Children's healthful eating: From research to practice

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Abstract

This paper provides a brief overview of some of the challenges facing the world community in promoting the nutrition status of schoolchildren. It begins by describing the main objectives and aims of children's nutrition promotion and then moves to consider the needs and environments of schoolchildren, the purposes of education and food and nutrition promotion, and the domains of schools and teachers. In the second part of the paper the evidence bases for food and nutrition promotion are considered, especially the gaps in current knowledge. This leads to a discussion of useful practice models as well as a case study of a school health promotion program in Australia. The final part of the paper examines some proposals for schoolchildren's food and nutrition policies, which might be implemented in local schools as well as nationally and internationally. The main theme underlying these proposals is that policies must be created and their effectiveness monitored regularly and reported back to schoolteachers, health workers, school communities, and governments.

Key words: Schools, education, promotion, systems, policies

Introduction

Other papers in this supplement to the *Food and Nutrition Bulletin* describe some of the research and intervention work that is being conducted around the world to promote schoolchildren's nutrition and educational performance. The International Union of Nutrition Sciences' (IUNS) objectives in this area have been described in detail by Galal [1]. This paper aims to review, summarize, and disseminate evidence relating to children's food security in terms of its prevalence and causation; document the evidence bases about the relationship of children's nutrition status to cognition, learning, and educational achievement; identify better ways to promote healthful eating and optimal nutrition (and health) status among schoolchildren; and document the costs of nutrition deficits on educational outcomes. It is hoped that these activities will help to foster the following:

- The promotion of schoolchildren's health and nutrition worldwide.
- The identification and promotion of best practice nutrition promotion in schools.
- The review and revision of teacher-training curricula to elevate the status of schoolteachers and associated health personnel as community advocates for healthful eating.
- The implementation of school food policy guidelines via international collaborative networks (such as the health promoting schools movement).

Schoolchildren: Who are they?

Most of the world's children between 5 and 15 years of age attend schools, although many do so under difficult circumstances [2] and many cease schooling before the end of high school. A large group of children, perhaps over half, are underfed, poorly nourished, and exposed to a range of parasitic and infectious diseases [2]. Micronutrient deficiencies, such as deficiencies of iron, iodine, and vitamin A are common in many parts of the world (including affluent societies) [3, 4, 5] and overweight and obesity associated with excessive energy intakes and sedentary lifestyles are becoming serious problems for children in all countries [6]. In

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many countries in Africa, Latin America, and south Asia substantial numbers of children do not have living parents because of the impact of HIV/AIDS or other epidemics including violence. Many schoolchildren live in material poverty and in substandard or no housing with poor water supplies and little or no sanitation, and are also often exposed to violence and exploitation. Schools represent one of the few opportunities to provide children with material resources (such as food, clean water, sanitation, and shelter) on a daily basis as well as to provide them with education for their future lives. The complexity of the likely interactions between nutrition and socioeconomic causes of poor health have been well illustrated by Grantham-McGregor and Ani in their review of the effects of iron deficiency on cognition [3].

If school staff are to provide useful services for children, they need first to consider the nature of children. In most societies in the past children were not only the light of parents' lives, but they we also economic players who provided material help for their families not many years after birth, for example through assistance in agricultural labor. After "the age of reason" or equivalent, children were (and are) regarded as mini-adults sharing many of their sanctions and duties. The rise of mass education marks a significant change in this view, with children now regarded as substantially different from adults and they are required to attend primary school and now secondary school, largely for the purposes of the state (for example, to aid industrialization or militarization). Childhood, then, is a special time when children are expected to learn to prepare themselves for adult life. Liberal educationalists emphasize the value of play, experience, and exploration [7], and conservatives emphasize the vulnerability of the child. The varying views are well represented in Archard and Macleod's recent book [8]. The prevailing (but not universal) view of children is that they are legal minors who cannot make binding legal contracts and who live in another form of existence—childhood with its play and fantasy—thus requiring the care and protection of adult society.

Children have always been seen as investments in the future, but today this investment is challenged by short-term libertine philosophies that regard childbearing as a "life choice" and not as a major economic investment in the future of society [9]. The views that education and health workers hold about the nature of children and childhood will inevitably affect the vigor and ways in which they approach education and health care. Therefore, it is important for professionals in nutrition promotion and education to be very clear about the views of childhood that they espouse (see Gussow and Contento, [10]).

