Feeding Practices and Growth among Low-Income Peruvian Infants: A Comparison of Internationally-Recommended Definitions

ELLEN G PIWOZ,* HILARY CREED DE KANASHIRO,** GUILLERMO LOPEZ DE ROMANA,** ROBERT E BLACK* AND KENNETH H BROWN†


Background. Data from a longitudinal study of 153 low-income Peruvian infants were used to assess the relationship between internationally-recommended definitions of feeding practices and infants’ monthly weight gain and weight status at 12 months.

Methods. Infants were classified into feeding categories using monthly reported data. Analysis of variance was used to assess the relationship between reported usual feeding practices and growth. Reported breastfeeding practices were compared to observed breastfeeding practices and to weighed breast milk intakes to determine the validity of recommended breastfeeding definitions.

Results. Breastfed infants who consumed non-human milks during the first month of life gained less weight during that month (P < 0.002) than exclusively and predominantly breastfed infants. Reported daily nursing frequency was associated with observed nursing frequency and breast milk energy intake (P < 0.05) for infants <9 months old. Patterns of growth varied according to early diets. Infants who consumed breast milk and non-human milks and those who were fully weaned by 4 months were more likely to be underweight at 12 months than other infants. Infants classified as token breastfeeders (<3 times/24 hours) from 0 to 120 days had monthly gains that were similar to those of fully weaned infants.

Conclusions. Infant feeding definitions should 1) continue to differentiate exclusively breastfed infants from other infants who are almost exclusively or predominantly breastfed; 2) distinguish partially breastfed infants who consume only non-human milks from those who also consume solid foods; and 3) distinguish partially breastfed infants according to their breastfeeding frequency or the % of their total daily energy that comes from breast milk.

Keywords: infant feeding practices, infant growth, nutrition surveys, nutrition assessment

Programmes to promote breastfeeding in developing countries have been intensified in recent years because of increased recognition that breastfeeding protects against morbidity and mortality from infectious diseases.¹⁻⁴ To assess the accomplishments of these programmes, population-based data on infant feeding practices, such as are presently collected in the Demographic and Health Surveys (DHS), are useful for monitoring trends within countries and regionally.

The use of inconsistent definitions of feeding practices, however, has resulted in contradictory conclusions about the prevalence of practices such as exclusive breastfeeding, the use of breast milk substitutes, and the introduction of solid food, as well as their effects on growth during infancy.⁵ For example, studies to evaluate the adequacy of exclusive breastfeeding for maintaining infant growth have classified infants who consumed juices and other non-milk liquids as exclusively breastfed.⁶ On the other hand, studies comparing growth among breastfed, formula-fed, and mixed-fed infants often fail to assess solid food consumption,⁷ whereas studies examining the effects of supplementation on growth often do not distinguish between milk and solid or semi-solid food supplements.⁸⁻⁹
To address these problems, members of the Interagency Group for Action on Breastfeeding (IAGB) convened a meeting in 1988 to formulate specific definitions of breastfeeding behaviour for use in research and nutrition programmes. These definitions, summarized at the top of Table 1, included specific requirements for exclusive (no other liquids can be given) and almost exclusive breastfeeding (non-milk liquids allowed), and differentiation of infants who were not exclusively breastfed into groups based on their breastfeeding frequency (high, medium, low, token). No precise guidelines were given on how to define these sub-categories, although nursing no more than 15 min/d or 2–3 times per 24 hours were suggested as possible definitions of token breastfeeding, and cutoffs were offered as definitions of high (>80% of infant feeds from breast milk), medium (20–80%), and low intensity (<20%) nursing. These cutoffs were based on studies of lactation and fertility.

In 1991 a second meeting was convened by the World Health Organization (WHO) to determine another set of definitions and indicators for studying feeding practices using 24-hour recall methods in household surveys. The second meeting resulted in a modification of the earlier breastfeeding definitions, including adding a definition for predominant breastfeeding and dropping the differentiation of partial breastfeeding by nursing frequency. Instructions for calculating age-specific population rates for timely complementary feeding, continued breastfeeding, and bottlefeeding were also added.
FEEDING PRACTICES AND GROWTH AMONG LOW-INCOME PERUVIAN INFANTS

The procedures with food weighing. Breast milk consumption was estimated by the test-weighing method. The procedures used to measure food and breast milk intake and to estimate 24-hour consumption have been described previously. Information on usual feeding practices was obtained at the end of each month through a questionnaire administered to the infant's mother or primary caretaker. The questionnaire ascertained each infant's breastfeeding status, the estimated number of times the infant was nursed per day (24-hour), and whether the infant consumed non-human milks, other liquids, and any of a list of locally available solid foods two or more times/week, on average, during the preceding month.

