

# Improving Young Child Feeding in Eastern and Southern Africa

## Household-Level Food Technology

Proceedings of a workshop  
held in Nairobi, Kenya,  
12-16 October 1987

Proceedings



The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in six sectors: agriculture, food, and nutrition sciences; health sciences; information sciences; social sciences; earth and engineering sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are located in Africa, Asia, Latin America, and the Middle East.

*Il existe également une édition française de cette publication.*

28523

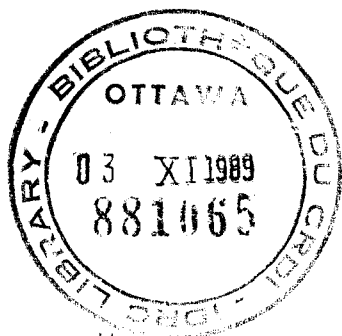
IDRC-265e

# Improving Young Child Feeding in Eastern and Southern Africa

## Household-Level Food Technology

Proceedings of a workshop  
held in Nairobi, Kenya,  
12-16 October 1987

Editors: D. Alnwick, S. Moses,  
and O.G. Schmidt



*Cosponsored by  
the International Development Research Centre,  
the United Nations Children's Fund, and the  
Swedish International Development Authority*

ARCHIVE  
MOSES  
AD. IE

© International Development Research Centre 1988  
P.O. Box 8500, Ottawa, Ont., Canada K1G 3H9

Alnwick, D.,  
Moses, S.,  
Schmidt, O.G.,  
IDRC. Regional Office for Eastern and Southern Africa, Nairobi KE  
UNICEF, New York, N.Y. US  
Swedish International Development Authority, Stockholm SE

Improving young child feeding in eastern and southern Africa :  
household-level food technology; proceedings of a workshop held in  
Nairobi, Kenya, 11-16 October 1987. Ottawa, Ont., IDRC, 1988. xxi +  
380 p. : ill. (Proceedings series/ IDRC)

/Feeding/, /weaning foods/, /infants/, /food technology/,  
/household/, /East Africa/, /Southern Africa/ - /diet/, /nutritive  
value/, /risk/, /malnutrition/, /food preparation/, /food hygiene/,  
/breast feeding/, /traditional culture/, /fermentation/, /cereals/,  
/conference reports/, /recommendations/.

UDC: 613.22(6)

ISBN: 0-88936-516-4

A microfiche edition is available.

The views expressed in this publication are those of the authors and  
do not necessarily reflect those of the sponsoring organizations.  
Mention of proprietary names does not constitute endorsement of the  
product and is given only for information.

## **Abstract**

The weaning period, that is the period in a young child's life when supplementary foods are introduced to complement breast milk, poses great nutritional risk to children in developing countries. By the end of the second year of life, one-third of children in eastern and southern Africa are chronically malnourished. The following factors contribute to the growth faltering commonly observed in weaning-age children: low nutrient intake, high incidence of diarrheal disease (often caused by contaminated weaning foods), and recent declines in duration and intensity of breastfeeding.

Food scientists, nutritionists, and health planners working in Africa and South Asia met in an international workshop to examine household-level food technologies that hold promise for improving nutrition of infants and young children. After reviewing current knowledge of breastfeeding and weaning practices in eastern and southern Africa, participants discussed the use in weaning diets of fermented foods and germinated flour, for both improved nutrient intake by young children and decreased risk of food contamination. Research that should be conducted into the effectiveness of the food technology was identified and its diffusion at the community level discussed.

This publication contains the proceedings, conclusions, and recommendations of the workshop. It is directed at scientists and health planners who are involved in nutrition research and developing programs to improve feeding of infants and young children in developing countries.

## **Résumé**

Le sevrage, c'est-à-dire la période où l'on commence à donner des aliments solides à un jeune enfant en complément du lait maternel, présente de graves risques nutritionnels pour les enfants dans les pays en développement. Dès la fin de leur deuxième année, le tiers des enfants en Afrique orientale et australe souffrent de malnutrition chronique. Les facteurs suivants sont à l'origine du retard de croissance que l'on retrouve couramment chez les enfants en âge d'être sevrés : carence nutritionnelle, forte prévalence des maladies diarrhéiques (qui s'expliquent souvent par la contamination des aliments) et diminution récente de la durée et de l'intensité de l'allaitement maternel.

Des spécialistes des sciences de l'alimentation, des nutritionnistes et des planificateurs de la santé travaillant en Afrique et en Asie du Sud se sont réunis dans le cadre d'un atelier international afin d'examiner des technologies alimentaires applicables au niveau des ménages qui semblent prometteuses pour améliorer la nutrition des nourrissons et des jeunes enfants. Après avoir examiné les connaissances actuelles en matière d'allaitement au sein et les pratiques de sevrage en Afrique orientale et australe, les participants ont discuté de l'utilisation, au cours du sevrage, d'aliments fermentés et de farine germée, tant pour améliorer l'apport nutritionnel chez les jeunes enfants que pour diminuer les risques de contamination des aliments. Ils ont également discuté des recherches qu'il y aurait lieu d'entreprendre sur l'efficacité des technologies alimentaires et sur leur diffusion dans la collectivité.

Cette publication fait un compte rendu des discussions de l'atelier et présente ses conclusions et ses recommandations. Elle s'adresse aux scientifiques et aux planificateurs de la santé qui participent à des recherches en matière de nutrition et à l'élaboration de programmes visant à améliorer l'alimentation des nourrissons et des jeunes enfants dans les pays en développement.

### Resumen

El período de destete, es decir, aquel período en la vida de un niño en que se introducen en su dieta alimentos suplementarios para complementar la leche materna, representa un gran riesgo nutricional para los niños de países en vías de desarrollo. Hacia el final de su segundo año de vida, un tercio de los niños en África oriental y del sur muestran señales de malnutrición crónica. Los siguientes factores contribuyen al crecimiento vacilante que se observa comúnmente en los niños que se encuentran en edad de dejar la lactancia materna: baja ingestión de nutrientes, alta incidencia de diarrea (a menudo causada por alimentos para el destete contaminados), y nuevas disminuciones en la duración e intensidad de la alimentación proveniente del pecho de la madre.

Científicos del campo de los alimentos, especialistas en nutrición y planificadores de la salud que trabajan en África y en el Sur de Asia se reunieron en un taller internacional para examinar las tecnologías de alimentos que se utilizan en el hogar y que prometen buenos resultados en el mejoramiento de la nutrición de lactantes y niños pequeños. Después de analizar el conocimiento que existe actualmente sobre la alimentación recibida a través del pecho de la madre y las prácticas que se utilizan para el destete en el oriente y sur de África, los participantes discutieron el uso en dietas para el destete de alimentos fermentados y harina germinada para que los niños puedan ingerir nutrientes mejorados y haya una disminución en el riesgo causado por la contaminación de los alimentos. Se identificó la investigación que se debe realizar sobre la efectividad de las tecnologías de alimentos y se discutió su difusión en el seno de la comunidad.

Esta publicación contiene las actas, conclusiones y recomendaciones del taller. Está dirigida a científicos y planificadores de la salud que participan en la investigación nutricional y en programas de desarrollo para mejorar la alimentación de lactantes y niños en los países en desarrollo.

## CONTENTS

Preface	viii
Foreword	ix
Acknowledgments	xi
Executive Summary	xiii
Session I Issues in Improving Child Feeding	1
Do we now have some real solutions for young child malnutrition? <b>T. Greiner</b>	2
Breastfeeding: a neglected household-level weaning-food resource <b>J. Bradley, S. Baldwin, H. Armstrong</b>	7
The complementary foods problem <b>T. Greiner</b>	34
Sorghum and millets in East Africa with reference to their use in weaning foods <b>M. Seenappa</b>	39
Weaning food provision in refugee situations <b>N.J. Binkin,     P. Nieburg, M.K. Serdula, A. Berry</b>	55
Discussion summary	65
Session II Weaning Practices and Promoting Change	69
Traditional weaning practices in Ethiopia <b>G. Abate,     C. Yohannes</b>	70
Weaning foods in Kenya: traditions and trends <b>R. Oniang'o, D.J. Alnwick</b>	76
Food processing in Uganda with special reference to infant feeding <b>L. Sserunjogi</b>	81
Weaning foods in Rwanda and the potential of sprouted sorghum <b>M. Ramakavelo</b>	90
Observations on child growth and weaning in Zimbabwe <b>J.R. Mutumba</b>	97
Use of fermented foods in child feeding in Botswana <b>C. Mkwena</b>	101
Weaning practices in Swaziland and social marketing to effect change <b>J.M. Aphane, L.K. Nilsson</b>	105

A strategy to improve weaning practices in Mozambique <b>A. Lechtig, A. Srivastava</b>	113
Reintroducing traditional weaning foods: social marketing considerations <b>L. Hendrata</b>	128
Discussion summary	131
 Session III Fermented Foods in Child Feeding	 135
Fermented foods for improving child feeding in eastern and southern Africa: a review <b>A. Tomkins, D. Alnwick, P. Haggerty</b>	136
Fermented "ugi" as a nutritionally sound weaning food <b>S.K. Mbugua</b>	168
Fermentation of maize-based "mahewu" <b>A.D. Ayebo, M.P. Mutasa</b>	174
Consumption of weaning foods from fermented cereals in Kwara State, Nigeria <b>K.H. Brown, K.L. Dickin, M.E. Bentley, G.A. Oni, V.T. Obasaju, S.A. Esrey, S. Mebrahtu, I. Alade, R.Y. Stallings</b>	181
Fermentation of cereal- and legume-based weaning foods <b>M.M. Keregero, R.L.N. Kurwijila</b>	198
Reducing dietary bulk in cassava-based weaning foods by fermentation <b>N.L.V. Mlingi</b>	209
Fermented cassava products in Tanzania <b>M. Hakimjee, S. Lindgren</b>	220
Discussion summary	229
 Session IV Food Contamination and Lactic Fermentation	 233
Weaning food hygiene in Kiambu, Kenya <b>A.M. Pertet, E. Van Praag, S.N. Kinoti, P. Waiyaki</b>	234
Fecal contamination of weaning foods in Zimbabwe <b>C. Simango</b>	240
Formulation and microbiological safety of cereal-based weaning foods <b>M.J.R. Nout, J.G.A.J. Hautvast, F. van der Haar, W.E.W. Marks, F.M. Rombouts</b>	245
Bacteriological properties of traditional sour porridges in Lesotho <b>A.L. Sakoane, A. Walsh</b>	261
Discussion summary	266



