Addressing malnutrition in young children in South Africa. Setting the national context for paediatric food-based dietary guidelines

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Abstract

Despite various national nutrition and primary healthcare programmes being initiated in South Africa over the last decade, child health has deteriorated. This is seen by the rise in infant and child mortality rates, the high prevalence of preventable childhood diseases, e.g. diarrhoea and lower respiratory tract infections, and the coexistence of under-nutrition along with HIV/AIDS. Poor dietary intake, food insecurity and poor quality of basic services prevail within this precarious causal web. The national Integrated Nutrition Programme is a comprehensive nutrition strategy that focuses on children below 6 years old, at-risk pregnant and lactating women, and those affected by communicable and non-communicable diseases. Focus areas relevant to pre-school children include disease-specific nutrition treatment, support and counselling; growth monitoring and promotion (GMP); micronutrient malnutrition control; breastfeeding promotion, protection and support; contributions to household food security; nutrition interventions among HIV-infected children; and nutrition promotion, education and advocacy. Progress towards this includes the Baby-Friendly Hospital Initiative; mandatory fortification of maize meal and wheat flour with multiple micronutrients; vitamin A supplementation coverage and mandatory iodization of salt by legislation; the provision of free road-to-health charts for GMP; and the National School Nutrition Programme. Since 2003, the basis of the nutrition education strategy has been the locally developed food-based dietary guidelines (FBDGs), directed at adults and school-going children. This review sketches the backdrop to and motivation for the introduction of specifically targeted paediatric FBDGs, for mothers and caregivers of children from birth to age 7 years, as a *national* initiative.

Keywords: food-based dietary guidelines, nutrition, infants, South Africa.

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In South Africa, the nutrition transition, which includes the coexistence of under- and over-nutrition, is evident between and within populations and across all ages (Bourne *et al.* 1994; Steyn *et al.* 1994; Mvo 1999). Superimposed on this is the HIV/AIDS pandemic, giving rise to several nutrition-related diseases. Because of the high prevalence of under-nutrition, micronutrient deficiencies and emergent over-nutrition, both primary and secondary interventions are essential (Labadarios *et al.* 2005). Given issues related to food insecurity in South Africa, this presents a complex series of challenges for health workers and policy makers.

In 2003, the Medical Research Council's national burden of disease study estimated that by the year 2000, the infant mortality rate had increased to 60 per 1000 live births and that under-5-mortality rate had increased to 95 per 1000 (Bradshaw *et al.* 2003). This deterioration in child health occurred despite the introduction of free health care to all children younger than 6 years in 1994, and various nutrition programmes. Low birthweight, diarrhoea, lower respiratory tract infections and protein energy malnutrition (PEM) accounted for 30% of the childhood deaths. A large number of these deaths are preventable through the delivery of conventional primary healthcare packages, including immunisations. Additionally, HIV/AIDS was estimated to account for 40% of under-5-year-old child deaths, commensurate with the high prevalence of HIV observed among pregnant women (Bradshaw *et al.* 2003).

Despite national improvements in living conditions over the past decade, it should be noted that relatively high proportions of South African households remain deprived of quality basic services such as housing, electricity, safe water, adequate toilet facilities and refuse removal. Almost one-third of South Africa's households live in informal dwellings, about two-thirds do not have piped water inside their homes, approximately half are using a flush or chemical toilet and 14% have no toilet (Statistics South Africa 2003).

In this paper, South Africa's profile of under- and over-nutrition, micronutrient deficiencies and nutrition problems relating to HIV/AIDS in children is described. National efforts to address malnutrition comprehensively are discussed, with emphasis on the

promotion of good nutrition and healthy lifestyles, thus complementing the existing national Integrated Nutrition Programme (INP). In South Africa, nutrition education aims to address the coexistence of under- and over-nutrition, and prevent nutrition-related diseases. Since 2003, this has been achieved via the introduction of locally developed food-based dietary guidelines (FBDGs), which are directed at adults and children of school-going age (Voster 2001). These guidelines were developed from recommendations of the Food and Agricultural Organization/World Health Organization (FAO/WHO) (WHO 1998). This review sketches the backdrop to and motivation for the introduction of specifically targeted paediatric FBDGs (PFBDGs), for mothers and caregivers of children from birth to up to the age of 7 years, as a *national* initiative. The role of FBDGs at *primary healthcare* facilities is dealt with in a separate paper (Hendricks *et al.* 2007).

