CHAPTER 7

NUTRITION FOR SCHOOL-AGE CHILDREN

Assessment, Analysis, and Action

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Outline

• Nutritional assessment of school-age children
  • Anthropometric assessment
  • Dietary assessment
• Common nutrition-related problems of school-age children
  • Undernutrition
  • Overweight and obesity
  • Body image and eating disorders
  • Micronutrient deficiencies
  • Adolescent pregnancy
  • Dental caries
• Promoting healthy eating for school-age children
  • Comprehensive school health and nutrition
  • Nutrition education
  • School-based food programmes

Objectives

After reading this chapter, you should be able to do the following with particular reference to school-age children in developing countries:

• Explain why nutrition is important
• Describe the principles of nutritional assessment in a community context
• Outline the individual, social, and macro-environmental factors that influence eating behaviour
• Describe the most prevalent nutrition-related problems
• Explain what is meant by an integrated strategy for nutrition action
• Give reasons why schools present special opportunities for nutrition promotion
• Discuss appropriate content and approaches for nutrition education in schools
• Critically evaluate the advantages as well as the challenges of school-based meal programmes
1. INTRODUCTION

The second of the United Nations’ eight Millennium Development Goals – “Achieve universal primary education” – recognizes that children have a right to basic schooling, which is essential to their opportunities in life. But progress towards this goal depends in no small measure on the first of the goals: “Eradicate extreme poverty and hunger.” Good nutrition is critical to a child’s physical and mental development, which will in turn influence a child’s ability to succeed in school. Children everywhere have a right to adequate nutrition, as well as to schooling, and yet many developing countries face enormous obstacles in their efforts to ensure that these rights are realized.

The focus of this chapter is the nutritional well-being of children from the time they begin school until they reach the end of their teens. The United Nations Convention on the Rights of the Child (1989) regards children as all individuals under the age of 18. In practice, however, children are often distinguished from adolescents. The World Health Organization (WHO, 2005b) defines adolescents as persons aged 10 to 19, making them a subset of “youth” or “young people,” that is, people from 10 to 24 years of age. While we will sometimes refer specifically to adolescents, unless otherwise specified, the term children will be used to refer to both primary and secondary school children.

Historically, developing countries have tended to have a relatively youthful population, owing to higher fertility rates in combination with shorter life expectancies. More recently, a decline in the under-five mortality has contributed to this pattern. The median age in developing countries, especially those in sub-Saharan Africa, remains significantly lower than it is in the industrialized world, with youth representing the broadest segment of the population. This alone provides a compelling reason to invest in the health of school-age children.

For a number of reasons, the period of childhood and adolescence provides a window of opportunity for community nutritionists, particularly those engaged in nutrition promotion (WHO, 2005b):

- Childhood and adolescence are the ideal time to foster sound dietary habits and prevent poor eating patterns from becoming ingrained.
- During this period, previous nutritional inadequacies may be corrected and catch-up growth achieved.
- Improving the dietary behaviour of children and youth is an investment in adult health. Apart from short-term effects, improved nutritional status also has long-term health benefits, such as the prevention of obesity, type 2 diabetes, ischaemic heart disease, osteoporosis, and tooth decay.
- In girls, nutrition interventions may help to break the generation-to-generation cycle of malnutrition, poverty, and chronic disease.
- Households and communities can be reached through children.
- Child-to-child health promotion initiatives offer promising possibilities for the improvement of a population’s overall health and nutritional status.

Although representative data on malnutrition among school-age children are scarce, patterns of malnutrition visible among pre-school children appear to persist once children begin school. Dietary interventions targeted at young people face two major barriers, however. First, adolescent morbidity and mortality are not closely linked to nutrition. Globally, among 10 to 24-year olds, the causes of years lost to disability are linked to neuropsychiatric disorders, unintentional injuries, and infectious and parasitic diseases. The main risk factors for disability-adjusted life-years are alcohol consumption, unsafe sex, iron deficiency, lack of contraception, and illicit drug use (Gore et al., 2011). In other words, adolescent morbidity is now less likely to be associated with health-related factors than with social causes. Second, in comparison to other age groups, young people tend to be relatively healthy, with the result that their nutritional needs may be neglected. Although youth may appear to be in a “Cinderella” phase in the life cycle, evidence suggests that young people may not be as healthy as they seem (Fatusi & Hindin, 2010). Bundy (2005) argues that poor health and malnutrition affect access to education, as well as participation in school, level of academic achievement, and the likelihood of completion. Clearly, school-based health programmes can provide an effective solution to addressing nutritional inadequacies among young people.
Community nutritionists often employ a method known as the Triple A approach: Assessment, Analysis, and Action. It has been described as follows:

The “Triple A” process or cycle, pioneered by UNICEF, is a participatory decision-making process wherein the problem of undernutrition is assessed (in terms of its nature, extent, distribution, etc.), its causes analyzed, along with the available resources and capacity to combat it, followed by a decision on appropriate mix of actions. The process is cyclical and iterative in that once the actions have been initiated, they are subsequently monitored and evaluated (reassessment). (Allen & Gillespie, 2001, p. 89)

This chapter is structured according to this approach. It begins with a focus on the nutritional assessment of children, which is followed by an analysis of the major nutrition problems encountered by children. This analysis serves to highlight the most common causes of malnutrition and the associated risk factors. The last section covers actions – that is, interventions and programmes intended to enhance the nutrition of school-age children.

2. THE NUTRITIONAL ASSESSMENT OF CHILDREN IN A COMMUNITY CONTEXT

A comprehensive assessment of nutritional status, involving clinical, dietary, anthropometric, and laboratory methods (see Chapter 22), is rarely feasible in the context of community-based nutrition programmes, especially given the limited resources typically available in developing countries. The backbone of community-based assessment of children is usually the evaluation of anthropometric growth, supplemented by dietary data and information concerning risk factors.

2.1 Anthropometric Assessment

The measurement of weight and height is an objective starting point for the health and nutritional assessment of children. An ongoing lack of adequate food, poor health related to chronic infectious diseases, and suboptimal socio-economic conditions are reflected in a low height for age, or stunting. Wasting refers to a low body mass index (BMI) for age (the equivalent to low weight for height in those under the age of 5). Wasting is typically associated with acute diseases or food crises and is uncommon in children and adolescents in countries in which food security is not generally a problem. The term thinness is sometimes used to refer to a low BMI for age. Tables are available that specify international cut-off points for BMI thinness grades 1, 2, and 3 according to sex and age (from 2 and 18 years). For example, at the age of 18, BMIs of 16, 17, and 18.5 correspond to grade 1, 2, and 3, respectively (Cole et al., 2007). The term underweight also indicates a failure to grow, but it does not distinguish between children whose weight is low for their height (wasting) and those whose weight is low because they are short for their age (stunting).

Overnutrition in school-age children is best assessed using BMI for age. Regardless of age or sex, an adult with a BMI of 25 is considered overweight, and one with a BMI of 30 is considered obese. In contrast, the interpretation of BMI in children is age- and sex-specific and requires growth charts. There is no universally accepted standard for classifying childhood overweight and obesity. The International Obesity Task Force supports the use of specific BMI cut-off points for overweight and obesity by age (for both genders) which are equivalent to an adult BMI of 25 or 30, respectively. For example, at the age of 6 years, BMI values of 17.6 for boys and 17.3 for girls are equivalent to an adult BMI of 25. The term underweight also indicates a failure to grow, but it does not distinguish between children whose weight is low for their height (wasting) and those whose weight is low because they are short for their age (stunting).