Session V Experiences in East Africa and Asia	271
Dietary bulk in weaning foods and its effect on food and energy intake U. <b>Svanberg</b>	272
High-nutrient density weaning foods from germinated cereals A.C. <b>Mosha</b> , W.S.M. <b>Lorri</b>	288
Child feeding patterns in Tanzania with reference to feeding frequency and dietary bulk Z. <b>Lukmanji</b> , B. <b>Ljungqvist</b> , F. <b>Hedqvist</b> , C. <b>Elisonguo</b>	300
Effect of food consistency on nutrient intake in young children R.P. <b>Kingamkono</b>	312
High-energy, low-bulk weaning food development in Zambia F. <b>Luhila</b> , P. <b>Chipulu</b>	322
Bulk reduction of traditional weaning gruels T. <b>Gopaldas</b> , P. <b>Mehta</b> , C. <b>John</b>	330
Malted weaning foods in India N.G. <b>Malleshi</b> , B.L. <b>Anla</b>	340
Weaning foods in Nepal Y. <b>Vaidya</b>	349
Cyanide content of germinated cereals and influence of processing techniques L.O. <b>Dada</b> , D.A.V. <b>Dendy</b>	359
Improved iron availability in weaning foods U. <b>Svanberg</b> , A.S. <b>Sandberg</b>	366
Discussion summary	374
Participants	377

## BREASTFEEDING: A NEGLECTED HOUSEHOLD-LEVEL WEANING-FOOD RESOURCE

Janet Bradley, Sandy Baldwin, and Helen Armstrong

International Baby Food Action Network Africa  
P.O. Box 34308, Nairobi, Kenya

**Abstract** Continued breastfeeding can make a significant contribution to child health and nutrition from 6 to 24 months of age, a period in which there is major risk of recurrent illness and malnutrition. Breastfeeding during the weaning period has, however, been largely neglected in research, in national statistics, and in nutrition programs, all of which often assume that breastfeeding will stop at 12 months or sooner. Three patterns of breastfeeding - exclusive, substantial, and token - are described here. Health planners are urged to set specific objectives for breastfeeding programs, and researchers are encouraged to determine breastfeeding patterns and actual breast milk intakes. The scattered data from the eastern and southern African region are presented on second-year breastfeeding prevalence and milk volumes. Breast milk contributes significantly to toddlers' intake of energy, protein, iron, vitamins A and C, and calcium. It offers protection against illness and therapy in diarrhea and provides an acceptable food for the anorexic child. Prolonged breastfeeding may also contribute both to fertility regulation and to an enhancement of the child's emotional development. A discussion of problematic current practices accompanies 13 recommendations for effective promotion, support, and protection of breastfeeding in the 2nd year.

Breast milk can contribute significantly to the nutrition and health of children, not only after birth, but during the entire weaning period. Although the importance of breast milk for the newborn is widely recognized, breastfeeding from 12 to 24 months is too often disregarded or seen as relatively unimportant - an expression of love, but not a source of nourishment or protection.

For children in industrialized countries who are, on the whole, adequately nourished - eating a full range of foods at family meals and living in a relatively hygienic environment - continued intake of breast milk may not be vital to survival and development. For children in the developing world, however, the period from 6 to 24 months of life is one of major risks - often one of hunger and of recurrent illnesses that have serious cumulative effects.

What contribution can breastfeeding make to child survival and development in such conditions? We suggest that the contribution that breast milk makes after 6 months and, indeed, in the 2nd and 3rd years of life, has been undervalued. As a consequence, the practice of breastfeeding has been neglected in research, in national statistics, and in practical nutrition programs. A continuous decline in breastfeeding practice is too often accepted as an inevitable concomitant of development, so that this national food resource is discounted in planning. Yet it is vital that breastfeeding be promoted and protected throughout every child's 2nd year of life, along with other weaning foods essential to adequate growth and health. In this paper, we assess the contribution to health that can be made by a daily reliable intake of breast milk during the 2nd year of life.

Initially a trend in industrialized countries, breastfeeding has also declined in the developing world, especially among the urbanized or more educated populations; this decline has been widely documented (WHO 1981). Ironically, in industrialized countries, breastfeeding rates have now been rising steadily over the last 30 years, especially among educated women. In other words, while figures for breastfeeding are rising for the world's most privileged children, these figures are falling among the disadvantaged, for whom breastfeeding could make a life-or-death difference.

Many countries in Africa have high breastfeeding initiation rates (90-100%), yet public health statistics reveal numerous problems of morbidity and mortality related to poor feeding of infants and young children; this suggests that, despite good statistics for starting,

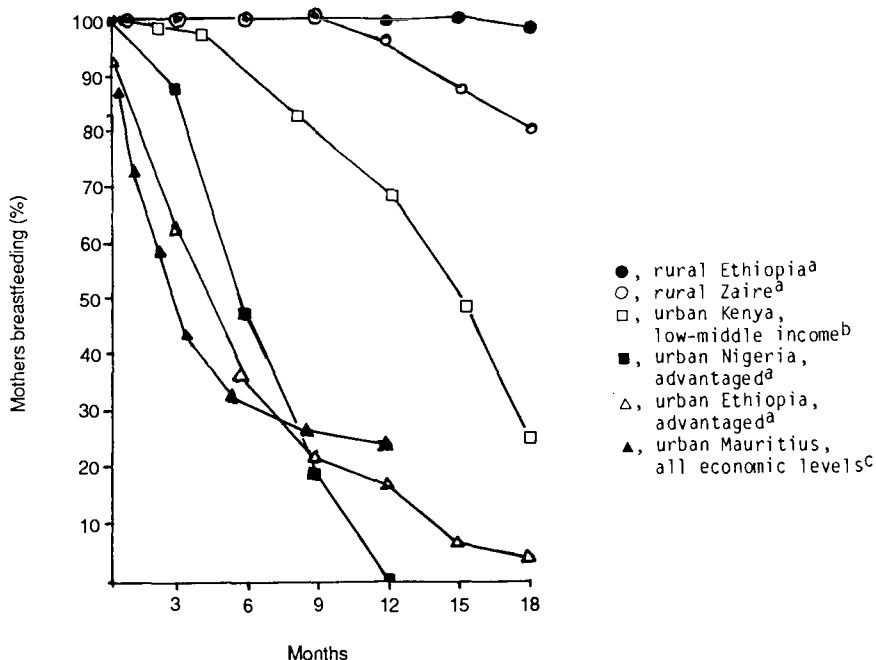


Fig.1. Breastfeeding initiation and duration. (<sup>a</sup>WHO 1981; <sup>b</sup>Winiakoff et al. 1983; <sup>c</sup>Rajcoomar and Wong 1986.)

the duration of breastfeeding is often abbreviated (Fig. 1). More commonly in our region, the pattern of breastfeeding may be inadequate: a mother may say "yes" to the query "Are you breastfeeding?" whereas the child's actual intake of breast milk is negligible because the breastfeeding is sporadic.

### Definitions

To say without clarification that a mother is "breastfeeding" is to make a statement of little significance, given the confusion that has arisen over the extremely varied use of the term. Sometimes it is taken to denote giving only the breast and nothing else. At the other extreme, the same word is used to mean any contact at all of baby and breast, regardless of frequency, length of feeds, effectiveness of sucking and of the milk ejection reflex, or any other consideration. Some researchers still put into a "breastfed" category those babies who receive bottle supplements from the 1st day (Feinstein et al. 1986), those who receive these supplements for no more than 25% of their feeds (Winikoff and Myers 1987), or those who were taken off the breast completely as early as 2 weeks of age (Gulick 1986). It is not surprising, then, that some studies reveal virtually no difference in nutritional or immunological status between the "breastfed" and the "not breastfed" groups. We propose that, in this discussion of the topic, three breastfeeding patterns be distinguished: exclusive, substantial, and token.

Exclusive breastfeeding means giving the breast in response to all the child's needs for food, drink, sucking, and perhaps comfort or soothing. Exclusive breastfeeding means that no other food or water or milk is given. It is usually practiced "on demand." The exclusively breastfed child will probably spend at least 1 h out of every 24 in sucking at the breast. The characteristic rhythm is one of frequent breast feeds, usually 10 or more in 24 h, either of long or short duration, with no very long intervals between. This has also been described as "unrestricted breastfeeding" by Newton (1971) and by Lawrence (1985).

Although the terms "partial breastfeeding" or "mixed breast and bottle feeding" are often used by researchers, it is important to distinguish between two breastfeeding patterns: substantial and token.

Substantial breastfeeding involves giving the breast in response to the child's needs, while allowing for the provision of food or drink supplements. The substantially breastfed baby of any age is still likely to show a rhythm of breastfeeding many times in a day and perhaps at night, still sucking for at least 1 h. With substantial breastfeeding, however, a long interval is common, either at night or during the mother's absence at work.

Token breastfeeding means limiting in frequency or duration the baby's time at the breast. If a mother is told to feed only on a timetable, to take the baby off the breast after a fixed number of minutes, and to keep the baby at some distance and not respond to its cries, then token breastfeeding occurs even before the introduction of other foods or drinks. In urban Africa, early use of supplements usually accompanies a token breastfeeding pattern. Disturbances in the mother-child bond, for whatever reason, may also promote such a

pattern. Token breastfeeding in the first few months is negatively correlated with breastfeeding duration (Savage 1983; Lawrence 1985).

During the 2nd and 3rd years, as the intake of other foods increases, the breastfeeding child may gradually lose interest in active breastfeeding; a slow diminution from substantial to token breastfeeding is a natural part of the weaning process. The pattern of perhaps three breast feeds in 24 h (usually those hours associated with sleep) still has value for both child and mother, especially as it allows for a reestablishment of substantial breastfeeding whenever the child is ill.