Under-nutrition

In 1995, it was estimated that 2.3–2.5 million South Africans were undernourished, most of whom were African children aged 0–15 years (The Community Agency for Social Enquiry (CASE) 1995). Two nationally representative studies were conducted on South African children, the first in 1994 undertaken by the South African Vitamin A Consultative Group (SAVACG) (1995) was on children aged 6–71 months. The second in 1999 by the National Food Consumption Survey (NFCS) consortium included children aged 1–9 years (Labadarios *et al.* 2000). Despite differences in sampling frames and methodology, these studies revealed similar overall results. In the former study, the national prevalence for underweight (weight-for-age $<-2SD$) was 9.3%, stunting (height-for-age $<-2SD$) was 22.9% and wasting (weight-for-height $<-2SD$) was 2.6%. In the latter study, the national prevalence for underweight was 10.3%, stunting 21.6% and wasting 3.7%. The prevalence of under-nutrition was highest in rural areas, particularly on commercial farms and in informal settlements compared with the urban areas.

From the SAVACG (1995) anthropometric data, stratified by age groups, the prevalence of under-

weight ranged from 7.1% in 6–11-month-olds, peaking at 10.2% in 24–35-month-olds, decreased to 9.0% in 36–47-month-olds and rose to 9.9% in 6–71-month-olds. By contrast, stunting appeared to be cumulative with increasing age, having ranged from 16.7% in 6–11-month-olds, increasing consistently through all age categories to a peak of 24% in children aged 49–59 months. The NFCS results (Labadarios *et al.* 2000) did not follow the same pattern, where the prevalence of stunting and underweight (not as marked) decreased with age.

The highest rates of stunting occurred in the predominantly rural Free State and the Northern Cape (30% each), while the lowest rates of stunting occurred in the Western Cape (14.5%) and KwaZulu-Natal (18.5%) (Labadarios *et al.* 2000). Although acute food shortage as suggested by data on the prevalence of underweight, and stunting (and supported by the household food inventory that was a component of the NFCS) (Labadarios *et al.* 2000) is a low public health priority *nationally*, it is a high priority public health problem in the Northern Cape (24%), and a moderate public health concern in the North-west (15%), Limpopo Province (15%) and the Free State (14%) (Labadarios *et al.* 2000). Superior maternal education, as one of the proxies utilized for socio-economic status, was associated with a signifi-

cant reduction in the prevalence of stunting, underweight and wasting in all age groups of children in the NFCS (Labadarios *et al.* 2000).

Over-nutrition

In the past, an emphasis on the problem of under-nutrition may well have led to overweight not being investigated in children. However, in 1994, 9.0% of children aged 3–6 years, from a representative sample of African children in Cape Town, were reported to be overweight (weight-for-age z-score $\geq 2SD$) while 20.1% reflected weight-for-height z-scores $>2SD$ (Bourne *et al.* 1994). The weight-for-height data, however, need to be interpreted with caution, as height measurements of the children were problematic. More recently, utilizing NFCS data, secondary analyses were performed on the weighted sample of children in terms of body mass index reference percentiles from the International Obesity Task Force (Cole *et al.* 2000; Steyn *et al.* 2005). Prevalence of overweight was highest in urban formal areas, especially in 1–3 years old children, which is consistent with data from other developing countries (Monteiro *et al.* 2002). The prevalence of combined overweight and obesity (17.1%) for this age group was nearly the same as that for stunting (21.6%) (see Table 1). A trend was noted

Table 1. Percentage South African children classified as overweight or obese with BMI reference cut-offs of the International Obesity Task Force (based on the weighted NFCS sample) (Cole *et al.* 2000; Steyn *et al.* 2005)