BMI may not be an accurate measure of overweight and obesity in stunted children. This poses challenges because concurrent stunting and overweight have repeatedly been documented in developing countries (Barquera et al., 2009; Javed et al., 2014). It may therefore be necessary for the nutritionist to take additional measurements when the focus is on excess body fat. The amount of subcutaneous fat can be estimated by measuring skinfolds. Percentile tables of triceps and subscapular skinfolds for age and sex are available, with the 85th percentile again as a cut-off point for risk of overweight and the 95th percentile as the cut-off for overweight. Abdominal obesity among children and adolescents is currently also receiving considerable attention.
attention. Measurement and interpretation of waist circumference is, however, not yet standardised (de Moraes et al., 2011). Using the mid-upper-arm circumference (MUAC) as a guide to body fat may appear to be an easy alternative to measuring skinfolds. Preliminary studies warn, however, that reference values may differ from country to country and may require regular updating (Ayatollahi & Shayan, 2008).

The above suggests some of the challenges and limitations of anthropometric assessments of children. Percentile charts show the distribution of values in connection with a particular measurement across a given reference population, but they do not necessarily specify cut-off points for values that are excessive or too low. Strictly speaking, the comparison of a child’s measurements to percentile charts allows us only to say where that child stands in relation to the reference population. For example, if a child’s BMI is at the 25th percentile, this means that 25% of the children in the reference population (of the same age and gender) have a smaller BMI. Nevertheless, in practice measurements smaller than the 5th percentile indicate underweight and measurements above the 95th percentile indicate over-fatness (Fernandez et al., 2004).

The recommendations for the nutritionist are therefore as follows:

- Use repeated measurements (growth monitoring) performed at regular intervals, rather than one-off evaluations. The slope and shape of a child’s individual growth curve over time should be compared to the slope and shape of the curve in the percentile chart. The development of under- or overnutrition is signalled by a change in the relative slope or trend of the curve, and action can be taken before malnutrition actually arises.
- Given the shortcomings of existing growth references for children (Butte et al., 2007), it is advisable to use the same anthropometric index, such as BMI for age, and the same reference data (that is, the same percentile chart) throughout the child’s period of development. The WHO Reference 2007, a set of reference charts and tables available at http://who.int/growthref/en (see also De Onis et al., 2007), is recommended for the interpretation of anthropometric information for individuals aged 5 to 19 years. (These guides complement the WHO’s 2006 reference statistics for younger children, which are discussed in section 3 of Chapter 6.) A useful tool is the WHO AnthroPlus software, which allows for the global application of the WHO Reference 2007: see http://www.who.int/growthref/tools/en.
- For the assessment of the nutritional status of an individual child, supplementary dietary, biochemical, and clinical information should be collected and interpreted as a whole (see Chapter 22). For children with special needs and developmental disorders, this assessment should include an evaluation of behavioural and skills development.
- Abnormal growth patterns that cannot be linked to nutritional status should be referred to a medical practitioner for early detection of other health problems.

2.2 Dietary Assessment

Assessing the diets of children involves finding out what they eat, why they eat the way they do, and whether their dietary intake meets nutritional requirements.

2.2.1 Factors influencing eating behaviour

The eating behaviour of children is the result of many influences, Story et al. (2002) proposed four major levels of influence as follows:

A. Individual or intrapersonal influences. These include: (i) psychosocial (food preferences, taste and the sensory perception of food; and level of nutrition knowledge); (ii) biological (hunger and gender); and (iii) lifestyle (time and convenience; cost; meal patterns; and dieting).

B. Social environmental influences (interpersonal). These include: (i) family / household (various demographic and cultural characteristics such as religion and food preferences within the family); (ii) food availability and access (household food security); and (iii) influence of peers.

C. Physical environmental (community settings). These include: (i) schools; (ii) fast food outlets; (iii) vending machines; (iv) convenience stores; and (v) workplaces.
D. Macrosystem influences (societal). These include: (i) food advertising; and (ii) media reports on such topics as body weight and body image.

Each of the above factors can be a cause (or a potential cause) of poor dietary intake or, conversely, can encourage healthy eating habits. These influences may therefore be important not only in dietary assessment per se but also in the analysis of the determinants of dietary intake. The relative importance of the various factors is affected by stages in the life cycle, by gender, and by a child’s individual circumstances, including geographical location, socio-economic class, and cultural background (Joshi & Amandi, 2013; Verstraeten et al., 2014). The relative influence of a particular factor in a particular situation should never be assumed but should be assessed and analyzed. For example, a teenager might be quite knowledgeable about nutrition, but, in comparison to peer pressure, this knowledge may be of little predictive value in determining his or her choices about diet and lifestyle (WHO, 2005b). In situations of conflict or disaster, eating behaviour is to a large extent governed by food availability, an aspect of the physical environment. Factors that play a role in the food choices of street children are obviously very different from those at work when a grandparent is taking care of a child. As everywhere else, context matters!

Identifying the factors that may influence dietary intake uncovers potential risk factors, which should be taken into account in the planning of interventions. For example, an intervention might aim at reducing risk factors by replacing less healthy foods in vending machines with healthier options.

2.2.2 Assessing the diet of children and adolescents

Various techniques are available for assessing a child’s diet. Apart from the well-known methods (see Chapter 22), new approaches, as well as modifications of existing approaches, are continuously being developed and tested for children (Boushey et al., 2009). Regardless of the technique used, it should be validated for the specific target group and setting and should take into account the child’s level of cognitive development. It appears that once children have reached the age of about 11, they should be able to provide reasonably accurate information about their diet on their own. Before that stage, caregivers should be included in the assessment.

Obtaining valid dietary information from children and adolescents is challenging. The nutritionist should make sure that the child understands what is required, can be relied upon to recall what he or she has eaten with a reasonable degree of accuracy, and is able and willing to pay sufficient attention to the task at hand. The child must also be able to distinguish among types of food and basic methods of food preparation and be able to organize the information as requested – for example, by grouping foods according to category or the occasion on which the food was consumed. The child must also be able to provide information about how much food was eaten (Baxter, 2009). This may involve the creative use of pictures of foods and various other aids for estimating portion size, as well as the ability to ask questions designed to elicit candid and complete information without creating a judgmental atmosphere. Food variety and dietary diversity scores also appear to be a promising method of assessing children’s diets, especially in countries where micronutrient malnutrition remains a problem of public health concern (Steyn et al., 2006).