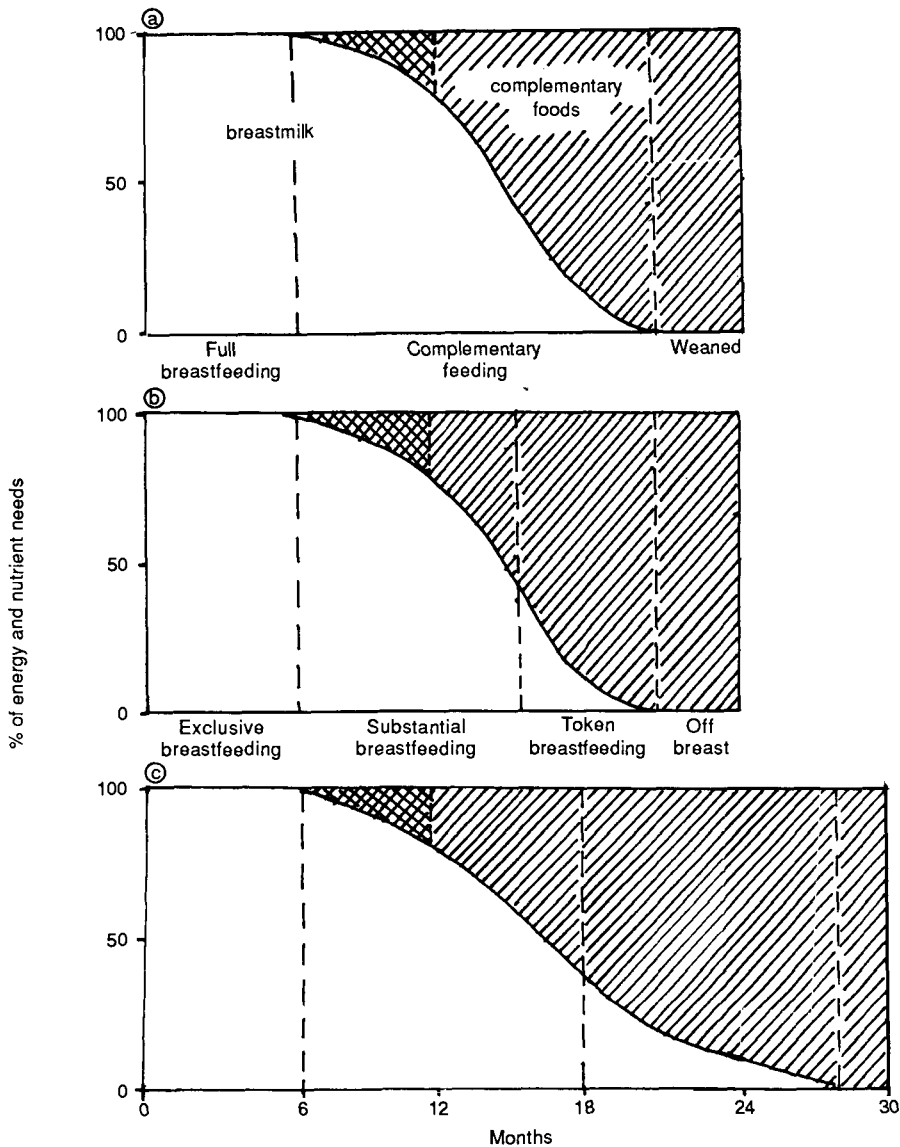
The term "weaning" is also imprecise. It can mean "to add other foods to the baby's diet." It can also mean "to stop the baby from breastfeeding." Because nutritionists now emphasize continued substantial breastfeeding after the introduction of other foods, it may be unwise to use the ambiguous word "weaning." The French "sevrage" and the Kiswahili "kuachisha" have the same unfortunate implication - that the child is to be cut off or urged away from the breast. All these words suggest that the other foods are added as substitutes for breast milk, not as additions to it. We would define the term "weaning" as "the addition of other foods to mother's milk." The period during which this takes place is the "weaning interval."

Hofvander and Underwood (1987) suggest a diagram to represent all stages of the process: first, full or exclusive breastfeeding; a weaning interval, with complementary feeding; and cessation of breastfeeding (Fig. 2a). We suggest a further division, to distinguish between substantial breastfeeding and the token pattern (Fig. 2b). Unless, however, months are stipulated on the time axis, such diagrams are of little use in planning health education and other programs (Fig. 2c). Discussing the ideal timing of these different stages will help national planners to define needs and programs objectives. We have failed thus far either to set these objectives or to explain clearly what breastfeeding patterns are recommended at 12, 18, and 24 months; this explains, in part, why breastfeeding promotion has been ineffective.

There are two periods in particular that we may need to consider. Early in the weaning interval, we need to ensure that other foods are not substituted for breast milk. At some later stage, we need to ensure that a mother does not give a breast feed in place of a meal of other foods.

### **Breastfeeding Practices in Eastern and Southern Africa**

What proportion of women in Africa breastfeed substantially, from the introduction of other foods (ideally by 6 months of age) right through the 2nd year? The length of this weaning interval is occasionally measured, but actual documentation is difficult to find. Most tabulations, including those of the United Nations Children's Fund (UNICEF) and the World Health Organization (WHO), stop at 12 months. Yet the majority of babies in this region are likely to be breastfeeding well into the 2nd year, considering that 75-95% of them are still breastfeeding at 12 months (WHO 1982; Kenya 1983; UNICEF 1987). National surveys in Botswana (1985) and Swaziland (1983) gave values of 74 and 58%, respectively. Where data have been collected



**Fig. 2. Stages in the breastfeeding period: (a) Hofvander and Underwood's (1987) diagram, (b) three breastfeeding patterns, and (c) a possible program objective.**

for our region on the 2nd and 3rd years, they should be viewed with some caution. The methodologies of the various studies, including sample selection, have varied greatly. Figure 3 attempts to bring together some available statistics. In Botswana, Ethiopia, Kenya, Swaziland, and Zaire, most women are still breastfeeding in the middle of the child's 2nd year. In Ethiopia, more than 75% of mothers, even among the urban poor, are breastfeeding when the child reaches 2 years of age, in rural Zaire, 60% are doing so. In Kenya, Oniang'o (1986)

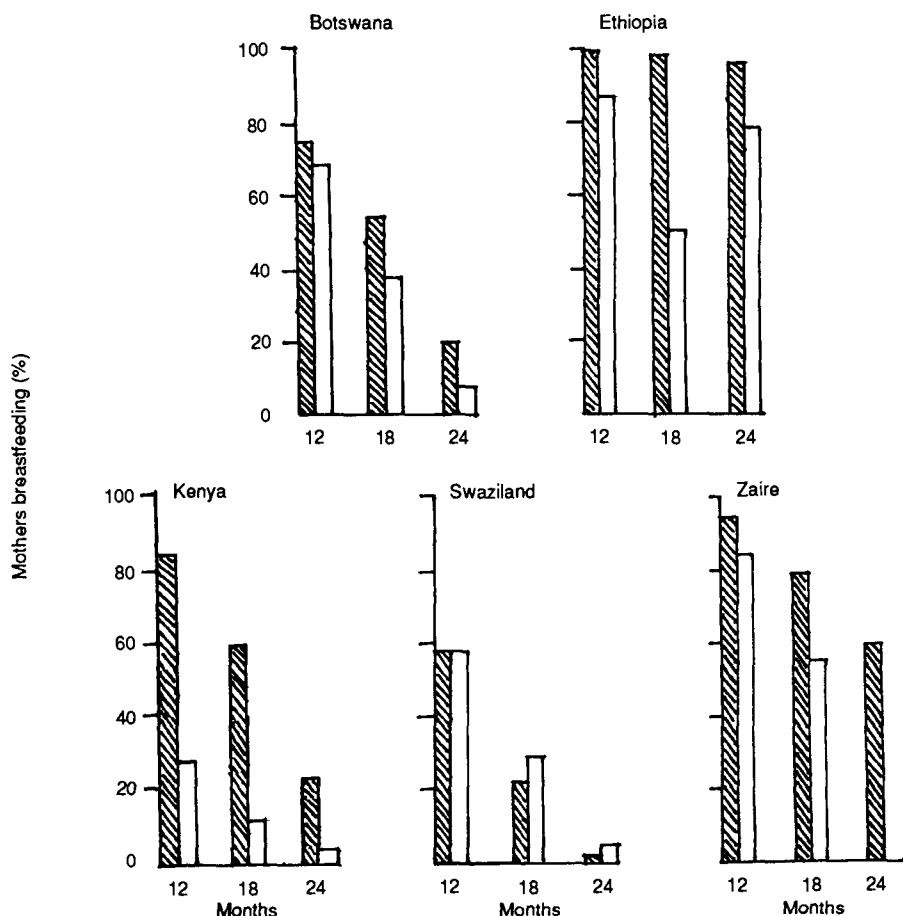


Fig. 3. Mothers breastfeeding in Botswana (Botswana 1984), Ethiopia (WHO 1981; Wolde-Gebriel 1981), Kenya (Kenya 1978/79, 1983), Swaziland (Swaziland 1983), and Zaire (Vis et al. 1981; WHO 1982). □, urban poor; ▨, rural.

found that 17% of rural women had breastfed a child in the past 3 years.

Demographers have projected that by the year 2000, a burgeoning percentage of Africa's population will be living in cities (Anyanwu and Enwonwu 1985). Will urbanization necessarily spell the end of prolonged breastfeeding? In Nigeria, there is a dramatic contrast between rural areas, with more than 90% of mothers breastfeeding at 16 months (WHO 1981), and the Lagos suburb where among middle- and low-income women only 25% were breastfeeding at 1 year (Anyanwu and Enwonwu 1985).

Khan's (1980) work in Bangladesh suggests, however, that urbanization need not lead to early cessation of breastfeeding. High rates were found among most poor women of urban Dhaka who were breastfeeding for long durations - 90% at 1 year, 63% at 2 years, and 15% at 3 years. Lactation of such long duration does not take place

because of any physical anomaly in the women of Bangladesh or because of unusually good diets; it arises from culturally determined child-rearing practices. Were their breastfeeding behaviour to change appropriately, mothers who have practiced token breastfeeding would be able to lactate just as long as the Bangladesh women.

### Breast Milk Volumes

Unfortunately, in investigating the intensity of breastfeeding in the 2nd year, most studies to date have gone no further than the simplest inquiry, "Are you breastfeeding, yes or no?" Vis et al. (1981), in a more detailed study in Kivu, Zaire, determined the number of breast feeds in 24 h, and measured 24-h volumes for 245 mothers. They found a remarkable consistency in the number of breast feeds - 12-14 per day through the first 2 years - and consequent high average milk yields throughout the period (Fig. 4).