Domain analysis	Number (<i>n</i>)	% BMI ≥ 30 (95% CI)	% BMI ≥ 25 (95% CI)
Area of residence			
Farms	108	3.5 (0.77–6.3)	10.8 (6.03–15.5)
Formal urban	946	6.2 (4.4–7.96)	20.1 (16.01–24.19)
Informal urban	272	5.9 (3.15–8.63)	13.4 (10.02–16.8)
Tribal	874	3.7 (2.55–4.93)	15.8 (13.52–18.14)
Rural/urban			
Rural	982	3.7 (2.64–4.79)	15.3 (13.15–17.4)
Urban	128	6.1 (4.55–7.67)	18.6 (15.15–22.06)
Age group (years)			
1–3	795	7.8 (6.07–9.49)	23.7 (20.87–26.62)
4–6	861	3.8 (2.5–5.12)	15.8 (12.84–18.75)
7–8	544	3.0 (1.13–4.83)	9.5 (6.37–12.69)
SA			
Total	2200	5 (4.1–6.0)	17.1 (15.0–19.2)

BMI ≥ 25 indicates overweight; BMI ≥ 30 indicates obesity (Cole *et al.* 2000); BMI, body mass index; NFCS, National Food Consumption Survey; SA, South Africa.

in four of the nine provinces for children to be overweight with higher levels of maternal education. In particular, improved maternal education was associated with an increased prevalence of a child being overweight, for children living in formal urban areas (Labadarios *et al.* 2000).

The increasing prevalence of overweight and obesity continues into adolescence and adulthood. These and the dietary shifts currently driving these, in the general population, have been described elsewhere (Monteiro *et al.* 2002), from many local studies (Bourne *et al.* 2002) and including national data from the South African Demographic and Health Survey (SADHS) (Department of Health 2004a).

Dietary intake

According to the NFCS (Labadarios *et al.* 2000), dietary intake in most children was confined to a relatively narrow range of foods, of low micronutrient density, and with variable reported energy intakes, which were particularly inadequate in rural areas. In

general, there were significant differences for added sugar intakes and a range of micronutrients including vitamin C, thiamin, riboflavin, niacin, vitamin B6, vitamin B12, folate, calcium, iron and zinc, between rural and urban areas ($P < 0.01$). In Table 2, nutrient intakes (Steyn *et al.* 2006), based on selected NFCS 24-h recall data (Labadarios *et al.* 2000), are presented for children aged 1–3 years and 4–6 years respectively having been updated for use by comparison with recommended nutrient intake (RNI) values (FAO & WHO Expert Consultation Group 2002). Energy intakes were below RNI values for both sets of rural children. While requirements were met for protein and macronutrients in general, inadequate intakes were reported for vitamins A, C, niacin, vitamin B6, folate, calcium, iron and zinc. These data support the high rate of stunting and underweight in these children and suggest that optimal growth and immune status are compromised. However, it must be noted that these data were collected prior to mandatory fortification of staple foods in 2003, and in fact formed the basis for those recommendations.

Table 2. Mean ($\pm$ SD) nutrient intakes of children aged 1–9 years from the National Food Consumption Survey (Labadarios *et al.* 2000; Steyn *et al.* 2006) utilizing data collected by the 24-h recall method

