

Introduction

Enhancing young child nutrition and development in developing countries

Sandra L. Huffman* and **Dominic Schofield†**

*Department of Nutrition and Program in International and Community Nutrition, University of California, Davis, California, USA, and †Global Alliance for Improved Nutrition (GAIN), Geneva, Switzerland

This supplement is the fourth in a series, first published as a special supplement of the *Food and Nutrition Bulletin* in June 2009, devoted to accelerating investments to address malnutrition in the 1000-day window of opportunity from a child's conception to her second birthday. As with its antecedents, this supplement represents the work of a growing number of advocates for a greater focus on maternal, infant and young child nutrition (MIYCN), the application of a lifecycle approach to programming and the breaking down of the barriers between expertise and sectors that limit the scale-up of access by vulnerable populations to adequate nutrition and cost-effective programmes that meet their needs on a sustained basis.

This MIYCN supplement continues to reflect and contribute to this movement by providing the results of leading-edge research to inform technical consensus, programme design, policy and further research. It brings together papers addressing the importance of support for breastfeeding and the need for more focused efforts to improve complementary feeding in order to reverse the high levels of malnutrition seen among children from 6 to 24 months of life. Both are equally important yet demand different actions suited to the strengths of a range of stakeholders acting in concert, through both public- and market-based channels, to improve practices and access among vulnerable populations to good quality services and foods.

While the World Health Organization (WHO) recommends exclusive breastfeeding for the first 6 months of life (where 100% of infants would be exclusively breastfed at age 6 months), rates in developing countries do not reach this level. UNICEF (2011) reports that the rate of exclusive breastfeeding for infants less than 6 months of age (on average at 3 months of age) ranges from 1% in Djibouti, 4% in Cote D'Ivoire, and 5% in Thailand to 61% in Zambia,

66% in Cambodia, 76% in Sri Lanka, and 88% in Rwanda. The low rates of both exclusive breastfeeding among infants less than 6 months of age and continued breastfeeding at 20–23 months of age in various regions in the developing world are shown in Table 1. Clearly, efforts are needed to discourage mixed feeding and increase durations of both exclusive and continued breastfeeding, and to ensure that the promotion of breast milk substitutes, complementary foods and other products meet internationally recognised ethical practices and do not negatively affect breastfeeding, both during the first six months and up to 24 months and beyond.

In the editorial in this supplement, Jane Badham (2013) states that the Baby Friendly Hospital Initiative and the International Code of Marketing of Breast-milk Substitutes need to be implemented in order to protect and promote breastfeeding. Additionally, young children should have access to low-cost, fortified complementary foods and food supplements to improve micronutrient status, especially for iron and zinc, which are only available in sufficient quantity and bioavailability in such fortified products and in animal-source foods. However, the cost of animal source foods is high and availability is often limited among low income groups. Even in the US, fortified foods made available through the food distribution system were needed to reduce iron deficiency among low-income infants and young children (Sherry *et al.* 2001). For example, the rate of anaemia among infants 6–11.9 months of age in one state (Oklahoma) was 24% in 1983, compared with 9% in 1993. The earlier rate of anaemia is similar to that seen now in 40 countries with moderate rates of anaemia among pre-school-aged children [including Mexico, most of Central America, Ecuador, Peru, Colombia, Egypt, South Africa and China (World

Table 1. Breastfeeding rates in the developing world by region (UNICEF 2011)

% of children (2005–2009*) who are:		
Region	Exclusively breastfed (<6 months)	Still breastfeeding (20–23 months)
Africa*	34	49
Sub-Saharan Africa [†]	33	51
Eastern and Southern Africa [‡]	47	64
West and Central Africa [§]	23	43
Middle East and North Africa [¶]	32	35
Asia	38	68
South Asia**	45	75
East Asia and Pacific ^{††}	28	–
Latin America and Caribbean**	43	32
CEE/CIS ^{§§}	29	21

*Africa includes all countries and territories of Eastern and Southern Africa and West and Central Africa, as well as the following countries and territories of the Middle East and North Africa: Algeria, Djibouti, Egypt, the Libyan Arab Jamahiriya, Morocco, the Sudan and Tunisia.

