

## Chapter 58

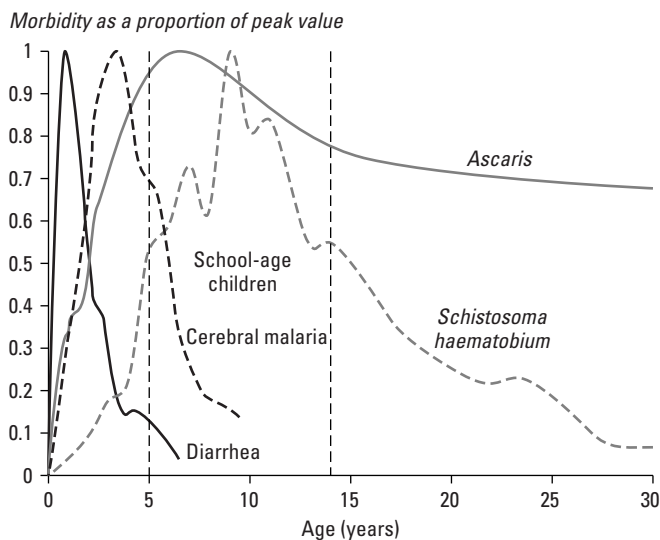
# School-Based Health and Nutrition Programs



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The paradigmatic shift in the past decade in our understanding of the role of health and nutrition in school-age children has fundamental implications for the design of effective programs. Improving the health and nutrition of schoolchildren through school-based programs is not a new concept. School health programs are ubiquitous in high-income countries and most middle-income countries. In low-income countries, these programs were a common feature of early, particularly colonial, education systems, where they could be characterized as heavily focused on clinical diagnosis and treatment and on elite schools in urban centers. This situation is changing as new policies and partnerships are being formulated to help ensure that programs focus on promoting health and improving the educational outcomes of children, as well as being socially progressive and specifically targeting the poor, girls, and other disadvantaged children. This evolution reflects five key changes in our understanding of the role of these programs in child development.

- First, ensuring good health at school age requires a life cycle approach to intervention, starting in utero and continuing throughout child development. In programmatic terms this requirement implies a sequence of programs to promote maternal and reproductive health, management of childhood illness, and early childhood care and development. Promoting good health and nutrition before and during school age is essential to effective growth and development.
- Second, operations research shows that the preexisting infrastructure of the educational system can often offer a more cost-effective route for delivery of simple health interventions and health promotion than can the health system. Low-income countries typically have more teachers than nurses and more schools than clinics, often by an order of magnitude.
- Third, empirical evidence shows that good health and nutrition are prerequisites for effective learning. This finding is not simply the utopian aspiration for children to have healthy bodies and healthy minds, but also the demonstration of a systemic link between specific physical insults and specific cognitive and learning deficits, grounded in a new multisectoral approach to research involving public health and epidemiology, as well as cognitive and educational psychology.
- Fourth, the provision of quality schools, textbooks, and teachers can result in effective education only if the child is present, ready, and able to learn. This perception has additional political momentum as countries and agencies seek to achieve Education for All (EFA) by 2015 and address the Millennium Development Goals of universal basic education and gender equality in education access. If every girl and boy is to be able to complete a basic education of good quality, then ensuring that the poorest children, who suffer the most malnutrition and ill health, are able to attend and stay in school and to learn while there is essential.



Source: Bundy and Guyatt 1996.

**Figure 58.1** Age Distribution of Infection-Specific Morbidity

- Finally, education, including education that promotes positive health behaviors, contributes to the prevention of HIV/AIDS—the greatest challenge for generations to come. School health and nutrition programs that help children complete their education and develop knowledge, practices, and behaviors that protect them from HIV infection as they mature have been described as a “social vaccine” against the disease.

Because of the success of child survival programs, the number of children reaching school age (defined as 5 to 14 years of age) is increasing and is estimated to be 1.2 billion children, with 88 percent living in less developed countries (U.S. Census Bureau 2002). As figure 58.1 illustrates, the pattern of disease is age specific. A large body of evidence shows that these conditions affect cognition, learning, and educational achievement (see Jukes, Drake, and Bundy forthcoming; Pollitt 1990 for reviews of this extensive literature).

This chapter focuses on the health, nutrition, and education of the school-age child and on the programs that can be implemented at school age to promote positive outcomes.

## INFECTIOUS DISEASE AND SCHOOL-AGE CHILDREN

A range of infectious diseases affect school-age children.

### Helminth Infections

Between 25 and 35 percent of school-age children are estimated to be infected with one or more of the major species of worms (Bundy 1997; see also chapter 24). The most common

and important infections are caused by geohelminths (the roundworm *Ascaris*, the whipworm *Trichuris*, and the two species of hookworms *Ancylostoma* and *Necator*) and by the schistosomes (*Schistosoma* spp.), which give rise to a wide range of chronic but largely nonspecific symptoms. The most intense worm infections and related illnesses occur at school age (Partnership for Child Development 1998b, 1999) and account for some 12 percent of the total disease burden and 20 percent of the loss of disability-adjusted life years (DALYs) from communicable disease among schoolchildren (World Bank 1993).

Infected schoolchildren perform poorly in tests of cognitive function; when they are treated, immediate educational and cognitive benefits are apparent only for children with heavy worm burdens or with concurrent nutritional deficits. Treatment alone cannot reverse the cumulative effects of life-long infection or compensate for years of missed learning, but studies suggest that children are more ready to learn after treatment for worm infections and may be able to catch up if this learning potential is exploited effectively in the classroom (Grigorenko and others forthcoming). In Kenya, treatment reduced absenteeism by one-fourth, with the largest gains for the youngest children who suffered the most ill health (Miguel and Kremer 2004).

### Malaria

Up to 5 percent of children infected with malaria early in life have residual neurological sequelae (Snow 1999). In areas of unstable transmission, malaria accounts for 10 to 20 percent of all-cause mortality among school-age children (Bundy and others 2000), and those who have suffered repeated attacks have poorer cognitive abilities. In Kenya, primary school students miss 11 percent of school days because of malaria, equivalent to 4 million to 10 million days per year (Brooker and others 2000).

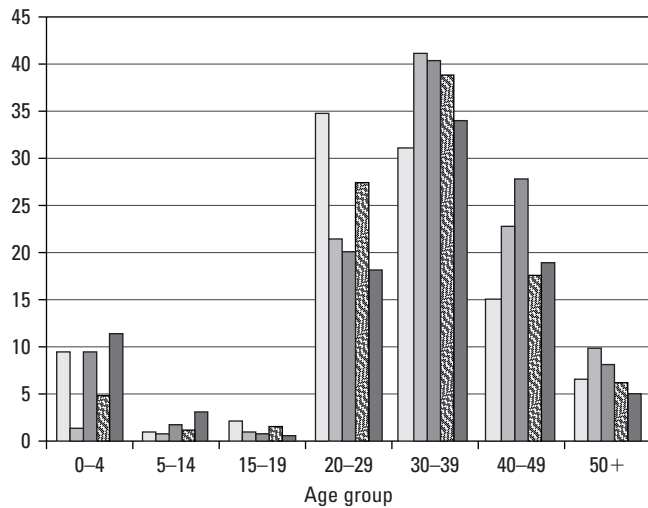
Oral antimalarial treatment reduced school absenteeism by 50 percent in Ghana (Colbourne 1955); the use of insecticide-treated bednets in Tanzania reduced malaria and increased attendance (Shiff and others 1996). Girls in The Gambia were more than twice as likely to enroll in primary school if they had received malaria prophylaxis in early childhood (Jukes and others submitted).