The child's environments

Educators and health workers must care for children and teach them within the contexts in which they live. There seems little point, for example, to teach cooking skills when children have no cooking utensils and limited access to food. A simplistic adherence to the notion that schools are places only in which basic curricula are taught ignores the complexity of environments in which children live and which create daily challenges for teachers and health workers. Schools are more than teaching centers; they are places in which children and their families come into contact with society and where services in addition to education must be provided if education is to be effective. There is little point in providing lessons in maths, science, and languages if children are too malnourished to concentrate. It is in the classroom and school yard that the effects of adverse environments are seen (by teachers and other staff) and so they are in a good position to recruit additional services (if these are available), such as additional food, anti-helmintic drugs, clean water, safety, etc. The sorts of environmental forces that affect children and their families include the following:

» Social influences: family, siblings, peers, adults; for example, if the parents smoke, the children's health is likely to be adversely affected; if parents eat poorly their children are likely to do so also.
» Financial restraints caused by unemployment and poverty, may be associated with malnutrition, child labor, and non-attendance at school, all of which affect children's educational prospects.
» The physical environment, such as the state of housing, sanitary conditions, food supply, location, and transport facilities can all affect children's health and nutrition status and ability to learn.
» Similarly, children's and their families' health status will also affect learning; for example, the prevalence of HIV/AIDS or iron-deficiency anemia will affect children's material and emotional status and their ability to profit from (or even to attend) school.
» Finally, exposure to the mediated environment can have both positive and negative effects. It may provide the benefit of stimulating curiosity and, therefore, motivate learning, but all too often it exposes children to unhealthful food products, cigarettes, and alcohol as well as materialistic, sedentary lifestyles. This is particularly evident in countries that adopt the implicit view that children, like adults, are consumers who can be exposed to marketing campaigns.

Educators have to deal with all these influences.

Children's needs

Parents, philosophers, psychologists, and educators

have all considered the nature of children's needs. Many of these are similar to those of adults in that children and their families must satisfy a variety of biologic, psychologic, and social needs [11–14]. In different cultures people may place greater emphasis on some needs than others; my own list includes the following:

» Sound material environments: water, food, shelter, transport
» Love, care, and safety
» Positive social interactions
» Cognitive consistency, stability
» Stimulation, information, knowledge, and activity
» Learning support and motivation
» Healthy, positive adult models
» Hope for the future

The point is that schools are custodians of children for substantial periods of their lives and so they have a duty of care to provide for a variety of children's needs in addition to their learning requirements. For example, in societies in which children are regarded as minors, schools may be responsible for the quality of food fed to their students; if the food inhibits learning (e.g., because of insufficiency [15]) or if it contributes to unhealthy states such as obesity (because of excessive energy content [16]), school and education administrations may be liable to future legal redress by the children or their families.

Duty of care of children's health and education systems

Several systems may be responsible for children's education and welfare including their families, pre-school centers, schools, health facilities such as mothers' and children's health services, religious organizations, and local communities and local government facilities. In addition, the mass media may provide special programs tailored to the interests and needs of children. These agencies may need to be considered within the contexts of individual cultures when considering the range of educational services provided. From the point of view of health and nutrition, if children spend more than a few hours in any institution we have to ask whether these agencies are accountable for food, nutrition, and health. The answer will vary from country to country but there should be clear policies about the responsibilities of all agencies in which children spend substantial amounts of time. Children need feeding regularly—Does the agency provide good food, and, if not, what arrangements has it entered into to ensure that children are well fed?

The purposes of education

Schools provide children (and their families) with a number of education services. These have been debated by many educationalists such as Dewey and Skemp [7, 17]. Most note that schools should meet the needs of individual children and of the wider society; for example, schools may be good places to teach children hygiene principles to curb the spread of infectious disease in the wider society (this is sometimes called "schooling"). By contrast, there are more individual benefits that may accrue to the child from a broader education [17]. Some of purposes of education include the following:

» Self actualization—learning how to be happy and good
» Cognitive—learning about the world so that it is more predictable/controllable. Cognitive learning is often assessed in nutrient supplementation programs, but it is only one (important) aspect of education.
» Socialization—learning the rules of the culture and learning how to get along with others
» Emotional—learning how to control one's emotions
» Life skills—acquisition of life skills such as reading and arithmetic, cooking and shopping, and job-related functions such as learning to use a keyboard

The attainment of these goals depends on the creation of a happy learning community in the school. This depends on management and organizational and teaching skills and on material resources such as adequate buildings, clean water, sanitation, and healthful food supplies. Summaries of what schools can do

TABLE 1. Suggested roles and requirements of schools

What should schools *do*?	What do schools *require*?
Care for and protect children	Infrastructures
Act for parents	Organization and management
Socialize children into "culture"	Physical infrastructure (e.g., buildings and equipment)
Expose children to new experiences	Resources to care for children
Teach about the world and people	Trained, learned, experienced teachers
Instill lifelong learning schema	Well-designed curricula and pedagogies
Model healthful behaviors	Peace and harmony
Motivate learning	

for children and the requirements they need to do so are listed in **table 1**.

