programs designed to combat the effects of poverty by meeting the health, social services, and educational needs of youth who live in low-income communities. Grantees will be encouraged to coordinate their efforts with programs and services provided by other federal agencies. By addressing the health barriers to learning and fostering coordination across funding streams, Promise Neighborhoods has great potential for making an important contribution to reducing the educational achievement gap. However, to have a major impact, this approach will need a much greater investment to follow up the $10 million for planning grants proposed by the president for FY 2010.

The U.S. Department of Education also needs to begin including student-level, health-related data in its longitudinal tracking systems; this would not

only assist with identifying needs and establishing strategic planning priorities, but would also be useful for assessing the extent to which different approaches are resulting in desired improvements. Although school climate and school connectedness are centrally important to improving educational outcomes, they are not currently included in most educational data or assessment systems. Guidance and technical assistance with measurements from USDOE's Institute of Educational Sciences would be extremely helpful to schools as they develop state and local level tracking systems.

In the past, USDOE has supported little research on the role of health in learning. In addition, it has typically not included educationally relevant health measures in its ongoing data systems, such as the Common Core of Data, which provides an annual comprehensive survey yielding comparative data across states, and the Statewide Longitudinal Data System Grant Program, which aims to help state level personnel develop and use data systems that include linked student records for planning and evaluation.

Recommendations

USDOE can only fulfill its mission of helping the nation's schools eliminate the educational achievement gap by helping schools eliminate health related barriers to learning through actions such as the following:

- Have departmental leadership consistently and passionately articulate in highly visible public forums the reasons why school health must be a fundamental part of school reform efforts.
- Collaborate with other federal agencies, national non-governmental organizations, foundations, and state and local education stakeholders to develop a national strategic plan for supporting school health programs to eliminate educationally relevant health disparities.
- Provide incentives for school leaders, teachers, and educational stakeholders to get involved with identifying high priority, educationally relevant health disparities and to develop high quality, strategically planned, and effectively coordinated school health programs to address these problems.
- Include efforts to reduce educationally relevant health disparities as required or recommended activities in the huge, new grant programs being established, such as Race to the Top.
- Ensure that new human capital grant programs, such as the Teacher and Leader Innovation Fund, support efforts to equip the next generation of educators and educational leaders with information about the impact of health problems on educational outcomes, as well as the knowledge and skills they need to implement high quality, strategically planned, and effectively coordinated school health programs.
- Integrate critical health related measures, such as school climate and students' connectedness with school, into existing USDOE data collection systems.
- Integrate into the USDOE research agenda, in a meaningful way, evaluations of school-based efforts to reduce health related barriers to learning.
- Collaborate with other agencies to *pool resources*, develop policies, coordinate activities, *integrate data elements into ongoing surveillance systems*, and *create interagency grants* promoting the dissemination, implementation, and maintenance of high quality, strategically planned, and effectively coordinated school health programs.

Policy Development

Current school health policies are an important indicator of where school health is prioritized within the overall education agenda. Stronger and more comprehensive school health policies are needed at the federal, state, and local levels. They should not only be consistent with laws governing school health and safety, but proactive in promoting health. Policies can encourage, if not require, districts and schools to invest in evidence-based programs and services based

on national standards.

Flexibility is important in translating policies and guidelines into practice. To promote lasting change, state and local level involvement and flexibility are essential. A frequent reaction of local school administrators and teachers to a new policy is that it is out of touch with the realities of their local context; not compatible with local cultural values and perceived needs and interests; impractical given available versus necessary resources; or inconsistent with local values.

Fit, Healthy, and Ready to Learn, developed by the National Association of State Boards of Education, is a useful guide for state and local education agencies in developing and implementing school health policies (*http://nasbe.org/index.php/shs/53-shs-resources/396-fit-healthy-and-ready-to-learn-a-school-health-policy-guide*). The National Association of State Boards of Education also maintains a database of state school health policies, which can provide reference points for leaders in state and local education agencies and help inform further policy development. The American Academy of Pediatrics' (2004) *School Health Policy Guide* is another authoritative and useful guide to policy development and implementation for leaders in state and district education agencies.