Nutrients	Children 1–3 years ($n = 1308$)			Children 4–6 years ($n = 1083$)		
	Urban	Rural	Total SA	Urban	Rural	Total SA
Energy (KJ)	4403 (2043)	3992* (1790)	4200 (1933)	5614 (2375)	4963* (2283)	5721* (2349)
Energy (calories)	1048 (486)	950* (426)	1000 (460)	1337 (565)	1182* (544)	1255* (559)
CHO (g)	154 (72)	151 (71)	152 (72)	192 (80)	193 (91)	193 (86)
Added sugar† (g)	26 (23)	18 (17)	22 (21)	36 (30)	24 (34)	29 (33)
Protein (g)	33 (18)	29 (17)	31 (18)	43 (21)	36 (19)	39 (21)
Fat (g)	29 (21)	22 (16)	25 (19)	38 (25)	42 (21)	31 (24)
Fibre (g)	9 (6)	10 (7)	9 (6)	13 (7)	13 (8)	13 (8)
Vitamin A RE	463 (943)	252* (349)	359* (723)	544 (1313)	319* (1007)	425* (1167)
Vitamin C† (mg)	41 (96)	20* (36)	31* (73)	36* (65)	29* (78)	33* (72)
Thiamin (mg)	0.6 (0.3)	0.6 (0.3)	0.6 (0.3)	0.7 (0.4)	0.7 (0.4)	0.7 (0.4)
Riboflavin† (mg)	0.8 (0.8)	0.6 (0.6)	0.7 (0.7)	1.0 (1.0)	0.7 (1.0)	0.8 (0.9)
Niacin† (mg)	6.4 (4.7)	4.8* (3.8)	5.6 (4.3)	9 (6.2)	6.3* (4.4)	7.6* (5.5)
Vitamin B6† (mg)	0.6 (0.4)	0.4* (0.3)	0.5 (0.4)	0.8 (0.6)	0.5* (0.4)	0.6 (0.5)
Vitamin B12† (µg)	2.7 (8.4)	1.4 (4.4)	2.1 (6.8)	3.7 (12.1)	2 (10.2)	2.8 (11.2)
Folate† (mg)	102* (81)	86* (84)	94* (83)	161* (119)	127* (111)	143* (116)
Calcium† (mg)	345* (326)	302* (326)	324* (327)	342* (282)	270* (254)	304* (269)
Iron† (mg)	4.9* (3.6)	4.7* (3.8)	4.8* (3.7)	6.7 (4.2)	6.1 (4.6)	6.4 (4.5)
Zinc† (mg)	4.5 (2.7)	3.9* (2.5)	4.2 (2.6)	5.9 (3.3)	4.8* (3.1)	5.3 (3.2)

After Steyn *et al.* (2006); *Mean intake < FAO/WHO RNIs (FAO & WHO Expert Consultation Group 2002); †Significant urban/rural differences; CHO, carbohydrate; FAO/WHO, Food and Agricultural Organization/World Health Organization; RE, retinol equivalent; RNI, recommended nutrient intake; SA, South Africa.

Micronutrient status in children

The micronutrient deficiencies that have been identified to be of public health significance are vitamin A, iron, zinc and iodine. The first nationally representative SAVACG (1995) survey in 1994 examined the vitamin A and iron status of children aged 6–71 months. Vitamin A deficiency was found to be a public health problem as 33% of the children sampled were marginally deficient (serum retinol $<20 \mu\text{g dL}^{-1}$). Children in the age group 36–47 months were the most affected. Eleven per cent of children had a haemoglobin concentration of $<11 \text{ g dL}^{-1}$ and 25% had low-iron stores (ferritin $<12 \mu\text{g dL}^{-1}$) (SAVACG 1995). The extent of zinc deficiency is not known although the NFCS showed that 52–69% of children had a zinc intake less than 50% of the recommended dietary allowance (RDA) (Labadarios *et al.* 2000).

Breastfeeding

According to the SADHS (conducted in 1998) only 10% of infants aged 0–3 months were exclusively breastfed, and 17% of infants in this age group were never breastfed (Department of Health 2004a). To improve rates of breastfeeding a combination of strategies to promote, protect and support breastfeeding is needed.

HIV/AIDS in South Africa

HIV and AIDS contribute to a higher prevalence and increased severity of under-nutrition and micronutrient deficiency in children. Manifestations include low birthweight, delayed postnatal growth, severe under-nutrition and impaired immunity to opportunistic infections that may lead to death. HIV-infected children receiving antiretroviral treatment may later be at risk of developing non-communicable diseases, such as fat redistribution syndromes, insulin resistance, and ultimately type II diabetes mellitus, cardiovascular disease and obesity (Jacquet 2000). It is important to note that the SAVACG and NFCS studies were conducted before the height of the HIV/AIDS pandemic.

Food security

Despite being a middle-income country with a high gross domestic product, household food security is an important consideration for South Africa. Food shortages in neighbouring countries affect South Africa and the recent food crisis in Southern Africa points to a direct relationship between famine and the worsening regional HIV/AIDS epidemic. The resultant under-nutrition completes a vicious cycle linking poverty and inequality, food insecurity, under-nutrition and HIV infection. Children are particularly vulnerable as an estimated 60% of the population in the region are under 18 years and because many lose their parents or caregivers to the epidemic (United Nations Regional Inter-Agency Coordination Support Office Southern Africa 2003; Human Sciences Research Council 2004).