### HIV/AIDS

Although school-age children have the lowest infection prevalence of any age group (figure 58.2), an estimated 3.8 million children under 15 years of age have been infected with HIV and more than two-thirds have died (UNAIDS 2002). Even uninfected children suffer physically, socially, and psychologically through death or illness in their family (World Bank 2002). The proportion of orphans, most of whom are of school age, has risen from 2 to 15 percent in some African countries, with

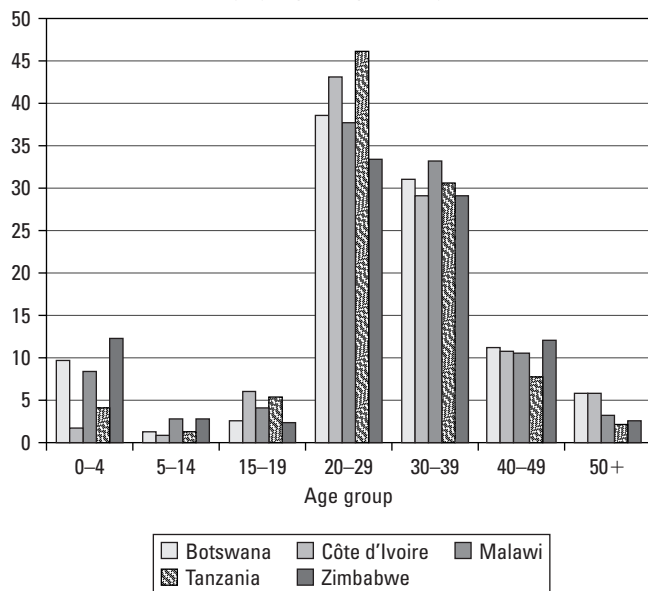
### a. Male Cases

Percent infected in each age group, as a percentage of cases



### b. Female Cases

Percent infected in each age group, as a percentage of cases



Source: UNAIDS epidemiological fact sheets 2000.

Note: Figure shows percentage of males (top) and females (bottom) infected with HIV in each age group (as a percentage of all HIV-infected males and females, respectively), for five countries in Africa. Infection peaks at a younger age in women than in men, and the lowest prevalence of infection occurs in school-age children.

**Figure 58.2** Age Prevalence of HIV/AIDS

AIDS accounting for 50 percent of this increase. The number of orphans is expected to reach more than 25 million by 2010.

School-age children with HIV infections have lower IQ levels and poorer academic achievement, language, and visual motor functioning. These deficits can be reduced or reversed with antiretroviral therapy. The improvement is greater for children of school age than for younger children.

## Acute Respiratory Infection

Acute respiratory infection, the most common acute infection in school-age children globally, is a significant cause of absenteeism. Research in industrial countries (Cohen and Smith 1996) finds that flu infection affects attention and reaction time; colds primarily affect hand-eye coordination, as well as reduce the ability to tolerate high levels of noise and other distractions common to the classroom.

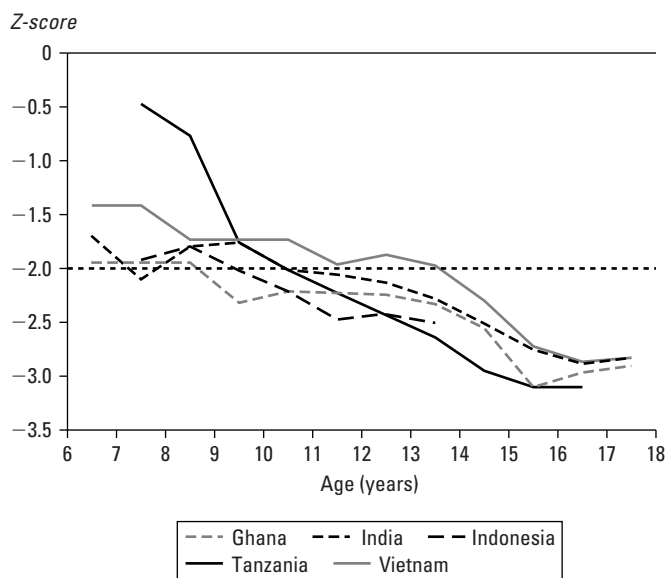
## MALNUTRITION, NONINFECTIOUS DISEASE, AND HEALTH AND EDUCATION

Malnutrition and noninfectious disease also affect school-age children.

### Malnutrition

Stunting (low height for age) is a physical indicator of chronic or long-term malnutrition, whereas underweight (low weight for age) is an indicator of both chronic and acute malnutrition. Both are common in school-age children (figure 58.3).

Girls who are better nourished are more attentive and more involved during class, and boys have improved classroom behavior and increased activity levels. One Z-score increase in height for age is associated with an increase of 0.1 standard deviation (SD) in tests of arithmetic and language. Stunted children enroll in school later than other children. School food-service programs have been successful in improving school attendance.



Source: Data from Partnership for Child Development 1998a.

Note: Z-scores of less than -2 indicate stunting.

**Figure 58.3** Mean Z-scores of Height-for-Age of Boys in Five Countries

## Short-Term Hunger

Hunger, which reduces ability to perform school tasks, is readily reversed by feeding. Children age 11 to 13 years in Jamaica improved their scores on arithmetic tests after one semester of receiving breakfast at school because they attended more regularly and studied more effectively (Simeon 1998). Missing breakfast impairs performance to a greater extent for children of poor nutritional status, who also benefit most from food intervention (Pollitt, Cueto, and Jacoby 1998; Simeon and Grantham McGregor 1989).

## Micronutrient Deficiency

Micronutrient deficiencies may take several different forms, each with negative impacts on children's ability to perform well in school.

**Iron Deficiency.** Iron deficiency, the most common form of micronutrient deficiency in school-age children, is caused by inadequate diet and infection, particularly by hookworm and malaria (Hall, Drake, and Bundy 2001). More than half the school-age children in low-income countries are estimated to suffer from iron deficiency anemia (Partnership for Child Development 2001). Children with iron deficiency score 1 to 3 SD worse on educational tests and are less likely to attend school. Iron supplementation reduces these deficits.

**Iodine Deficiency.** Iodine deficiency affects an estimated 60 million school-age children; studies indicate prevalence rates between 35 and 70 percent. Iodine deficiency is related to lowered general cognitive abilities and tests scores. No conclusive evidence shows that iodine supplementation improves cognitive abilities in this age group (Huda, Grantham-McGregor, and Tomkins 2001).

**Vitamin A Deficiency.** Vitamin A deficiency affects an estimated 85 million school-age children. The deficiency, which causes impaired immune function and increases risk of mortality from infectious disease, is an important cause of blindness. Recent studies suggest that this deficiency is also a major public health problem in school-age children. Multiple-micronutrient supplements have improved cognitive function and short-term memory in schoolchildren and have reduced absenteeism caused by diarrhea and respiratory infections.

## Obesity

An estimated 17.6 million children worldwide are overweight. Obesity is associated with underperformance in education. In low-income countries obesity is still rare, but the prevalence in

the children of many middle-income countries is similar to that in the United States.

## ESTIMATING THE BURDEN OF DISEASE

The cost per DALY of school health programs has been estimated at US\$20 to US\$34, implying that the programs are at least as cost-effective as many other public health "best buys" (Bobadilla and others 1994). However, current methods of estimating the burden for school-age children result in a significant underestimation of both the developmental consequences of disease and malnutrition at school age and the overall benefits for health and development of school health and nutrition programs.