Recommendations

Federal, state, and local governments can help schools eliminate health-related barriers to learning by adopting and implementing the following types of policy measures:

- Require schools to include health goals in their mandated school improvement plans. This is perhaps the single most important policy that can be implemented, because it ensures that schools will be held accountable for their ongoing efforts and the success of their health policies and programs.
- Ensure an ongoing process to create, implement, and maintain a high quality, strategically planned, effectively coordinated school health program by, for example, requiring the establishment of a school health council or leadership team and supporting professional development of staff.
- Ensure that a sufficient amount of curricular time is devoted to health education, with a particular focus on helping youth learn and practice social-emotional skills that reduce susceptibility to health compromising behaviors. The acquisition and maintenance of such skills, including noncognitive skills, requires time and practice. A high quality health curriculum includes developmentally appropriate teaching and learning activities that have scope and sequence whereby cognitive, affective, and psychomotor objectives are built upon in a step-by-step fashion.
- Adopt policies to address the educationally relevant health disparities discussed in this essay. These might include:
  - requirements for schools to follow up with students who "fail" vision screening to help ensure they receive adequate corrective services;
  - commit curricular time to implementing proven or promising curricula to prevent teen pregnancy, aggression and violence, and promote physical activity;
  - ensure that students with chronic disease such as asthma and ADHD receive health services that are consistent with current standards of care;
  - ensure that youth who become pregnant have support to complete school;
  - ensure multiple opportunities for daily physical activity;
  - provide universal breakfast; and
  - adopt measures designed to create a supportive *school climate*.
- Address additional critical health needs by, for example, prohibiting all tobacco use in school buildings and on school grounds and establishing

nutrition standards to ensure that only healthy foods and beverages are available on campus.

Guidance, Technical Assistance, and Professional Development

Implementation of what we already know—translating current knowledge into practice—is the greatest challenge to immediate progress in reducing educationally relevant health disparities. Unfortunately, the school personnel who would be responsible for implementing high quality, strategically planned, and effectively coordinated school health programs typically lack the knowledge, skills, and training needed to manage this work. Many school health program leaders have not been trained to identify evidence-based approaches or on how to adapt them appropriately to fit their communities; furthermore, they lack skills and information needed to stay up to date on the constantly changing research base of proven and promising practices.

Federal, state, and local agencies can meet a vital need by providing school personnel the guidance, technical assistance, and professional development they need to implement high quality, strategically planned, and effectively coordinated school health programs. Government agency efforts can be complemented by support from nongovernmental organizations and foundations. Without major efforts in this area, schools are not likely to succeed in reducing educational relevant health disparities.

The CDC's Division of Adolescent and School Health, the only entity in the federal government devoted to increasing the dissemination and implementation of coordinated school health programs, currently funds collaborations between education agencies and health departments in 22 states to help local districts and schools implement coordinated school health programs. The extent of funding per state (around $400,000 per year) allows only limited possibilities in terms of technical assistance and support that can be provided.

Schools and districts also can learn a great deal from each other through the development of *school health learning communities*. This approach to community development, which emphasizes maximizing community involvement and democratic decision making, has the advantage of yielding the most sustainable changes, but the disadvantage of requiring considerable time. While change is needed urgently, such longer term investments are warranted as well.

State-of-the-art professional development opportunities can give teachers the skills needed to implement evidence-based health curricula; identify youth with physical or mental health problems and know when and to whom referrals should be made; help students learn and practice critical social-emotional skills; and relate to students in ways that help them feel valued as people and achieve cognitive learning objectives. It is also critically important to provide professional development opportunities in school health for school principals, whose leadership is particularly important in effecting implementation of school health programs and policies. Principals influence which curricular priorities teachers focus on and model key behaviors that influence the social climate within schools. Professional development for principals can help ensure their appreciation of the health and learning connection, and how different kinds of school health programs and services can be implemented to reduce health-related barriers to students' motivation and ability to learn.