The effects of education

The effects of education are well established but worth summarizing. First, education gives people a sense of control over their lives and a future orientation that encourages investment in the future, such as saving for old age [18, 19]. Second, it fosters life-long learning and the socialization of children into active citizens. Third, it clearly promotes higher standards of health when girls as well as boys are educated [20]. Fourth, it promotes the economic well-being of society.

The aims of food and nutrition education promotion

There is a substantial body of literature that deals with the aims of food and nutrition education promotion [10]. The key aims include the following:

» The provision of healthful food now and in future. This raises the issue of ecologic sustainability and thus of education about nature and ways to maintain the ecosystem. It also implies that before any learning can occur children must be well-fed.

» Provision of procedural knowledge and skills associated with exposure to a variety of healthful foods and the development of preferences for healthful foods as well as the ability to acquire and prepare healthful, tasty foods. The idea is that food consumers should be active participants in food preparation and consumption rather than passive purchasers of mass-marketed, poor quality foods. The "Slow Food" movement is an example of an active consumer approach [21].

» Acquisition of knowledge framework (core schema) for interpretation of food and nutrition information [10, 22]. This equates to an understanding of key nutrition principles such as energy balance, the importance of food variety, etc., which will enable learners to interpret and assimilate future information, i.e., to know what they are doing in relation to food and nutrition. If effective, this helps consumers defend against quackery and marketing of foods of dubious quality.

» To emphasize the salience of food and nutrition to the individual and in the community. Food is important but many consumers do not know it. School education can impart life-long motivation to eat healthful foods. Educators are also in a good position in the local community to advocate for good nutrition. For example, home economics teachers may call for reduction in the supply of poor quality foods to children at school. At present, good nutrition has few effective advocates in many countries.

» Provision of environments and resources that maintain healthful food supplies. The aim of nutrition promoters is to feed children (and their families) well. Therefore, it is important that all places in which children usually eat are provided with healthful food. This often requires the development of local food policies by schools, preschool centers, religious organizations, and health facilities, as well as guidance on food advertising and marketing.

Stakeholders in schools: Who has interests in the school?

Many groups have interests in what goes on in schools. They all must be involved in the promotion of healthful eating and children's nutrition status. Chief among them are the children, who are usually divided in groups with differing interests (e.g., boys and girls, juniors and seniors). Effective school food policies usually allow children a say in the management of food programs. The children's parents and families often play key roles, from actually building the school (as in Tanzania), to assisting with reading and other teaching, to serving in school canteens. But are they really involved in the management of the school? Examples of adults' views of some of the aims of school food education are given in **box 1**. The local community in the form of religious or business organizations may have strong influence. For example, in the United States it is not uncommon for companies to market their foods directly to children.

BOX 1. Adults' views of what children should learn about food, Victoria 2003 (n = 430)

Children should learn to cook while at school	87%
Children should be taught how to deal with advertising and marketing in school lessons	80%
Children should learn how to shop for healthful foods	93%
All boys and girls should learn how to shop and cook	94%
School canteens should sell fresh fruit	98%
Primary schools should have fruit and vegetable gardens	70%
All soft drink and confectionery vending machines should be banned from schools	71%
Food companies should not market high-energy/high-fat products at school	77%
All schools should have school food policies to control types of foods sold	73%
Governments need to spend more on nutrition and physical activity in schools	82%

Teachers clearly play pivotal roles but are they well trained in food and nutrition? In many countries they are poorly or infrequently paid, affecting their ability to perform well. School administrators may play major organizational roles in the running of school food policies, but they may be poorly trained or absent from many schools. The government or ministry of education is usually involved in setting national curricula and in training teachers, but in many countries, including affluent countries, it may have only weak influence and insufficient resources. Finally, local health agencies may be involved in the delivery of health services to children at school. These personnel are often in a good position to support the efforts of teachers in providing food and nutrition services for children. It is important that the activities of all these stakeholders are coordinated through a school-based food and health policy (see health promoting schools network).

