J. biosoc. Sci. (2001) **33**, 321–338

A BIOCULTURAL INVESTIGATION OF THE WEANLING'S DILEMMA IN KATHMANDU, NEPAL: DO UNIVERSAL RECOMMENDATIONS FOR WEANING PRACTICES MAKE SENSE?

TINA MOFFAT

Department of Anthropology, McMaster University, Hamilton, Ontario, L8S 4L9, Canada

Summary. The primary objective of this report is to use data from a study of infant growth and weaning practices in Kathmandu, Nepal, to investigate universal recommendations about exclusive breast-feeding up to 6 months postpartum. A secondary objective is to demonstrate the complexity of the biocultural nature of infant feeding practices. A sample of 283 children under 5 years of age and their 228 mothers living in a peri-urban district of Kathmandu participated in this study. The children's height/length and weight were measured three times over 9 months. At each session, a demographic, child health and infant feeding survey was administered; between sessions, in-depth interviews were conducted with mothers regarding infant feeding practices. While a few of the infants under 2 months were receiving non-breast milk foods, at 3 months of age half of the sample had been introduced to non-breast milk foods and by 7 months all infants were eating non-breast milk foods. A comparison of growth indices and velocities between exclusively and partially breast-fed infants from birth to 7 months of age shows no evidence for a difference in nutritional status between the two groups. Although there are cultural rules about breast-feeding that vary by ethnic group, all mothers followed a feeding method that depended on their assessment of whether the child was getting enough breast milk. The conclusion is that exclusive breast-feeding up to 6 months may not be appropriate for all infants. In this sample, breast-feeding duration is not shortened by the early introduction of non-breast milk foods, as the median age of breast-feeding cessation is 36 months. One of the main reasons for severance was the onset of another pregnancy. Investigation of infant feeding practices must be contextualized in the local ecology of the population. While cultural beliefs about breast-feeding are relevant, mothers' individual assessments of their children's nutritional needs and demographic events in parents' lives must also be considered.

Introduction

The timing and practice of breast-feeding and weaning is crucial to the growth and development of the human infant. It is also an important issue for human biologists and bioanthropologists as it is related not only to human nutrition but also to population biology. Breast-feeding and weaning are best understood as biocultural phenomena; that is, they are influenced and determined by both biological and cultural factors (Stuart-Macadam, 1995). Although there have been calls to separate the biological and cultural factors that influence infant feeding practices (Allen & Pelto, 1985), it is difficult to do so given the fact that they are so intertwined, one often determining the other and vice versa.

Although the best method of infant feeding has been described using biomedical and physiological evidence (Akre, 1989), a variety of research has demonstrated that there is a great deal of variation from one human population to another (Dettwyler, 1986, 1987; Panter-Brick, 1991; Harrison *et al.,* 1993; Bohler & Ingstad, 1996; Gray, 1996) and throughout human history (Fildes, 1982, 1995). Indeed, biomedical advice has changed from one decade to another through the 20th century (Dettwyler & Fishman, 1992, p. 191), so it is often difficult to know the truly ideal method. It is suggested, following Gray (1996), that rather than looking for a universal human strategy, the 'best' method will be contingent on the local environment, cultural customs and the particular situation of the mother and infant.

Weaning is often considered to be synonymous with the termination of breast-feeding; however, in recent years many authors contend that weaning is more accurately viewed as a process rather than a specific event (Dettwyler & Fishman, 1992; Katzenberg, Herring & Saunders, 1996; Herring, Saunders & Katzenberg, 1998). As such, the weaning process can be broken down into multiple stages: (1) the introduction of complementary food; (2) the period of complementary feeding coupled with breast-feeding; (3) the cessation of breast-feeding. Each of these stages differs in terms of practice and tempo among a variety of historical and geographical populations. As Greiner (1996) points out, the length and importance of the second stage of weaning throughout the world is sometimes a difficult concept to fathom because, in industrialized nations, non-breast milk foods are often considered to be a replacement for breast milk rather than a complement to it.

Although the cessation of breast-feeding is thought to be a traumatic transition for infants, it is probably the introduction of non-breast milk foods that is the most risky event for the child because microbiologically contaminated substances can induce diarrhoeal morbidity and mortality (Katzenberg *et al.,* 1996). In addition to the introduction of non-breast milk foods, however, an important factor is the duration of breast-feeding. It is clear from studies, both contemporary and historical, that the early cessation of breast-feeding (i.e. before 6 months of age) in environments with inadequate sanitation and clean water is clearly detrimental to the survival of infants (Knodel & Van De Walle, 1967; Knodel & Kintner, 1977; Plank & Milanesi, 1973). What is less clear-cut, though, is the risk of the early (i.e. from 3 to 6 months) introduction of non-breast milk foods as a complement rather than a replacement for breast milk. This is what is referred to as the 'weanling's dilemma' (Lutter, 1992). The weanling's dilemma is such that on the one hand, the introduction of non-breast milk food exposes infants to contamination that otherwise would be avoided by exclusive

breast-feeding; on the other hand, non-breast milk foods start to become a necessary component of an infant's diet to sustain adequate growth (Rowland, Barrell & Whitehead, 1978).

The World Health Organization (WHO) has established recommendations for infant feeding in developing countries that advocate exclusive breast-feeding up to 4–6 months postpartum and prolonged breast-feeding well into the second year of life (Akre, 1989; Lutter, 1992). Other medical experts, moreover, question whether it is necessary to introduce non-breast milk foods at 6 months, arguing that the growth of exclusively breast-fed infants with access to the breast on demand is adequate up to 9 and even 12 months postpartum (Borresen, 1995).

Despite biomedical recommendations for exclusive breast-feeding, worldwide data, in fact, show that it is more common than not for mothers to introduce non-breast milk foods to children before 6 months of age (Rowland & Barrell, 1980; Launer & Habicht, 1989; Jackson *et al.,* 1990; Popkin *et al.,* 1990; Schmidt, 1990; Gray, 1996; Davies-Adetugbo, 1997; Sellen, 1998). While it may be argued that these practices are based on misguided cultural rules or dangerous folk wisdom, given that they are practised so widely, it is worth investigating the behaviour before judging it as wrong-headed in light of current biomedical recommendations. As Gray (1996, 1998) points out, mothers may understand more about the contingencies of their local ecology than researchers and medical professionals acknowledge.