A major aspect of the U.S. Department of Education's investment in the nation's schools is related to professional development. For example, the Teacher and Leader Innovation Fund is intended to support improvements in human capital systems and provide incentives for teachers and school leaders to work in the most challenging schools, and the Teacher and Leader Pathways authority supports alternative routes to certification and strengthening professional preparation programs. Such programs provide excellent opportunities to help both the current and the next generation of school leaders and teachers develop greater interest in and capability for reducing educationally relevant health disparities.

This is particularly significant given that a substantial portion of the current teacher workforce will change in the next decade.

For pre-service school leaders and teachers, learning opportunities in and out of the classroom are important. The system of apprentice models, whereby students gain experience under the supervision of well qualified practitioners, is a proven model. Opportunities for school leaders, within and between schools, to network with each other enables them to share ideas and experiences, thereby gaining knowledge, skills, and appreciation of the importance of addressing health factors as prerequisites to achieving other teaching and learning objectives.

Support for training as a school health coordinator with the expectation that graduates will work in schools serving urban minority populations has never existed, but is desperately needed to support human capital development in this crucially important, yet generally overlooked, aspect of school improvement. Pre- and post-doctoral fellowships can provide incentives that enable and encourage talented individuals within the workforce to pursue careers related to school health and expansion of this element of the labor force is greatly needed.

Recommendations

Federal, state, and local governments can help schools eliminate health related barriers to learning by implementing the following types of activities:

- Intensive efforts to disseminate the most up-to-date, evidence-based guidance, technical assistance, and professional development on all aspects of implementing school health programs to teachers, principals, pre-service school leaders, and all other relevant school personnel.
- Support with skills that local school personnel are likely to lack in areas such as data management and analysis; building a sustainable school health team; identification, tailoring and implementation of proven and promising approaches; program monitoring and formative evaluation; and ongoing planning and evaluation.
- Provision of ongoing follow-up consultation and support for school personnel as they experience challenges in implementing school health programs.
- Increased funding to CDC's Division of Adolescent and School Health to ensure that all states and many large cities are funded – at levels substantially higher than those currently provided – to implement collaborative efforts between education and health agencies to support high quality, strategically planned, and effectively coordinated school health programs.
- Providing opportunities for members of the school health teams across a state or region to share problems and strategies that were successful for addressing them in their district
- Integration of professional development opportunities related to school health into the large USDOE human capital improvement systems
- Aid programs to support the training of school health coordinators for schools serving urban minority populations
- Awards for pre- and post-doctoral fellowship opportunities to expand the school health program workforce

Accountability and Data and Software Systems

The issue of accountability has been a dominant theme in recent debates about education. Accountability is important given the extent of social resources invested in education and the importance of closing the achievement gap for the future vitality of the nation. Education and learning about health in schools is generally not measured. This is problematic not only because it suggests that such learning is not important, but also because, without such measures, it is difficult to assess which areas within the school health program do and do not need improvement. The inclusion of educationally relevant health factors as part

of accountability measures for school improvement efforts is justified in terms of the effects of these factors on educational opportunity.

Measures of accountability for what students should know and be able to do relevant to health at various stages of development have been developed by the Council of Chief State School Officers (i.e., Health Education Assessment Process), but these measures have never been widely used. This is telling in terms of the low priority school health has in the current conceptualization of education. At this point, consensus development is needed to conceptualize and operationally define teaching and learning outcomes, and other factors (e.g., school climate, student connectedness and engagement) relevant to school health.

