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Perspective Piece

The Role of Health in Education and Human Capital: Why an Integrated Approach to School Health Could Make a Difference in the Futures of Schoolchildren in Low-Income Countries

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Abstract. Healthy students learn better, yet most current investments in schoolchildren focus on education and learning while largely neglecting the health of the learner. Some school-based interventions, such as school feeding and deworming, are already successfully targeted at this age-group, but the efficiency and cost-effectiveness of such programs could be greatly enhanced by better integrated delivery alongside other priority health interventions. A symposium at the society's 68th annual meeting launched a process to explore how integrated delivery of school-based interventions can address prevalent health conditions in school-age children.

On January 23, 2020, at the World Economic Forum in Davos, Switzerland, UNICEF and the World Food Programme announced joint action to address the needs of children throughout the first 8,000 days of life. Existing investments in the first 1,000 days of life should be complemented and enhanced by continued investment in the next 7,000 days. This helps maintain the early gains, provides an opportunity for catchup, and addresses specific phases of vulnerability which includes the middle childhood (5–9 years), when infection and malnutrition continue to hinder growth and development; the adolescent growth spurt (10–14 years), when increased growth rate requires good diet and health; and the adolescent phase of growth and consolidation (15–19 years), when brain maturation, and social and emotional development require support.[1] The aim of "Nurturing Human Capital: Achieving more for children in 2020 and beyond" is to improve the health of schoolchildren, to promote their learning and to help them achieve their full potential. This initiative recognizes the crucial role of good health at school age for promoting educational outcomes and building human capital—the sum of a population's health, skills, knowledge, and experience—that is central to a country's economic growth. In many low-income countries, the population contributes only 30% of the nation's wealth, whereas in rich countries, the proportion is near 70%. Since 2018, the World Bank, through the Human Capital Project,[2] has raised awareness of the substantial economic returns and poverty reduction that result from increased health and education programming, leading to a 4% increase (from US$2.9 to US$4.5 billion) between 2017 and 2019 in World Bank International Development Association investments in the health and education sectors.

At the 68th Annual Meeting of the American Society of Tropical Medicine and Hygiene in 2019, we presented a symposium on school-based health interventions, bringing together expertise across multiple disciplines to investigate current health policies for schoolchildren and adolescents. The aim was to explore the potential of the school as a platform for the integrated delivery of multiple health interventions, to improve the health of the learner and to increase cost-effectiveness, cost-efficiency, coverage, and sustainability.[1] Coordinating and expanding current school-based health interventions to form an integrated school health package should lead to synergistic effects, shared costs, and stronger health returns than singular interventions.

School feeding currently has the largest footprint of all school-based interventions, reaching more than 350 million children daily with a total investment of more than $70 billion a year.[3] Rigorous studies have shown that well-implemented school meal programs can improve children's education, as well as their physical and psychosocial health, with most benefits accruing for more disadvantaged children.[4–6] Despite these achievements, 73 million of the most vulnerable children still do not have access to school feeding programs in low- and middle-income countries.[7] Moreover, where programs exist, there is little evidence on implementation fidelity of the food service provision, including the nutritional quality and food safety of the meals, and on the links between program fidelity and effectiveness. Developing and monitoring food and nutrition standards for school meal programs that encompass both under- and overnutrition perspectives is an important challenge in low- and middle-income countries.[8] Innovative precision approaches to dietary planning have shown potential in enhancing the nutritional quality of school meals, addressing the dual burden of overweight/obesity and malnutrition, and shortening supply chains through home-grown school feeding, which aims to also promote the local agricultural economy and mitigate climate change.[9] Important evidence gaps also exist regarding the impact of government programs at scale or in fragile, conflict settings, where technical capacity and implementation constraints may be critical. Other areas of ongoing research focus on how to leverage school meals to reach important life cycle age-groups, including 1) early childhood development, as an opportunity for both continued coverage to preschool children and a platform to influence caregivers of younger siblings still at home[10]; and 2) to improve diets and nutrition of adolescent girls and potentially extend the benefits of the intervention to the next generation as well.