2.2.3 Nutritional requirements

Appropriate standards are needed for the evaluation of dietary assessment data. Many countries have their own dietary guidelines, often based on food groups, which can be used as a rough way to judge food intake. Sometimes special versions are available for school-age children. In evaluating the energy and nutrient level of foods, it is customary to follow the Dietary Reference Intakes of the U.S. Institute of Medicine (Institute of Medicine, 2005). These are described in more detail in section 4.1 of Chapter 14 and in Appendix III. Acceptable Macronutrient Distribution Ranges (AMDRs) as a percent of energy intake for children aged 4 to 19 years are:

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>AMDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate</td>
<td>45% to 65%</td>
</tr>
<tr>
<td>Fat</td>
<td>25% to 35%</td>
</tr>
<tr>
<td>Protein</td>
<td>10% to 30%</td>
</tr>
</tbody>
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doi:10.15215/aupress/9781927356111.01
The wide ranges refer to acceptable limits and should not be confused with recommendations (e.g., for protein the upper recommended level would be considerably lower than 30%).

3. ANALYSIS OF COMMON NUTRITION-RELATED PROBLEMS OF SCHOOL-AGE CHILDREN

Undernutrition is, of course, rife in developing countries, but, at the same time, increasing numbers of children consume diets that put them at risk of developing diet-related chronic diseases of lifestyle (CDL), that is, non-communicable diseases. Although seemingly unrelated, it appears that undernutrition in utero and during early childhood may leave children especially vulnerable to the effects of overnutrition later in life, with the result that, as adults, they are predisposed to develop obesity and some CDL, particularly if they begin consuming a Western diet (see the discussion in section 3 of Chapter 4).

Children are often affected by infectious diseases and closely related health problems that are associated with poverty, underdevelopment, and undernutrition. Examples include tuberculosis, malaria, and diarrhoea. HIV/AIDS is also a major threat, in that it may hinder the ability of parents or other caregivers to provide for the children who depend on them. More generally, childhood and adolescence are periods of nutritional vulnerability, in part because of the high nutrient requirements associated with accelerated growth. But children and, especially, adolescents are also susceptible to environmental influences, including pressure from their peers, who may encourage them to experiment with various risk-taking behaviours, ranging from alcohol and drugs to crash diets. A nutritionist must always be sensitive to the influences at work in a child’s life and strive not to condemn them but to work with them.

3.1 Poor Eating Habits

International literature suggests that school-age children often have poor eating habits. Contributory factors include a decline in family cohesion, the growing need for children to take care of themselves (especially in single-parent households or families in which both parents must work to make ends meet), and a greater tendency for the children to eat meals and snacks away from home. Added to these are the marketing of food of poor nutritive value to children, the increased availability of energy-dense, nutrient-depleted foods, and peer pressure. Adolescents, especially females, often have concerns over their physical appearance (Story et al., 2002; WHO, 2005b).

The consumption of food prepared away from home is becoming more common among children in developing countries. This trend is associated with urbanization and with the nutrition transition, while the ability to purchase prepared foods is a mark of socio-economic status. A common sight in cities (and to a lesser extent in rural regions) is street vendors and kiosks. They are often located next to schools. Such foods may be nutritious (fresh fruit, for example), but more often they are inexpensive fast foods and snacks high in fat and sugar. For reasons of hygiene, as well as the potential for spoilage, the safety of these foods is also a concern. School-age children, in particular, may pay scant attention to snack food safety (Gavaravarapu et al., 2009).

Soft drink consumption is on the increase among youth internationally (French et al., 2003). Because these drinks are high in sugar, they can make a significant contribution to daily energy intake and are directly implicated in increased levels of obesity (Chapter 13). Alongside the upsurge in soft drink consumption, milk intake among adolescents has decreased in many countries (Vartanian et al., 2007). Energy-dense snack foods often replace not only milk but fruit, vegetables, and other nutrient-dense foods (Bowman et al., 2004). Low intake of milk has been associated with shorter stature, overweight, and poorer bone health (de Beer, 2012; Louie et al., 2011).

Research conducted with school-age children has also shown that breakfast makes a significant contribution to overall daily nutrient intake (Granham-McGregor, 2005). Eating a school breakfast or a morning snack has beneficial effects on the cognitive and behavioural performance of undernourished children (Van Stuijvenberg, 2005).
3.2 Undernutrition (Underweight and Stunting)

Both underweight (low weight for age) and stunting (low height for age) are prevalent among school-age children in many developing countries. This is usually the result of a cumulative process that starts in early childhood, perhaps even antenatally (WHO, 2005b). Continuing undernutrition, especially a lack of micronutrients (e.g., zinc, iron, and vitamin A), causes a delay in and subsequent slowdown of the adolescent growth spurt. Stunting can pose particular problems for women, given that short women tend to have relatively small pelvises, which can lead to complications during labour. As the WHO (2005b, p. 16) notes, “delayed growth and maturation in girls as a result of malnutrition further increases the risks associated with adolescent pregnancy, as biological age lags behind chronological age.”

Early undernutrition has an adverse impact on height, body mass, and, in particular, muscle tissue. Evidence thus suggests that chronic malnourishment reduces a person’s capacity to perform physical labour, which in turn limits productivity. Although few studies have focused specifically on adolescents, in many developing countries families must rely on adolescent children to help with both agricultural and domestic chores (see WHO, 2005b, pp. 16–17). More generally, a population in which a significant proportion of adults were malnourished as children is likely to be at a disadvantage in terms of economic output.

Equally damaging are the effects of malnutrition on brain development. Stunting and underweight in early childhood – especially undernutrition in utero and during the first two years of life – have been associated with poor motor skills but also with impaired cognitive function, which later manifests itself in poor school achievement (Wheeler, 2004).

3.3 Overweight and Obesity

Many factors, both nutritional and non-nutritional, contribute to the current surge in childhood obesity, a subject discussed more fully in Chapter 13. Although this increase in the proportion of overweight children is a global phenomenon, affecting low-income countries as well as more affluent ones, it can be traced in part to the growing popularity of Western foods high in fat and sugar, such as soft drinks, snack chips, and sweetened breakfast cereals, in tandem with the relatively sedentary lifestyles that tend to accompany urbanization.

The growth of cities in developing countries is leading to a reduction in physical activity. In particular, an increase in childhood obesity or overweight has been linked to depressed neighbourhoods in which children have little or no access to parks or recreation facilities and even the streets may be unsafe (Singh et al., 2010).

Especially in societies in which food insecurity is common, the problem of combating obesity can be compounded by cultural associations of heaviness and a sedentary lifestyle (that is, the absence of any need to do physical work) with wealth and high social status (Onywera, 2010). Indeed, overweight and underweight often co-exist in developing countries. The rise of obesity does not mean that undernutrition is no longer a problem: the two are often seen together. In Pakistan, for example, a rapid rise in the number of overweight and obese school-age children has been observed despite a persistently high burden of undernutrition (Jafar et al., 2008). Stunting and overweight may even be present in the same child.

3.4 Body Image and Eating Disorders

Body image consists of one’s perception of one’s body – its size, weight, and shape – together with how satisfied one feels about one’s body. Body image is therefore heavily influenced by cultural factors, which favour certain body types over others. As is well known, in the Western world, thinness is highly valued: the ideal man is lean and muscular, while the ideal woman is slender but full-breasted. As people in developing countries make the transition from a condition of food insecurity, in which fatness is perceived as a sign of privilege, to one of relative affluence and a Westernized lifestyle, their image of the ideal body tends to shift accordingly.