Two data systems collected biennially by the Centers for Disease Control and Prevention are the School Health Profiles and the Youth Risk Behavior Survey. The former tracks particular school health efforts occurring in the nation's secondary schools. The latter provides prevalence estimates of relevant health behaviors that influence current and future risk of morbidity and mortality among youth. These data systems provide useful measures for both evaluation and strategic planning at the state and district level. Other relevant, existing data systems include School Health Policies and Programs Study, National Longitudinal Survey of Youth, National Survey of Children's Health, National Survey of Children with Special Health Care Needs, Vital Statistics routinely collected by the National Center for Health Statistics, National Health Interview Survey, National Asthma Survey, State and Local AREA Integrated Telephone Survey, National Health and Nutrition Examination Survey, Uniform Crime Reports, Indicators of School Crime and Safety, and Vital Statistics.

Development of national surveillance systems are needed relevant to incidence and prevalence of eye disease and vision problems affecting school-aged youth, as well as the extent to which youth receive vision screening and, more importantly, indicated follow up care. Data systems are also needed to track process measures—intermediary factors presumed to mediate the relationship between school health programs and services and teaching and learning outcomes. These include data describing school climate and school connectedness.

Recent progress has been made in conceptualizing and measuring school climate as well as measures of student connectedness and engagement with school (Osher, Kendziora, & Chinen, 2008; *www.schoolclimate.org*). Such measures should be incorporated into all schools improvement plans, even if the goal is to maintain a supportive school climate and high level of school connectedness. Data systems to track school climate and school connectedness in all of the nation's urban public schools do not currently exist. These data are needed to help assess which schools are succeeding in maintaining a supportive school climate and enhancing student connectedness and engagement with school, which in turn will facilitate teaching and learning to improve students' test scores in mathematics, language arts and science, among other topics.

Software to help conceptualize, implement, and maintain high quality, strategically planned, and effectively coordinated school health programs do not exist. Given the constantly changing scope of proven and promising approaches, useful software must be maintained on an ongoing basis. Software development, including capacity for linked student records, is an example of a project that requires interagency collaboration to help ensure that it is comprehensive, acceptable to the intended users, and relevant to school leaders' decisions for improving students' motivation and ability to learn.

Such software should be available within the public domain, along with support and technical assistance, to help school health program staff easily estimate the prevalence of behavioral risk factors affecting youth in urban areas; identify proven or promising approaches for given topics and age levels; and link deficiencies identified in self-assessment processes, such as the CDC

School Health Index, to a solutions database providing guidance and suggestions that warrant consideration. In addition, software can be developed to link data systems to inform school improvement decisions. Examples of relevant data to be linked include student emergency contact information; physical and mental health problems (e.g., asthma, ADHD); medications, including ones to be taken at school; emergency response needs; vision screening results, whether follow up care was obtained, and whether recommendations are followed; frequency of participation in physical activity; frequency of participation in breakfast; overall attendance; standardized test scores; grades; student's connectedness with school; teacher's ratings of student's attention/hyperactivity, aggressive, disruptive or violent behavior; disciplinary actions; counseling and psychological services provided; medical and dental care provided; and referrals for additional services and follow up to encourage referrals to be acted upon.

Recommendations

In summary, federal, state, and local governments can help schools eliminate health related barriers to learning by implementing the following types of activities:

- Systematically exploring how health-related measures can be integrated into accountability measures for school improvement efforts.
- Assessing the extent to which existing health data systems are useful for monitoring educationally relevant health problems and can be used to guide national and state strategic planning and evaluation.
- Supplementing existing data with measures of eye disease and vision problems, school climate, and school connectedness, among other factors, that should be collected routinely to assess needs, monitor changes, and plan and evaluate programs and services.
- Convening stakeholders to develop a menu of potential health-related metrics that states and school districts could use for accountability.
- Collaborating to develop software to help conceptualize, implement, and maintain *high quality, strategically planned, and effectively coordinated* school health programs.