There are two key reasons for this underestimation. The first issue relates to time scales. Many serious diseases in adulthood, including heart disease and carcinomas, are a consequence of unhealthy practices established in early life. This later burden can be substantially and cost-effectively averted by early intervention, particularly by school-based life-skills programs. For example, in the United States (Del Rosso and Marek 1996), US\$1 invested can avert US\$18.80 spent on the later problems caused by tobacco and US\$5.70 on problems of drug and alcohol abuse. DALY estimates cannot capture these downstream consequences of upstream intervention and instead attribute the disease burden to the adult age group in which it appears. This kind of estimate is particularly misleading in the case of HIV/AIDS, for which prevention education at school age is effective in averting later infection and disease (World Bank 2002), and in the case of estimates of intergenerational effects, in which ensuring the health of an adolescent girl may help secure the health of her baby born a few years later.

The second issue is illustrated by experience with helminth infections. In 1990, the burden was first estimated at 18 million DALYs, close to the value for tuberculosis, measles, and malaria. This estimate reflected the ubiquity of infection and the long-term consequences of cognitive impacts. In 2001, the estimate was only 4.7 million DALYs (WHO 2003), and during the intervening years one estimate put the value as low as 2.6 million.

This extraordinary variability is caused in part by different emphases on the cognitive and health impacts and illustrates how, for very common conditions, even minor changes in disability weight can affect the overall values. This variability also reflects the importance of a sectoral perspective, because the low estimates reflect a focus on health, whereas the higher estimates include impact on educational achievement and child development.

The scale of the burden of disease in terms of cognition is illustrated by estimating the impact of stunting, anemia, and helminths on the cognition of the estimated 562 million school-age children in developing countries. According to typical

deficits in test scores attributable to these diseases, the total global loss of points ranges from 600 million to 1.8 billion IQ points, an additional 15 million to 45 million cases of mental retardation (defined here as IQ less than 70), and a loss of between 200 million and 524 million years of primary schooling (Jukes, Drake, and Bundy forthcoming). Although the precision of these striking figures may be open to debate, they clearly show that even minor cognitive deficits resulting from ubiquitous conditions can result in an extraordinarily large scale of effect.

## INTERVENTIONS

In light of the significant effects of ill health and malnutrition on educational outcomes, the role of effective health promotion and simple school-based programs to deliver low-cost interventions becomes increasingly important (Bundy and others 1992). Other chapters provide information on the integrated management of childhood illness, early child development, and adolescent health (see chapters 63, 27, and 59, respectively). The focus here is on ill health and malnutrition at school age and the role of the formal and nonformal education sector in delivering interventions.

### Developing a Programmatic Approach

The focus of school health and nutrition programs in low-income countries has shifted significantly over the past two decades away from a medical approach that favored elite schools in urban centers and toward an approach that improves health and nutrition for all children, particularly the poor and disadvantaged. This change began in the 1980s, when research showed not only that school health and nutrition programs were important contributors to health outcomes but also that they were essential elements of efforts to improve education access and completion, particularly for the poor.

In an effort to reconceptualize the relationship between health and education, the United Nations Education, Scientific, and Cultural Organization (UNESCO) hosted a series of workshops on this topic in the 1980s (Bundy 1989; Halloran, Bundy, and Pollitt 1989) and supported one of the first authoritative reviews of the area (Pollitt 1990). Similarly, the United Nations Development Programme, in conjunction with the Rockefeller, Edna McConnell Clark, and J. S. McDonnell Foundations supported the creation of the Partnership for Child Development to strengthen the evidence base across the education and health sectors and to support the dissemination of information (Berkley and Jamison 1990; Bundy and Guyatt 1996). This paradigm shift coincided with the World Conference on Education for All in Jomtien, Thailand, in 1990 and led to renewed efforts by countries and agencies to develop more effective programmatic approaches to school health and nutrition.

The United Nations Population Fund (UNFPA) has pioneered population and family life education (PopEd) as an intrinsic part of school curricula. In 1994, the International Conference on Population and Development placed specific emphasis on school health, including reproductive and sexual health. Efforts at country level have addressed PopEd both within the school system and outside, and the concept has evolved to include references to family life education, sex education, HIV/AIDS awareness and prevention, and life-skills programs. Today, approximately 84 countries have UNFPA-supported school health programs.

In 1995, the World Health Organization (WHO) launched its Global School Health Initiative to foster the development of health-promoting schools (HPSs) (WHO 1996). The concept started in Europe in the early 1990s, based on the Ottawa Charter of Health Promotion (WHO 1986; European Commission 1996), which recognized that health is created by caring for oneself and others, by being able to make decisions and have control over one's life and circumstances, and by creating conditions that support health for all. WHO's European Regional Office, the Council of Europe, and the Commission of the European Communities widely promoted the concept of HPSs to foster healthy lifestyles and develop environments conducive to health (European Commission, WHO Europe, and Council of Europe 1996). Although definitions vary among regions, countries, and schools, an HPS may be characterized as one that is constantly strengthening its capacity as a healthy setting for living, learning, and working. The initiative fosters the development of HPSs by the following:

- consolidating research and expert opinion to describe the nature and effectiveness of school health programs
- building capacity to advocate for the creation of HPSs and to apply the components to priority health issues
- strengthening collaboration and national capacities to assess the prevalence of important health-related behaviors and conditions and to plan and implement policies and programs that improve health through schools
- creating networks and alliances, including regional networks.

The key elements of how this approach is interpreted today are listed in table 58.1.

In the mid 1990s, the United Nations Children's Fund (UNICEF) began promoting the Child-Friendly Schools framework as a holistic way to promote children's rights as expressed in the Convention on the Rights of the Child (UNICEF 1990) and children's access to education as stated in the World Declaration of Education for All (UNESCO 1990). This approach included a gender-sensitive component, which was further strengthened when girls' education became the first priority in UNICEF's Medium Term Strategic Plan, 2002–5. Another key element is skills-based health education,



**Table 58.1** Characteristics of Agency-Specific School Health and Nutrition Programs, within the FRESH framework

<b>FRESH framework</b>	<b>Health-promoting schools (WHO)</b>	<b>Child-friendly schools (UNICEF)</b>	<b>PopEd (UNFPA)</b>	<b>Global school feeding campaign (World Food Program)</b>
Policy	Respects an individual's well-being and dignity Provides multiple opportunities for success Acknowledges good efforts and intentions as well as personal achievements	Respects and realizes the rights of every child Acts to ensure inclusion, respect, and equality of opportunity for all children Is gender sensitive and girl friendly Is flexible and responds to diversity Sees and understands the whole child in a broad context Enhances teacher capacity, morale, commitment, and status	Creates a supportive and enabling policy environment for reproductive health and HIV prevention for young people	Focuses on the poorest and most food-insecure communities. Gives priority to girls and AIDS-affected children
School environment	Is healthy Provides opportunities for physical education and recreation	Is healthy, safe, and secure Is protective emotionally and psychologically	Protects young people from early and unwanted pregnancy, sexually transmitted diseases, sexual abuse, and violence	Serves as platform for essential package approach that includes water, sanitation, and environmental measures
Education	Provides skills-based health education Fosters health and learning	Promotes quality learning outcomes Provides education that is affordable and accessible Provides skills-based health education, including life skills relevant to children's lives	Strengthens HIV/AIDS and sexual and reproductive health education programs	Supports learning through good nutrition Promotes access to education
Services	Provides school health services Provides nutrition and food-safety programs Provides programs for counseling, social support, and mental health promotion Provides health promotion programs for staff Includes school and community projects and outreach	Promotes physical health Promotes mental health	Ensures access to youth-friendly sexual and reproductive health services	Provides food Promotes and supports deworming
Supportive partnerships	Engages health and education officials, teachers, teachers' unions, students, parents, health providers, and community leaders in efforts to make the school a healthy place	Is child centered Is family focused Is community based	Targets young people in school and out of school Ensures active participation of parents, youths, community leaders, and organizations	Promotes community and school partnerships