Body image has a behavioural component. Dissatisfaction with one’s body, which is especially common among adolescents, often provokes efforts to alter its shape and size, generally through some combination of diet and exercise. Although in many cases these efforts are harmless (and may even have benefits), distortions in body image can lead to compulsive exercise and potentially harmful dieting practices, as well as to eating disorders, which have now become a major chronic illness among adolescent females, including athletes, in
many high-income countries. Again, as developing countries, particularly those in the nutrition transition, embrace Western standards, one can expect to see an increased preoccupation with weight loss, especially among adolescent girls (Petersen et al., 2006). Early detection is important, and nutritionists and other health care providers should be alert to the danger signals: a low BMI for age (below the 5th percentile) or significant weight loss (either 2 BMI points or a 10% decrease from the previous weight), and/or evidence of inappropriate feelings of being overweight (WHO, 2005b, p. 71).

3.5 Micronutrient Deficiencies

The nutritional management of micronutrient disorders is covered in detail in Chapter 9. However, it is worth highlighting the most important aspects of micronutrient nutrition among school-age children and youth.

*Iron* deficiency is a common problem in school-age children and is associated with loss of appetite, higher morbidity, growth retardation, poor cognitive function, and a reduced ability to concentrate (Low et al., 2013).

*Zinc* deficiency is associated with short stature. Supplementation of children with zinc deficiency results in numerous favourable effects, including improved growth and a lower frequency of infections and diarrhoea (Mayo-Wilson et al., 2014).

The high *calcium* requirement of children during growth spurts is well known. At the same time, calcium intake is often lower than recommendations. This can be a problem as the greatest increase in bone density occurs in mid-adolescence. Milk avoidance is the primary reason for low intake.

Children from *iodine*-poor regions tend to have depressed IQ scores. Children born more than 3.5 years after the implementation of an iodine-supplementation programme in China had significantly higher IQ scores (12 to 17 IQ points) than children born earlier (Qian, 2005).

*Vitamin A* deficiency leads to growth faltering, infection, eye diseases, blindness, and death. Xerophthalmia is associated with stunting and wasting in young children. School-age children appear to remain at risk for vitamin A deficiency, albeit mainly at a subclinical level, as was shown to be the case in a study conducted in Brazil (Custodio et al., 2009).

Micronutrient deficiencies rarely occur in isolation. Furthermore, children with multiple micronutrient deficiencies typically live in disadvantaged communities and may grow up in households where the mother or caregiver provides little care and stimulation to the child. Children’s development is influenced not only by their own health and nutritional status but also by the quality of mother-child interaction, the level of stimulation in the home environment, parental educational status, and cultural and neighbourhood factors (Kurpad et al., 2013).

3.6 Adolescent Pregnancy

Early pregnancy exposes both the mother and the child to nutritional risk. While this risk stems partly from the potential competition for dietary energy and nutrients, it is also due to the fact that the mother is not yet physiologically mature. Moreover, “the more undernourished or stunted the young mother is, the more immature she may be for her age, and consequently the higher the level of risk” (WHO, 2005b, p. 27).

Specific nutrition concerns of adolescent pregnancy relate to the girl’s pre-pregnancy weight, which may be too low, her height (as we have seen, short stature is associated with problems during labour), and her iron and folate status. Good nutrition is important not only for maintaining the health of the mother but also for the unborn baby and for breaking the intergenerational cycle of growth failure.

Evidence from Mexico and Bangladesh suggests that pregnancy halts the growth of the adolescent girl (Casanueva et al., 2006; Rah et al., 2008). In rural Bangladeshi women, this cessation of linear growth as the result of early pregnancy was associated with a loss of between 0.6 and 2.7 cm in attained height. It appears that for each year that the age of first pregnancy is below 20, the adult woman’s final height is reduced by about a centimetre.

Decreasing the rate of adolescent pregnancy will require long-term interventions based on policies that encourage formal education, including sex education and family planning services. Nutritionists should not only be aware of such programmes but should advocate for them and work to strengthen their nutrition content (Kurz et al., 2005; WHO, 2005b).
3.7 Dental Caries

The vast majority of humans suffer from dental caries. Marked differences exist, however, both between countries and within countries, with respect to sugar intake, fluoride usage, and dental care, as well as in the social and attitudinal factors that influence health maintenance. As Edelstein (2006) notes, whereas in developed countries the prevalence of decayed, missing, and filled teeth (DMFT) among 12-year-olds has steadily declined since 1980, in developing countries the severity of the problem has increased (even though, worldwide, the average rate has remained more or less constant). Given that higher rates of dental caries are associated with both with sugar intake and with urbanization, this increase may reflect, on the one hand, the growing popularity of sugar-laden Western foods and, on the other, the expansion of urban populations in developing countries.

4. ACTION: PROMOTING LIFELONG HEALTHY EATING FOR SCHOOL-AGE CHILDREN

An integrated approach to the management of nutrition-related problems of children and adolescents calls for multisectoral collaboration, involving, at the very least, government agencies responsible for health, education, and agriculture. An overall strategy must include nutrition promotion, prevention management, and clinical case management – that is, primary, secondary, and tertiary prevention, respectively (see Figure 7.1).

![Figure 7.1: Three-tiered strategy for nutrition intervention in adolescents.](https://example.com/figure7.1)


Story et al. (2002) have identified multiple environments, physical and social, all of which influence the eating habits of children and adolescents (see section 2.2). Schools stand out among these environments as one of the main social contexts in which life skills can be developed.

4.1 Integrated Approaches to School-Based Nutrition Interventions

Schools are generally acknowledged as critical settings for promoting health and lifelong healthy eating among children. In the context of community nutrition, a focus on schools has a number of advantages: (FAO, 2005a; CDC, 1996):

- Schools can reach almost all children, for a number of years, on a regular basis.
- Schools can provide opportunities to practise healthy and safe eating by means of the meals they provide and the foods sold on their premises.
Schools reach children at a critical age, when eating habits and attitudes are formed. Schools can teach children how to resist social pressure. Since eating is a socially learned behaviour, social (peer) pressures that discourage healthy eating can be directly addressed, and positive peer pressure can be reinforced. Skilled personnel are available. Teachers can receive nutrition training and then use their instructional skills to reach children. Health and sanitation services that are linked to nutritional status, such as treatment for worms or the provision of toilet facilities, can be implemented at schools. School-based nutrition education programmes have been shown to improve the eating habits of children.

The health problems that stand in the way of children’s education differ from country to country, and often even within a country. Consequently, the optimal response will differ too. One widely recognized means of planning the most appropriate response is the FRESH (Focusing Resources for Effective School Health) Framework (UNESCO et al., 2000). This approach promotes school-based health interventions under four “pillars”:

- School-based health and nutrition services
- Skills-based health and nutrition education
- Ensuring clean water and sanitation in schools
- Development of health-related policies

These four components are intended to be supported by effective partnerships between all parties involved.