Research Agenda

The highest priority for research is to discover ways to put into practice what we already know. How can high quality, strategically planned, effectively coordinated school health programs be widely disseminated, implemented, and maintained in the nation's schools serving urban minority youth? At an earlier stage of the research spectrum, the emphasis was on randomized trials designed to demonstrate program efficacy and effectiveness. Now the emphasis must shift toward understanding ways to implement proven and promising program approaches, in a strategic and coordinated way, in the challenging context of urban public schools.

Demonstration programs are needed to show what is possible. There is a large body of rigorous evaluative research demonstrating the efficacy of categorical programs. To date, there has not been any rigorous evaluation research on the potential of high quality, strategically planned, and effectively coordinated school health programs on educational outcomes. Conducting this work during the coming years with dozens, if not hundreds, of schools can demonstrate the value of school health for enhancing students' motivation and ability to learn, and educational outcomes.

Participatory research is needed that involves school leaders, teachers, parents, and community members. This research should emphasize local significance and external validity. Large-scale funding mechanisms for this kind of research—focusing on multiple rather than categorical problems and specifically directed toward reducing educationally relevant health disparities—are not currently available. But this is precisely the kind of research that should be supported though pooled investments by funding agencies that share mutual goals related to education

and health.

Little change in the nation's urban schools serving youth from poor families will occur without substantive and ongoing involvement of school leaders and teachers. The fact that there are virtually no useful data describing relevant characteristics of these stakeholders is telling. Do the nation's teachers believe that these issues are important? Do they feel that it is their responsibility to address health issues? Which health issues are deemed more or less important? Do educational leaders feel prepared to navigate their way through the morass of policies and resources and to conceptualize, implement, and maintain a coordinated and strategic school health program that is aimed at favorably affecting teaching and learning? If not, what kind of training, technical assistance and other support would be most useful? What are the best ways to help school leaders and teachers design, implement and maintain ongoing high quality programs and services?

Other important groups about which little information is available are faculty and administrators in colleges and universities. Have faculty responsible for preparing the next generation of school leaders and teachers embraced the notion of coordinated school health? What are their beliefs about the importance of this versus other topics? To what extent do the presidents and deans at the nation's colleges of education believe that addressing students' health factors is central to the mission of schools? To what extent do curricula in professional preparation programs for teachers and administrators around the United States address the need for and approaches to coordinated and strategic school health?

Nearly all research on interventions to improve health outcomes among youth, mostly funded by the National Institutes of Health, has not measured impact on educational outcomes. At the outset of this essay, a basic premise was that health and education are causally related in reciprocal ways. While the focus here has been on the ways that health factors adversely affect teaching and learning outcomes, there has recently been increasing recognition of the impact that education has on health status (Freudenberg & Ruglis, 2007; Kimbro, Bzostek, Goldman, & Rodriguez, 2008). Given the mutual goals shared by social institutions concerned with education and health, greater collaboration is needed in developing investments to support an overall research portfolio for youth development.

Statistical models estimating effect sizes of health factors on educational outcomes are likely to yield underestimates. The data used for deriving these estimates and their relevance to urban minority youth are questionable. It seems likely that these effects are underestimated for a variety of reasons, for example, because they are calculated based on health factors considered *singly* rather than when *synergistically interacting* with each other. Measurement of educationally relevant health disparities in ongoing data systems maintained by the National Center for Educational Statistics that enable the linking of health and education data within individual respondents would be helpful in deriving more accurate effect-size estimates. Intervention research aimed at reducing multiple, educationally relevant health disparities would also provide direct evidence of the effect sizes that can be expected from high quality, strategically planned, and effectively coordinated school health efforts. Currently, however, there is no empirical basis for estimating the effect size of educationally relevant health disparities that considers the *collective and interactive* effects of interventions to address multiple, educationally relevant health disparities simultaneously.

A panel convened by the National Academy of Sciences could be instrumental in evaluating the extent to which current knowledge supports the value of a nationwide investment in high quality, strategically planned, and effectively coordinated school health programs as part of a national strategy for closing the achievement gap. Recommendations would be an important step in developing a national school health strategic plan and point to priorities that warrant the greatest investment of social resources.