Source: Summarized from World Bank Fresh Toolkit (2000), WHO (1996), and personal communications from Arlene Mitchell and Sheldon Shaeffer (May 2005).

including life skills, which has been promoted through UNICEF with partner organizations as part of HPSs, child-friendly schools, and the framework for Focusing Resources on Effective School Health (FRESH). Research shows that this approach is more effective than traditional strategies, which tend to be didactic and to focus on scientific information alone. In contrast, skills-based health education uses the experiences of students as the starting point and explores the links between knowledge, attitudes, and the interpersonal skills

required to promote health and learning (UNICEF, WHO, World Bank, UNFPA, UNESCO 2003). The approach is interactive, activity based, and flexible so that it can be used to address a range of health and social issues, including HIV/AIDS, sanitation, drug use, violence and bullying, nutrition, and cross-cutting issues such as gender and culture. Some key elements of how the child-friendly schools approach is interpreted currently, including its focus on healthy and protective learning environments, are listed in table 58.1.

Also during the 1990s, the World Bank Human Development Network sought to support countries in implementing school health and nutrition programs (Del Rosso and Marek 1996; World Bank 1993) and launched an International School Health Initiative with the aim of raising awareness among decision makers in the education sector.

Thus, the 1990s were characterized by the creation of a number of apparently separate programs to promote and support school health. However, analysis at the country level revealed that although the various agency initiatives used different “prisms” to view school health—public health for WHO, quality education for UNESCO, and child rights for UNICEF—the core activities for all the programmatic approaches were essentially the same.

### **FRESH Framework**

A major step forward in international coordination and cohesion was achieved when the FRESH framework was launched at the World Education Forum in Dakar in April 2000 (World Bank FRESH Toolkit 2000). Among the early partners in this effort were the Education Development Centre, Education International, the Partnership for Child Development, UNESCO, UNICEF, the World Food Programme (WFP), WHO, and the World Bank. This partnership recognizes that the goal of universal education cannot be achieved while the health needs of children and adolescents remain unmet and that a core group of cost-effective activities can and must be implemented across the board to meet those needs and to deliver on the promise of EFA.

The expanded commentary on the Dakar Framework for Action reflects the recommendations of this partnership and describes three ways in which health relates to EFA: as an input and condition necessary for learning, as an outcome of effective quality education, and as a sector that must collaborate with education to achieve the goal of EFA. In the follow-up to the Dakar Forum, UNESCO designated FRESH as an interagency flagship program that will receive international support as a strategy to achieve EFA.

The FRESH framework, which is based on good practice recognized by all the partners, provides a consensus approach for the effective implementation of health and nutrition services within school health programs. The framework proposes four core components that should be considered in designing an effective school health and nutrition program and suggests that the program will be most equitable and cost-effective if all of these components are made available, together, in all schools:

- *Policy:* health- and nutrition-related school policies that are nondiscriminatory, protective, inclusive, and gender sensitive and that promote the nutrition and physical and psychosocial health of staff, teachers, and children

- *School environment:* access to safe water and provision of separate sanitation facilities for girls, boys, and teachers
- *Education:* skills-based education, including life skills, that addresses health, nutrition, HIV/AIDS prevention, and hygiene issues and that promotes positive behaviors
- *Services:* simple, safe, and familiar health and nutrition services that can be delivered cost-effectively in schools (such as deworming services, micronutrient supplements, and nutritious snacks that counter hunger) and increased access to youth-friendly clinics.

The FRESH framework further proposes that these four core components can be implemented effectively only if they are supported by strategic partnerships between the following groups:

- health and education sectors, especially teachers and health workers
- schools and the community
- children and others responsible for implementation.

Adopting this framework does not imply that these core components and strategies are the only important elements; rather, implementing all of these in all schools would provide a sound initial basis for any pro-poor school health program.

The common focus has encouraged concerted action by the participating agencies. It has also provided a common platform on which countries, agencies, donors, and civil society can support all programs, including agency-specific programs (table 58.1). Another important consequence of the FRESH consensus framework has been to offer a common point of entry for new efforts to improve health in schools, as illustrated by the three examples in box 58.1.

This consensus approach has increased significantly the number of countries implementing school health reforms. The simplicity of the approach, combined with the enhanced resources available from donor coordination, has helped ensure that these programs can go to scale. Annual external support from the World Bank for these actions approaches US\$90 million, targeting some 100 million schoolchildren.

### **Common Interventions**

Table 58.2 lists some specific interventions commonly combined within the school health intervention package, but it should be recognized that not all of these interventions will be needed or be appropriate for all locations. Some interventions are synergistic: for example, worm infection will be addressed by the provision of latrines, the promotion of hand washing, relevant health and hygiene education, and deworming services. Similarly, HIV/AIDS infection among youths will be addressed by ensuring girls’ participation in school, offering

## Box 58.1

### Three Efforts to Improve Health in Schools

#### The Multiagency Effort to Accelerate the Education Sector Response to HIV/AIDS in Africa

This effort, coordinated by a Working Group of the UNAIDS Inter-Agency Task Team on HIV/AIDS and Education, promotes the FRESH framework specifically and helps education systems do the following:

- adopt policies that avoid HIV/AIDS discrimination and stigmatization
- provide a safe and secure school environment
- provide skills-based health education, including life skills, in schools to promote positive behaviors and healthy lifestyles
- improve access to youth-friendly health services.

More than 36 countries and a similar number of agencies, bilateral donors, and nongovernmental organizations have collaborated in this effort since November 2002.

#### The Global School Feeding Campaign of the WFP

This campaign has gone beyond providing food aid to develop a programmatic link between nutrition and education. Working with partners, including national governments, parent-teacher and other community organizations,

*Source:* Authors.

UNICEF, WHO, the World Bank, UNESCO, and the Food and Agriculture Organization, the campaign promotes the following:

- policies that make food aid conditional on girls' participation in education
- an essential package that includes school sanitation and water and environmental improvement
- nutrition education that improves the quality of students' diets and HIV prevention education
- nutrition services that include food, deworming, and alleviation of short-term hunger.

Some 70 countries have begun to implement these principles and activities since 2002.

#### The Partnership for Parasite Control

Led by WHO and involving a broad range of development partners, this initiative promotes public and private efforts to include deworming in school health services, following a resolution of the 54th World Health Assembly to provide by 2010 regular deworming treatment to 75 percent of school-age children at risk (an estimated target population of 398 million). Of 41 target countries in Africa, 19 have begun school-based deworming programs since 2001.

skills-based health education (including life skills), offering peer education, providing access to health clubs, and providing access to treatment for sexually transmitted infections (STIs) at clinics. It is also apparent that whereas some interventions promote multiple outcomes—for example, skills-based health education and life-skills development can help promote positive behaviors that prevent STIs and substance abuse—other interventions may have a single focus, such as iron supplementation to avoid anemia.

#### Out-of-School Children

More than 100 million school-age children are out of school; 60 percent are girls (UNESCO 1993). School health programs in Guinea and Madagascar have demonstrated that many of these children will take advantage of simple services, such as deworming, provided in schools (Del Rosso and Marek 1996); the school acts essentially as a community center. It also has been demonstrated that deworming programs in schools benefit out-of-school children by reducing disease transmission in the community as a whole (Bundy and others 1990).