Schools – primary, middle, and secondary, in both urban and rural settings – have often been the site of programmes that seek to improve nutrition. Many of these programmes target undernutrition, in one or more of its multiple dimensions, while others have specific goals, such as reducing the risk factors associated with chronic diseases of lifestyle such as preventing obesity (da Silveira et al., 2013; Saraf et al., 2012; Sbruzzi et al., 2013). Sometimes these are stand-alone nutrition education projects. In other instances, however, they are integrated programmes in which, for example, nutrition education, food provision, agriculture, and/or the promotion of physical activity are combined (Briggs et al., 2003; Masset & Gelli, 2013).

One example of such an integrated approach is the WHO’s Global School Health Initiative, launched in 1995. This initiative “seeks to mobilize and strengthen health promotion and education activities at the local, national, regional, and global levels,” with the goal of increasing the world’s number of genuinely health promoting schools (WHO, 1998, p. 2). A health promoting school is defined as one that:

- Fosters health and learning with all the measures at its disposal;
- Engages health and education officials, teachers, students, parents and community leaders in efforts to promote health;
- Strives to provide a healthy environment, school health education, and school health services along with school/community projects and outreach, health promotion programmes for staff, nutrition and food safety programmes, opportunities for physical education and recreation, and programmes for counselling, social support, and mental health promotion;
- Implements policies, practices, and other measures that respect an individual’s self-esteem, provides multiple opportunities for success, and acknowledges good efforts and intentions as well as personal achievements;
- Strives to improve the health of school personnel, families and community members as well as students; and works with community leaders to help them understand how the community contributes to health and education. (WHO, 2005b, p. 44)

The concept of health promotion is an important innovation in health care. It starts from the conviction, expressed in the “Ottawa Charter” adopted at the First International Conference on Health Promotion, that “health is created and lived by people within the settings of their everyday life, where they learn, work, play and love” (WHO, 1986). The health promotion approach defines people as active participants in creating...
health, not merely as recipients of health care. To be effective, health care requires strategies that produce health, just as much as they aim to prevent health problems.

Health promotion is grounded in respect for human rights. It focuses on achieving equity in health by reducing differences in current health status and by ensuring equal opportunities and resources to enable all people to achieve their fullest health potential. Health promotion explicitly goes beyond traditional curative approaches or simple health education by adding five essential interrelated actions, as shown in Box 7.1.

**Box 7.1: Essential Elements of Health Promotion**

- Building healthy public policy
- Creating supportive environments
- Strengthening community action
- Developing personal skills
- Reorienting health services


In 2005, the Sixth Global Conference on Health Promotion resolved to make health promotion “central to the global development agenda; a core responsibility for all of government; a key focus of communities and civil society; and a requirement for good corporate practice” (WHO, 2005a). The World Bank (2012), in addition, emphasizes a systems approach (“SABER”: Systems Approach for Better Education Results), in which school health and school feeding are seen as part of a process which must identify how well a county’s policies are oriented toward delivering learning for all children and youth.

When applied to nutrition, a health promotion approach aims at preventing nutritional disorders while at the same time creating nutritional well-being by developing conditions and settings that are conducive to sound nutritional health. It further seeks to involve people as partners in health and to help them develop the skills they need to make healthy choices. South Africa’s National School Nutrition Programme (see Box 7.2) is one example of the application of health promotion in the area of nutrition.

Finally, it is important to recognize that nutritionists are becoming increasingly involved in the multidisciplinary management of children with developmental disabilities. The movement away from institutionalization, efforts to achieve full integration of children with developmental disorders into the school system, and a philosophy of inclusion or normalcy are among the factors that have contributed to this shift. Close collaboration with occupational therapists and social workers is essential to ensure that children with special needs receive the care, including the nutritional care, they deserve. This includes, in particular, advocating for funding on behalf of children who have special nutrition requirements or who need help in order to feed themselves (Rokusek et al., 2005).

### 4.2 Nutrition Education

#### 4.2.1 Nutrition education within the school curriculum

Lack of nutrition knowledge is one common reason for inappropriate food choices, with the result that nutrition education has traditionally focused on providing children with information. Increasingly, however, the objectives have broadened to address the values, attitudes, and patterns of behaviour that surround food and to develop skills relevant to nutrition.

Some argue that nutrition should be incorporated into the school curriculum as an independent subject. School curricula are, however, generally overcrowded, and it may be difficult to add another subject. Quite apart from nutrition-related learning as a stand-alone subject in the classroom, there are many other ways for children to learn about food and nutrition within the school context. These include:

- Cross-curricular “infusion” – that is, the incorporation of information about food and nutrition into existing school subjects, when the opportunity arises
Box 7.2: The South African National School Nutrition Programme

The National School Nutrition Programme (NSNP) focuses on improving the health and active learning capacity of primary school learners in South Africa through school feeding. It aims to contribute to improving the quality of education and general health and nutritional status of children by reducing short-term hunger, improving school attendance, addressing micronutrient deficiencies, controlling parasite infestations, and improving nutritional knowledge and behaviour among primary school learners, their parents, and their teachers.

The following are the primary objectives:

- To feed learners at designated schools
- To enhance nutrition education through the curriculum
- To facilitate the establishment of sustainable food production initiatives in schools

An evaluation of the NSNP in 2008 concluded that “The NSNP is generally perceived to have contributed in addressing hunger and poverty among the learners and families and communities in which participating schools are located.

There has been an increase in the school attendance, concentration levels, and social and physical participation by learners in school related activities. The level of absenteeism by learners has dropped among the schools participating in the programme.”


- Extra-curricular activities such as excursions to farms, factories, or markets, “school action” days that focus on nutrition and health, or cooking clubs
- School-feeding programmes and school canteens
- School gardening
- Small food shops and food vendors, both in and near the school
- School food policies
- Nutrition-related events and other forms of collaboration with families and the community.

Classroom lessons have an important role to play in reinforcing such initiatives and providing opportunities for discussion. At the same time, nutrition-related homework and projects that involve families and the community can powerfully extend the impact of nutrition education, without making significant inroads on a crowded school timetable.

A framework for nutrition education in the school curriculum is provided in Table 7.1. The framework includes eight broad topics, each with a number of main themes, which should serve as a basis for formulating learning outcomes. The first seven topics are recommended for both developed and developing countries, whereas the eighth, “hygiene and sanitation,” is an additional topic of particular importance for developing countries. Tailoring the framework to local conditions and to the various age groups (from 4 to 16 years, grouped according to the school system) is essential. It is also critical that, from the outset, plans are made to include all topics and themes and cover all age groups and that sufficient time is allowed for each topic. Picking and choosing a few topics or skipping around in the progression from topic to topic will not be as effective.

A key feature of the framework is the emphasis, in each topic, on the learner’s own responsibility – an empowerment dimension. Imparting knowledge is not enough; attitudinal and skill training are very much part of a holistic approach, enabling the child to take charge.

Research shows that behaviour change correlates positively with the amount of nutrition education received. As a general rule, a minimum of 50 hours per year of nutrition education appears to be required in order to effect positive attitudinal and behavioural change (Lytle & Achterberg, 1995). Apart from enough
time, the school food environment, sufficient educational materials, appropriate educator training, and adequate funding are important elements for successful implementation of nutrition education in schools that will result in change of eating behaviour (Busch et al., 2013; Faber et al., 2013; Nguyen et al., 2013; Wang & Stewart, 2013).