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The WHO currently recommends school-based mass drug administration to control soil-transmitted helminths and schistosomiasis in the estimated 0.87 billion children at risk of infection.[11,12] Soil-transmitted helminths and schistosomiasis have both been linked to negative impacts on child health and education including anemia, poor growth, decreased cognitive function and educational achievement, and ultimately reduced human capital over time.[13–16] Schools with trained teachers are an effective platform for delivery: in India, 89 million schoolchildren were dewormed in a single day during the 2015 National Deworming Day, which had increased to 266 million by 2018.[17] As of 2018, more than 96 endemic countries were implementing deworming programs, seven of which have reached < 1% moderate and high-intensity infections and 21 have maintained > 75% coverage for 5 years or more.[18] The global reach of both school feeding and deworming programs illustrates the ability of school-based approaches to access children in need.

Tetanus toxoid vaccination has long been delivered through schools, and recently, human papilloma virus (HPV) vaccination has been added to school health platforms as a new model of sustained delivery.[19,20] Human papilloma virus vaccination targeted at 9- to 14-year-old girls aims to reduce the risk of cervical cancer, the second most frequent cancer among women in low- and middle-income countries, with an annual incidence of 19.8 cases/100,000 women.[21,22] Currently, HPV vaccine has been introduced in 106 countries and reaches an estimate of only 15% of the global population of adolescent girls.[23] Models predict that 90% coverage could reduce the incidence of cervical cancer in women aged < 45 years by 85% in the next 30 years.[22] Integrated delivery with other school-based health interventions could support achieving this level of coverage.

Perhaps surprisingly, there are currently no interventions that specifically target malaria control in school-age children. Yet there is a growing body of evidence that in areas where malaria burden remains high, the peak prevalence of infection is in school-age children, who are a key reservoir of human-to-mosquito infection, perpetuating malaria transmission.[24–31] In addition to the broader impacts on the community, infection in this age-group is associated with anemia, decreased cognitive function, and is a major cause of school absences.[32–34] Beyond inclusion of malaria in school health curricula, there is no consensus on whether or which school-based interventions should be used to decrease malaria burden in schoolchildren. Potential, non-mutually exclusive options include enhanced malaria-related health promotion in schools, distribution of bed nets directly to schoolchildren, school-based testing and treatment of symptomatic students, screening and treatment, or intermittent preventive treatment of all students. The optimal approach depends on local prevalence and local preferences, but the current lack of malaria-related policy for schoolchildren is a critical barrier to efforts to develop an integrated school-health package. Additional research is needed to guide the choice of malaria interventions for this population.

Schools can also be effective platforms for delivery of other cost-effective health interventions.[1] Puberty education and menstrual hygiene management in schools, including distribution of sanitary products, can increase school attendance among girls post-menarche[35,36] and serve as an entry point for sexual and reproductive health education. Critical clinical services, such as vision screening and provision of corrective lenses, and oral health promotion and dental care, can also be delivered intermittently through an integrated platform. Behavior change communication around water, sanitation, and hygiene can be supported by united messaging interwoven throughout an integrated package.

Combining multiple interventions in an integrated platform offers economies of scope and scale, which may lead to increased cost-effectiveness and cost-efficiency. For example, school deworming programs have already established processes for mapping and targeting; procurement, supply chain, and distribution; community mobilization; teacher training; treatment implementation; monitoring and evaluation; and reporting.[37] Other health interventions could usefully share in these processes. Combining the common steps for programs with different health targets has attractive cost and logistical benefits, as well as promoting overall health messaging (Table 1).

Thoughtfully integrated, well-orchestrated and continuously deployed school-health packages can improve sustainability, whereas campaign approaches can often overwhelm routine health delivery systems and overburden teachers.[38] Undermining teachers, and thus detracting from learning, is counter to the developmental purpose of school health programs. Further

TABLE 1
Examples of opportunities for integration

	Health education and BCC*	School feeding	Soil-transmitted helminths + schistosomiasis	Human papilloma virus vaccination	Malaria (nets, treatment, and chemoprevention)	Other interventions†
Planning and targeting	Knowledge, attitude, practice	Surveys	Surveys and sample collection	–	Survey of intervention use and prevalence surveys	Screening for prevalence of other diseases
Procurement and distribution	Materials	Food supplies	Drugs	Vaccines	Nets and drugs	Glasses, hygiene, and oral health products
Training	✓	✓	✓	✓	✓	✓
Community mobilization	–	✓	✓	✓	✓	✓
Implementation	Continuous	Continuous	Biannual/annual/biennial	Annual	Depends on intervention	Annual
Monitoring and evaluation	✓	✓	✓	✓	✓	✓
Reporting and budgeting	–	✓	✓	✓	✓	✓

* Behavior change communication.
† Menstrual hygiene, sexual and reproductive health, vision screening, and oral health.