[†]Sub-Saharan Africa includes Djibouti and the Sudan, as well as all the countries and territories of Eastern and Southern Africa and West and Central Africa. [‡]Eastern and Southern Africa includes Angola; Botswana; Burundi; Comoros; Eritrea; Ethiopia; Kenya; Lesotho; Madagascar; Malawi; Mauritius; Mozambique; Namibia; Rwanda; Seychelles; Somalia; South Africa; Swaziland; Uganda; United Republic of Tanzania; Zambia; Zimbabwe. [§]West and Central Africa includes Benin; Burkina Faso; Cameroon; Cape Verde; Central African Republic; Chad; Congo; Côte d'Ivoire; Democratic Republic of the Congo; Equatorial Guinea; Gabon; Gambia; Ghana; Guinea; Guinea-Bissau; Liberia; Mali; Mauritania; Niger; Nigeria; Sao Tome and Principe; Senegal; Sierra Leone; Togo. [¶]Middle East and North Africa includes Algeria; Bahrain; Djibouti; Egypt; Iran (Islamic Republic of); Iraq; Jordan; Kuwait; Lebanon; Libyan Arab Jamahiriya; Morocco; Occupied Palestinian Territory; Oman; Qatar; Saudi Arabia; Sudan; Syrian Arab Republic; Tunisia. **South Asia Afghanistan; Bangladesh; Bhutan; India; Maldives; Nepal; Pakistan; Sri Lanka. ^{††}East Asia and Pacific includes Brunei Darussalam; Cambodia; China; Cook Islands; Democratic People's Republic of Korea; Fiji; Indonesia; Kiribati; Lao People's Democratic Republic; Malaysia; Marshall Islands; Micronesia Federated States of; Mongolia; Myanmar; Nauru; Niue; Palau; Papua New Guinea; Philippines; Republic of Korea; Samoa; Singapore; Solomon Islands; Thailand; Timor-Leste; Tonga; Tuvalu; Vanuatu; Viet Nam. ^{§§}Latin America and Caribbean Antigua and Barbuda; Argentina; Bahamas; Barbados; Belize; Bolivia (Plurinational State of); Brazil; Chile; Colombia; Costa Rica; Cuba; Dominica; Dominican Republic; Ecuador; El Salvador; Grenada; Guatemala; Guyana; Haiti; Honduras; Jamaica; Mexico; Nicaragua; Panama; Paraguay; Peru; Saint Kitts and Nevis; Saint Lucia; Saint Vincent and the Grenadines; Suriname; Trinidad and Tobago; Uruguay; Venezuela (Bolivarian Republic of). ^{§§}Central Eastern Europe/Commonwealth of Independent States (CEE/CIS) includes Albania; Armenia; Azerbaijan; Belarus; Bosnia and Herzegovina; Bulgaria; Croatia; Georgia; Kazakhstan; Kyrgyzstan; Montenegro; Republic of Moldova; Romania; Russian Federation; Serbia; Tajikistan; The former Yugoslav Republic of Macedonia; Turkey; Turkmenistan; Ukraine; Uzbekistan.

Health Organization & Centers for Disease Control 2008)].

While private sector actions related to the marketing of infant formula have been detrimental to breastfeeding practices (Singh *et al.* 2010), harnessing market-based channels through private-sector sales of micronutrient powders (MNPs) has been associated with increased access to micronutrients and improvements in iron status in young children (Suchdev *et al.* 2013). Efficacy trials have shown the benefits of a lipid-based nutrient supplement (a complementary food product) produced by the private sector on child growth (Adu-Afarwah *et al.* 2007). The promotion and sale of such products, if sufficiently low in cost, could be an important means to prevent malnutrition and reduce micronutrient deficiencies and stunting in developing countries.

However, as Badham (2013) stresses, appropriate private-sector involvement in improving complementary feeding requires careful planning of the policy and regulatory environment. There is a need for development and enforcement of clear and agreed upon standards for engagement, which should define appropriate product composition, labelling and marketing practices. Marketing of such products should also be used to reinforce continued breastfeeding and recommended complementary feeding practices, such as provision of a diverse diet. These efforts are needed to reduce the excessively high levels of stunting seen in the developing world (see Table 2.) and should be driven by a joint imperative to reinforce optimal infant and young child nutrition practices and provide population-wide and equitable access to good quality foods and services on a sustained basis. For example,

Table 2. Rates of stunting among children under 5 years of age in the developing world by region (UNICEF 2011)