Table 7.1: Framework for a nutrition, food, and eating curriculum

<table>
<thead>
<tr>
<th>Topic</th>
<th>Main themes for learning outcomes</th>
</tr>
</thead>
</table>
| 1. Food and emotional development  | - Sensory awareness  
- Food preferences  
- Trying out new foods  
- Feelings about eating and drinking  
- Body image  
- Self-esteem  
- Social significance of food and eating  
- Own responsibility |
| 2. Eating habits and socio-cultural influences | - Own eating habits and values  
- Eating habits of others  
- Factors influencing food choice (individual, psychological, environmental, and socio-cultural)  
- Variation in food habits (food trends)  
- Norms and etiquette for eating behaviour  
- Own responsibility |
| 3. Nutrition and personal health   | - Relationship between eating and health  
- Growth and eating  
- Eating and physical activity  
- Nutrients and their functions  
- Nutritional value of basic food groups  
- Food-based dietary guidelines for healthy eating  
- Energy/weight balance  
- Food and diet-related problems (overweight, underweight, malnutrition, eating disorders, dental caries, cardiovascular disease, cancer, food allergies)  
- Own responsibility |
| 4. Food production, processing, and distribution | - The food chain  
- Production of plant and animal foods  
- The food industry  
- Factors influencing food production  
- Food manufacturing and processing (novel foods, biotechnology, product design)  
- Distribution of food in the world  
- Politics of food  
- Food policies  
- Environmental implications  
- Own responsibility |
### 5. Consumer aspects of foods
- Food quality
- Shopping and buying
- The interests of the buyer and seller
- Handling a budget
- The influence of advertising and marketing
- The function of packaging
- Food labels
- Supply in food shops, markets, and supermarkets
- Environmental implications of consumption patterns
- Own responsibility

### 6. Food preservation and storage
- Lifecycle of foods
- Food storage
- Hygiene
- Food poisoning
- Food preservation (including additives, irradiation)
- Food legislation
- Own responsibility

### 7. Food preparation
- Food and personal hygiene
- Cooking techniques (including safe handling of food)
- Planning the process
- Serving food
- Eating as a social event or celebration
- Own responsibility

### 8. Hygiene and sanitation
- Water
- Personal hygiene
- Food safety
- Waste disposal
- Diarrhoea
- Own responsibility

Sources: Dixey et al., 1999; FAO, 2005a.

### 4.2.2 Moving beyond the classroom
Internationally, there is a move away from traditional, top-down pedagogical approaches, in which teachers dispense factual information to pupils. The preferred approach, more and more, is interactive, discussion-oriented methods in which learners play an active role. Collective action, in the form of group work and collaborative problem solving, encourages children to explore the cultural, social, political, and economic aspects of food choices (Florencio, 2001). Involving children as partners in spreading the nutrition message to other children, their families, and their communities allows them to become the teachers and fosters a sense of partnership, as well as an awareness of social and economic issues.

Experiential learning, in which nutrition education is linked with practical food- and nutrition-related activities carried out in the school environment, can demonstrably increase young people’s knowledge of nutrition and improve their dietary habits. Children generally respond well to “learning by doing.” A school garden, for example, can encourage fruit and vegetable intake, as well as providing opportunities to teach children about environmental issues and agricultural techniques (McAleese & Rankin, 2007; Parmer et al., 2009).

Recognizing that the classroom is not the only situation in which children learn about food and nutrition, the FAO has developed the concept of the extended curriculum. The concept rests on a tripartite approach that integrates three areas in which learning occurs: the classroom curriculum, the broader school environment, and the family and community. With regard to nutrition, the FAO notes:

In no other school subject is there such a constant flow of learning from other sources. School nutrition education must therefore work with and through the other contexts in which nutrition is being learned. This means that schools
will need to enter into dialogue with families, collaborate with them, and accept that their own role is to explore and find out, as much as it is to teach and instruct. It will be important to make positive links with families and with other sectors, organizations and individuals concerned with food and nutrition in the community. (FAO 2005a, vol. 1, p. 8)

Instructing children about nutrition is important, but unless what they learn in the classroom is both applied to and reinforced by the surrounding physical and social environment, this learning is apt to have little lasting impact. Initial results from a nutrition and health education programme for primary schools in Zambia suggest, for example, that, even in the absence of school-based nutrition and health services, significant gains in awareness and knowledge, as well as behavioural change, can be achieved among children and their families by means of an actively implemented classroom curriculum backed by teacher training and parent involvement (Sherman & Muehlhoff, 2007).

Classroom learning is embedded the broader school environment, which refers not only to the school’s physical surroundings but also to its staff – basically, to everything that exists and occurs outside the classroom proper. The school environment includes:

- Places for eating and the people who keep them clean
- School meals and the people who prepare and serve them
- Snacks and those who provide them
- The playground and those who look after it
- School clubs and staff members who organize and run them
- The school’s water supply and those responsible for maintaining it
- The school garden (if one exists)
- The school’s stated policies on all of the above

As the FAO (2002a, pp. 73–74) explains, actions designed to improve the school environment can include “developing and promoting a school philosophy and policy on nutrition education; obtaining training for staff; creating healthy surroundings; improving the quality of food eaten in school; organizing whole-school activities; involving school staff; [and] above all, raising awareness of what it means to have a healthy environment. This is part of the concept of the ‘health promoting school’ – or, in this case, the ‘nutrition-promoting school.’” Activities in which all staff and children participate help to increase internal cohesion, while articulating the school’s policy on nutrition makes it easier for both children and staff to spread the message.

At the same time, the FAO’s tripartite approach acknowledges that, to be effective, nutrition education must extend beyond the immediate school environment to families and the surrounding community. Families are already involved in nutrition “education,” if only through the foods they eat together. The school can involve them further by, for example:

- Inviting families to information sessions or “open house” days at the school
- Involving them in school trips
- Encouraging them to take an active interest in their children’s homework
- Discussing their ideas about diet and healthy eating
- Consulting with them about food cultivation, preservation, and preparation

Such dialogue and collaboration serve to engage parents’ interest and create a sense of common purpose. The chances that schools can make an impact on children are greatly increased if schools have the support of children’s families.

Beyond the family, nutrition education should be a community effort. Links can be established with public service agencies and local government, with private companies and organizations, and with churches, as well with food producers and retailers, bars and eating places, the local media, clinics, and youth clubs. Activities involving the community could include inviting speakers to visit schools, planning food shopping, making a trip to a local farm or factory, asking children to study advertisements, making posters as homework assignments, or reporting on the food consumed at a festival. Such activities will allow children to become
familiar with local foods and food practices.

Because eating is a social phenomenon, it needs to be understood in its social context – the situations in which food is eaten, for what reasons, and in whose company. In addition, meals and the foods associated with them are linked to values that are communicated and thus reinforced by the entire community. Children must also learn to cope with peer pressure, which is often closely tied to advertising and food packaging. The community is therefore a major source of messages about food, including its relationship both to physical health and to social cohesion. Children may benefit simply by seeing that members of the community share a school’s concern with healthy eating.