This report describes the weaning process for a sample of mother–infant dyads living in a peri-urban community of Kathmandu, Nepal. Using anthropometric data from children under 5 years of age, it will assess the effect of early complementary feeding on the nutritional status of infants. In addition, ethnographic data are used to compare actual practices of Nepali mothers with their own cultural rules and norms, as well as the WHO recommendations for infant feeding. The aim of the study is to make sense of mothers' disparate and often complex practices and to illustrate the truly biocultural nature of the weaning process.

Methods

Study setting, sample and design

The investigation of infant feeding practices was part of a larger study about child health and nutrition in a peri-urban community near Kathmandu, Nepal. A sample of 283 children, all under 5 years of age, were measured and their mothers were interviewed using demographic, child health and infant feeding questionnaires. The parents, the vast majority of whom are rural-to-urban migrants with little formal education, work in the carpet-making industry, either spinning wool or weaving carpets. Although there is some variation in wage structure in the carpet-making industry, the majority of the weavers and wool spinners in this study have a low income with poor access to resources beyond basic food and shelter.

The study site is located in two peri-urban neighbourhoods, approximately 5 km east of downtown Kathmandu. One squatter community, where women spin wool in their homes, and a sample of seventeen carpet factories were targeted and families were asked to participate. From a total of 113 houses in the squatter community,

59 households participated in the study. These were all households in the community with children under 5 years of age that were able to participate in the study. The carpet factories were randomly selected from a total of 80 that were mapped in a circumscribed study area. Criteria for inclusion were the presence of parents with children under the age of 5 years and the permission of the factory owner (three attempts were made to contact the owner before the factory was deleted from the study sample). All parents with children under 5 years of age living in and/or working in the seventeen factories included in the study participated in the study.

A mixed cross-sectional and longitudinal study was conducted over a 9-month period from January to September 1995 for a total of three rounds of anthropometric measurements and interviews with parents. Anthropometric measurements and interviews were done either in a health centre or on-site at a carpet-making factory. The research project was affiliated with two health clinics, one of which was located in the squatter community and another located at the other end of the study area. Parents and children were brought to a health centre when it was located conveniently near their home or workplace. For those factories that were very large or were located too far from the health clinic, the author and research assistants brought the portable anthropometric equipment to the factory and collected data on-site.

Anthropometry

All measurements were taken by the author and done according to Lohman, Roche & Martorell's (1988) standardized techniques. For each measurement children's shoes, socks and caps were removed, although total nudity was not permissible because of low temperatures in the cold season. Heavy sweaters and belts, however, were removed. Children's weight was measured with a portable suspended infant/child weighing scale (Perspective Enterprises, PE-HS-25, Kalamazoo, MI) to the nearest 0·1 kg. The scale was set to zero at the beginning of each session and checked periodically throughout the sessions. The scales were calibrated bi-monthly with a 2 kg weight; no changes were detected throughout the study period. Recumbent length was taken for children up to and including 24 months, and height was measured for those over 24 months with a portable wooden adult/infant measuring board (Perspective Enterprises, PE-AIM-101, Kalamazoo, MI) to the nearest millimetre.

Survey and interview methods

At each session, a demographic, child health and infant feeding survey was administered to each mother. Mothers were asked if they were currently breast-feeding their child. A status quo method of inquiry was used rather than a retrospective questionnaire, because the children in this study ranged from 0 to 5 years and were therefore at different stages in their infant feeding regimen. Recall questions about infant feeding transitions, moreover, are known to be subject to a high rate of error (Quandt, 1987).

Twenty-four hour recalls using a food frequency questionnaire were collected for each child. It should be noted that results for feeding practices and diarrhoeal point

prevalence presented in this report come from the data gathered on the first survey for each of the 283 children in the sample.

In addition to the quantitative methods, a total of 23 tape-recorded in-depth interviews were also conducted. These were done throughout the 9-month study period, usually at the end of a measuring session. Among other topics, the interviews explored further intricacies of infant feeding beliefs and practices, information that was unobtainable from a quantitative survey alone.

Analysis

Each height and weight measurement was converted in Epi Info version 6 software (CDC, 1994) to weight-for-age (WAZ), height-for-age (HAZ) and weight-for-height (WHZ) *Z*-scores of the NCHS reference population for boys and girls. Growth velocities were calculated using difference in length and body weight between Rounds I and II. Growth data from Round III were not utilized as there were no infants under 6 months of age remaining in the sample by Round III. The differences were divided by the exact time period in months between the measuring sessions to obtain average monthly growth rates. These rates were then multiplied by six to make them comparable to the reference population's velocity over a 6-month period (see Leonard *et al.,* 1995, for this method).

The median age at which breast-feeding ceased was determined from the status quo data using probit procedures (following Tracer, 1996). Probit models are appropriate for dependent variables that have binary all-or-none outcomes, in this case either breast-feeding or not at the time of survey. For a probit transformation, the observed proportions at each stimulus (the stimulus in this case is the infant's age category) are replaced by the value of the standard normal curve below which the observed proportion of the area is found (Norusis/SPSS, 1994, p. 249).

Factors that might be influential in parents' timing of the introduction of non-breast milk food, such as the child's ethnic background and the sex of the child, were compared using chi-square tests. Comparisons of infants who were partially breast-fed with those who were exclusively breast-fed were made for anthropometric indices using general linear multivariate tests. Comparisons between partially breast-fed and exclusively breast-fed infants were made for the presence or absence of diarrhoea in the previous 2 weeks with chi-square tests. All statistical analysis was performed using SPSS version 9.0.

Results

Breast-feeding and the introduction of non-breast milk food

Although all of the mothers in this sample were doing piecework wage labour, either at home or in a factory setting, among this sample breast-feeding was practised almost universally. Mothers breast-feed freely in the carpet factories as work schedules are flexible, such that women can take frequent breaks or even breast-feed at the loom as they weave. As seen in Table 1, most of the families were young and

Table 1. Number of living children per woman at time of study, $n=228$

Number of children	*n*	Per cent
1	115	50·2
2	68	30·1
3	23	10·0
4	11	4·8
5	4	1·7
6	6	2·6
11	1	0·4

Table 2. Number of children by breast-feeding status for infants under 8 months of age

Age (months)	*n* not breast-feeding	*n* partially breast-feeding	*n* exclusively breast-feeding	Total
0·0–0·9	0	1	3	4
1·0–1·9	0	1	2	3
2·0–2·9	0	0	5	5
3·0–3·9	0	5	5	10
4·0–4·9	2*	7	3	12
5·0–5·9	0	6	2	8
6·0–6·9	0	5	3	8
7·0–7·9	0	14	0	14
Total	2	39	23	64

*One child had meningitis and was unable to suckle after 3 months of life; the other child died 4 months later. These children were removed from the data set for subsequent analysis.

new; half of the total sample of mothers were primiparous and had not completed their families at the time of the study.