Determining more precisely which federal agencies are allocating school health investments for which health problems and in which localities of the United States would be a useful step in identifying prospects for pooling investments. It is likely that a substantial portion of the current investment is being devoted to school health efforts that are too often low quality, categorical, and fragmented. To the extent that current investments can be reallocated to programs that are high quality, strategically planned, and effectively coordinated, a much better yield from current investment can be achieved.

Recommendations

Federal, state, and local governments can help schools eliminate health related barriers to learning by implementing the following types of research activities:

- Collaborating to develop a joint national research agenda that documents the impact of high quality, strategically planned, and effectively coordinated school health programs on educational outcomes. These studies need to evaluate interventions that focus on multiple rather than individual categorical problems.
- Conducting formative research to improve understanding about the motivations and skills of school leaders and teachers, as well as of faculty and administrators in the colleges and universities that deliver pre-service education for school leaders and teachers.
- Including educational outcomes as key measures in evaluations of interventions designed to promote the health of young people that are sponsored by health agencies.
- Developing an empirical basis for estimating the collective and interactive effects of interventions to address multiple educationally relevant health disparities.
- Documenting the extent and nature of current federal investments in support of school health programs.
- Conducting research related to the kinds of evidence valued by state legislators with respect to supporting changes in policies and legislation to help ensure adequate educational opportunity by reducing educationally relevant health disparities.

Conclusions

If children can't see well, if their eyes do not integrate properly with their brain and motor systems, they will have difficulty acquiring the basic and essential academic skills associated with reading, writing, spelling and mathematics. If their ability to concentrate, use memory, and make decisions is impeded by ill-nourishment or sedentary lifestyle, if they are distracted by negative feelings, it will be more difficult for them to learn and succeed in school. If their relationships at school with peers and teachers are negative, they will be less likely to be connected with and engaged in school, and therefore less motivated and able to learn. If they are not in school, because of uncontrolled asthma or because they are afraid to travel to or from school, they will miss teaching and learning opportunities. If they drop out, perhaps because they are failing or faltering; or because they are socialized to believe that, even if they complete school, there will be no better opportunities; or because they associate with peers who do not value school; or because they become pregnant and there are no resources in place that enable them to complete school while pregnant and after they have a newborn, it is not likely that they can succeed. If they cannot focus attention and succeed socially, it is unlikely that they will succeed academically.

Healthier students are better learners. Urban minority youth are disproportionately affected by educationally relevant health disparities. A substantial investment in health related programs and services already exist in the nation's schools, including urban public schools. But because current programs are

categorical and fragmented rather than strategic and coordinated the return on investments is limited.

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. Consequently, the majority of the nation's schools have not implemented strategic or coordinated school health programs and policies. For the nation's schools to address educationally relevant heath disparities in a strategic and coordinated way there must be a fundamental social change in the goals of schools, the way schools are financed, the personnel and services available and accessible, and the amount of time devoted to help youth learn social-emotional skills. Such change will not occur without leadership at the U.S. Department of Education. Now is an opportune time for such leadership.

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. These are worthy goals for elementary and secondary education. Indeed, pursuing these goals is a moral imperative.

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For Introduction

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For Breakfast

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Charles E. Basch is the Richard March Hoe Professor of Health and Education at Teachers College, Columbia University. He specializes in planning and evaluating health education programs for urban minority populations to reduce health and educational disparities. His work has been diverse with respect to population groups (ranging from young children to older adults), disease topics (AIDS, cardiovascular disease, cancer, diabetes, and eye disease), and behaviors (vision, diet, physical activity, and screening), but has a common theme of translating research into practice. The health education programs he has developed and evaluated are philosophically grounded in informed voluntary decision making and rely heavily on building strong interpersonal relationships. His evaluative research has been collaboratively conducted with self-insured unions, hospitals, community-based clinics, and schools.