Region	
Africa	40%
Sub-Saharan Africa	42%
Eastern and Southern Africa	40%
West and Central Africa	44%
Middle East and North Africa	31%
Asia	45%
South Asia	38%
East Asia and Pacific	22%
Latin America and Caribbean	14%
CEE/CIS	16%

the promotion of complementary food products such as multiple MNPs or lipid-based nutrient supplements should inform families of the nutrient content of these products compared with other foods of limited nutritional value that are heavily marketed to the general population and are often purchased by the poor to feed to infants and young children (e.g. biscuits, instant noodles, chips). In this regard, Sweet *et al.* (2013) highlight key questions related to health and nutrition claims on packaging of complementary foods in South Africa, underpinning the need for accurate information that will allow consumers that rely on these products to differentiate good quality products from inappropriate foods. They also illustrate that labelling of many complementary foods does not clearly indicate that they are suitable only for infants over 6 months of age. For example, 35% of labels did not provide an appropriate age of introduction while 23% used images of infants appearing younger than 6 months. International guidelines are thus needed to ensure that marketing of complementary foods supports breastfeeding.

In addition to marketing and labelling practices, the appropriate nutritional content of a complementary food products is also a paramount concern given that many products now marketed for complementary feeding in developing countries are not nutritionally suitable for infants and young children because of low nutrient content and suggested serving sizes that are too large or too liquid and thereby may compete with the appetite for breast milk. Unlike infant formula, which is highly regulated (Koletzko *et al.* 2005)

because it is the sole food for non-breastfed infants under 6 months of age, complementary foods are foods meant to complement breast milk from 6 to 24 months of age. The appropriate nutritional content of complementary foods is currently difficult to ensure, however, because of a lack of consistent and up-to-date national standards or international guidelines for complementary foods and complementary food supplements.

The Codex Alimentarius Commission of the Food and Agriculture Organization of the United Nations (FAO) and the WHO is currently revising its Guidelines on Formulated Complementary Foods for Older Infants and Young Children (FAO/WHO 2011), which provides guidance on nutritional and technical aspects of their production. These guidelines suggest that the total quantity of vitamins and minerals contained in a daily ration of a formulated complementary food be at least 70% of the recommended nutrient intake, and also provides minimum levels of energy density, protein quality and fat content, maximum fibre content, and suggested serving sizes (10–50 g), depending on energy density. Once these guidelines are finalised, they can be used as an additional means to assess the quality of fortified complementary food products to help ensure products are both high quality and consumers are informed about these important elements of quality through appropriate product promotion, labelling and marketing.

The current substantial use of commercial products even among the poor, especially in urban areas, is highlighted by Pelto *et al.* (2013) in their description of three focused ethnographic studies about feeding of young children in Ghana, South Africa and Afghanistan. In urban Ghana, researchers discovered that traditional cereal-based foods are regarded by mothers as the least healthy type of food (unless prepared with milk), whereas commercial cereal-based foods are regarded as very healthy. Commercial products including individual serving size packets of an instant, fortified cereal are ubiquitous in all neighbourhoods. In addition to being viewed as healthy, instant cereals, although expensive, are seen as beneficial as they reduce the amount of time needed to prepare the child's meal. Non-instant cereals, made at home from recipes, from mixes obtained from clinics

or purchased as commercial products, are seen as requiring too much time to prepare and are also 'not inexpensive'. On the other hand, affordable, traditional cereal preparations, whether made at home or purchased from informal food sellers, are regarded as having poor nutritional value. Ghana's stunting rate among children less than 5 years of age is 28%, one of the lowest in Africa (UNICEF 2011).

In South Africa, in the urban area studied, instant commercial cereal-based food is the preferred food used in complementary feeding, whereas a maize based porridge (*mealie meal*) is typically used in the rural community studied. When asked specifically if they added peanut butter to their children's porridge, nearly all mothers reported having done so. This suggests that a fortified lipid-based nutrient supplement could fit in with current feeding practices. The stunting rate in South Africa is 25% (Kennedy *et al.* 2006).

Surprisingly, in Afghanistan, there is no routine household use of special, home-prepared complementary foods. Fruits, vegetables and animal source foods are regarded as healthy and held in high esteem by caregivers, but are not fed frequently because of high costs and limited availability. The most common commercial foods in the diets of young children are sweetened cookies, which were reported in more than 50% of children's diets in the two rural, one urban and one peri-urban area of the study. The other main foods given were bread, tea and rice, illustrating the need to improve the nutritional quality of foods used in complementary feeding. Correspondingly, the rate of stunting among children under five is 59% (UNICEF 2011).