All but two of the 64 children under 8 months of age were breast-fed (Table 2). One of these children had suffered from meningitis as a young infant and as a consequence had neurological damage that rendered him incapable of suckling a breast. The other infant's mother was not forthcoming as to why she was not breast-feeding, but she stated that the child was underweight, sickly and suffered from chronic diarrhoea. This latter child was reported later to have died while his parents were en route to their home village in the hills. It can be inferred from these examples that breast-feeding for low-income people in Nepal is not only culturally valued but is also a matter of survival for infants.

Figure 1 illustrates the stages of infant feeding followed by the majority of the Nepali mothers and children in this study. The exact timing in postpartum months

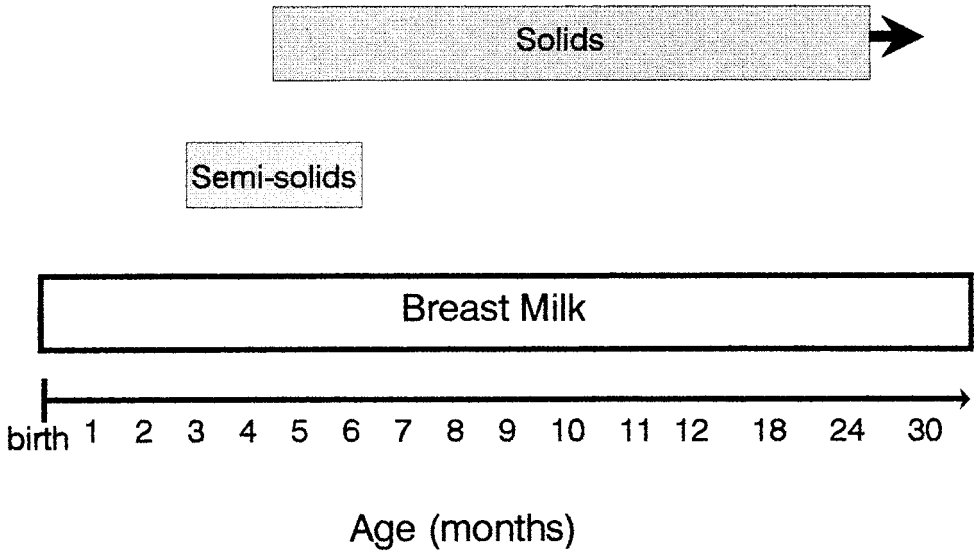

Fig. 1. The order and timing of infant feeding.

varies from one mother–child dyad to another. The purpose of the diagram is not to identify specific time periods, but rather to emphasize the long overlap in time between the introduction of non-breast milk foods and the cessation of breast-feeding. Thus, infants and children in Nepal are for the most part in this transitional weaning stage.

In the infant feeding survey each mother was questioned about whether her infant had ever been given food other than breast milk. In Table 2 children under 8 months of age are categorized on a gradient from exclusive breast-feeding (no non-breast milk food given), to partial breast-feeding (breast milk and non-breast milk foods given), to not breast-feeding (only non-breast milk foods and/or infant formula given). From 4 months of age it appears that exclusive breast-feeding was more the exception than the norm.

When breast-feeding status is analysed by ethnic identity (i.e. Indo-Aryan versus Tibeto-Burman peoples), there is no difference in the proportion of infants under 6 months of age that were exclusively breast-feeding. Of the 39 children under 6 months of age in the sample, 20 were of Indo-Aryan background and 19 of Tibeto-Burman background: 55.0% of the Indo-Aryan infants had been fed non-breast milk food before 6 months, as had 42.1% of the Tibeto-Burman infants. This difference in proportions is not statistically significantly different ($\chi^2=0.65$, df=1, $p=0.42$). Similarly, there was no statistically significant observed difference in the number of boys who were introduced to solid food before 6 months (52·9%) compared with girls (45·5%) ($\chi^2=0.22$, df=1, $p=0.64$).

It appears from the survey results that cultural rules pertaining to ethnicity and gender do not govern infant feeding practices. Indeed, when mothers were asked individually during in-depth interviews when they thought it was a good time to introduce food, they never referred to any rules, but treated the matter on a

https://doi.org/10.1017/S0021932001003212 Published online by Cambridge University Press

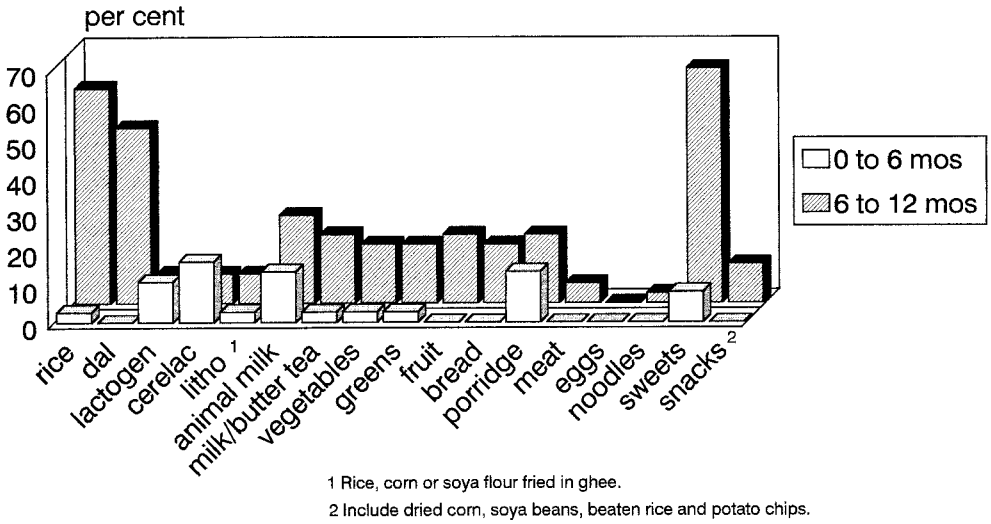

Fig. 2. Proportion of children eating non-breast milk foods on the day previous to the first survey by age group, 0–6 months ($n=36$) and 6–12 months ($n=37$).

case-by-case basis. The most common response that was repeated almost word for word in many interviews was: 'it is not necessary to give food if milk is enough; if milk is not enough, we must feed'. The implication of this statement is that the longer you can breast-feed the child the better, but sometimes the quantity of breast milk is deemed to be insufficient for the child's needs. This approach to feeding on an individual basis occurred even within families. For example, several women said that they introduced non-breast milk foods to one of their children at 3 months of age because they did not have enough breast milk, but they exclusively breast-fed another for 6 months because they did have enough.

