Establishing food-based dietary guidelines for children: the challenge

National and international organisations formulate nutritional recommendations for all age groups, including infants and young children (WHO/FAO 2004). In other words, they recommend how much energy, protein, vitamins and mineral children should eat to remain healthy and grow well. Carers, however, feed their children foods: breast milk, cereals, meat, milk, fruits and vegetables. It is not straightforward for them to determine if foods given to children correspond to nutritional recommendations. To do that, carers first need to know exactly what to feed their children and in what quantities. The calculations needed to translate these amounts of foods into nutrients are rather complex. In mathematical terms, this means they should calculate the product of the vector of the quantities of foods they want to feed to their children with the matrix of the nutrient composition of these foods. Also, nutritional requirements of each child vary around the estimated average requirement, and there is some variation in the nutritional content of the foods given to children. Hence, the advice to carers to use a probabilistic approach to assess nutritional adequacy of the diets they give to children (Murphy *et al.* 2002). If such calculations show that the foods that are intended to be given are unlikely to be nutritionally adequate, the rigorous way to optimize the children's diet at the lowest possible cost is to optimize its composition by using linear programming, a technique that became more accessible with the advent of modern powerful computers (Briend *et al.* 2003).

One might argue that mothers over the past centuries managed to feed their children, somehow without using matrices or vectors nor having any computer help, in a way that was successful enough to allow a spectacular population growth. This achievement, however, is likely to have happened as a result of many unsuccessful experiments at a considerable cost in terms of deaths from malnutrition during childhood. Presumably for this reason and to avoid

repetition of some fatal mistakes generation after generation, all cultures have developed strong traditions regarding infant feeding that persist even now in modern societies. Formulation of food-based guidelines can be regarded as a modern attempt to guide mothers and other carers on how to feed children, without making major mistakes and without any need for individual rigorous mathematical approaches.

Traditions, and to a lesser extent some aspects of modern food-based dietary guidelines, however, have a major limitation: they often conflict with the other mechanism which protected our species over the past millennia, namely evolutionary adaptation to available foods. This results from the switch which took place about 5000 years ago from a diet based mainly on meat and fruits collected by hunter gatherers to a diet based on cereals following the invention of agriculture (Eaton & Konner 1985). During the process, the quantity of food increased at the expense of the quality of the diet, particularly in terms of micronutrient content. It has been argued that our species is not yet fully adapted to this major change in dietary habits. Children have particularly high micronutrient requirements in relation to energy for some micronutrients, in particular iron and zinc (WHO 1998). As a result, they suffer most from the lower nutritional content of our present diet compared with the diet of our ancestors. In most societies, children fed in a 'traditional' way are given cereals and cow milk as complementary foods, two foods that were totally absent from the diet for the millions of years during which our species evolved. Diets based on cow milk do not provide enough iron to cover nutritional requirements during the complementary feeding period. Iron deficiency anaemia disappeared in Western countries where children were traditionally fed large quantities of cow milk only after the introduction of fortified infant foods (Fomon 2001). Children in other parts of the world receiving mainly cereal-based porridges and gruels as complementary

foods get diets inadequate in iron, zinc, calcium and vitamins and which are variably associated with growth failure.

The complexity of feeding infants and young children and the mismatch between the evolution of the human species and tradition that still today influences the formulation of food-based guidelines demands a critical approach and a careful composition and evaluation of food-based dietary guidelines; as was the case in the preparation of the current WHO guidelines. These provide useful information to formulate recommendations for feeding young children (WHO 2003, 2004).

The recognition that in South Africa child malnutrition, and in particular stunting, remains a major public health issue led to the constitution of a diverse multisectorial working group of health professional with a focus on paediatric nutrition. The paediatric food-based dietary guidelines (PFBDG) for South Africa elaborated by this group are presented in this issue of *Maternal and Child Nutrition*. These guidelines definitely represent a valuable attempt to help mothers adequately to feed their children. These guidelines examine separately different age categories: birth to 6 months, 6–12 months and 1–7 years. From birth to 6 months, PFBDG rightly mentions that breastfeeding is best. It is also important to highlight the importance for the health of the child below 6 months of exclusive breastfeeding. There is a strong tradition in many societies to introduce other foods at an earlier age, particularly cereal-based porridge and milk from other animals. These foods, especially cereals, are nutritionally not adequate in terms of micronutrient content to feeding the young infant. Also, these foods, and particularly milk, expose the child to pathogens if not prepared in perfect hygienic conditions. Not surprisingly, the evidence is strong that exclusive breastfeeding protects children against infectious diseases, in particular diarrhoea (WHO 2001), still a major killer in all poor societies. So it is important when the current PFBDG are evaluated that the need to reinforce the message about the importance of exclusive breastfeeding should be considered. Recent findings on the reduced risk of mother to child transmission of HIV when breastfeeding is

exclusive also support the need to have a strong message on this point (WHO 2006).