Adult (and parental) views about the need for strict control over foods sold at school, and the need for life skills training at school, appear to depend mainly on their degree of confidence in government and school authorities (**figs. 1 and 2**) and upon the strength of their equity and harmony values. The more they believe that equity and harmony are good end results, the more they think there should be strong school food control policies (**fig. 3**). The creation of trust in school and government agencies on the part of parents and adults is a key task for promoters of schoolchildren's health and nutrition status.

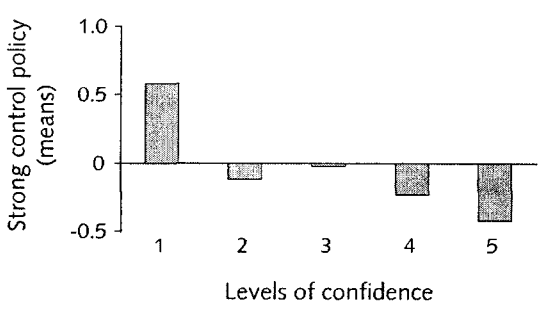

FIG 1. The relationship between adults' confidence in government and school authorities and their desire for strong control food policies in schools (n = 430; Victoria, Australia, 2003)

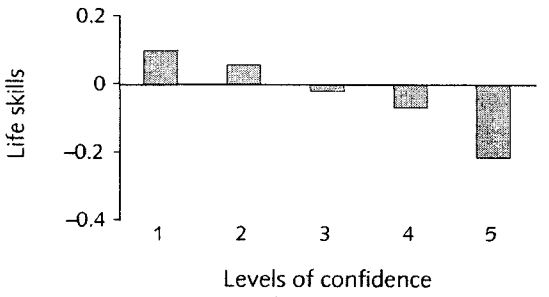

FIG 2. The relationship between adults' confidence in government and school authorities and their desire for life skills education in schools. (n = 430; Victoria, Australia, 2003)

The evidence base: What do we know?

There are at least two major evidence bases that are relevant to the taskforce's aims. The first concerns the links between food and nutrition status and children's health status and learning abilities. This will be discussed further in related papers. However, it is fairly certain that children require several types of resources for optimal learning and health, including the following:

» A variety of foods
» Breakfast and lunch
» Perhaps fortified food and supplements
» Perhaps anthelmintic treatment, depending on the situation
» Clean water and sanitation
» Integrated programs to offset poverty
» Sound teaching skills and educational delivery

The second evidence base concerns findings from healthful eating interventions, many of which have been conducted during the past century. My comments below are based on a review of children's healthful eating interventions in western countries [23]. (There is also a large database, with similar lessons, from developing countries.)

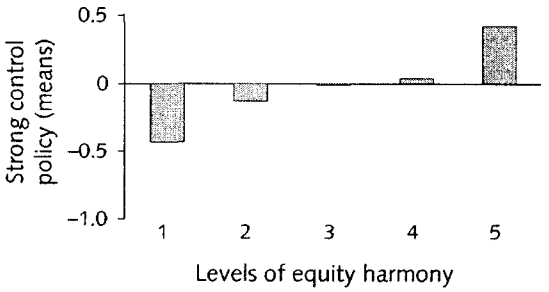

FIG 3. The relationship between adults' equity-harmony values and their desire for strong control food policies in schools. (n = 430; Victoria, Australia, 2003)

It is quite clear that school-based healthful eating programs can improve children's eating and nutrition status. There are many examples of evaluated effective programs (as illustrated in this supplement). Our review, however, showed that most interventions have not been evaluated, were aimed mainly at primary schoolchildren or at mothers and babies in the perinatal period, were of less than 3 months duration, and were not sustained in the long term. The effectiveness of particular intervention methods (e.g., changes to the

school food service, parental involvement, classroom lessons) remains unclear. The main problems or gaps in the intervention literature are shown in **box 2** [30–42]. The main lessons we draw from the review include the following:

» All interventions should be evaluated (or at least the methods and observed effects documented), so that the case for interventions can be strengthened.
» Long-term evaluations should be conducted.
» Sustainability of programs is difficult to maintain, suggesting that long-term local (and regional) school food policies focusing on management and resource issues are required.
» Clear goals, monitoring, and feedback of attainment of policy goals are needed.
» Teacher training, participation in design, and support during program delivery is essential.