As seen from Fig. 2, in addition to breast milk, infants under 6 months were mostly eating weaning gruel, commercial infant formula or pabulum, and animal milk. The most common weaning gruel is *litho*, made from rice flour mixed with water and sugar and fried in ghee. Non-breast milk foods and liquids were fed with a cup and spoon; feeding bottles were very rarely used among this group of mothers.

The concern of the World Health Organization about the early introduction of complementary food is based on the risk of diarrhoeal diseases introduced via contaminated foods. In order to evaluate whether this is indeed a problem for these children, growth indices for children aged 0–7 months ($n=48$) are compared for the exclusively breast-fed (EBF) and partially breast-fed (PBF) infants (Table 3). Seven months is used as the cut-off age because after this point all infants were partially breast-fed and the issue is thus moot (see Table 2). The two infants who were not being fed any breast milk were excluded from this analysis.

Mean cross-sectional growth indices and mean longitudinal growth velocities for EBFs and PBFs are presented in Table 3. Differences between these groups in terms of cross-sectional anthropometric indices and longitudinal growth velocities are compared using general linear multivariate tests. Independent factors included in the

Table 3. Comparison of measurements of growth for EBF (exclusively breast-fed) and PBF (partially breast-fed) children aged 0–7 months

	EBFs			PBFs		
Measure	*n*	Mean	SD	*n*	Mean	SD
HAZ	23	− 0·98	1·02	25	− 0·65	0·84
WAZ	23	− 0·73	1·07	25	− 0·75	0·78
WHZ	23	− 0·03	0·94	25	− 0·33	0·64
Wtvel*	10	2·83	1·66	14	2·07	1·09
Htvel*	10	11·61	4·67	14	10·38	4·86

*Weight and height velocities (Wtvel and Htvel) measured between Rounds I and II; breast-feeding status noted at Round I survey.

Table 4. Tests of between-subject effects for breast-feeding status (EBF and PBF) for children aged 0–7 months in general linear multivariate test

Dependent variable	df	Mean square	*F*	Sig.
HAZ	1	2·01	2·76	0·10
WAZ	1	0·03	0·43	0·84
WHZ	1	1·31	2·11	0·15
Wtvel*	1	0·87	0·92	0·35
Htvel*	1	29·95	2·04	0·17

*Weight and height velocities (Wtvel and Htvel) measured between Rounds I and II; breast-feeding status noted at Round I survey.

model are the child's gender and whether the child is exclusively or partially breast-fed. Age is included as a covariate because in low-income countries growth faltering has been documented to begin between 2 and 4 months of age (Naborro *et al.,* 1988; Waterlow, 1988; Neumann & Harrison, 1994; Leonard *et al.,* 1995) and thus the impact of the introduction of non-breast milk foods on growth status will vary with age. As seen in Table 4, no statistically significant effects are found for any of the anthropometric indicators when comparing partially and exclusively breast-fed infants.

Similarly, a comparison of the point prevalence of diarrhoea during the first survey indicates that 47.6% of PBFs were reported by their mothers as having diarrhoea compared with 46.2% of EBFs ($\chi^2=0.01$, df=1, $p=0.93$). One day of survey may not be enough to detect differences in diarrhoeal prevalence. As almost half of the exclusively breast-fed infants were reported to have diarrhoea, however, it is possible that even exclusively breast-fed infants are subject to diarrhoeal infection

https://doi.org/10.1017/S0021932001003212 Published online by Cambridge University Press

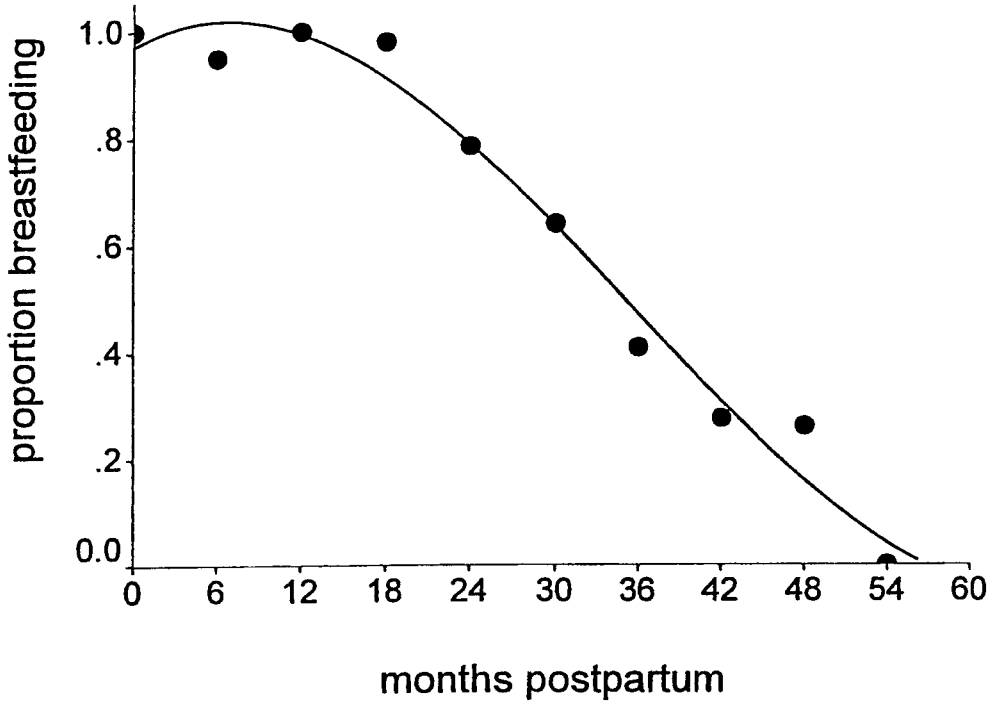

Fig. 3. Proportion of children being breast-fed from 0 to 60 months at time of first survey (n=283).

through inserting dirty hands in their mouths, being bathed in contaminated water, or the occasional feeding of water. Five of the 23 infants whose mothers reported that they gave their infants only breast milk did admit that they fed them water occasionally.