Nevertheless, it is apparent that out-of-school children cannot benefit from many of the important components of school-based programs, such as skills-based health education and life-skills development programs to prevent HIV/AIDS. Reaching these children requires more flexible approaches that combine the best of nonformal, informal, and community-based approaches (see chapter 59).

### COST-EFFECTIVENESS OF INTERVENTION

A key issue in addressing the costs of the new approach to school health and nutrition programs is the significant savings offered by using the school system infrastructure rather than that of the health system as the key delivery mechanism. The school system provides not only a preexisting mechanism, so costs are at the margins, but also a system that aims at being pervasive and socially progressive. Some important interventions, especially in terms of health education, may be virtually cost free; they require only policy changes that result in doing things differently.



**Table 58.2** Common Interventions within a School Health Program

FRESH category	Intervention	Expected outcome
Policy	<ol style="list-style-type: none"> <li>1. Child rights, avoidance of discrimination and stigmatization, gender sensitive, child centered</li> <li>2. Inclusion of pregnant girls and mothers in education</li> <li>3. Enforcement of code of practice for teacher behavior zero tolerance policy</li> <li>4. Collaboration between health and education sectors</li> </ol>	<ol style="list-style-type: none"> <li>1. Inclusion of all children</li> <li>2. Specific inclusion of girls</li> <li>3. Avoidance of harassment and abuse</li> <li>4. Effective implementation</li> </ol>
Environment	<ol style="list-style-type: none"> <li>1. Access to safe water</li> <li>2. Hand washing</li> <li>3. Provision of sanitation</li> <li>4. Gender-separate sanitation</li> <li>5. Garbage disposal</li> </ol>	<ol style="list-style-type: none"> <li>1,2,3,5. Reduced infection</li> <li>4. Reduced drop out of adolescent girls</li> </ol>
Education	<ol style="list-style-type: none"> <li>1. Curriculum addressing health, hygiene, and nutrition</li> <li>2. Life-skills program</li> <li>3. Peer education program</li> <li>4. Health-promoting clubs</li> </ol>	<ol style="list-style-type: none"> <li>1. Improved knowledge and skills to promote good health, hygiene, and nutrition</li> <li>2. Lifelong positive behaviors such as avoidance of HIV/AIDS and substance abuse</li> <li>3, 4. Reinforcement of positive behaviors</li> </ol>
Services	<ol style="list-style-type: none"> <li>1. Deworming for intestinal worms and schistosomiasis</li> <li>2. Prompt recognition and treatment of malaria</li> <li>3. Insecticide-treated nets</li> <li>4. Micronutrient supplements</li> <li>5. Breakfast, snacks, and meals</li> <li>6. First-aid kits</li> <li>7. Referral to youth-friendly clinics</li> <li>8. Counseling and psychosocial support</li> </ol>	<ol style="list-style-type: none"> <li>1. Reduction in worm infection</li> <li>2. Reduction in impact of malaria</li> <li>3. Reduction in incidence of malaria</li> <li>4. Reduction in anemia and malnutrition</li> <li>5. Avoidance of hunger</li> <li>6. Management of injuries</li> <li>7. Access to specific treatment</li> <li>8. Mental health</li> </ol>

Source: Authors.

**Table 58.3** Annual per Capita Costs of School-Based Health and Nutrition Interventions Delivered in Schools

Condition	Intervention	Cost (US\$)
Intestinal worms	Albendazole or mebendazole	0.03–0.20
Schistosomiasis	Praziquantel	0.20–0.71
Vitamin A deficiency	Vitamin A supplementation	0.04
Iodine deficiency	Iodine supplementation	0.30–0.40
Iron deficiency and anemia	Iron folate supplementation	0.10
Refractive errors of vision	Spectacles	2.50–3.50
Clinically diagnosed conditions	Physical examination	11.50
Undernutrition, hunger	School feeding	21.60–151.20, 21.26–84.50 <sup>a</sup>

Sources: Del Rosso and Marek 1996; Partnership for Child Development 1999; WHO 2000.  
a. For South America and Africa, costs are standardized for 1,000 kilocalories for 180 days.

Annual costs of providing some common school-based interventions to students are given in table 58.3. This table illustrates two important points. First, some of the most widely needed interventions can be provided at remarkably low cost. Second, significant diversity exists in the cost of interventions,

which is affected by factors such as local capacity, location and remoteness of communities, and community values and opinions; hence, these factors must be borne in mind when identifying a school health package. (See chapter 41 for details of the costs of sanitation provision.)

Not illustrated in the table is the cost advantage of using the existing school infrastructure for delivery. Estimates for delivery of simple interventions (such as anthelmintic pills or micronutrient supplements) suggest that the teacher-delivery approaches listed here may be one-tenth of the cost of the more traditional mobile health teams and yet equally effective (Guyatt 2003). As with all education innovations, however, the additional cost of teacher orientation and training (in-service as well as preservice) needs to be factored into the costs of using the education system for delivery of health services.

## ECONOMIC BENEFITS OF INTERVENTION

The most obvious benefit of school health interventions is arguably through the economic returns of improved adult health outcomes. Studies have increasingly documented a causal effect of adult health (broadly defined) on labor force participation,

wages, and productivity in developing countries; Strauss and Thomas (1995) present an overview of economic studies in this area. For example, height has been shown to affect wage-earning capacity as well as participation in the labor force for both women and men (Haddad and Bouis 1991). The effect of health on productivity and earnings may be strongest where low-cost health interventions produce large effects on health, such as low-income settings where physical endurance yields high returns in the labor market. For a 1 percent increase in height, Thomas and Strauss (1997) find a 7 percent increase in wages in Brazil compared with a 1 percent increase in the United States.

However, the apparent benefits of school health and nutrition programs will be underestimated when measured using only mortality or health-related disability metrics because these measures do not capture the impact of ill health on cognitive development or educational outcomes. Evidence over the past decade suggests these impacts have effect sizes in the range 0.25 to 0.4 SD and have implications for the child's education and for life beyond school, including future earning potential. We investigate those implications by considering the economic benefits in terms of IQ and school attendance and by comparing school health programs with traditional education interventions.

### **Economic Benefits of Long-Term Improvements in IQ**

School health interventions can yield considerable economic benefits through returns to wages and productivity if they translate into improved cognitive functioning and IQ in adulthood.

For the United States, Zax and Rees (2002) estimate conservatively that an increase in IQ of 1 SD is associated with an increase in wages of more than 11 percent, falling to 6 percent when controlling for other covariates. Similar estimates for the relationship between IQ and earnings have been made for Indonesia (Behrman and Deolalikar 1995) and Pakistan (Alderman and others 1997) and in a review of developing countries (Glewwe 2002). In South Africa, an increase of 1 SD in literacy and numeracy scores was associated with a 35 percent increase in wages (Moll 1998). Extrapolating these results, a 0.25 SD increase in IQ, which is a conservative estimate of the benefit resulting from a school health intervention, would lead to an increase in wages of from 5 to 10 percent.

### **Economic Benefit of Improved School Attendance**

School health interventions can raise adult productivity not only through higher levels of cognitive ability, but also through their effect on school participation and years of schooling attained. Healthier children are more likely to attend, and modest improvements in examination scores can be associated with continuation in schooling.