The NFCS showed that among children 1–9 years of age, 52% reported experiencing hunger, 23% were at risk of hunger and 25% were food secure. A significantly higher proportion of rural children (62%) compared with urban children experienced hunger. This potentially translates into about 4.6 million children who experience hunger in South Africa. Children in KwaZulu-Natal, Eastern Cape and Limpopo provinces accounted for 50% of children suffering from hunger (Labadarios *et al.* 2000). Although the reporting of states of hunger are subjective, these data were generally supported by the anthropometric data as well as data from the household food inventory data that were collected in this national study.

Current governmental strategies to address nutritional problems in infants and young children

In South Africa, while the focus of health policy remains at primary level (as described by Hendricks *et al.* 2007), governmental strategies have been introduced at national level, with national support through provincial departments to district level. Key nutrition-related efforts are described briefly below in order to set the context for FBDGs, as these are not an isolated initiatives, but both part of and complementary to a holistic plan.

The INP

Nutritional problems in infants and young children are presently being addressed through the INP. The INP is a comprehensive nutrition strategy that focuses on children under 6 years of age, at-risk pregnant and lactating women, and those affected by communicable and chronic diseases of lifestyle. The strategic plan for the INP includes eight interlinked focus areas with goals, objectives and targets set for 2007, aimed at addressing the main nutritional problems. These focus areas are supported by a nutrition information system, a human resource plan and a financial and administrative system (Department of Health, Directorate Nutrition 2002).

The focus areas relevant to the pre-school child include the following (Department of Health, Directorate Nutrition 2002) (Box 1):

Disease-specific nutrition support, treatment and counselling

This relates to nutrition counselling, support and treatment to prevent and rehabilitate children with under-nutrition, over-nutrition, tuberculosis and HIV/AIDS, using nutrition guidelines, e.g. the Integrated Management of Childhood Illness, the WHO Ten Steps on the management of severe under-nutrition (Department of Health, Directorate Nutrition 2002) and the South African Nutrition Supplementation Programme (former PEM Scheme) for growth faltering and underweight children younger than 6 years of age, at-risk pregnant and lactating women and those

with chronic illness. The aim is to lower the proportion of children aged 1–9 years with underweight from 10.3% to 8%, stunting from 21.6% to 18% and overweight from 6% to 4% by 2007 (Jacquet 2000).

Growth monitoring and promotion (GMP)

Growth monitoring includes the regular measurement and recording of weight, and promotion regarding improving growth. Guidelines and training materials have been developed on GMP nationally. Provision of road-to-health-charts (RTHC) and training of health workers are essential in ensuring effective GMP. In 1998, 74.6% of children aged 12–13 months had an RTHC and the target is to increase this to 85% by 2007 (Department of Health, Directorate Nutrition 2002).

Micronutrient malnutrition control

Efforts to control micronutrient deficiencies include the promotion of dietary diversification, supplementation and food fortification. It is hoped that by 2007, vitamin A deficiency will drop from 33% to 19%, iron deficiency from 10% to 7.5% and iodine deficiency from 10.6 to 5%.

High-dose vitamin A supplementation is being implemented nationally for children 6–60 months and for post-partum mothers within 6–8 weeks of delivery. The 2007 targets set for vitamin A supplementation coverage are 95% for infants and post-partum mothers and 80% for children for 1–5-year-olds.

Compulsory iodization of salt has been in effect since 1995 and the impact of this has been evaluated (Jooste *et al.* 1999; 2001). In 2003, regulations for the mandatory fortification of all maize meal and wheat flour with vitamin A, thiamin, niacin, riboflavin, pyridoxine, folate, iron and zinc were introduced. A monitoring framework has been set up on the national food fortification programme, the results of which are not yet available. However, a randomized intervention trial was conducted in the North-west Province (Nesamvuni *et al.* 2001) to evaluate the effectiveness of a vitamin-fortified maize meal in

Box 1. Integrated Nutrition Programme focus areas for pre-school children

- Disease-specific nutrition support, treatment and counselling
- Growth monitoring and promotion
- Micronutrient malnutrition control
- The promotion, protection and support of breastfeeding
- Contributions to household food security, e.g. the National School Nutrition Programme
- Nutrition interventions for children with HIV
- Nutrition promotion, education and advocacy
- Food service management

improving the nutritional status of 1–5-year-old malnourished children. Despite the small sample size, after 12 months, the study showed that fortified maize meal could significantly improve the weight gain of children in the experimental group (4.6 kg vs. 2.0 kg) and micronutrient status of 1–3-year-old children. It would, however, be important to see whether these results could be replicated when evaluating the national food fortification programme, as the participants in this study were provided with free maize meal.