For children more than 6 months of age, the PFBDG have opted for simple messages which can be easily followed by the families. For children aged 6–12 months, the guidelines rightly recommend to continue breastfeeding and to give solid foods. However, at this age, nutritional requirements of children are high in relation to energy, and it is important also to stress the need for nutrient rich foods (Dewey & Brown 2003). Animal source foods that are particularly rich in iron and zinc should be included in the diet from this age. There may be a need to be more specific on this point in the proposed PFBDG. For children aged 1–7 years, the guidelines recommend that the child enjoys a large variety of foods. It is recommended that children eat plenty of fruit and vegetables, which is important for providing some minerals and vitamins. The need for animal source foods, and especially of milk, is also rightly mentioned. Quantities are not mentioned, although some families may underestimate what is really needed. Families will undoubtedly comply with the recommendation of making starchy foods the basis of children's main meal: presumably families with a low income already do that, as cereals represent the less expensive source of energy. Stressing the need for regular activity is highly relevant with the occurrence of overweight and obesity becoming a major concern in South Africa (Armstrong *et al.* 2006).

There is some merit in opting for simple messages that families can easily remember. However, there is a concomitant risk of oversimplifying a problem that in reality is complex. Arguably, some children getting diets complying with the present PFBDG will not get enough micronutrients, especially in the age range 6–12 months. Only surveys carried out after these guidelines are implemented will be able to say if these PFBDG are adequate and ensure a satisfactory nutrient intake, or that they are too complicated, and cannot be remembered by families or implemented, or too simplified, and leave many children eating diets which are still missing in micronutrients.

Developing food-based guidelines is a real challenge, especially in young children, during the

complementary feeding. The work described in this issue of *Maternal and Child Nutrition* is a first step in the right direction. The task, however, is not finished. These guidelines should be implemented and evaluated, not only in terms of applicability, but also for their ability to ensure an adequate intake in all nutrients needed by children and their long-term health outcomes. This may be the beginning of a long process that will gradually lead to the objective of ensuring that all children in South Africa get an adequate diet that will provide all nutrients needed for optimal growth and development.

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References

- Armstrong M.E., Lambert M.I., Sharwood K.A. & Lambert E.V. (2006) Obesity and overweight in South African primary school children – the Health of the Nation Study. *South African Medical Journal* **96**, 439–444.
- Briend A., Darmon N., Ferguson E. & Erhardt J.G. (2003) Linear programming: a mathematical tool for analyzing and optimizing children's diets during the complementary feeding period. *Journal of Pediatric Gastroenterology and Nutrition* **36**, 12–22.
- Dewey K.G. & Brown K.H. (2003) Update on technical issues concerning complementary feeding of young children in developing countries and implications for intervention programs. *Food and Nutrition Bulletin* **24**, 5–28.
- Eaton S.B. & Konner M. (1985) Paleolithic nutrition. A consideration of its nature and current implications. *The New England Journal of Medicine* **312**, 283–289.
- Fomon S. (2001) Infant feeding in the 20th century: formula and beikost. *The Journal of Nutrition* **131**, 409S–420S.
- Murphy S.P., Barr S.I. & Poos M.I. (2002) Using the new dietary reference intakes to assess diets: a map to the maze. *Nutrition Reviews* **60**, 267–275.
- WHO/FAO (2004) *Vitamin and Mineral Requirements in Human Nutrition*, 2nd edn. WHO/FAO: Geneva.
- WHO (1998) *Complementary Feeding of Young Children in Developing Countries: A Review of Current Scientific Knowledge*. World Health Organization: Geneva. Available at: http://www.who.int/child-adolescent-health/publications/NUTRITION/WHO_NUT_98.1.htm
- WHO (2001) *The Optimal Duration of Exclusive Breast-feeding. Report of an Expert Consultation*. World Health Organization: Geneva. Available at: http://www.who.int/child-adolescent-health/New_Publications/NUTRITION/WHO_CAH_01_24.pdf
- WHO (2003) *Guiding Principles for Complementary Feeding of the Breastfed Child*. World Health Organization: Geneva. Available at: http://www.who.int/child-adolescent-health/New_Publications/NUTRITION/guiding_principles.pdf
- WHO (2004) *Guiding Principles for Feeding Non-breastfed Children 6–24 Months of Age*. World Health Organization: Geneva. Available at: http://www.who.int/child-adolescent-health/New_Publications/NUTRITION/ISBN_92_4_159343_1.pdf
- WHO (2006) *HIV and Infant Feeding Technical Consultation Held on behalf of the Inter-agency Task Team (IATT) on Prevention of HIV Infections in Pregnant Women, Mothers and their Infants*, Geneva, Switzerland, October 25–27, 2006. Consensus Statement. World Health Organization: Geneva. Available at: http://www.who.int/child-adolescent-health/New_Publications/NUTRITION/consensus_statement.pdf