Malaria chemoprophylaxis given in early childhood in The Gambia led to an increase of more than one year in primary

schooling. In preschool children in Delhi, iron supplementation was associated with an increase of 5.8 percent in rates of participation at the preschool level (Bobonis, Miguel, and Sharma 2004). In western Kenya, deworming treatment improved primary school participation by 9.3 percent, with an estimated 0.14 additional years of education per pupil treated (Miguel and Kremer 2004). On the basis of crude estimates of returns to schooling, an increase of 9.3 percent in participation rates results in a return of US\$44. Miguel and Kremer (2004) conclude that these benefits still outweigh the costs even if increased school participation leads to greater costs in teacher compensation through the need for additional teachers. They note that the benefit-cost ratio remains over 10 even if the rate of return to an additional year of schooling is as low as 1.5 percent. These results suggest that for realistic estimates of returns to schooling, the net present discounted value of lifetime earnings is likely to be high compared to the costs of treatment even for small gains in school participation.<sup>1</sup>

In the absence of studies estimating the direct link between school health interventions and school participation, the relationship can be estimated indirectly by considering the effect of interventions on test scores and the implications that improved test scores have for school participation. Improvements in cognitive function can be converted into an equivalent number of years of schooling. For example, Jukes and others (2002) found that heavy schistosomiasis was (nonsignificantly) associated with a decrease in arithmetic scores of 1.35 marks (0.25 SD). An extra year of schooling was associated with an increase in arithmetic scores of 2.24 marks (0.42 SD). Thus, the negative effect of heavy schistosomiasis was equivalent to missing just over half a year of schooling. The cognitive gains from an extra year of schooling can also be estimated retrospectively: in a study of adults in South Africa, each additional year of primary schooling was associated with a 0.1 SD increase in cognitive test scores (Moll 1998). According to these estimates, a typical increase of 0.25 SD associated with school health and nutrition programs is equivalent to an additional 2.5 years of schooling.

Liddell and Rae (2001) assessed the direct effect of test scores on grade progression in Africa. Each additional SD scored in first-grade exams resulted in children being 4.8 times as likely to reach seventh grade without repeating a year of schooling.<sup>2</sup> According to these estimates, an increase of 0.25 SD in examination scores, which is typically achieved by school health and nutrition programs, will make children 1.48 times<sup>3</sup> as likely to complete seventh grade, which implies that the extra cumulative years of schooling attributable to the school health intervention average 1.19 years per pupil. The previous estimates for added years of schooling owing to school health interventions range from seven months to two years. Increased years of schooling are associated with, among other outcomes, higher worker productivity and generally higher productivity in nonmarket production activities, including greater farmer

efficiency and productivity (Jamison and Lau 1982; Psacharopoulos and Woodhall 1985; Strauss and Thomas 1995). Psacharopoulos and Patrinos (2002) summarize a wide range of studies that focus on individual wage earnings. For Sub-Saharan Africa, they find a 12 percent rate of return to one additional year in school, compared with 10 percent for Asian countries. These returns are very high, even allowing for a portion of the return to years of schooling to be capturing ability and factors other than schooling itself (Card 2001).

Education brings benefits beyond improved earnings. One year of extra education for girls can lead to a reduction of from 5 to 10 percent in infant mortality (Schultz 1993). Five extra years of education for women in Africa could reduce infant mortality by up to 40 percent (Summers 1994).

### **Economic Benefits of Programs**

The educational gains from school health and nutrition programs should be considered in the context of alternative educational inputs, such as improving teacher salaries and qualifications, reducing class size, improving school facility infrastructure, and providing instructional materials. Many studies relate student outcomes to school characteristics, but few of these studies provide information on the relative or actual costs of the educational inputs. The costs, however, are substantially greater than for the school health interventions considered here. Despite the higher costs, the evidence from the few randomized evaluations that have been conducted suggests that the scale of effect of additional education inputs is typically low (see discussion in Miguel and Kremer 2004). A review of studies showed that instructional materials (such as additional textbooks) had the highest productivity, raising student test scores significantly more than other inputs for each dollar spent. However, even these interventions have only a weak effect. In a randomized experiment in Kenya, for example, providing textbooks had no effect on the bottom three quintiles of students and raised test scores by only 0.2 SD for the upper two quintiles. Relating these results to the findings in the previous section and to the annual per pupil costs, school health interventions appear very cost-effective compared to the highest-productivity, more traditional education inputs.

Recently, conditional cash-transfer programs have been viewed as potentially very cost-effective methods to increase school enrollment. These programs are generally large in scope, representing a commitment of between 0.1 and 0.2 percent of gross national income. The Progresá program in Mexico is estimated to have increased enrollment by 3.4 percent and to have increased schooling by 0.66 years, with an average cash transfer (for grades 3 to 8) of about US\$136 per child per school year (assumed to be 180 days). Gains from a similar program in Nicaragua were estimated at 0.45 years of school at a cost of US\$77 per year. If we compare these results with those presented for school health and nutrition programs, the condi-

tional cash-transfer approach is, in both cases, apparently at the lower end of effectiveness and the higher end of cost.

## **IMPLEMENTATION OF PROGRAMS AND LESSONS FROM EXPERIENCE**

The FRESH framework provides strategic guidance, but the practical design of actual programs reflects differences in local needs and capacity. Successful and equitable programs in low- and middle-income countries are characterized by a focus on school-based delivery, on a public health paradigm that minimizes the need for clinical intervention and reliance on health service facilities, and on participation of the public sector and civil society locally.

### **Policy and Economic Issues in Defining Sectoral Roles in Intervention**

A negative correlation between income level and both ill health and malnutrition is clearly demonstrated both in cross-country comparisons and within countries (see de Silva and others 2003), partly because poverty promotes both disease and an inadequate diet. Similarly, children who are not enrolled in school come from households with lower income levels (Filmer and Pritchett 2001). This fact suggests that school health services that are pro-poor and specifically linked to efforts to achieve universal participation in education will have a greater return.

Early school health programs, particularly in colonial Africa, were intended to serve the minority of children who had access to school in urban centers or elite boarding facilities. They relied on specific infrastructures and services—such as mobile health teams, school visits, school nurses, and in-school clinics—that were additional to the normal range of health service provision. This approach has proven difficult to make universally available, even in middle-income countries. A school nurse program in KwaZulu-Natal, for example, achieved inadequate coverage (18 percent of the target population) and little referral or follow-up treatment of cases of ill health detected, despite a relatively high investment of US\$11.50 per student targeted per year (World Bank FRESH Toolkit 2000). As shown in the following examples, using the FRESH framework approach reduces costs significantly and enhances both coverage and outcomes.

An important element of the new approach to school health is a focus on minimizing the need for clinical diagnosis. Mass delivery of services, such as deworming and micronutrient supplementation, is preferable on efficacy, economic, and equity grounds to approaches that require diagnostic screening (Warren and others 1993).