Useful examples of healthful eating interventions include the following:

» **Food Dudes** (UK) shows parents how to feed children [24].
» **Start Right Eat Right** (Australia) is a 12-hour healthful eating and nutrition education program for child care workers, which led to the development of accredited training programs [25].
» **FoodCent$** (Australia) used the healthful eating pyramid to promote inexpensive eating strategies (and, indirectly, healthful eating) to low-income families [26].
» **The Focus on Educational Resources for School Health** (FRESH) is a program described in **box 3** [27].
» **Maribyrnong Fruit Breaks and Water Bottles** (Australia) sets times for consumption of fruit during school day and for unrestricted use of water bottles in class throughout the day [28].
» **The Women, Infants, and Children (WIC)** program (USA) meets food needs of financially disadvantaged people.
» **New Information System Approaches** include **Kidsfood Club** (Australia), which provides information and exercises for primary children [29], and Humanrace.com (Australia), a website that provides self-monitoring of self-selected physical activity and food consumption targets for primary children.

BOX 2. Gaps in children's healthful eating intervention research

1. Healthful eating is often poorly defined and measured
» An overemphasis on biomedical and nutrient outcomes rather than food consumption and skills acquisition outcomes
» Studies of the promotion of the whole diet are largely absent
  – Meals and meal timing have been ignored
  – Physical activity habit learning has often been absent from health eating interventions

2. Limited theoretical basis and ignorance of several evidence bases
» Most behavioral theories are inadequate [30]
» Psychophysiology of eating is largely ignored, for example:
  – Timing of food consumption [31]
  – Satiety and appetite regulation [32]
  – Food, mood, and cognition systems [33]
  – Food choice motivation, consumer behavior, and marketing theory [34, 35]
  – Learning and cybernetic theory has been underutilized [36–39]
» Social and family theory [40]
» Food policy research [41]
» Health promotion theory e.g., PRECEDE/PROCEED [42]
» Practitioners' experiences are crucial but often ignored

3. There are few evaluated studies of:
» Parental behaviors and family influence
» Preschoolers
» Teenagers
» Child-oriented community programs
» Long-term interventions
» Food consumption outcomes
» Broad health outcomes
» Effects of local food policies

4. Failure to deal with organizational and social contexts, for example:
» Lack of material resources (e.g., finance, housing)
» Behavioral problems (e.g., physical abuse, drug abuse)
» Lack of parental knowledge and skills (e.g., how to deal with feeding problems)
» Poor social and economic support
» Negative effects of government policies (e.g., employment, technology, and transport policies)

A brief case study

In South Australia in 1978–85 two school-based "lifestyle" intervention studies among 10-year-olds, namely

BOX 3. The FRESH framework [27]

Four key components
» Health-related school policies
» Provision of safe water and sanitation, for healthful physical, learning environment
» Skills-based health education
» School-based health and nutrition services

Benefits of a school health, hygiene, and nutrition program
» Response to increased enrollments
» Increases the efficacy of other investments in child development
» Ensures better educational outcomes
» Achieves greater social equity
» Is a highly cost-effective strategy

the SHAPE and Body Owners programs [43–45] led to the adoption of daily physical education and nutrition programs by most primary schools in the state. This brought about the following in the study participants:

» reductions in body-mass index (BMI), blood pressure, serum cholesterol levels
» improved nutrition knowledge and behavior
» participation in daily physical education by most primary children in the state
» probable long-term effects, such as less smoking and more exercise in adulthood*

However, today Australia faces the following challenges:

» Twenty percent of 10-year-olds are overweight or obese (16).
» Children's energy intake has risen by 20% over 20 years*
» Only one-third of primary school children do daily physical education at school.*
» About one-quarter do not have breakfast on any given school day.*
» There is general ignorance in the community regarding of the nutrition status of children.*

What happened?

What caused these shifting trends? Basically there were policy failures at both the school and government levels.

At the school level there were the following:

» Failure to train new teachers
» A difficult-to-manage curriculum—the program took time and effort away from other areas of the school curriculum
» The health curriculum was too narrow, focusing too much on biomedical outcomes to the exclusion of social and food consumption skills
» There was a lack of regular monitoring of children's health status. This weakened schools' abilities to defend their programs since there was little evidence of effectiveness. This enabled government to withdraw its support.
» There was a prevailing limited view of the role of schools. Schools were seen as being only for "education," not as a child and community resource.