Breast-feeding duration

Using probit analysis for this sample of infants (n=283), the estimated median duration of breast-feeding in months postpartum is 35·97 with 95% confidence intervals around the median of 31·18 and 42·90 months. Over 90% of children in the 12–24 month age category, in fact, were still breast-feeding, after which the proportion of children being breast-fed declined to 0% by 54 months of age (Fig. 3). It should be underlined that the cessation of breast-feeding occurred for all children when the feeding of non-breast milk foods had become routine. Thus, the cessation of breast-feeding is a gradual process in that the amount of breast milk decreases as more non-breast milk foods are added to the child's diet.

All the mothers in the sample who had stopped breast-feeding their children (n=82) were asked during the infant feeding survey why they had stopped. The responses are shown in Fig. 4. The stated reason for why more than half the women decided to discontinue breast-feeding was because they had become pregnant again.

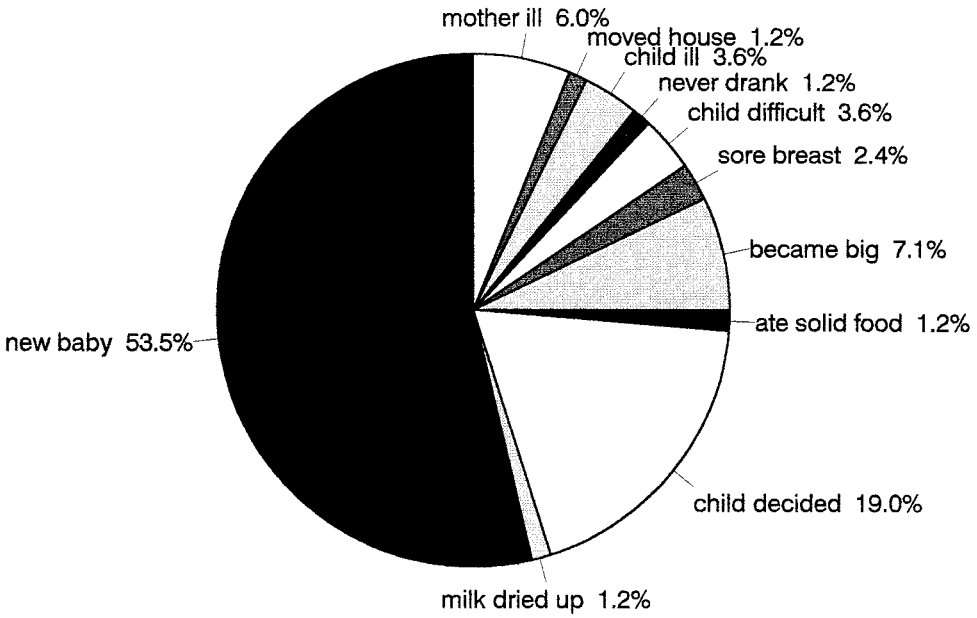

Fig. 4 Reasons why mothers stopped breast-feeding infants (n=82).

Another 19% of the 82 children who had been completely weaned at the time of the survey were reported to have 'stopped themselves', as the mothers phrased it. Another reason stated (7%) was that the child had 'become big'; that is, it was deemed that s/he was old enough to stop. Another five mothers (6%) said that they had taken ill and were no longer able to breast-feed (Fig. 4).

Discussion

Although recommendations for infant feeding practices are based on physiological and epidemiological evidence, ethnographic data from a variety of countries worldwide have shown that weaning practices, to a large extent, are determined by social, cultural, economic and biophysical aspects of the environment in which people live (Bohler & Ingstad, 1996; Dettwyler, 1995; Fildes, 1982, 1995; Gray, 1996, 1998; Harrison *et al.,* 1993; Jackson *et al.,* 1990; Levine, 1988; Panter-Brick, 1991). The ethnic and cultural variety within the nation of Nepal is diverse and it stands to reason that it might have some bearing on infant feeding practices. Indeed, the two major ethnic identities in Nepal, Indo-Aryans (practising Brahminical Hinduism) and Tibeto-Burmans (practising numerous local traditions of the hill and mountain peoples) have discrepant attitudes and beliefs about breast milk and infant feeding.

Breast milk and solid food for infants, like many aspects of Hinduism, is interpreted in terms of purity and pollution (see Dumont, 1970). Breast milk is considered to be pure, and while the infant is only drinking breast milk she or he is not yet polluted as are adults (Paneru, 1981, p. 49). Exclusive breast-feeding,

therefore, is considered to be ideal until the infant is around 5 or 6 months of age (Paneru, 1981, p. 45). The first introduction of solid food is celebrated as an important milestone in a child's life and it is the custom to hold a party for family and friends called the 'rice-feeding ceremony', or in Nepali language, *pasni*.

A *pasni* was held for the son of one of the families participating in the study. Their son had just turned 6 months old and the celebration was held in their home. A Hindu priest officiated at the ceremony, which consisted of prayers and blessings for the child and family. The priest, and each member of the family thereafter, fed the child a dab of rice pabulum using a gold coin as a spoon. As in a Christening ceremony, for example, guests gave presents to the infant and everyone partook in a large meal. The family who hosted this ceremony had the means to afford it. Other people in the study sample when asked whether they had held a rice-feeding ceremony for their children said that they had not done so because they could not afford to host the party. Some other nominal Hindus – that is, those ethnic groups who participate in some Hindu customs but also have their own tribal customs – may not have been so concerned about celebrating this rite of passage. Nevertheless, the belief that it was a good thing not to feed an infant solid food until s/he is 5 or 6 months was agreed upon by most Hindu people in the study.