### **Sectoral Roles in Implementation**

Table 58.4 gives examples from low- and middle-income countries of how the four core components of FRESH are being supported by different approaches. In about 85 percent

**Table 58.4** Nine Low- and Middle-Income Countries and How They Use FRESH

Program approach	Country examples	Policy	Environment	Health education	Health services	Outcomes (Costs per child per year)
Public sector: public sector—supported and —implemented	Guinea, Ghana, and Tanzania	In all three countries, the Ministry of Education (or in Ghana, its executive body, the Ghana Education Service) implements the program under the guidance of the Ministry of Health, on the basis of a formal policy agreement. In Tanzania, the Ministries of Community Development and of Local Government are also parties to the agreement. The existing in-service teacher training and supply-line infrastructures are used to prepare teachers and supply the necessary materials.	Separate sanitation facilities for girls and boys in all new schools; access to potable water in all schools.	Health, hygiene, and nutrition education as part of the formal curriculum.	Deworming (for both schistosomiasis and intestinal worms) provided by teachers twice a year; in Guinea, this service is followed by iron folate supplementation.	In three years, in Guinea—1.1 million students, in Ghana—577 schools and 83,000 students (US\$0.54), in Tanzania—353 schools and 113,000 students (US\$0.89).
Parastatal support for public sector intervention	Madagascar	The Community Nutrition Programme provides training and support to the Ministry of Education on the basis of a formally agreed-on health policy for the education sector. In all schools in the 43 poorest districts (44 percent of all districts), the program prepares teachers and provides materials. In addition, the program also provides Parent-Teacher Associations (PTAs) with access to a social fund to support construction of facilities. Each PTA can request up to US\$500, with a 20 percent community contribution based on an annual parental contribution of US\$0.16.	Access to potable water and hand-washing facilities, in all schools; where requested by PTAs, construction of latrines, wells, fences, and sports facilities.	A formal health education curriculum, supported by community information, education, and communication (IEC).	Twice-yearly deworming and iron folate (for three months) delivered by teachers; test kits to confirm iodization of local sources of salt; where requested by PTAs, provision of food preparation facilities.	In three years, 14,000 teachers trained in 4,565 schools, 430,000 students (US\$0.78 to US\$1.08 per capita per year).
Social fund: public sector support for community intervention	Tajikistan	The Ministry of Labor and Social Protection, with the Ministries of Education and of Health, have developed a memorandum of understanding that sets out health policies for the education sector. The program channels resources through PTAs, which identify and assist needy children. A training program, delivered by NGOs, prepares PTA members to develop proposals of up to US\$5,000 for their school to support activities selected from a menu of items.	Provision of sanitation facilities, potable water, and sports facilities.	Training of teachers in health promotion.	Training of teachers to provide first aid, micronutrients, and deworming; provision of food preparation facilities.	The program targets the 100,000 neediest children in all 200 schools in the six poorest districts of Tajikistan (US\$1 per capita per year).

Private sector: community payment for NGO-implemented intervention	Indonesia	The NGO Yayasan Kusuma Buana has a formal agreement with the education department in Jakarta and three other major cities to train teachers, perform diagnostic tests, and provide medicines and materials. The NGO offers Papanicolaou smear tests and referral services to teachers. Unit costs are low because parasite diagnosis involves mass screening in a central laboratory (approximately 2,500 diagnoses per day) and medicines are obtained at preferential rates from two commercial partners.	Not included in program.	Nutrition and hygiene education as part of the curriculum.	Stool examination by the laboratory and deworming by teachers as necessary twice a year; iron folate provided by teachers twice a year (for three months).	The program has been in existence for 17 years and currently reaches 627 schools and 161,000 students, at a cost to parents of US\$0.10 annually.
NGO implementation with financial support from public sector	Burkina Faso, Malawi, and the Philippines	The international NGO Save the Children U.S.A. implements school health and nutrition activities in nonformal schools created with support from government, local communities, and private donations.	Separate sanitation facilities for girls and boys and access to potable water.	Health, hygiene, and nutrition education as part of the curriculum supported by extracurricular IEC activities	Deworming and micronutrient supplementation (vitamin A and iron) provided by teachers annually.	In three years, in Burkina Faso, 42,000 students plus nonenrolled children in 171 schools (US\$2). In four years, in Malawi, 122,000 children in 181 schools (US\$3). In four years in the Philippines, 23,000 children in 53 schools (US\$6).

Source: Authors.



of programs reviewed, school health and nutrition programs are delivered and funded by the public education sector, with a formal role for the health sector in design and supervision.

Although this public sector “mainstream” model has proven the most popular approach, it is not the only successful one. In some cases, the public sector has identified appropriate options and developed operational manuals but then has used a social fund to provide direct support to communities and has used schools to select and implement the most relevant actions locally, often with the assistance of nongovernmental organizations (NGOs). In other cases, services have been contracted out by the public sector, and in some middle-income countries, the move toward a demand-led approach has resulted in a private sector service.

The private sector approach has proven sustainable over nearly two decades in urban Indonesia but may require a technical infrastructure and local market base that are inappropriate for predominantly rural low-income countries. The approach is modeled on a program initiated in Japan in 1948, which relied on private sector technicians, working independently at first but later formalized within the Japan Association of Parasite Control, who conducted stool examinations and then treated infected individuals for a per capita fee equivalent to approximately US\$0.74 in 2004. At its peak, the private sector program conducted some 12 million examinations annually, implying a turnover of nearly US\$9 million at today’s prices. The prevalence of roundworm infection fell from a high of 73 percent in 1949 to less than 0.01 percent by 1985.

Although a private sector response is effective in some circumstances, overall the characteristics of school health and nutrition programs make a compelling case for public sector intervention. First, treatment externalities may create external benefits to others in addition to the benefit for the treated individual. This situation is clearly the case for communicable disease interventions, especially against worm infection. Second, some forms of intervention (such as vector control, health education campaigns, epidemiological surveillance, and interventions that have strong externalities) are almost pure public goods; that is, no one can be excluded from using the goods or service they deliver, and thus the private sector is unlikely to compete to deliver these goods. Finally, there is typically little private demand for general preventive measures, such as information on the value of washing hands. None of these factors is an argument against a private sector role in service delivery, but they do suggest that private sector demand is likely to be greater in middle-income populations and where public sector actions have created a demand.

### Roles of Key Stakeholders in Implementation

There are many ways to approach the delivery of school health, but these diverse experiences suggest common features—in

particular, the consistency in the roles played by government and nongovernmental agencies as well as other partners and stakeholders (table 58.5). In nearly every case, the Ministry of Education is the lead implementing agency, reflecting both the goal of school health programs in improving educational achievement and the fact that the education system provides the most complete existing infrastructure for reaching school-age children. However, the education sector must share this responsibility with the Ministry of Health, particularly because the latter has the ultimate responsibility for health of children. It is also apparent that the program’s success depends on the effective participation of numerous other stakeholders, including civil society, and especially the beneficiaries and their parents or guardians. The children and their families are the clients of these programs, and their support for program implementation is critical to the program’s success.

### Key Issues in Designing Effective Programs

The diverse experiences of school health programming suggest some key elements that are common contributors to success in many programs.

- *Focus on education outcomes.* Making explicit links among school health programs and learning and education sector priorities (especially EFA and gender equity) helps ensure the commitment of the sector to program support and implementation.
- *Develop a formal, multisectoral policy.* Education sector actions in health require the explicit agreement of the health sector. This potential tension can be resolved by defining sectoral responsibilities at the outset; failure to enter into dialogue has led, in Africa and Central Asia, to some health sectors resisting teacher delivery of deworming drugs, despite WHO recommendations.
- *Initiate a process of wide dissemination and consultation.* Because there are multiple stakeholders, implementers, enablers, and gatekeepers, a process of consultation is necessary to establish ownership and to identify obstacles before they constrain progress. The process should involve at least community-based organizations, NGOs, faith-based organizations, pupils, and teacher associations. In one country in East Africa, lack of prior agreement on the content of sexuality education delayed implementation for more than three years.
- *Use the existing infrastructure as much as possible.* Building on existing curriculum opportunities and the network of formal and nonformal teachers will accelerate implementation and reduce costs. Programs that rely on the development of new delivery systems—mobile school health teams, a cadre of school nurses—take longer to establish and are expensive and complicated to sustain and take to scale.