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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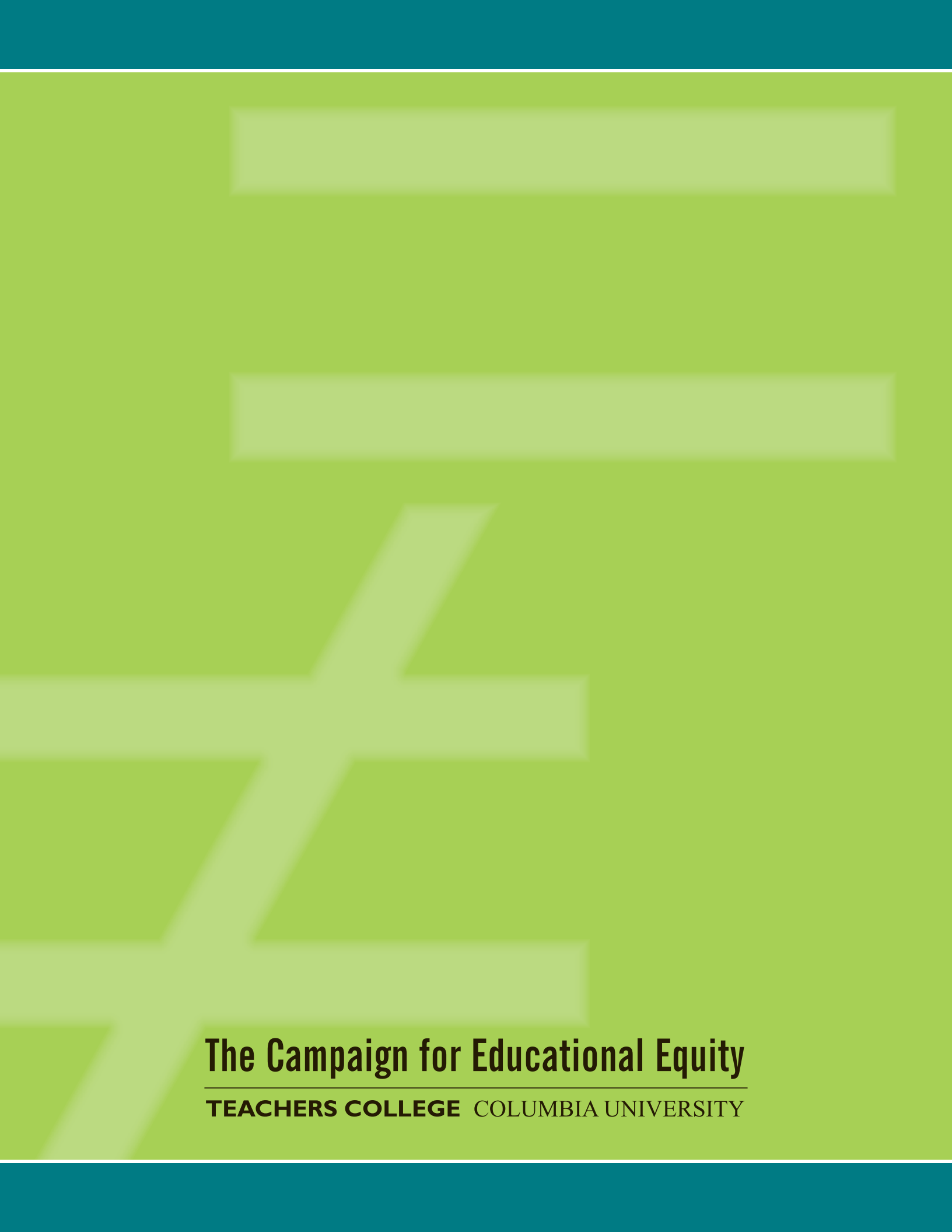
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