Tibeto-Burman people – Sherpas, Limbus and Rais among others – who are not Hindus, made a point of stating that they did not practise the rice-feeding ceremony, as it is not part of their belief system. Sherpas are reputed to begin feeding their children grain porridge when they are 5 or 6 days old. Indeed, Sherpas seemed less concerned about withholding food from a baby until a certain age, and did not worry about purity and pollution with regard to breast milk and non-breast milk food. It is interesting to speculate on why Tibeto-Burman and Indo-Aryan peoples may have divergent customs. One possibility is that Tibeto-Burman peoples come mainly from higher altitudes where it is colder and their children may need a higher calorie intake to compensate for the rigorous environment. Alternatively, or in combination, it may have something to do with women's activity patterns. Tibeto-Burman women, in contrast to many Hindu women's domestic focus, tend to be more concerned with agricultural work located away from the home. Tibeto-Burman mothers may have less time to breast-feed and therefore may have developed the tradition of supplementing their infants' diets at an earlier age with non-breast milk foods. This difference in women's activity, however, may actually have the opposite effect. In Panter-Brick's (1991) study, which contrasts breast-feeding practices of Indo-Aryan Kami (low-caste) with Tibeto-Burman Tamang women, it was found that Kami women, who spend more time at home, actually introduce non-breast milk foods to their infants at an earlier age than Tamang women.

Despite ethnic rules and norms, however, the mothers in this sample appear to be operating within their own understanding of infant feeding practices. Marriott (1998), researching in Mali, has also reported a weak relationship between ethnicity and infant feeding practices. The Nepali women in this study appear to be reacting to what they perceive to be the needs of their infants on a case-by-case basis. The mothers who began complementary feeding early firmly believed that their infants were not getting enough nourishment from their breast milk alone and that they required other foods. This explanation for the early introduction of non-breast

milk foods has also been reported by women in other studies located in rural Nepal (Levine, 1988, p. 243; Moser, Archarya & Reynolds, 1986, p. 98), as well as a variety of other parts of the world (Dettwyler, 1987, p. 639; Haider *et al.,* 1996; Harrison *et al.,* 1993, p. 1067; Segura-Millan, Dewey & Perez-Escamila, 1994; Davies-Adetugbo, 1997).

The infant's gender is said to be an influential factor in the timing of the introduction of non-breast milk food in Nepal. It is said, in fact, that girls should begin eating non-breast milk food at 5 months and boys at 6 months (Paneru, 1981, p. 45). When asked why, most people stated that it was because girls need solid food earlier than boys, although why girls need it earlier was not articulated. Again, however, despite stated ideals, gender was not found to affect the timing of the introduction of non-breast milk foods.

A comparison of the anthropometric data for EBFs and PBFs under 7 months of age for this sample shows no difference in mean *Z*-scores for height and weight indices and mean velocities for weight and height. This was found even when sex and age of the child were controlled for using multivariate tests. There was also no difference in reported point prevalence of diarrhoea between the two groups. While the limitations of a small sample size and a retrospective study design are acknowledged, the fact that there is no difference between EBFs and PBFs in anthropometric and morbidity indicators suggests that the allegedly harmful consequences of early supplementation may not apply to these infants. Alternatively, exclusively breast-fed infants were likely to have come into contact with contaminated fluids via other routes such as through bathing or the occasional supplementation with water. Therefore, exclusive breast-feeding, while perhaps helpful in the short term, will not necessarily protect children from the risks of an unhygienic environment, especially as they become more mobile and interact more with their environment.

The mothers and infants in this study, like those living in adverse environments all over the world, face the 'weanling's dilemma'. The timing of the initiation of the weaning process is a fine balance. Accordingly, studies that compare the growth and morbidity status of EBFs and PBFs have contradictory results. Popkin and colleagues (1990), for example, found in a longitudinal study of mothers and their infants in the Philippines that exclusively breast-fed infants had a significantly lower relative risk of diarrhoea compared with those who were fed non-breast milk foods before 6 months of age. In a similar study in urban Brazil, Martines and colleagues (1994) observed that EBF infants living in unhygienic conditions had better growth and a lower mean incidence of diarrhoea, but only up till the fourth month of age. They found, moreover, that by 5 months of age, the growth of EBF infants lagged behind other groups (partial, predominantly and non-breast-fed) and behind the WHO/NCHS reference. Partial breast-feeding was, however, protective against diarrhoea for infants through 6 months of life. Thus, they recommend that a combination of breast-feeding and non-breast milk foods be introduced at 5 months postpartum. At the other end of the spectrum, Zumrawi and colleagues (1987), studying a sample of 436 infants in Khartoum Province, Sudan, found that from 1 to 6 months of age there was no difference in the incidence of growth faltering between EBFs and PBFs. It is important to note, however, that the current WHO/NCHS growth reference is based

on a study done by the Fels institute in Ohio between 1929 and 1975 with predominantly formula-fed infants. Studies comparing healthy breast-fed and formula-fed infants living under favourable conditions show that formula-fed infants have higher skinfold thicknesses and weight-for-length *Z*-scores after 3 months of age (Dewey *et al.,* 1993). Thus, the reference population may not represent the growth of healthy breast-fed infants and may exaggerate growth failure.

Similar to the situation for the mothers and infants in this study, Zumrawi and colleagues (1987, p. 392) state that there is so much variability around when mothers begin to supplement their children that it is difficult to produce any clear-cut policy about when non-breast milk feeding should begin among breast-fed children. Indeed, the biomedical recommendations about when to introduce non-breast milk food to an infant's diet are also rather ambiguous. As stated earlier, the WHO's policy is that breast-feeding should be continued exclusively until 6 months postpartum; however, the point up to which exclusive breast-feeding is considered to be adequate is deemed to be between 4 and 6 months of age. That age range allows for some inter-individual variability, which is bound to exist in any population of infants (Zumrawi *et al.,* 1987, p. 383). It is possible that those mothers who give infants complementary foods early may well be correct in their assessment that their children's nutritional needs are slightly below the lower end of the recommended age range. Waterlow, Ashworth & Griffiths (1980), for example, argue that for some children in a developing country setting, where growth faltering may begin at 3 months, breast milk may not be adequate to maintain individual infants' nutritional needs.

It must be emphasized that, contrary to many Western researchers' fears, supplementation with weaning gruel and/or commercial formula or pabulum and/or animal milk does not necessarily mean that infants will be taken off the breast altogether. In this study, all the children continued to breast-feed at least through the first year postpartum and many received breast milk right through their third year. This is fortunate as for children living in extreme conditions of poverty, breast milk may provide important nourishment and have a protective effect on the infant through the ingestion of immune system properties that may increase resistance to infection (Briend, Wijtyniak & Rowland, 1988; Victora *et al*., 1987).