4.3 The Provision of Food in Schools

4.3.1 General objectives

Various approaches to school-based feeding programmes are in use around the world. Three basic rationales for such programmes exist, which have much overlap: one focuses on the nutritional status of the child and its implications, one on nutritional problems, and one on the children’s potential for scholastic achievement (Florencio, 2001). Within each rationale, a staggered subset of objectives can be identified, as illustrated in Figure 7.2.

![Figure 7.2: Three fundamental rationales for school-feeding programmes.](source: Florencio, 2001)

The implementation of school-feeding programmes depends primarily on the objectives chosen, but it also depends on other factors, such as constraints on the resources available, the local or national legislative framework, and the specific circumstances in which the programme will operate. Certain decisions will need to be made, such as whether to provide full meals (breakfast and/or lunch) or simply snacks, whether to offer the food free of charge or to require payment, whether to make the food available to every child or to set eligibility criteria, whether to involve teachers, parents, or other community members (and if they are involved, on what basis), whether to link the feeding programme to school food shops, and whether to provide food during school holidays. Such questions should be thought through carefully before the programme is implemented.

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4.3.2 Addressing micronutrient deficiencies

Interventions aimed at improving the micronutrient status of children can have a positive impact not only on their growth and health but on their degree of educational achievement and their productivity as adults (Micronutrient Initiative & UNICEF, 2003). Numerous interventions that rely on fortified foods have been tested using school-based feeding programmes as a vehicle. A review of South Africa’s school-feeding programme, for instance, which examined the use of micronutrient-fortified biscuits, bread spreads, and soup, concluded that such programmes can contribute significantly towards reducing “hidden hunger” – that is, micronutrient deficiencies (van Stuijvenberg, 2005).

Foods that are naturally rich in nutrients are, of course, another option. For example, orange-fleshed sweet potato – a staple food in many developing countries – is rich in beta-carotene. When given as part of school meals, it was well accepted by primary school children and improved their vitamin A status (van Jaarsveld et al., 2005). Interventions designed to address micronutrient deficiencies can also include the supplementation of a child’s diet with milk and other dairy products. Evidence indicates, for example, that the addition of cow’s milk to the diet of stunted children improves their linear growth, which leads in turn to a decline in morbidity (Hoppe et al., 2006). Similarly, a meta-analysis of findings from several studies suggests that, in children whose baseline intake of dietary calcium is low, an increased intake of dairy products and dietary calcium significantly increases their bone-mineral content (Huncharek et al., 2008). More robust growth may also be associated with the consumption of meat. A two-year intervention study in Kenya revealed that the growth of school-age children improved when they consumed a diet that provided generous amounts of energy and nutrients from animal-source foods (meat and milk), as distinct from plant foods (Grillenberger et al., 2006).

Jomaa et al. (2011) reviewed the impact of school-based feeding programmes in developing countries and noted a relatively consistent positive effect on energy intake and micronutrient status, as well as on school enrolment and attendance. However, the question remains how such dietary changes can be sustained. In one study, carried out in rural South Africa, primary school children were given biscuits fortified with beta-carotene, iron, and iodine. During the first year of the intervention, a significant improvement was seen in a number of variables, including serum retinol, iron status, and urinary iodine. Then the summer holidays intervened. When school started up again, all variables except urinary iodine had returned to their previous levels. This pattern was repeated, with children showing a gradual deterioration in iron status (van Stuijvenberg et al., 2001). Such findings suggest one answer to the question of whether school-based feeding programmes should continue during holidays. But they also underscore the importance of extending nutrition education beyond the school setting in an effort to achieve broad-based change that is sustained.

4.3.3 School gardens

Gardens offer a key means of improving nutrition. In a set of studies conducted in a rural South African village, home gardens planted with yellow and dark green, leafy vegetables were linked to significant improvements in the vitamin A status of preschool children (Faber, Venter & Benadé, 2002, Faber et al., 2002). There was also a higher intake of several other vitamins. Setting up and maintaining a school garden can likewise play an important role in improving children’s nutrition. Beyond that, however, school gardens serve to enhance children’s education. As an FAO report observes:

School gardens, both urban and rural, can have several interrelated objectives, including:

• increasing the relevance and quality of education for rural and urban children through active learning and through introduction of agriculture and nutrition knowledge and skills, including life skills, into the curriculum;
• providing school children with practical experience in food production and natural resource management, which serve as a source of innovation they can take home to their families and apply in their own household gardens and farms;
• improving school children’s nutrition by supplementing school feeding programmes with a variety of fresh micronutrient and protein-rich products, and increasing children’s knowledge of nutrition, to the benefit of the whole family. (FAO, 2004, p. 1)
School gardens offer a multisensory learning environment that children naturally find engaging. Planting and caring for a school garden can teach children about sustainable methods of food production, about the use of collected rainwater for irrigation, and about environmental issues such as erosion. In addition to encouraging the consumption of nutrient-rich fruits and vegetables, school gardens improve food diversity and, especially in food-insecure communities, provide children with practical skills that can help their families survive in times of food shortage (FAO, 2004). And, of course, they also afford an opportunity for children to get outdoors and engage in physical activity, which can be especially valuable in urban settings.

In addition to horticultural production, raising small animals, such as chickens and rabbits, can be considered a part of sustainable food production in a school context. Small livestock development at the community level, accompanied by appropriate education, is probably the most appropriate way of promoting animal source foods for improving diet quality in developing countries (Neumann et al., 2002). However, both animals and food gardens require maintenance. Thus, if a school is planning to set up a garden, it needs to spell out who will be responsible for the various tasks involved in taking care of it (and the same applies, of course, to raising animals). In addition, thought will need to be given to what will be done with the food produced – whether, for example, it will belong to the school and be incorporated into school meals or whether the school will have the option of distributing it to those most in need of it.

Above all, though, the focus must remain on education. As the FAO (2010, p. 15) notes, “Gardens are particularly able to link abstract and concrete concepts, theory and practice, verbal and visual learning, reflection and action, behaviour and attitude, bringing learning to life and making it memorable.” To realize the educational potential of gardens, however, a clear link must be established between the garden and the classroom by integrating garden activities into the curriculum. This is the key to to ensuring that children derive benefits from these practical activities.

4.3.4 Promoting healthy school meals and creating dietary change

Even if material resources are limited, schools can create an environment that encourages healthy eating and lifestyles. Crucial to achieving this goal is the willingness to implement policies that require foods sold and consumed at the school to be consistent with government-mandated dietary guidelines. Schools can, for example, institute programmes that promote the consumption of fruits and vegetables (De Sa & Lock, 2007; Knai et al., 2006). They can also restrict the sale of soft drinks and foods high in fat and sugar on school premises (Budd & Volpe, 2006). Although schools have no direct control over many of the factors that determine a child’s diet and lifestyle, such as a family’s economic status or the messages conveyed by advertising, they are in a position to exert a countervailing influence that may carry over into the child’s adult years.

All nutrition interventions, whether carried out in schools or elsewhere, should emphasize balance, variety, and moderation in food intake, three principles that are also fundamental to most national dietary guidelines. They should also support the objectives of nutrition education.