TABLE 2
Key questions for the development of integrated school health packages include the following

Implementation and operational research questions
How can health, education, and other sectors work together to efficiently implement school health programs?
How best to map and link schools to the health facility for school health service delivery?
Which are the best strategies to reach non-enrolled school-age children?
How to monitor quality of service delivery?
How can school-based health packages provide leverage to change health at home (diet, younger sibs, . . .)?
How to use the school platform to expand reach to women of early reproductive age?
What is the threshold to stop interventions as control is achieved?
Policy and funding questions
How to manage/balance/maintain intervention specific vs broader school health funding?
How to manage the public–private sector interface?
How long will drug donations continue?
How to strengthen alignments with other sectors: WASH, agriculture?
Intervention-specific questions
How to address the needs of both under- and overnutrition? (school feeding)
How to further implement home-grown school feeding to use local agriculture to increase economic and social benefits? (school feeding)
Which are the optimal malaria control interventions in specific transmission and intervention settings? (malaria)
How to best monitor for and decrease the risk of drug resistance? (Soil-transmitted helminths, schistosomiasis, and malaria)
How to best integrate school-based vaccine delivery with routine immunization programs? (Human papilloma virus and Td)

benefits from a systematic, integrated approach include stronger health returns by simultaneously addressing the multifactorial etiologies of poor health, such as addressing anemia by combining deworming, nutrition, and malaria treatment; schoolchildren can be agents of change for multiple health messages, especially around environmental health and WASH[39–42]; health education can increase the overall health literacy of communities; and schools will be better prepared to respond to new social shocks and epidemics, as we have learned from the COVID-19 pandemic, and more readily adapt to more slowly evolving health needs of schoolchildren.

To be effective, school-based health interventions must be context-specific, and therefore, the menu of options for inclusion in the package must be tailored to local epidemiology, resources, and priorities. Symposium participants identified key cross-cutting research and policy questions which could contribute to more locality-specific school health packages (Table 2).

School health is not a niche issue. In low-income countries, the median age is often 15 or 16 years, meaning that 40% of the population are schoolchildren. Universal primary education was one of the most successful of the Millennium Development Goals, and the vast majority of these children now have access to school. Following that success, the United Nations' Sustainable Development Goals now focus on improving the quality of education, and to this end, low- and lower-middle–income countries invest approximately $210 billion annually in education and learning. But those same countries invest less than 5% of that amount in the health of the learner, allocating $1.4–5.5 billion for the health of schoolchildren.[7] This relative neglect of the health of schoolchildren is an unintended consequence of what is now recognized as too narrow a focus on the first 1,000 days of life, and the resulting relative lack of health policies for the "next 7,000 days," as illustrated by the surprising lack of interventions that specifically target malaria control in school-age children. Underinvestment in the health of this age-group is now known to be a false economy, and countries are increasingly recognizing that the lack of effective school health programs seriously undermines the returns on their investment in education. Filling this gap in investment will require appropriate health policies for middle childhood and adolescence, as well as a rebalancing of resource allocation. In this context, it is noteworthy that modern thinking around universal health care, by both governments and development partners, increasingly includes school health programs in budgeting and planning.

The closure of schools worldwide in response to the COVID-19 pandemic, and the resulting exclusion of 1.5 billion schoolchildren from access to education and 400 million from school health and nutrition programs, has helped remind policy-makers of the scale and reach of school-based health and nutrition services, whereas the experience of the back-to-school movement has demonstrated that integrated school health programs, including school meals, can offer a powerful incentive for attracting children to stay in school, and convincing parents to send them.

School health is a developing area for health programming, and there remain many important evidence gaps in understanding programming needs. Yet it is also the key to unlocking the potential of the world's children: schools offer a uniquely sustainable platform for health delivery in low-resource settings, while at the same time widely influencing community behavior change through their education role. Responding to this challenge offers the American Society of Tropical Medicine and Hygiene an unrivaled opportunity to think beyond our often disease-specific silos and to develop new, innovative ways to secure the health, development, and future of the poorest children.

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