Breast-feeding duration for this sample of mother–infant pairs is very long, the median falling within the third year of life. Thus, many mothers are breast-feeding well into the third and fourth years of life. Dettwyler (1995) argues, based on a primate model, that human lactation should last anywhere from 2.5 to 7 years. The breast-feeding duration of the children in this sample fits well within this range, although all of the children after their fourth year had stopped breast-feeding. Despite the fact that these women are working as wage earners and living in an urban setting, in terms of breast-feeding duration, they follow what is considered by Dettwyler (1995) to be a 'natural' age of weaning.

One of the most salient findings in this study is that the decision to end weaning was not one made consciously by the mother, but rather it was a by-product of the fact that she became pregnant again. This has also been found worldwide by other researchers (Bohler & Ingstad, 1996; Dettwyler, 1986; Gray, 1996). Bohler & Ingstad (1996, p. 1812), for example, who investigated weaning processes in Bhutan, found that mothers felt that pregnancy turned breast milk 'to rot' and that it would harm

the child. There may be some biological basis to this assertion as hormonal changes in the mother during pregnancy do diminish both the quantity and quality of breast milk (Vis & Hennart, 1978).

Conclusion

The creation and promotion of universal recommendations, while appropriate for a theoretical population based on epidemiological studies, does not necessarily fit with the everyday reality in which women live their lives. Breast-feeding and weaning practices are excellent examples of biocultural phenomena: they are influenced by the biological state of the mother and infant, cultural norms, socioeconomic circumstances and the ecological setting. It is clear that even though cultural rules exist, the women in this study do not follow them blindly. Rather, they negotiate practices within a complex web that includes their cultural beliefs, their assessment of their local ecology and their child's nutritional status, as well as their personal life circumstances.

Acknowledgments

The author is grateful to the parents and children in Kathmandu who participated in this research study. Funding was provided by the International Development Research Council of Canada (IDRC) and the Social Science and Humanities Research Council of Canada (SSHRC). The author would also like to thank Ann Herring, Bill Leonard and Shelley Saunders for their comments in the preparation of this material.

References

Akre, J. (1989) Infant feeding: the physiological basis. *Bull. Wld Hlth Org.* **67** (supplement), 1–108.

Allen, L. H. & Pelto, G. H. (1985) Research determinants of breastfeeding duration: suggestions for biocultural studies. *Med. Anthrop*. **9**(2), 97–106.

Bohler, E. & Ingstad, B. (1996) The struggle of weaning: factors determining breastfeeding duration in East Bhutan. *Social Sci. Med.* **43**(12), 1805–1815.

Borresen, H. C. (1995) Rethinking current recommendations to introduce solid food between four and six months to exclusively breastfeeding infants. *J. hum. Lact.* **11**(3), 201–204.

Briend, A., Wojtyniak, B. & Rowland, M. G. M. (1988) Breastfeeding, nutritional state, and child survival in rural Bangladesh. *Br. med. J.* **296**, 879–882.

CDC (Centers for Disease Control and Prevention) (1994) *Epi Info, Version 6*. The Division of Surveillance and Epidemiology, Epi Info Program Office, Atlanta.

Davies-Adetugbo, A. A. (1997) Sociocultural factors and the promotion of exclusive breastfeeding in rural Yoruba communities of Osun State, Nigeria. *Social Sci. Med.* **45**(1), 113–125.

Dettwyler, K. A. (1986) Infant feeding in Mali, West Africa: variations in belief and practice. *Social Sci. Med.* **23**(7), 651–664.

Dettwyler, K. A. (1987) Breastfeeding and weaning in Mali: cultural context and hard data. *Social Sci. Med.* **24**(8), 663–644.

Dettwyler, K. A. (1995) The hominid blueprint for the natural age of weaning in modern human populations. In: *Breastfeeding: Biocultural Perspectives.* Edited by P. Stuart-Macadam & K. A. Dettwyler. Aldine De Gruyter, New York.

Dettwyler, K. A. & Fishman, C. (1992) Infant feeding practices and growth. *Ann. Rev. Anthrop.* **21**, 171–282.

Dewey, K. G., Heinig, M. J., Nommsen, L. A., Peerson, J. M. & Lonnerdal, B. (1993) Breast-fed infants are leaner than formula-fed infants at 1 y of age: the DARLING study. *Am. J. clin. Nutr.* **57**, 140–145.

Dumont, L. (1980) *Homo Hierarchicus: The Caste System and Its Implications.* University of Chicago Press, Chicago.

Fildes, V. (1982) The age of weaning in Britain 1500–1800. *J. biosoc. Sci.* **14**, 223–240.

Fildes, V. (1995) The culture and biology of breastfeeding: an historical review of Western Europe. In: *Breastfeeding: Biocultural Perspectives*. Edited by P. Stuart-Macadam & K. A. Dettwyler. Aldine De Gruyter, New York.

Gray, S. (1996) Ecology of weaning among nomadic Turkana pastoralists of Kenya: maternal thinking, maternal behavior, and human adaptive strategies. *Hum. Biol.* **68**(3), 437–465.

Gray, S. (1998) Butterfat feeding in early infancy in African populations: new hypotheses. *Am. J. hum. Biol.* **10**, 163–178.

Greiner, T. (1996) The concept of weaning: definitions and their implications. *J. hum. Lact.* **12**(2), 123–128.

Haider, R., Islam, A., Kabir, I. & Habte, R. (1996) Early complementary feeding is associated with low nutritional status of young infants recovering from diarrhea. *J. trop. Pediatr.* **42**, 170–172.

Harrison, G. G., Zaghloul, S. S., Galal, O. M. & Gabr, A. (1993) Breastfeeding and weaning in a poor urban neighborhood in Cairo, Egypt: maternal beliefs and perceptions. *Social Sci. Med.* **36**(8), 1063–1069.

Herring, D. A., Saunders, S. R. & Katzenberg, M. A. (1998) Investigating the weaning process in past populations. *Am. J. phys. Anthrop.* **105**, 425–239.

Jackson, D. A., Imong, S. M., Woolridge, M. W., Wongsawasdii, L., Chiowanich, P., Drewett, R. F., Baum, J. D. & Amatayakul, K. (1990) Supplementary feeding and infant growth in Northern Thailand. In: *Breastfeeding, Nutrition, Infection and Infant Growth in Developed and Emerging Countries.* Edited by S. A. Atkinson, L. A. Hanson & R. K. Chandra. ARTS Biomedical Publishers and Distributors Ltd, St John's, Newfoundland.

Katzenberg, M. A., Herring, D. A. & Saunders, S. R. (1996) Weaning and infant mortality: evaluating the skeletal evidence. *Yrbk phys. Anthropol.* **39**, 177–199.