Promotion, protection and support of breastfeeding

South Africa has adopted and implemented the Baby-Friendly Hospital Initiative and health facilities are being transformed to comply with the Ten Steps to Successful Breastfeeding, which was launched in 1993 (Department of Health 2000). The 'Ten Steps to Successful Breastfeeding' forms the basis of the South African Breastfeeding Guidelines for Health Workers (2000) (Department of Health 2004b). In 1995, the number of baby-friendly hospitals in South Africa was estimated to be three (1%) with a target set for 15% by 2007.

Contribution to food security

The Integrated Food Security Strategy is a national strategy that aims to eradicate hunger, undernutrition and food insecurity by 2015 (Department of Agriculture 2002). The main challenges are to: ensure the availability of sufficient food for all; match income with food prices; empower citizens to make optimal choices for nutritious and safe food; ensure adequate safety nets and food emergency management systems for those who cannot meet their food needs; mitigate the extreme impact of natural or other disasters on people; and to collect relevant information to ensure monitoring, evaluation and reporting on the impact of food security programmes.

Household food security activities linked to the INP (Henderson & Saavedra 1995) include: (1) education and promotion on school gardens and

micronutrient-rich foods; (2) advocacy for the use of appropriate methods of food production and for certain foods to be exempt from value added tax (VAT); (3) nutrition guidelines for sectors caring for children, e.g. crèches, AIDS orphans; (4) provision of food to Early Childhood Development Centres; (5) establishment of day care centres linked to income generating activities for women's groups; (6) subsistence and commercial food production; and (7) school feeding programmes.

Nutrition interventions for children with HIV

In HIV-infected children, food supplementation is made available to children with growth faltering and underweight, using specific food supplements that are distributed at antiretroviral treatment sites (Miller 2003). Reviews of implications of macro- and micronutrient intakes have been published for HIV-infected children and the WHO guidelines are used for HIV-infected children with severe under-nutrition (Henderson & Saavedra 1995; Miller 2003; World Health Organization 2003; Department of Health 2006).

Nutrition promotion, education and advocacy

Finally, as responsibility for the infant and young child should ultimately be in the hands of the primary caregiver, the mother/caregiver should be empowered to make informed choices. This aspect of the INP aims at effective communication in improving awareness and importance of good nutrition, and ultimately practices that could effect nutrition-related behavioural change in the public. It also includes creating nutrition awareness and general advocacy for implementation of the INP among policymakers. Educational and promotional material on breastfeeding, TB/HIV, micronutrients, food fortification and FBDGs has been developed by the National Nutrition Directorate. There are 11 FBDGs for adults and children older than 7 years based on locally available foods, which are affordable to most families (Voster 2001). The supportive text accompanying the messages

addresses the prevention and management of both under- and over-nutrition, essentially promoting optimal nutrition. The material produced includes fact sheets, booklets and flip charts. However, there are no data on the current status of their usage and impact or targets for this focus area.

Conclusion – the PFBDGs

It should be clear that the public health problems for young children are different to those issues that are required to be addressed for the adult population or those where dietary and lifestyle habits have already become more established. There is a unique opportunity to address the problems at an early age, starting with infancy and building up to the pre-school child. The preliminary PFBDGs have thus been formulated to address diet-related health issues in South African infants and young children, to complement governmental strategies described above (including the existing FBDGs targeting children over the age of 7 years, adolescents and adults), as well as prevent nutrition-related non-communicable diseases of lifestyle that are increasingly evident in South African adults. Together with accompanying supportive text and appropriate visual material, it is intended that these statements will provide tools for health professionals to empower and inform mothers/caregivers with targeted, appropriate information. The technical support papers that follow set out the scientific basis to these messages reached by consensus by the Working Group.

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