**Table 58.5** Roles of Agencies, Partners, and Stakeholders in School Health and Nutrition Programs

Partner	Roles	Comments
Ministry of Education	Lead implementing agency Lead financial resource Education sector policy	Health and nutrition of schoolchildren is a priority for EFA. Education policy defines school environment, curriculum, duties of teachers. Education system has a pervasive infrastructure for reaching teachers and school-age children.
Ministry of Health	Lead technical agency Health sector policy	Health of school-age children has lower priority than clinical services, infant health. Health policy defines role of teachers in service delivery, procurement of health materials.
Other public sector agencies (for example, Welfare, Social Affairs, local government)	Support for education and health systems Fund holder	Ministries of local government are often fund holders for teachers and schools and for clinics and health agents. Ministries of Welfare and Social Affairs provide mechanisms for providing social funds.
Private sector (for example, health service, pharmaceuticals, publications)	Specialist service delivery Material provision	Sector has major role in drug procurement and training materials production. Sector has specialist roles in health diagnostics.
Civil society (for example, NGOs, faith-based organizations, PTAs)	Training and supervision Local resource provision	At the local level, organizations serve as gatekeepers and fund holders and may target implementation. Organizations provide additional resource streams, particularly international NGOs.
Teacher associations	Definition of teachers' roles	School health programs demand an expanded role for teachers.
Community (children, teachers, parents)	Partners in implementation Definition of acceptability of curriculum and teachers' roles Supplementation of resources	Communities are gatekeepers for the content of health education (especially moral and sexual content) and for the role of nonhealth agents (especially teachers) in health service delivery; pupils are active participants in all aspects of the process at the school level. Communities supplement program finance at the margins.

- *Use simple, safe, and familiar health and nutrition interventions.* Success in rapidly reaching all schools depends on stakeholder acceptance, which is more likely if the interventions are already sanctioned by local and international agencies and are already in common use by the community.
- *Provide primary support from public resources.* Compelling arguments exist for public investment in school health programs: the contribution to economic growth, the high rate of return, the large externalities, and the fact that the majority of interventions are public goods.
- *Be inclusive and innovative in identifying implementation partners.* Although public resources are crucial for school health programs, contributions from outside the public sector can be vital. NGOs have proven effective in supporting public sector programs through training and supervision, particularly at local levels. Although market failure appears to have largely precluded the private sector from effectively implementing national programs in low-income countries, examples of successful contributions do occur, particularly in dense urban populations and in middle-income countries.

## RESEARCH AND DEVELOPMENT AGENDA

Reliable evidence suggests that ill health and malnutrition affect education access, participation, completion, and achievement, and that school-based health and nutrition programs can provide a cost-effective and low-cost solution. This evidence does not imply, however, that no uncertainties exist.

### Cost-Effectiveness of School-Based HIV/AIDS Prevention

Substantial evidence suggests that skills-based health education, including life-skills development programs, can promote positive behaviors and reduce the risks of exposure to HIV infection, and that girls' education programs have similar effects (Kirby 2002). Evidence also exists for a positive effect of completing education on HIV prevalence (de Walque 2004; World Bank 2002). What is lacking is direct evidence about the contribution that school-based prevention programs can make in reducing the incidence of HIV infection, as well as evidence for the relative cost-effectiveness of such programs compared with existing efforts to promote education completion and girls' education.

### Cost-Effectiveness of Malaria Programs

Malaria occurs commonly in schoolchildren, particularly in areas of unstable transmission in Africa and Asia. It is a leading source of mortality in this age group and adversely affects education by reducing school attendance, cognition, learning, and school performance. Current school-based approaches focus on knowledge of the disease and the use of impregnated bed-nets but do not address the need for treatment of affected children. Yet presumptive treatment by teachers has been shown to significantly reduce mortality (Pasha and others 2003), and intermittent preventive treatment also shows considerable promise (Brooker and others 2000). There is a need to confirm the success of school-based treatment in different epidemiological settings and to address questions about the cost and sustainability of this approach.

### Cost-Effectiveness of Targeting Food Aid

The high prevalence of malnutrition in children continues to be a major challenge for low-income countries. Providing food to children at school is often seen as an important part of the solution and is a major focus for food aid. However, the nutrition literature suggests that ensuring good nutrition earlier in life—certainly before 3 years of age, but perhaps earlier—is essential to ensuring an appropriate development trajectory throughout life (see chapter 27). Where food is limiting, it raises the question whether the first target should be preschool rather than school-age children. This debate has been blurred by admixing the nutrition outcomes with broader social and education issues. Clearly, providing a meal at school is socially desirable and can offer education benefits for children who otherwise would have to walk often long distances home to eat or remain hungry. It is also clear that schools represent an extensive and established network for providing nutrition interventions to very large numbers of children at a low cost per child. No comparable network exists to reach preschool children. However, from a nutritional perspective, it remains unclear whether ensuring good nutrition early in life has more effect on subsequent development—including educational achievement—than providing food at school age.

## CONCLUSIONS

The rationale for school-based health and nutrition programs and the approach to their implementation have undergone a paradigm shift over the past two decades.

The traditional perception of these programs as seeking to improve the health of schoolchildren cannot be justified on the basis of mortality or public health statistics alone. Instead, it is increasingly recognized that a major—perhaps the major—impact of ill health and malnutrition on this age group is that on cognitive development, learning, and educational achievement.

In consequence, the clearest benefit of school health and nutrition programs is measurable in terms of education outcomes and their economic returns. The scale of benefit is significant: school health and nutrition interventions can add four to six points to IQ levels, 10 percent to participation in schooling, and one to two years of education. This scale of benefit can add 8 to 12 percent to labor returns and provide a rate of return that offers a strong argument for public sector investment.

Compelling evidence suggests that education qua education can help protect individuals from HIV infection. Achieving EFA goals and combining this outcome with school health programs that help establish lifelong positive behaviors are now recognized as essential to the multisectoral prevention response to HIV/AIDS.

The scale of the education benefit and the role of education in the fight against HIV/AIDS mean that school health and nutrition programs are today seen as a priority for both the education and the health sectors. This focus, in turn, has resulted in a shift toward public health rather than clinical intervention and toward school-based delivery rather than health system approaches. These policy changes enhance cost-effectiveness and social progressiveness, because delivery through the school system is an order of magnitude less costly than using health systems and in low-income countries is better targeted to the poor.

These changes in emphases have coincided with significant technical and political policy reform. Technical consensus around the FRESH framework has encouraged countries and agencies to develop programs around a common coordinating principle, while the political imperative has been strengthened by the recognition that school health and nutrition programs are essential to achieving EFA and the Millennium Development Goals and are at the center of the preventative response to the HIV/AIDS pandemic.

Although much of this change has evolved over the past two decades, significant acceleration has occurred since the World Education Forum in 2000. Today, a majority of low-income countries have recognized the need for school health and nutrition programs and are seeking to implement them.

## NOTES

1. These calculations assume the following: a return to an additional year of school is 7 percent; wage gains are earned over 40 years in the workforce, discounted at 5 percent per year with no wage growth; annual wage earnings are US\$400 per year, which is below the estimated agricultural and nonagricultural annual wages for low-income countries (World Bank 2003). The opportunity costs of the additional schooling (child labor) have not been considered but are likely to be negligible.

2. These calculations assume that a pupil's falling behind the equivalent of one year in test scores has the same effect on earnings as losing one year of schooling; that the advantage that third graders have over second graders, for example, is the same as the advantage someone who has studied for a total of three years has over someone who has studied for two years; and that the impact of first-grade examination scores on

the probability of transition from one class to the next is the same at each grade level.

3. If an increase of 1 SD in exam scores leads to children being 4.8 times as likely to reach seventh grade, the increased likelihood of reaching seventh grade because of a 0.25 SD increase can be calculated as  $EXP(0.25 \times LN(4.8))$ .

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