School initiatives that promote fruit and vegetable consumption appear to have their greatest impact if they integrate several components. One is government support, in the form of the free or subsidized provision of fruits and vegetables to schools. Even in the absence of such support, access can be increased by the promotion of fruits and vegetables in the school canteen, by classroom food tasting or food preparation lessons, and by school gardens. Another important component is nutrition education, which is generally built into the standard curriculum and may involve special training of teachers and peer leaders, who can also serve as role models. In addition, active participation on the part of parents, both at home and at school, helps to reinforce the messages that the school is trying to deliver (De Sa & Lock, 2007). Not surprisingly, although such initiatives can have a short-term impact after as little as one year, the longer they are sustained, the more likely they are to make a lasting difference to dietary habits.

Another promising approach was tested in a pilot intervention carried out over a period of six months in three government primary schools in New Delhi, India, using the government’s established Mid-Day Meal (MDM) programme, which provides a free hot lunch to primary school children, as an entry point. The intervention involved the introduction of low-cost seasonal vegetables into the midday meals, in an effort to diversify children’s diets as well as to address low intake of vitamin A. In addition, the intervention sought to
show teachers how to use the MDM programme to educate children about the importance of a balanced meal (one that includes vegetables) and to illustrate how low- and middle-income families can integrate vegetables into their daily meals at an affordable cost. Children also received intensive nutrition education for a period of one week (Muehlhoff et al., 2011).

The scope of the intervention was fairly modest. It did not seek, for example, to assess whether the vegetable-enriched MDM resulted in a net increase in children’s consumption of vegetables, nor did it attempt to argue that a short-term infusion of nutrition knowledge could have a lasting impact on food preferences or eating behaviour. However, it demonstrated that incorporating seasonal vegetables into school lunches is a feasible idea that could be sustained at relatively low cost. The conclusion was that, if the intervention were scaled up, it could become a significant tool for improving children’s nutritional status and promoting vegetable consumption.

4.4 Programme Evaluation

Like other programmes that seek to effect change, nutrition programmes, regardless of their specific objectives, require the investment of time, money, and human effort. They therefore demand evaluation in an effort to determine how effective they are – that is, to what extent they are meeting their objectives – and how they might be improved. This is all the more true of programmes that rely on government funding and other forms of external support. The evaluation of community nutrition programmes is the topic of Chapter 18, and we refer readers to that chapter for a detailed discussion of goals and methods.

Although programme evaluation can be relatively informal, based simply on observation and general impressions, it is more often quite elaborate, often employing both qualitative and quantitative research methods. Evaluations generally focus on three broad categories: inputs, outputs, and outcomes. Inputs are the resources, both material and human, that were invested in the programme; outputs refer to the specific uses that were made of these resources – what the interventions were and at whom they were directed. As distinct from outputs, outcomes are a broader category: a programme’s outcomes are its overall results or impact, both short-term and long-term. In other words, outcomes are a measure of change.

It is impossible to list all the possible indicators of change, but assessments very often focus on variables such as:

• The availability of food and the relative ease of access to that food
• The quality and quantity of food and nutrient intake
• Growth rates and the prevalence of stunting, underweight, and overweight or obesity in a population
• The prevalence of specific dietary deficiencies and diseases
• Overall nutritional status
• Motor development, cognitive function (including IQ), and the ability to concentrate
• Levels of school enrolment and consistency of attendance, as well as retention rates (that is, the likelihood that children will remain in school)
• School performance and degree of academic achievement
• Level of nutrition knowledge

Such indicators have the advantage of quantifiability, which makes them attractive both to scientists (who are trained in quantitative methods) and to funding agencies (who tend to be convinced by statistics). In addition, programmes are frequently evaluated purely in terms of cost: cost per beneficiary, cost per unit of a given nutrient, and overall cost-effectiveness (Galloway et al., 2009).

Especially in the case of nutrition programmes that aim to bring about lasting change, however, the critical outcomes are often less easily quantified. These may include:

• Changes in dietary behaviour: what foods are eaten, when and with whom, and for what reason
• The influence of indigenous cultural traditions on food behaviour and the impact of global influences
• Shifts in personal attitudes toward food
The impact of nutrition education on children and on their families and local community
The development of health-related values
Commitment to lifestyle changes
The contribution of a programme to social protection – that is, to the reduction of the effects of poverty and the level of vulnerability within a specific population.

Such changes, which involve shifts in attitudes and behaviour, are less easily assessed, in part because they develop over the long term, whereas programme evaluation often seeks to demonstrate short-term effects, not the least because continued funding for programmes often hinges on evidence of relatively quick success. How best to measure the long-term impact of nutrition programmes is thus an issue that warrants careful consideration by nutritionists concerned with health promotion and with sustained improvements in the health status of both the children and the adults who live in developing countries.

Programme evaluation can be broader than the areas mentioned above. Other aspects that can be usefully evaluated include:

- Gender-related issues (is the programme achieving aims that have a specific focus on girls and women?)
- Economic evaluation (is the programme cost-effective, e.g., by delivering improved nutrition to each member of the target group at an acceptably modest cost?)
- Agricultural evaluation (is the programme improving the local agriculture?).

**DISCUSSION QUESTIONS AND ASSIGNMENTS**

1. Look at the nutrition curriculum presented in Table 7.1 and select a theme from one of the eight main topics. Next, decide on a target group. Specify the country in which the school is located and whether it is urban or rural; the class size, the age range of the students, their grade level, and their general economic status; and the facilities available (space, equipment, classroom materials). Then design a nutrition education lesson for these students. Describe the content to be covered, the teaching methods to be used, the desired learning outcomes, and how you will evaluate the effectiveness of the lesson.

2. Visit a local primary school and, if possible, make arrangements to conduct an anthropometric screening either of the entire school (if it is relatively small) or of the children at a specific grade level. Prepare a report for the school in which you describe and evaluate your findings and make whatever recommendations seem appropriate. (Note: This assignment is optional, as it depends on the cooperation of the school.)

3. You work in an urban area in which a high proportion of primary school children suffer from vitamin A deficiency. Local schools have expressed their concern about this problem. Plan a school-based health promotion campaign that aims to increase children’s consumption of yellow and dark green, leafy vegetables. Consider how this campaign would extend beyond the classroom to the school environment and how it might involve families and the surrounding community.

4. A local school-feeding programme supplies a mid-morning snack and a hot lunch to primary school students. Plan a week’s worth of menus. Explain the criteria that you used in planning these menus and evaluate the cost per student per week.

5. Visit three different schools in the region in which you live, including one in a relatively affluent area and one in a low-income area. Assess the nutritional quality of the food served at meals, as well as the snacks sold in school shops and vending machines, with a view to determining how closely the food available at the school aligns with your government’s recommended dietary guidelines and/or stated policies on nutrition. Analyse the information you collect and provide realistic recommendations to the schools on possible improvements.

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**ADDITIONAL RESOURCES**

European Network of Health Promoting Schools: http://www.euro.who.int/ENHPS

FAO: www.fao.org


Right to Food: www.fao.org/righttofood/index_en.htm

Ottawa Charter for Health Promotion: http://www.who.int/healthpromotion/conferences/previous/ottawa/en/

School Gardens: www.fao.org/schoolgarden/

School Health and Nutrition: www.schoolsandhealth.org/

SCN News–UN Standing Committee on Nutrition: www.unsystem.org/SCN/

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