Knodel, J. & Kintner, H. (1977) The impact of breast feeding patterns on the biometric analysis of infant mortality. *Demography* **14**(4), 391–409.

Knodel, J. & Van De Walle, E. (1967) Breast feeding, fertility and infant mortality: an analysis of some early German data. *Popul. Stud.* **21**, 109–130.

Launer, L. J. & Habicht, J. P. (1989) Concepts about infant health, growth, and weaning: A comparison between nutritional scientists and Madurese mothers. *Social Sci. Med.* **29**(1), 13–22.

Leonard, W. R., DeWalt, K. M., Stansbury, J. P. & McCaston, M. K. (1995) Growth differences between children of highland and coastal Ecuador. *Am. J. phys. Anthropol.* **2**, 613–626.

Levine, N. (1988) Women's work and infant feeding: a case from rural Nepal. *Ethnology* **27**(1), 231–251.

Lohman, T. G., Roche, A. F. & Martorell, R. (1988) *Anthropometric Standardization Reference Manual*. Human Kinetics Books, Campaign, Illinois, USA.

Lutter, C. (1992) *Recommended Length of Exclusive Breastfeeding, Age of Introduction of Complementary Foods, and the Weanling Dilemma*. Document Number WHO/CDD/EDP 92·5. World Health Organization, Geneva, Switzerland.

Marriott, H. (1998) In-depth study of breastfeeding structure: new data from Mali. *Am. J. hum. Biol.* **10**(2), 179–190.

Martines, J. C., Habicht, J. P., Ashworth, A. & Kirkwood, B. R. (1994) Weaning in Southern Brazil: is there a 'weanling's dilemma'? *J. Nutr.* **124**, 1189–1198.

Moser, P. B., Archarya, S. & Reynolds, R. D. (1986) Cultural and environmental influences on the nutritional status of lactating women and their infants in Nepal. In: *Human Lactation 2: Maternal and Environmental Factors.* Edited by M. Hamosh & A. S. Goldman. Plenum Press, New York.

Naborro, D., Howard, P., Cassels, C., Pant, M., Wijga, A. & Padfield, N. (1988) The importance of infections and environmental factors as possible determinants of growth retardation in children. In: *Linear Growth Retardation in Less Developed Countries. Nestle Nutrition Workshop Series,* Vol. 14, pp. 165–184. Edited by J. C. Waterlow. Raven Press, New York.

Neumann, C. G. & Harrison, G. G. (1994) Onset of evolution of stunting in infants and children. Examples from the Human Nutrition Collaborative Research Support Program. Kenya and Egypt Studies. *Europ. J. clin. Nutr.* **48** (suppl. 1), S90–120.

Norusis, M. J./SPSS Inc. (1994) *SPSS Advanced Statistics, Release 6·1.* SPSS Inc, Chicago.

Paneru, S. (1981) Breast feeding in Nepal: religious and culture beliefs. *Contributions to Nepalese Studies* **8**(2), 43–54.

Panter-Brick, C. (1991) Lactation, birth spacing and maternal work-loads among two castes in rural Nepal. *J. biosoc. Sci.* **23**, 137–154.

Plank, S. J. & Milanesi, M. L. (1973) Infant feeding and infant mortality in rural Chile. *Bull. Wld Hlth Org.* **48**, 203–210.

Popkin, B. M., Adair, L., Akin, J. S., Black, R., Briscoe, J. & Flieger, W. (1990) Breast-feeding and diarrheal morbidity. *Pediat.* **86**, 874–882.

Quandt, S. A. (1987) Material recall accuracy for dates of infant feeding transitions. *Hum. Org.* **46**(2), 152–160.

Rowland, M. G. M. & Barrell, R. A. E. (1980) Ecological factors in gastroenteritis. In: *Disease and Urbanization,* pp. 21–35. Edited by E. J. Clegg & J. P. Garlic. Taylor and Francis Ltd, London.

Rowland, M. G. M., Barrell, R. A. E. & Whitehead, R. G. (1978) The weanling's dilemma. Bacterial contamination in traditional Gambian weaning foods. *Lancet* **1**, 136–138.

Schmidt, B. J. (1990) Interrelationships of infant feedings and infection in countries of Latin America. In: *Breastfeeding, Nutrition, Infection and Infant Growth in Developed and Emerging Countries*. Edited by S. A. Atkinson, L. A. Hanson & R. K. Chandra. ARTS Biomedical Publishers and Distributors Ltd, St John's, Newfoundland.

Segura-Millan, S., Dewey, K. G. & Perez-Escamila, R. (1994) Factors associated with perceived insufficient milk in a low-income urban population in Mexico. *J. Nutr.* **124**, 202–212.

Sellen, D. W. (1998) Infant and young child feeding practices among African pastoralists: the Datoga of Tanzania. *J. biosoc. Sci.* **30**, 481–499.

Stuart-Macadam, P. (1995) Biocultural perspectives on breastfeeding. In: *Breastfeeding. Biocultural Perspectives*. Edited by P. Stuart-Macadam & K. A. Dettwyler. Aldine De Gruyter, New York.

Tracer, D. P. (1996) Lactation, nutrition, and postpartum amenorrhea in lowland Papua New Guinea. *Hum. Biol.* **68**(2), 277–292.

Victora, C. G., Vaughan, J. P., Lombardi, C., Fuchs, S. M. C., Gigante, L. P., Smith, P. G., Nobre, L. C., Teixeira, A. B., Moreira, L. B. & Barros, F. C. (1987) Evidence for protection by breast-feeding against infant deaths from infectious diseases in Brazil. *Lancet* **2**, 319–322.

Vis, H. L. & Hennart, P. (1978) Decline in breastfeeding. About some of its causes. *Acta paediatr.* **31**, 195–206.

Waterlow, J. C. (1988) Observations on the natural history of stunting. In: *Linear Growth Retardation in Less Developed Countries. Nestle Nutrition Workshop Series,* Vol. 14, pp. 1–16. Edited by J. C. Waterlow. Raven Press, New York.

Waterlow, J. C., Ashworth, A. & Griffiths, M. (1980) Faltering in infant growth in less-developed countries. *Lancet* **2**, 1176–1178.

Zumrawi, F. Y., Diamond, H. & Waterlow, J. C. (1987) Faltering in infant growth in Khartoum Province, Sudan. *Hum. Nutr. clin. Nutr.* **41C**, 383–395.