At the government level there were the following:

» Lack of coherent state or federal government policy regarding the promotion of children's health.
» Failure to influence teacher training and curricula, resulting in a lack of long-term advocacy.
» Weak advocacy—other lobbies were more successful than health lobbies at influencing government agendas.
» Widespread adoption of neo-liberal policies throughout Australia, resulting in withdrawal of resources from schools, failure to control food marketing, the promotion of the view that "government has no role in public life," and lack of content expertise in government as content specialists were removed from government service.

Two key conclusions are that programs must become institutionalized policies at both the local school level as well as at the government and community level, and governments must be made accountable for their actions.

Proposals for new initiatives at local, national, and international levels

Below are some proposals for the implementation of schoolchildren's food policies. These include recognition for monitoring of chosen policy goals. This will allow for the development of advocacy and responsibility within schools and within government and NGOs.

1. Form/link advocacy groups.
2. Set up school accreditation systems.
3. Define roles of school and link schools with health sector agencies.
4. Define roles of teachers as community advocates.
5. Design food and nutrition policy templates for schools and governments.
6. Create codes of practice and standards.
7. Promote model curricula in schools.
8. Set up monitoring and feedback systems.
9. Provide international exchange of experiences by teachers and health workers via the Internet and regional meetings.

Three of these suggestions merit further discussion:

1. **Monitoring.** School performance could be self-monitored by the school and might include estimates of the degree of compliance with the following criteria:
   » The FRESH criteria.
   » National dietary goals for children.
   » The provision of healthful food and beverages at school at reasonable prices.
   » Optimal standards of nutrition and health status.
   » The teaching of food skills, e.g., purchasing and preparation.
   » The teaching of relevant nutrition knowledge and attitudes, e.g., knowledge of ways to prevent iron-deficiency anemia.
   » Teachers' levels of knowledge and skills, and advocacy activities relating to health and nutrition.
   » The school's responsiveness to parents' concerns and its nutrition promotion among them.

   Such information should be fed back by school or education service administrations to teachers,

* Details of recent research available from the author.

parents, local health practitioner schools and other stakeholders regularly.

2. **Accreditation programs.** Monitoring and promotion programs could be accredited by government or NGOs (e.g., Ministry of Education or community and teacher groups). Accreditation programs have several advantages:
   - » They hold government accountable for implementation of policy goals.
   - » They can be run by local and national teacher associations.
   - » They allow for flexible local initiatives.
   - » They set quality criteria that are appropriate to local conditions.
   - » They allow for entry/progress at all levels.
   - » They can be financially self-sufficient and independent of industry and government.
   - » They can shape market forces, e.g., by setting rules about types of foods permitted to be sold on school premises.

   The Start Right Eat Right program [25] is a useful example of accreditation program (although it was government sponsored). An outline of the criteria that an accreditation program might employ is given in **box 4.**

3. **Teacher-training curriculum.** There is a need to develop the roles of teachers as educators and as community advocates and leaders. To take such roles, teachers will require training that will accomplish the following:
   - » Develop pro-nutrition attitudes and motivation.
   - » Provide them with basic nutrition knowledge.
   - » Provide knowledge of key health issues, e.g., anemia, HIV/AIDS, obesity.
   - » Provide knowledge of human (eating) and learning processes (e.g., Food Dudes).
   - » Develop their understanding of social forces and trends relating to food, nutrition, and health.
   - » Develop their social, organizational, and management skills.

BOX 4. Accountability issues for nutrition promotion accreditation systems in the school sector

1. What percentage of children attend primary and secondary schools?
2. How many children attend preschool centers?
3. How many primary and secondary schools provide healthful food for children (e.g., breakfast, lunch). How is school food paid for?
4. How many foods supplied at school comply with national dietary guidelines?
5. What percentages of preschoolchildren in primary and secondary are regarded as being malnourished?
6. What percentage of children are overweight or obese?
7. Do maternal and child health services provide information to parents about the nutrition care of children?
8. Approximately what percentage of mothers are reached by maternal and child health (MCH) programs?
9. What percentage of primary and secondary schools have a food policy?
10. What percentage of primary and secondary schools teach a nutrition education curriculum? How adequate is the curriculum content and frequency of teaching?
11. What percentage of primary and secondary schools provide physical education lessons? What is the frequency of these lessons?
12. What percentage of schoolteachers receive training in nutrition education?
13. Are continuing education courses in nutrition promotion widely available?

Special food policies for the education sector, with their inherent accountabilities and responsibilities are required. They will require financing and substantial commitment by national and international stakeholders along with collaboration between governments, universities and school education and health systems.

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