Improving the quality of complementary foods is a needed step towards improving nutritional outcomes in children. Roos *et al.* (2013) assessed the bioavailability of iron, zinc and calcium in complementary foods (foods used in food aid programmes, local blended foods, fortified instant porridges and 'baby foods') from developing countries. These researchers also screened these foods for anti-nutritional compounds, including phytate, polyphenols, inhibitors of trypsin and chymotrypsin, and lectins. Unrefined cereals (as used in homemade porridges from maize or wheat) have been shown to have higher phytate levels than those that are made from refined grains

(Gibson *et al.* 2010). There is a persistent problem with high levels of phytate in cereal and legume-based products, which lead to reduced absorption of iron when complementary foods are made with these products. The Roos *et al.* (2013) results illustrate that reducing phytates in complementary foods will help enhance iron absorption.

The amount of essential fatty acids (EFAs) in young children's diets in relation to requirements is another area of concern for optimal complementary feeding. EFAs may be especially important in preventing malnutrition because of their role in ensuring structural integrity of the gut wall (which is needed to prevent intrusion by pathogens) (Colomé *et al.* 2007) and additionally in enhancing immune response (Damsgaard *et al.* 2007; Field *et al.* 2008; Thienprasert *et al.* 2009). However, national guidelines for recommended intakes of EFAs are lacking in most developing countries. Using the FAO daily energy requirements based on body weight and the recommended intakes of EFAs, Yang & Huffman (2013a) calculate requirements for young children that can serve as a guideline for developing countries for setting national standards on EFA needs. These could then be used to assess adequacy of intakes and to guide improvement of complementary foods and products to meet these requirements.

Despite the demonstrated efficacy of MNPs for both treating and preventing anaemia in young children, few studies have reported on the operational and cost considerations of programmes to distribute them. Suchdev *et al.* (2013) evaluated the sustainability of market-based community distribution of Sprinkles (an MNP) 18 months after the end of subsidised marketing activities; 21.9% of children used Sprinkles in the previous 7 days and average consumption was 1.1 sachets per week. Use of Sprinkles was associated with reduced iron deficiency in children 6–35 months of age. While usage declined by about two-thirds compared with the period when marketing of the MNP was still occurring, this continued use without any marketing is impressive. Finding sustainable means to market these products, while keeping costs low, is a challenge.

An important means to encourage policy makers to expand MIYCN programmes is to illustrate their

beneficial impacts on child development. Many researchers have used age of attainment of motor milestones to assess programme impacts in young children, but there is little information on how this relates to later intelligence quotient (IQ). Hamadani *et al.* (2013) assessed the relationship of age of walking to IQ at 5 years of age in 2000 children in Bangladesh. While there was a significant, although low, correlation between age of walking and later IQ, height for age at 15 months was highly correlated with later IQ after adjustment for potential confounders and accounted for some of the association between motor milestones and IQ. Thus while more difficult to measure than age of walking, in developing countries, height-for-age is a clear predictor of later IQ, thus underscoring the need to reduce levels of stunting in developing countries. Interestingly, the number of words used at 18 months of age was more predictive of future IQ than motor milestones assessed up to 15 months. A combination of these 3 indicators may be a useful composite indicator to assess child development in malnourished populations.

Yang and Huffman report on the role of nutrition in pregnancy and feeding in early childhood influence a child's risk of obesity. Malnutrition in pregnancy through its role in increasing low birth weight, results in an increased risk of obesity in adulthood. While breastfeeding is essential to reduce mortality and provides the nutritional foundation for young children in developing countries, it may also serve to protect against obesity (Yang & Huffman 2013b). In addition, ensuring that foods fed to young children promote healthy growth and do not contribute to obesity is necessary to help reduce the double burden of malnutrition. Increasing rates of obesity in children under 5 in Egypt were reported to be explained by changes in dietary habits which included increased consumption of more energy-dense fast foods and beverages with high sugar content (Hassan *et al.* 2006). Yang and Huffman report that high protein intake during early childhood is also associated with higher body fat mass and obesity in adulthood. They emphasise that guidelines on composition of complementary foods are needed to ensure that protein, sugar and fat content (with optimal intake of essential fats) and serving sizes, are appropriate.

This supplement provides evidence that caregivers wish to feed their young children nutritious foods. It is the responsibility of those committed to young child nutrition to provide caregivers in developing countries with support to breastfeed optimally and access to low-cost, high-quality complementary foods to ensure that their children will be well-nourished and thus able to reach their potential in terms of growth, health and development.

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