By plotting day and night feedings separately for rural Machakos, Kenya, van Steenberg et al. (1984) showed that for very actively employed farming women, night feeds outnumbered daytime feeds from 5 months onward. Night feeds contributed more breast milk than daytime feeds to the Machakos children from 5 months to 21 months (Fig. 4). Both Vis and van Steenberg also noted seasonal variations in milk output. In the harvest season, breast milk output was higher and correlated in Machakos with increased frequency and length of feeds, and with more minutes of sucking per day.

Vis et al. (1981) showed that, because of the continuing pattern of substantial breastfeeding among the rural mothers of Zaire, average yields of breast milk declined very little, from 517 g/day at 1 month to 473 g/day at 24 months. Becroft (1967), in a study in New Guinea, found women with 2-year-olds producing 560 mL/day. In a study in Bangladesh, it was found that children of 12-17 months were receiving almost 600 mL of breast milk per day (Roy et al. 1984).

It is often claimed that poorly nourished women cannot breast-feed. Studies have shown, however, that such mothers can produce up to 700 mL/day during the first 6 months and 300-500 mL in the 2nd year (Jelliffe and Jelliffe 1978). In the lean preharvest season in Machakos, van Steenberg et al. (1984) found levels of breast milk averaging 405 mL/day for infants of 12-17 months. Similarly, Whitehead (1985) found that 400-500 mL/day was being produced by Gambian "marginally nourished mothers" of infants of 18 months. At a time when there may be little else available to eat, breast milk is proving an irreplaceable source of nourishment, especially created for the most vulnerable family member - the child of 2 years or less.

Mothers can supply breast milk to their children for long periods without themselves suffering nutritionally. In Côte d'Ivoire, rural mothers, breastfeeding for 23 months on a diet composed mainly of yam, plantain, and cassava, showed no variation in weight throughout the period, leading Lauber and Reinhardt (1979) to remark: "These findings support the assumption that prolonged lactation has no unfavourable effect on the nutritional status of the mother." Nevertheless, the increased nutritional needs of lactating women, which surpass those of pregnant women, must not be forgotten when setting national nutritional policies.



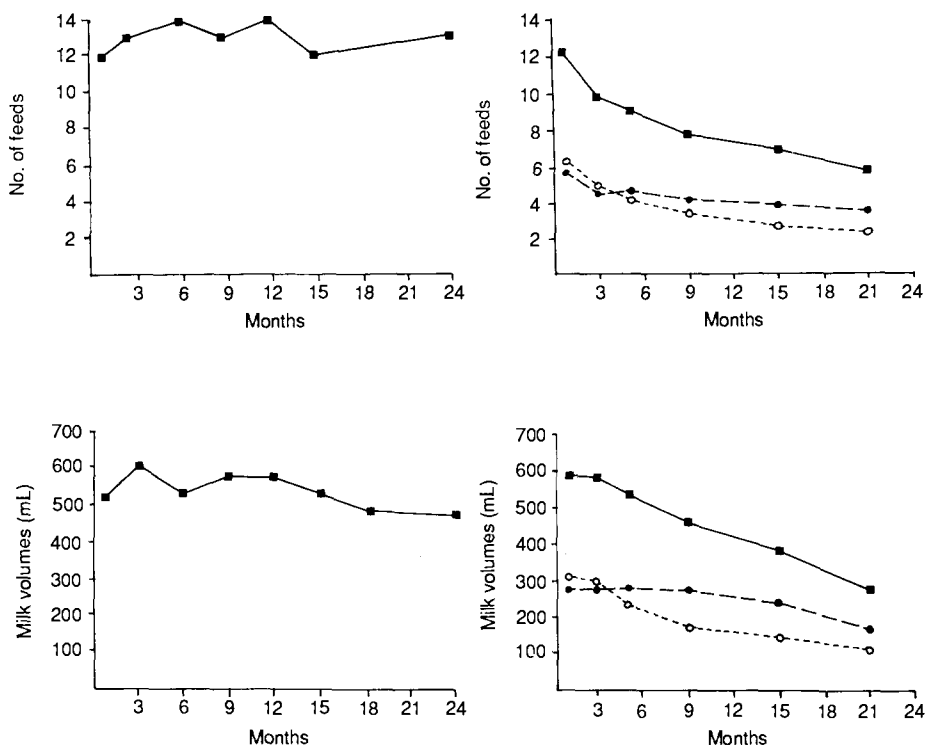


Fig. 4. Total number of breast feeds and milk volumes in 24 h in rural Zaire, left (adapted from Vis et al. 1981), and rural Kenya, right (adapted from van Steenberg et al. 1984): ●, night; ○, day; ■, total.

### Nutritional Importance of Breast Milk

Perhaps because so much of the research has been done in populations with abbreviated breastfeeding durations, breast milk seems not to have been perceived as an essential component of the diet past 6 months. Phrases such as "non-nutritional sucking" (Bowlby 1969) are misleading: in an established breastfeeding relationship, milk flows whenever the child sucks, and even an intake of 100 mL/day has nutritive value.

It is often remarked by health workers, trained in a system that discounts the nutritional value of breast milk after 6 months, that by the 2nd year the milk must be "thin," "weak," or otherwise changed in composition. This error in thinking may arise from the use of inaccurate training materials, which say that breast milk becomes "inadequate" after 6 months: the materials do not explain that this "inadequacy" applies only to quantity and not to the quality of the

milk, which remains excellent. Helsing and King (1982) urge that this widespread error be corrected:

It is of vital importance to understand and to teach others clearly that because an infant needs a supplement... it does not mean that the amount of milk produced by the breast has decreased and it does not mean that there is anything wrong with breastmilk, and it does not mean that breastfeeding should stop. It means that the amount of milk that can be produced has reached its upper limit and will not increase any more... The volume of milk will remain the same for a long time, provided the child is put to the breast as often as before... The quality of the milk is still excellent, and it continues to be the most important part of the baby's diet. Breast milk also continues to be the most important source of good-quality protein, vitamins, and other nutrients. All that the child needs is some extra energy and protein.

### Energy Value

A study of Ugandan children up to 36 months (Rutishauser 1974) examined factors influencing low energy intake. These included poor appetite, high levels of infection, consumption of foods of low energy concentration, infrequency of feeding, and lowered breastfeeding prevalence. An attempt was made, using traditional weaning foods, to increase the frequency of feeding; this, however, proved fruitless. The bulkiness and the very low energy value of the traditional foods meant that no overall increase in the daily energy intake was possible using these foods. Although high-energy weaning foods were clearly called for, it was shown that breast milk, at 70 kcal/100 mL, has twice the energy density of the weaning porridges common in this region. Rutishauser concluded that this high-energy breast milk was essential to good growth.

A significant difference in energy consumption was found during the 2nd year of life between breastfed and nonbreastfed children. Breastfed children aged 13-18 months received 25% more energy than those who were not breastfed. Among older children, the consumption of energy was 17% higher for those who were breastfed than for those who were not. Rutishauser also found that even after breastfeeding had stopped, and the intake of other food had increased by 60%, this was insufficient to make up for the energy previously supplied by breast milk, leaving the nonbreastfed child with an energy deficit of 28% (Table 1).

A similar relationship between energy intake and continued breastfeeding was found in Machakos, Kenya, particularly from the ages of 18-23 months (van Steenberg 1981). Those infants who were breastfeeding had 108% of recommended daily calorie intake (RI), compared with 84% of RI in the nonbreastfed group. Other variables did not show any definite association with the child's energy intake: those variables included source of major foods consumed (whether purchased or home produced), size of household, sex of child, presence or absence of father, marital status of mother, and percentage of time spent at home. On the other hand, there was clearly a relationship between energy intake and breastfeeding. This study also found that

**Table 1. Energy intake (%) of children breastfeeding or not breastfeeding in 2nd year.**

	Breastfeeding	Not breastfeeding
Breast milk	53	-
Cow's milk	5	13
Sugar and cereals	7	14
Staples	20	26
Other foods	15	19
<b>Energy deficit</b>	-	28

Source: Rutishauser (1974).

breast milk could provide almost 50% of caloric RI for infants of 7-18 months, and more than 10% of RI for infants of 19-36 months (van Steenberg et al. 1984).

According to Behar (1986), "particular attention should be given to proteins, iron, and vitamins A and C, nutrients that are frequently found to be deficient in the diet of young infants." Continued breastfeeding provides important amounts of all these critical nutrients. Using figures for recommended intake from Cameron and Hofvander (1983), we find that a child of 1-2 years would receive the following percentages of his or her needs from 500 mL of breast milk: energy, 31; protein, 38; vitamin A, 100; vitamin C, 95; calcium, 44.

### **Protein**

There is some variation in protein levels in breast milk from one time of day to another, from the beginning of a feed to the end of the feed, and from one mother to another. Perhaps the most dramatic change appears in the reduction, as breastfeeding progresses, of the high protein levels in colostrum. An approximate protein figure that has been widely used is 1.07 g/100 mL (Cameron and Hofvander 1983). It should be noted that the protein in breast milk is considered a reference protein; few other dietary sources are so well absorbed (Helsing and King 1982).

Studies of protein in extended lactation are few, but researchers in Côte d'Ivoire found that, after an initial drop from higher levels, a fairly steady level was reached at 0.96 g/100 mL over 23 months of breastfeeding. This level was comparable to that found in studies carried out in Ethiopia, Nigeria, and Zaire; Lauber and Reinhardt (1979) concluded that composition both in proteins and in lipids "remained virtually constant over 23 months of lactation."

In examining Ugandan breastfed children receiving supplementary foods, Rutishauser and Whitehead (1972) found a mean daily protein intake of 2.2 g/kg of body weight during the 2nd year. In Machakos, Kenya, children of 13-18 months were taking 2.2 g of protein/kg of body weight from breast milk and from other sources. The protein contributed by breast milk at this age ranged from a mean of 4.25 g/day during the lean season to 5.0 g during the harvest season (van Steenberg 1984).

## Iron

Like other milks, breast milk is not rich in iron. Values for iron in breast milk vary from 0.8 mg/L (Cameron and Hofvander 1983) to 1.0 mg/L (Lawrence 1985) to 2.0 mg/L (Latham 1979). Iron deficiency anemia is rare in young, exclusively breastfed babies. Epidemiological studies have not yet been undertaken, however, to compare anemia rates of substantially breastfed and nonbreastfed children aged 1-2 years in developing countries.

The iron in breast milk is 49% absorbed, a far better absorption than from most other dietary sources (McMillan et al. 1976; Lawrence 1985). It is hypothesized that many elements in human milk, including vitamin C and lactose, enhance iron absorption, and that the folic acid, vitamin E, and copper in breast milk also help to prevent anemia (LLLI 1975).

If we take Latham's figures for iron content, 500 mL of breast milk contains 1 mg of iron. Absorption of 49% of this amount would provide about 50% of the daily requirement of absorbed iron for children of 1-2 years. The usual 10 mg recommended intake presumes that only 10% (i.e., 1 mg) will actually be absorbed.

## Vitamin A

Amounts of vitamin A in breast milk may vary with a mother's intake, and may decrease somewhat with extended lactation (Anon. 1985). Breast milk is nevertheless an excellent source of this vitamin (Berg and Brems 1986). If vitamin A levels in the mother are low, an oral supplement of 200,000 IU every 4-6 months is recommended. A volume of 500 mL of breast milk gives 100% of the daily requirement in the 2nd year of life.

Breast milk protects babies against xerophthalmia, even if maternal vitamin A levels are not optimal. As was stated in Dialogue on Diarrhoea (Anon. 1985): "Even without vitamin A supplementation of the mother, the risk of xerophthalmia for children under two who are not breastfed is nevertheless six to eight times greater than for those receiving breast milk."

If the breastfeeding is substantial and prolonged, then the protection provided by it lasts beyond its cessation. West et al. (1986) showed lower risk of xerophthalmia from ages 2-6 years among children in Malawi who had been exclusively breastfed for longer, and who had had a longer weaning interval. Children presenting with xerophthalmia between 24 and 47 months were more than three times as likely to have stopped breastfeeding before 24 months, compared with children who had no xerophthalmia.

## Vitamin C

A daily volume of 500 mL of breast milk provides 19 mg of vitamin C, 95% of the amount that children need in the 2nd year. Weaning recommendations that ask parents to buy citrus fruits and vitamin C drinks are unnecessary for substantially breastfeeding children. Studies in Finland (Salmenpera 1984) show that vitamin C concentration in breast milk at 12 months is 3.3 times the mother's plasma level. In these studies, exclusively breastfed babies had better vitamin C

levels at 12 months (mean 1.43 mg/100 mL serum) than did babies fed on vitamin C-fortified formula, fruits, and vegetables (mean, 1.02 mg/100 mL). If the mother had a subnormal plasma level of vitamin C (0.6 mg/100 mL), the infant usually had a plasma concentration 6-12 times that of the mother, showing that maternal plasma concentrations had only a marginal effect on infant plasma levels.

Karra et al. (1986) found that vitamin C plasma-milk ratios increased from 1-6 months, and then remained steady through 24 months of lactation. Subjects in the study went from a mean of 5.5 breast feeds/day (substantial breastfeeding) at 7 months to a mean of 1.5 breast feeds/day at 24 months. Vitamin C levels increased in some mothers' milk during the last 2 months of breastfeeding, suggesting that levels of specific nutrients may be affected by the token breastfeeding pattern.

### **The Malnourished Breastfeeding Child**

With all the nutritional benefits of prolonged breastfeeding, why do some studies find an association between long breastfeeding duration and malnutrition? Victora et al. (1984) found in Brazil that children who were breastfed past 12 months showed a higher rate of malnutrition. In Kenya, children breastfed beyond 16 months have also shown higher rates of malnutrition than those off the breast, whereas those who are breastfed up to 15 months have shown an advantage over those not being breastfed (Kenya 1984).

These studies have not, however, collected data on the frequency of breast feeds, on the overall breastfeeding pattern, or on the volume of breast milk taken. They have not looked at the adequacy of other foods given to the child, nor have they corrected for socio-economic and other factors. It may be that women tend to go on breastfeeding when, for economic or other reasons, they have little else to offer their child, so that supplementation is delayed or minimal. A study of the Kenya Central Bureau of Statistics (Kenya 1977) concluded that "breastfeeding itself is not at fault, and makes a positive contribution to the diet."

Johnson and Zeitlin (1984) in Mexico found another possible factor. Mothers distracted by many responsibilities would reach a point of impatience with breastfeeding and with any other feeding that required their personal attention. In some cases, the mother would bond preferentially with one child and neglect another. Under these circumstances, only those children who were able to feed themselves would get enough to eat, and those still depending on the breast would receive only token feeds.

### **Breast Milk and Illness**

#### **Protective Value**

Breast milk contains protective factors unavailable from any other source. These are adapted to the child's needs and to the stage of lactation. A child off the breast may become ill and stay ill longer, not in all cases because the mother is preparing other milks carelessly, but often because those substitutes are completely unable

to protect the child during the vulnerable period from birth to 2 years. Studies in industrialized countries show higher rates of illness in babies off the breast, even when those babies are fed on clean formulas (Cunningham 1977; Koopman et al. 1985).

Human milk contains living cells, both macrophages and lymphocytes, and also carries various protective humoral factors: there is one that promotes the growth of *Lactobacillus bifidus* in the gut, a staphylococcal resistance factor, interferon, lactoferrin (which inhibits growth of *Escherichia coli* by binding iron), and lysozyme, which acts against intestinal bacteria. Lysozyme, a nonspecific antimicrobial factor, is highly concentrated in milk, compared with maternal serum values. Lysozyme levels rise from the 2nd month of lactation, in some samples reaching levels exceeding those in colostrum at about 12 months (Peitersen et al. 1975). Goldman et al. (1983) found first a rise in lysozyme levels, from 12-25 months, and then a fall; they found a continuing rise in levels of lactoferrin. Clearly, more investigation is needed in this area.

Mother's milk also provides the baby with all classes of immunoglobulins, especially IgA. Early studies of these showed a high level in colostrum, falling off sharply in the first 15 days and then declining more slowly to the age of 16 months. When breast milk studies were limited to the first 6 months, it was reasonable to assume that the protection afforded by mother's milk in breastfeeding of longer duration must be negligible. Later studies of prolonged lactation showed, however, that immunoglobulin levels increased from 6 months onward, apparently in response to the decreasing volumes of milk produced. At about 20 months, IgA and IgG approached the levels found in the 2nd week postpartum (Peitersen et al. 1975).

Antibodies in breast milk are specifically adapted to the child's needs for protection. A mother exposed to infection via the gastrointestinal tract or the respiratory tract will show in her breast milk secreted antibodies specific to that infection (Minchin 1985). During the breastfeeding period, there exists a mother-child bond that is not only emotional but also immunological.

### **Diarrheal Diseases**

Continued breastfeeding may contribute significantly to preventing diarrheal diseases at every economic level. Feachem and Koblinsky (1984), analyzing 35 studies of diarrhea morbidity, concluded that "the data ... gave no grounds for supposing that the relative risks of diarrhoea for bottle fed infants are lower in more wealthy families."

In many studies, however, it has not been shown that breastfeeding plays a protective role after the first 12 months; indeed, some studies correlate prolonged breastfeeding with slightly increased rates of diarrhea. Like the nutrition studies, however, these studies do not distinguish substantial from token breastfeeding, nor do they control for other factors such as amount of breast milk taken, amount and suitability of supplemental foods, adequacy of growth pattern, concurrent infections, maternal education, and household sanitation.

Other studies have indeed found that prolonged breastfeeding plays a protective role. Clemens et al. (1986) state: "The high

degree of protection against severe shigellosis was evident for breastfed children up to 35 months of age." Le Page et al. (1981), in a hospital-based study of 2339 children in Kigali, Rwanda, concluded that the protective effect of breastfeeding is not limited to the 1st year. For three disease categories, case fatality rates were significantly lower in breastfed children than in those completely off the breast: these categories were measles, diarrheal diseases, and acute lower respiratory infections. This advantage was observed for all age groups studied, including children up to 24 months.

When diarrhea does occur, breastfeeding is also an essential element in oral rehydration therapy (Tripp et al. 1979; Khin-Maung-U et al. 1985). Reestablishment of substantial lactation was incorporated into diarrheal management during the 1960s at Mulago Hospital, Kampala (Jelliffe and Jelliffe 1978), and in Nairobi during the 1980s (J. Turkish, personal communication). This, however, is not yet a universal practice: in some communities of our region, breastfeeding when a child is ill or has diarrhea may not be culturally accepted; it may also be prevented by hospital practices that exclude mothers from pediatric units except at limited visiting hours.

Because breast milk production depends on sucking stimulation, hospitals that insist on withdrawing breast milk from sick children may not only delay the child's recovery, but may also cause the mother's milk to dry up. In Mauritius, Rajcoomar and Wong (1986) found that 7% of women who had stopped breastfeeding had done so because their babies were sick, and 25% of these had been advised to stop by health professionals. If breastfeeding is interrupted by a child's illness, especially if it is stopped every time that diarrhea occurs, there will soon be much less of this important food available for the child when he or she is most vulnerable (Anon. 1983).

Roy et al. (1984) are among those researchers who have verified that, with substantial continued breastfeeding (about 600 mL/day) during oral rehydration therapy, no additional water is needed by children aged 12-17 months. Nutritionists are aware, as many health workers may not be, that every water feed from birth onward displaces a more nourishing feed that contains nutrients needed for growth. During diarrheal illnesses, feeding with water instead of with nutrient-rich breast milk may lead to greater weight loss than is necessary.

### **Anorexia**

Anorexia may contribute to negative outcomes of relatively mild diseases. A sick child, however, will still seek comfort at the mother's breast, even when he or she cannot be tempted by any other foods (Brewster 1979; Bumgarner 1980). If not impeded, sick children will usually increase their breastfeeding frequency, thus increasing the mother's production of breast milk. Hospitalized children allowed to breastfeed on demand day and night will stimulate ample milk secretion with frequent suckling. If all pediatric facilities urged mothers to be present around the clock and to breastfeed whenever they wished, there might well be a significant lessening of illness-related weight loss, of its attendant anorexia, and of the subsequent need for major "catch-up" growth. In these settings, however, mothers are, at present, rarely told of the protective and curative effects of breast

milk, or informed about the process of reestablishing substantial lactation.

A study by Hoyle et al. (1980) in Bangladesh compared the normal dietary intake of children aged 6-35 months with that of a matched group who were hospitalized with diarrhea. Overall, the energy intake of the ill children decreased by 40%. Among those who were substantially breastfed (average frequency, 11 times/day), the energy intake from breast milk showed little decrease. Breast milk provided 62-81% of the ill children's caloric intake, the higher figure relating to those mothers who had been educated by staff as to the increased nutritional needs of children with diarrhea. Although a specially prepared weaning food of local ingredients was served (rice, "dhal," pumpkin, sugar, and oil), the continued breastfeeding contributed 2.5 times as much protein to the ill children.

It was concluded that during acute episodes of diarrhea, continued substantial breastfeeding afforded protection to a child against reductions in caloric and protein intake, and confirmed that anorexic children will accept fluid in the form of breast milk. A later study also demonstrated that breastfeeding during diarrhea reduces the number and volume of diarrheal stools (Khin-Maung-U et al. 1985). Rohde (1974) points out also that the high-quality protein taken in from breast milk by an anorexic child may help to restore appetite for needed carbohydrate foods.

Especially in communities where breast milk is the young child's principal reliable source of energy and high-quality protein, continued breastfeeding throughout the 2nd year contributes to illness prevention and treatment. Even if breastfeeding has been reduced to token levels of once or twice a day, the informed mother can reestablish an ample flow when motivated by the knowledge that this has enormous value for her child's recovery, and when encouraged by appropriate hospital management practices.

### **Fertility Regulation**

It is now clearly recognized that breastfeeding, by extending the postpartum anovulatory period, makes a significant contribution to birth spacing and fertility regulation. The increasing of birth intervals has important positive consequences for maternal health, and for child health and development. Breastfeeding - a cost-free, universally available, and natural method of birth spacing - is responsible for "more spacing of pregnancies than any other currently available technique or method" (Carballo and Marin-Lira 1984).

The decline in breastfeeding durations found in many developing countries, especially among urban populations, has enormous consequences in terms of increased maternal fertility (Lesthaeghe et al. 1981; McCann et al. 1981; Mosley et al. 1982; Short 1984). Were periods of lactational amenorrhea to drop, a vast increase in contraceptive use would be needed to keep fertility at its present level in many developing countries (McCann et al. 1981). In Bangladesh and Kenya, for example, dramatic changes in contraceptive practice would be necessary to offset the effects of a decline in breastfeeding. Should postpartum amenorrhea decline to a 2-month period, a 25% increase in fertility rates in Kenya would result (Mosley et al. 1982).



Studies exploring the relationship between breastfeeding patterns and amenorrhea have demonstrated that frequency of suckling, the giving of night-time breast feeds, and the timing of supplementation were the most important factors affecting the maintenance of amenorrhea (Gross and Eastman 1985; Elias 1986; Huffman 1986). According to the WHO (1981) study, 85% of variability in the return of menstruation was attributed to differences in breastfeeding behaviour. Among women in rural Bangladesh, Huffman et al. (1980) found that during the 2nd year postpartum, the number of breast feeds in an 8-h period was maintained at five or six. These women breastfed for more than 2 years, slept with their children at night, and supplemented the breast milk, generally after an initial 6 months of exclusive breastfeeding; they experienced amenorrhea of up to 20 months.

Similarly, in Zaire, where on average women breastfeed more than 2 years, Huffman (1986) found that only 10% of those whose babies sucked more than 10 times per day showed signs of ovulation. It has also been suggested that the length of the longest interval between breast feeds (for example, during sleeping hours or during periods when the mother is separated from the baby) may be an important variable directly affecting the duration of amenorrhea (Greiner 1985).

During amenorrhea, the risk of conception is greatly decreased. About 2-8% of lactating, amenorrheic, noncontracepting women will conceive, demonstrating that lactation protection is as effective as other contraceptive methods used in developing countries (Short 1984; Greiner 1985).

The significance of breastfeeding in delaying pregnancy is greatest where other methods are not widely accepted as, for example, in Kenya and Zaire. In Zaire, at 12-17 months postpartum, up to 60% of nonbreastfeeding women were pregnant, in contrast with only 5% of their breastfeeding counterparts (WHO 1981).

Although the effect of breastfeeding on fertility levels is substantial, few family-planning programs now teach mothers how to use breastfeeding to enhance their protection against a new pregnancy. Such emphasis on teaching women the use of breastfeeding as a contraceptive measure is especially important in cultures where only natural family-planning measures are acceptable, and in areas with high discontinuation rates or low acceptance rates for other methods of contraception.

### **Emotional and Social Development**

Prolonged breastfeeding may improve the child's psychosocial development. For the mother whose work takes her away from the child for long periods each day (e.g., the typical African woman), breastfeeding keeps her in closer touch with the child. Working mothers in other societies have stated this to be an important reason for continuing breastfeeding (Bungarner 1980).

Reamer and Sugarman (1987) report that North American mothers who breastfed an average of 18 months (much longer than usual in that culture) felt that their children were more secure emotionally and had warmer personalities than might otherwise have been the case. The mothers themselves felt that the mother-child bond was strengthened by

prolonged breastfeeding. According to these mothers, the principal drawback was criticism by other people. Our experience suggests that such negative community opinions about prolonged breastfeeding may be a factor of increasing significance in the trend toward early cessation in urban Africa.

If breastfeeding in the 2nd year does enhance bonding, the mother's attentiveness to her child and to its health may also be improved. Dettwyler (1986) in Mali established a connection between the growth and health of children and their mother's attitude toward feeding them and seeking health care. Researchers found that it was not the variable of socioeconomic status that correlated with good growth and health, but rather "above average maternal attitude." The culture studied is characterized by prolonged breastfeeding of all children, but those children in the higher weight group were breastfed about 2 months longer than those in the low weight group, and were more likely to have "above average attitude" mothers. Johnson and Zeitlin (1984) found in Mexico that, on the one hand, children showing good growth had caretakers of whom 85% were attentive; on the other hand, those children with poor growth had caretakers of whom only 40% paid much attention to their charges. These results suggest a line of inquiry that might reward research in other African communities.

Most child specialists agree that the soundest development proceeds at the child's own pace. Because every child as it grows will sooner or later lose interest in breastfeeding, a practice of gradual weaning may be psychologically beneficial. Traumatic or forced cessation has been associated with anorexia, illness, and regression. It may be even more damaging if the child is sent away from his or her parents, or is stopped from breastfeeding by a hospital stay (Bowlby 1969).

Some mothers and health workers fear that so long as children are still breastfeeding, they will not eat sufficient amounts of other foods. This can be the case where the mother's only close contact with her child is during breastfeeds. Giving ample attention to the child in nonfeeding contexts will, however, build an emotional rapport that permits the child gradually to relinquish the breast without fearing a loss of contact with the mother.

## Discussion

Breastfeeding should be considered an essential part of the diet for at least the first 2 years. Breast milk is a vital national food resource, produced at the household level, perfectly stored, and specifically targeted at small children in their vulnerable first years. Because prolonged breastfeeding is a valuable practice, it should not go unrecognized and unrewarded.

To advise mothers to "breastfeed as long as possible" is to give inadequate guidance to parents and health workers. National nutritional plans should include specific targets for breastfeeding patterns, stipulating the ideal number of months for exclusive breastfeeding and for substantial breastfeeding (including night feeding), and a minimum age for the cessation of breastfeeding.

Food-intake recommendations of WHO and the Food and Agriculture Organization (FAO) of the United Nations still advise additional food for mothers only during the first 6 months of lactation (WHO/FAO 1976). After that, the nutritional requirements of continued breastfeeding are discounted. If the mother does breastfeed for another 18 months, she will do so with no assistance from present WHO nutritional guidelines or from food policies based upon them.

In the absence of strong health-education measures, improving the overall food supply will not necessarily improve breastfeeding performance. The breastfeeding pattern of well-nourished urban women, for example, is adversely affected by commercial company advertising, growing customs of mother-baby separation, and possibly societal disapproval of breastfeeding beyond 1 year. Health education that ignores breast milk as a component of the young child's diet may also discourage continued breastfeeding. There are very few nutrition posters that show the older child breastfeeding in the sitting-up position typical of the walking child. There is a greater need for such posters in national health education campaigns, than for posters showing the breastfeeding of newborns.

Multinational companies are now producing more "weaning" products. Both mothers and health workers are deluged with messages suggesting that the child at 6 months or older must have commercial products or suffer a weaning diet that is incomplete and dangerous. Usually such promotion makes no mention at all of breast milk, but urges the use of some form of cow's milk. Strong codes are needed to eliminate such marketing.

Women whose work separates them from their children are of special concern to health and nutrition policymakers. Longer post-partum maternity leaves are extremely important for establishing breastfeeding. To ensure, however, that breastfeeding extends to 2 years, other policy measures are needed. These include

- support for breastfeeding at the workplace and in the community;
- continued flexible breastfeeding breaks;
- flexible working hours for breastfeeding mothers and no extraordinarily long working hours, as in night-nursing duty;
- education on the value and importance of continued, unrestricted night feeds and close physical contact;
- feeding of the child during the mother's absence without any use of feeding bottles: milk can be given from a cup to any baby weighing more than 2 kg (IBFAN Africa and UNICEF 1986);
- where feasible, workplace care facilities for young children;
- when necessary, nutritional supplementation programs for mothers; and
- access for every woman to effective and acceptable family-planning methods that are fully compatible with extended substantial lactation.

Where, then, does breast milk fit into the weaning diet? As health educators, we need to emphasize that food supplements are not substitutes for breastfeeding. Provision of supplementary foods should not lead immediately to token breastfeeding. Weaning programs have often recommended large quantities of fairly liquid food for small children. The Kenya Ministry of Health (Kenya 1986) suggests 900 mL of porridge per day for children 6-12 months. For corrective nutritional programs, OXFAM (1984) recommends 1500 mL/day of high-energy milk for malnourished children weighing 7.5-10.0 kg. Yet these programs also rightly stress the importance of continued breastfeeding and, when necessary, the reestablishment of lactation. This fluid-intake recommendation may be unrealistic for the small child. Will a baby want 500 mL or more of breast milk in addition to these large quantities of other liquid? Foods that are drier may make the child somewhat thirsty, encouraging him or her to seek a drink from the breast at more frequent intervals and thus promoting continued or reestablished substantial lactation.

When a busy mother sits down to eat her meal, it may be the first time in some hours that there is sufficient quiet to allow a breast feed. To breastfeed when the rest of the family are eating may mean, however, that the young child is not likely to get much, if any, of the family pot food: at the time when this food is available, the child is filling up with breast milk. One suggested routine is that the mother breastfeed before preparing the meal, then encourage the child to eat foods with the rest of the family, then breastfeed again after the meal.

Will the feeding mixtures we recommend require more attention from the mother than she can spare? Because they do not need to be served warm or to be spoonfed, meals of cassava and sauce, bread and margarine, fried staple foods, or chapatis cooked with oil might give the child a greater net intake. Is it wise, therefore, to advocate many months of feeding with thin porridge? What is the best use of a mother's limited time with her child - breastfeeding, feeding with thin porridge, or feeding mashed family pot foods? The answers change as the child grows; in most African situations, however, a mother has many claims on her time. We should perhaps advocate the occasional use of other foods - cold rather than freshly cooked - that 1-year-olds can easily feed themselves; this would supplement the breast milk that mothers can give whenever they have a quiet 5 minutes to spare.

Promotion of extended breastfeeding deserves effective incorporation into all child-survival strategies. No immunization program is complete unless it teaches all mothers that only breastfeeding can protect their babies against the gastroenteritis and respiratory infections for which no injections are available. Growth monitoring programs can give reassurance to mothers who, without justification, fear that they have insufficient milk. If growth falters, health workers can be alerted to teach a more effective breastfeeding pattern and to follow up on the mothers' progress. Unless they stress diarrhea prevention through more substantial breastfeeding, and diarrhea treatment through increasing breast-milk intake, oral rehydration efforts will be incomplete. Feeding programs need to teach and to reinforce substantial breastfeeding patterns during the weaning interval. If family-planning programs mention breastfeeding (either positively or negatively) without teaching those breastfeeding patterns that can inhibit ovulation, then they do a disservice to

millions of Roman Catholic, Islamic, and other women who will not use alternative contraceptive methods.

Too many children under 2 years are taken off the breast because of illness or diarrhea, especially when treated in an institution. Too many feeding programs distribute powdered milks, instead of reestablishing substantial breastfeeding. National reeducation programs are needed to familiarize nutritionists and health workers with the techniques of breastfeeding maintenance and of relactation; this knowledge can then be incorporated into hospital, outpatient, and nutrition-rehabilitation programs.

Maternal education tends to improve child-survival statistics (UNICEF 1985). In Africa, however, it also seems to contribute to declines in breastfeeding rates and durations. The education system, its teachers, and its domestic science and health textbooks may in some way be encouraging girls to reject practices not presented as "modern," thus creating patterns of poor infant feeding for the future. Many texts include lessons on the use of feeding bottles, while giving no information on prolonged breastfeeding, or on cup-feeding by employed mothers (BIG 1985). It is important to consider what aspects of the educational environment may influence pupils' later decisions about infant feeding.

Despite disincentives, a great deal of breast milk is fed to the children of this region well beyond the age of 1 year. Research should reflect the importance of breastfeeding throughout the first 24 months: to this end, there should be a painstaking examination of breastfeeding patterns, and of levels of breast milk intake and of total energy intake during the weaning period. Researchers must go beyond the simple question "Are you breastfeeding?" to record frequency and length of feeds, both day and night, and intervals between them. As van Steenberg (1981) demonstrated, it is possible in African home settings to gather milk-volume data on demand feeding for both day and night. Extrapolating 24-h volumes from partial measurements is not acceptable methodology, given the probable diurnal variations in breastfeeding behaviour. As they are surrounded by communities where the majority of women practice prolonged breastfeeding, researchers in Africa are exceptionally well placed to undertake the fundamental studies needed.

Much remains to be done to ensure that breast milk retains its important place in the diet of the young child. There can be no justification for accepting breastfeeding declines as inevitable, particularly as rates rise dramatically in other countries. Breastfeeding should be promoted, protected, and assisted, not only in the early months of life, but throughout the 2nd and even 3rd years. It should be understood and valued for the unique contribution it makes to the nutrition, health, and well-being of every child, rural or urban. Our attitudes, policies, training for health workers, and contacts with families should now begin to reflect this understanding.

### **Recommendations**

- Governments should consider positive incentives to reward women who breastfeed for 2 years.

- National health policymakers should set targets for the duration of breastfeeding, and should recommend appropriate breastfeeding patterns for each age group.
- Tables of nutrient requirements should stipulate recommended intakes for lactation up to 2 years.
- Education directed either at parents or at health workers should promote breastfeeding as a vital component of the diet of the 2nd year. The importance of appropriate breastfeeding patterns should be emphasized.
- A national code of marketing should be adopted and enforced by each country. These codes should include in their scope all food and drink products for children of 2 years or under.
- Employed women need government support and education to continue substantial breastfeeding and to reject the idea of bottle feeds.
- There should be an investigation into the reduced use of liquid weaning foods: the less liquid consumed by the child, the greater will be his or her interest in frequent breastfeeding.
- Frequent breastfeeding should be encouraged for the child of 1-2 years; it should be emphasized, however, that these feeds take place at times that do not interfere with the child's interest in the family pot food.
- Programs should recognize the constraints on women's time and adapt their recommendations to these limits.
- In teaching exclusive, substantial, and prolonged breastfeeding, all child-survival programs should emphasize both the appropriateness and the cost-free nature of these techniques.
- Nutrition-rehabilitation centres, diarrheal-control programs, and hospitals should incorporate modern breastfeeding management and relactation into all programs for children under 2 years.
- For the assurance of health protection for children yet unborn, information on nutrition must be incorporated into the formal education of all young people: texts should contain accurate information on prolonged breastfeeding and on good child nutrition.
- Appropriate research, using sound methodology, should be undertaken on breastfeeding for the entire weaning period.

### **Acknowledgments**

The International Baby Food Action Network (IBFAN) Africa Regional Office supports infant feeding activities throughout sub-Saharan Africa. We gratefully acknowledge the support of IBFAN Coordinators Margaret Kyenkya and Christine Lwanga in the preparation of this paper. IDRC and Dr Nan Jolly and Mrs Nancy Turnbull of La Leche League International gave essential help by providing relevant articles.

### References

- Anon. 1983. Dangerous partners. *Diarrhoea Dialogue*, 15, November 1983.
- Anon. 1985. Treating the whole child. *Dialogue on Diarrhoea*, 21, June 1985.
- Anyanwu, R.C., Enwonwu, C.O. 1985. The impact of urbanization and socioeconomic status on infant feeding practices in Lagos, Nigeria. *Food and Nutrition Bulletin*, 7(1), 33-37.
- Becroft, T.C. 1967. Child rearing practices in the highlands of New Guinea: a longitudinal study of breastfeeding. *Medical Journal of Australia*, 2, 598-602.
- Behar, M. 1986. Physiological development of the infant and its implications for complementary feeding. World Health Organization, Geneva, Switzerland. WHO/MCH/NUT 86. 20 pp.
- Berg, A., Brems, S. 1986. Vitamin A: partner in child health. *Mothers and Children*, 5(3), 1-3.
- BIG (Breastfeeding Information Group, Kenya). 1985. The teaching of breastfeeding in schools. *BIG Newsletter*, May/June 1985.
- Botswana, Ministry of Health. 1985. Family health survey. Family Health Division, Ministry of Health, Gaborone, Botswana.
- Bowlby, J. 1969. *Attachment*. Penguin Books Ltd, Harmondsworth, U.K. 478 pp.
- Brewster, D.P. 1979. You can breastfeed your baby even in special situations. Rodale Press, Emmaus, PA, USA. 596 pp.
- Bumgarner, N.J. 1980. *Mothering your nursing toddler*. Norman Publishing Corp., Altadena, CA, USA. 208 pp.
- Cameron, M., Hofvander, Y. 1983. *Manual on feeding infants and young children*. Oxford University Press, Nairobi, Kenya. 214 pp.
- Carballo, M., Marin-Lira, A. 1984. Patterns of breastfeeding, child health and fertility. In WHO Inter-Regional Workshop on Breastfeeding and Fertility, Singapore. World Health Organization, Geneva, Switzerland.
- Clemens, D., Stanton, B., Stoll, B., Shahid, N.S., Banu, H., Alauddin Chowdhury, A.K.M. 1986. Breastfeeding as a determinant of severity in shigellosis. *American Journal of Epidemiology*, 124(4).
- Cunningham, A.S. 1977. Morbidity in breast-fed and artificially-fed infants. *Journal of Pediatrics*, 90(5), 726-729.
- Dettwyler, K.A. 1986. Infant feeding in Mali, West Africa: variations in belief and practice. *Social Science and Medicine*, 23(7), 651-664.

- Elias, M.T. 1986. Nursing practices and lactation amenorrhea. *Journal of Biosocial Science*, 18, 1-10.
- Elliott, T., Kevokole, J. 1984. Infant feeding practices in Nairobi, Kenya. In *Social perspectives*. Volume 8(1). Central Bureau of Statistics, Nairobi, Kenya.
- Feachem, R.G., Koblinsky, M.A. 1984. Intervention for the control of diarrhoeal diseases among young children: promotion of breast-feeding. *Bulletin of the World Health Organization*, Geneva, 62(2), 271-291.
- Feinstein, J.M., Berkelhamer, J.E., Gruszka, M.E., Wong, C.A., Carey, A.E. 1986. Factors related to early termination of breastfeeding in an urban population. *Pediatrics*, 78(2), 210-215.
- Gillin, F.D., Reiner, D.S. 1983. Human milk kills parasitic intestinal protozoa. *Science (Washington, DC)*, 221, 1290-1291.
- Goldman, A.S., Goldblum, R.M., Garza, C. 1983. Immunologic components in human milk during the second year of lactation. *Acta Paediatrica Scandinavica*, 72, 461-462.
- Gopalan, C. 1958. Effect of protein supplementation and some so-called galactogogues on lactation in poor Indian mothers. *Indian Journal of Medical Research*, 48, 317.
- Greiner, T. 1985. Making optimal use of breastfeeding for birth spacing. In *Planning for action within the health sector*. WHO Inter-Regional Workshop on Breastfeeding and Fertility, Mauritius. World Health Organization, Geneva, Switzerland. 17 pp.
- Gross, A., Eastman, C.J. 1985. Prolactin and the return of ovulation in breastfeeding women. In Potts, M., Thapa, M., Herbertson, M., ed., *Breastfeeding and fertility*. *Journal of Biosocial Science*, 9(Suppl.), 25-42.
- Gulick, E.E. 1986. The effects of breastfeeding on toddler health. *Pediatric Nursing*, 12(1), 51-54.
- Helsing, E., King, F.S. 1982. *Breastfeeding in practice*. Oxford University Press, Oxford, U.K. 271 pp.
- Hofvander, Y., Underwood, B. 1987. Processed supplementary foods for older infants and young children with special reference to developing countries. *Food and Nutrition Bulletin*, 9, 1.
- Hoyle, B., Yunus, M., Chen, L.C. 1980. Breastfeeding and food intake among children with acute diarrhoeal disease. *American Journal of Clinical Nutrition*, 33, 2365-2371.
- Huffman, S.L. 1986. Promotion of breastfeeding: can it really decrease fertility? *Clearinghouse on Infant Feeding and Maternal Nutrition*, American Public Health Association, Washington, DC, USA.



- Huffman, S.L., et al. 1980. Breastfeeding practices in rural Bangladesh. *American Journal of Clinical Nutrition*, 33, 144-154.
- IBFAN (International Baby Food Action Network) Africa and UNICEF (United Nations Children's Fund). 1986. Feeding low birthweight babies. IBFAN Africa, Nairobi, Kenya. Videotape, 29 min.
- Jelliffe, D.B., Jelliffe, E.F.P. 1978. Human milk in the modern world. Oxford University Press, Oxford, U.K. 500 pp.
- Johnson, F.C., Zeitlin, M.F. 1984. Analysis of qualitative and semi-qualitative indicators distinguishing between well-nourished versus malnourished toddlers in a Mexican squatter settlement. Tufts University School of Nutrition, Medford, MA, USA.
- Karra, M.V., Udipi, S.A., Kirksey, A., Roepke, J.L.B. 1986. Changes in specific nutrients in breast milk during extended lactation. *American Journal of Clinical Nutrition*, 43, 495-503.
- Kenya, Central Bureau of Statistics. 1978/79. Child nutrition survey. *Social Perspectives*, 2(14), Nairobi.
- \_\_\_\_\_. 1983. Third rural nutrition survey, 1982. Ministry of Finance and Planning, Nairobi, Kenya.
- \_\_\_\_\_. 1984. Situation analysis of children and women in Kenya. Parts 1-4. Central Bureau of Statistics, Nairobi, Kenya. 375 pp.
- Kenya, Ministry of Health. 1986. Improving young child growth using the child health card. Nutrition Section, Ministry of Health, Nairobi, Kenya. 60 pp.
- Khan, M. 1980. Infant feeding practices in rural Meheran, Comilla, Bangladesh. *American Journal of Clinical Nutrition*, 33, 2326-2364.
- Khin-Maung-U, Nyunt-Nyunt-Wai, Myo-Khin, Mu-Mu-Khin, Tin-U, Thane-Toe. 1985. Effect on clinical outcome of breastfeeding during acute diarrhoea. *British Medical Journal*, 290, 587-589.
- Koopman, J.S., Turkish, V.J., Monto, A.S. 1985. Infant formulas and gastrointestinal illness. *American Journal of Public Health*, 75(5), 477-480.
- Latham, M.C. 1979. Human nutrition in tropical Africa. Food and Agriculture Organization, Rome, Italy.
- Lauber, E., Reinhardt, M. 1979. Studies on the quality of breast milk during 23 months of lactation in a rural community of the Ivory Coast. *American Journal of Clinical Nutrition*, 32, 1159-1173.
- Lawrence, R. 1985. Breastfeeding: a guide for the medical profession (2nd ed.). The C.V. Mosby Co., St Louis, MO, USA. 601 pp.
- Le Page, P., Munyakazi, C., Hennart, P. 1981. Breastfeeding and hospital mortality in children in Rwanda. *Lancet*, August 1981, 409-410.

- Lesthaeghe, R.J., Shah, I.H., Page, H.J. 1981. World Conference of the International Union for Scientific Study of Population (IUSSP), Manila, the Philippines. IUSSP, Liège, Belgium. 27 pp.
- LLLI (La Leche League International). 1975. Anemia and the breastfeeding mother. LLLI, Chicago, IL, USA. Information Sheet 24.
- McCann, M.F., Liskin, L.S., Piotrow, P.T., Rinehart, W., Fox, G. 1981. Breastfeeding, fertility, and family planning. *Population Reports*, 9(5), 525-575.
- McMillan, J., Landaw, S.A., Oski, F.A. 1976. Iron sufficiency in breast-fed infants and the availability of iron from human milk. *Pediatrics*, 58, 686-691.
- Minchin, M. 1985. Breastfeeding matters. Alma/Allen and Unwin, Alfredton, Australia. 348 pp.
- Mosley, W.H., Werner, L.H., Becker, S. 1982. The dynamics of birth spacing and marital fertility in Kenya. *World Fertility Survey, Scientific Reports*, 30. 30 pp.
- Newton, N. 1971. Psychologic differences between breast and bottle feeding. *American Journal of Clinical Nutrition*, 24, 993-1004.
- Oniang'o, R.K. 1986. A study of maternal and infant care practices in Kenya. Department of Home Economics, Kenyatta University, Nairobi, Kenya. 215 pp.
- OXFAM (Oxford Committee for Famine Relief). 1984. OXFAM's practical guide to selective feeding programmes. Health Unit, OXFAM, Oxford, U.K. 92 pp.
- Peitersen, B., et al. 1975. Quantitative determination of immunoglobulins, lysozyme, and certain electrolytes in breast milk during the entire period of lactation, during a 24 hour period, and in milk from the individual mammary gland. *Acta Paediatrica Scandinavica*, 64, 709-717.
- Rajcoomar, V., Wong, P.C. 1986. Breastfeeding and infant health in Mauritius. UNICEF Social Statistics Programme, Nairobi, Kenya. Occasional Paper 6. 50 pp.
- Reamer, S.B., Sugarman, M. 1987. Breastfeeding beyond six months: mothers' perceptions of the positive and negative consequences. *Journal of Tropical Pediatrics*, 28, 93-97.
- Rohde, J.E. 1974. Human milk in the second year: nutritional and economic considerations for Indonesia. *Paediatrica Indonesiana*, 14, 198-207.
- Roy, S.K., Rabbani, G.H., Black, R.E. 1984. Oral rehydration solution safely used in breast-fed children without additional water. *Journal of Tropical Medicine and Hygiene*, 87, 11-13.
- Rutishauser, I.H.E. 1974. Factors affecting the intake of energy and protein by Ugandan preschool children. *Ecology of Food and Nutrition*, 3, 213-222.

- Rutishauser, I.H.E., Whitehead, R.G. 1972. Energy intake and expenditure in 1-3 year old Ugandan children living in rural environment. *British Journal of Nutrition*, 28, 145.
- Salmenpera, L. 1984. Vitamin C nutrition during prolonged lactation: optimal in infants while marginal in some mothers. *American Journal of Clinical Nutrition*, 40, 1050-1056.
- Short, R.V. 1984. Breastfeeding. *Science of America*, 250 (4), 23-29.
- Swaziland, Government of. 1983. National Nutrition Status Survey. USAID.
- Tripp, J., et al. 1979. Infant feeding practices: a cause for concern. *British Medical Journal*, 2, 707-709.
- UNICEF (United Nations Children's Fund). 1981. Collecting information on the prevalence and duration of breast feeding. UNICEF/ESARO Social Statistics Bulletin, 4(2).
- 1985. Socio-economic maps of Kenya. UNICEF/ESARO Social Statistics Bulletin, 8(1).
- 1987. The state of the world's children. Oxford University Press, Oxford, U.K. 110 pp.
- van Steenberg, W.M. 1981. Lactation performance of Kamba mothers, Kenya: breastfeeding behaviour, breast milk yield and composition. *Journal of Tropical Pediatrics*, 27, 3.
- van Steenberg, W.M., et al. 1984. Lactation performance. In van Ginneken, J.K., Muller, A.S., ed., *Maternal and child health in rural Kenya*. Croom Helm Ltd, Beckenham, Kent, U.K. pp. 153-165.
- Victora, C.G., Vaughan, J.P., Martines, J.C., Barcelos, L.B. 1984. Is prolonged breast-feeding associated with malnutrition? *American Journal of Clinical Nutrition*, 39, 307-314.
- Vis, H.L., Hennart, P., Rachababisha, M. 1981. Some issues in breastfeeding in deprived rural areas - maternal nutrition and breast-feeding in the Kivu, Zaire. *Assignment Children*, 55/56, 183-200.
- West, K.P., Chirambo, M., Katz, J., Sommer, A. 1986. Breast-feeding, weaning patterns and the risk of xerophthalmia in southern Malawi. *American Journal of Clinical Nutrition*, 44, 690-697.
- Whitehead, R.G. 1985. The human weaning process. In *Feeding the normal infant*. *Pediatrics*, Supplement, 189-193.
- WHO/FAO (World Health Organization/Food and Agriculture Organization). 1976. Food and nutrition strategies in national development. 9th Report of the Joint FAO/WHO Expert Committee on Nutrition. WHO, Geneva, Switzerland.

- WHO (World Health Organization). 1981. Contemporary patterns of breastfeeding. WHO, Geneva, Switzerland. 211 pp.
- . 1982. The prevalence and duration of breast-feeding: a critical review of available information. *World Health Statistics Quarterly*, 2, 92-116.
- Winikoff, B., et al. 1983. The infant feeding study: Nairobi site report. The Population Council, Washington, DC, USA. 138 pp.
- Winikoff, B., Myers, D. 1987. Overcoming obstacles to breastfeeding in a large municipal hospital: applications of lessons learned. *Pediatrics*, 80(3), 423-433.
- Wolde-Gebriel, Z. 1981. The breastfeeding situation in Ethiopia. *Assignment Children*, 55/56, 201-209.