On the basis of this information, infants were classified into one of seven feeding categories to describe their usual feeding practice during the month (Table 2). These classifications are the same or slightly modified forms of the IAGB and WHO definitions for most practices. Household socio-demographic information was obtained via questionnaire at the end of the study. Analytical Methods

Calculating infant growth increments. Growth increments were calculated in a two-step process. First, each infant's weight on his or her monthly birthday (30 days) was estimated by linear interpolation from two successive measurements, up to a maximum of 45 days apart. Increments were calculated as the difference between the interpolated values at the start and end of each 30-day period.

Infants who were not measured within 15 days of their birthday were assigned a missing value for the month and relevant increments. Growth increments were available for ≥95% of 1–7 month old infants for each month they were enrolled in the study, and for ≥90% of 8–11 month olds.

Feeding practices and infant growth. The growth of infants following different feeding patterns was analysed in several ways. Monthly weight increments were compared for infants following different feeding practices during the month. In these analyses infants move into and out of feeding categories each month throughout the year.

Average monthly increments, cumulative growth, and weight status at 12 months for infants classified according to their feeding practices during the first four months were also examined. In these analyses infants remain in one category for the entire year. Infants were classified this way to determine whether early feeding practices influenced growth during later infancy. This was believed to occur because feeding practices in early infancy influenced feeding decisions throughout the first year in this population.

METHODS

Field Methods

Data from a community-based longitudinal study of the relationships among nutrition, infection, and growth were used for this analysis. The study was carried out from July 1982 to June 1984 in Pueblo Joven ('Young Town') Huascar, a low-income community in Lima, Peru. Characteristics of the community and the study methods have been described previously. The community was believed to be typical of other recently settled peri-urban neighbourhoods in Lima, in terms of the quality of public services available, and the education, employment, demographic and health status of its members.

In all, 156 full-term, singleton infants with birthweights ≥2500 g and no congenital abnormalities were enrolled in the study at birth. Body weights were measured by trained anthropometrists at or within one week of birth (N = 113) and at monthly intervals thereafter. Weights were determined using a portable, spring-balance scale that was sensitive to 100 g. Infants were weighed unclothed, and weights were recorded as the mean of two consecutive weighings.

Monthly measurements of all infants were scheduled for the date of their monthly birthday. Overall, 79% were completed within 3 days, and 92% were completed within 7 days of the scheduled time. Periodic standardization exercises were held to minimize measurement error.

All study infants were visited in their homes three times/week to obtain information on infectious diseases and other illnesses on the day of the visit and the two preceding days. The morbidity records were reviewed weekly, and all symptoms were diagnosed and coded according to criteria that have been published previously. Information on dietary intake was obtained 1–2 times/month, by 12-hour daytime observations with food weighing. Breast milk consumption was estimated by the test-weighing method. The procedures

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Table 2  Feeding definitions used in this study and their relationship to internationally-recommended definitions

<table>
<thead>
<tr>
<th>Internationally-recommended definition</th>
<th>This study</th>
<th>Definition</th>
<th>Relationship to international definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full breastfeeding (FB)</td>
<td>Exclusive breastfeeding (EXBF)</td>
<td>Infant consumes only BM&lt;sup&gt;a&lt;/sup&gt; during the month and not other liquids, milks or solid foods.</td>
<td>Same as IAGB&lt;sup&gt;b&lt;/sup&gt; definition of EXBF.</td>
</tr>
<tr>
<td>Breast milk + Other Liquids (BM+OL)</td>
<td></td>
<td>Infant consumes BM and non-milk liquids (including teas, water, juices, and other water-based drinks, vitamins, medicines) during the month.</td>
<td>Same as IAGB definition of almost exclusive breastfeeding and WHO definition of predominant breastfeeding.</td>
</tr>
<tr>
<td>Partial breastfeeding (PB)</td>
<td>Breast milk + Non-Human Milks (BM+NHM)&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Infant consumes BM and non-human milks ≥2 times/week during the month. Other liquids also allowed.</td>
<td>No IAGB or WHO equivalent.</td>
</tr>
<tr>
<td></td>
<td>Breast milk + Solid Foods (BM+SO)&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Infant consumes BM and (semi)-solid foods ≥2 times/week during the month. Non-milk liquids also allowed.</td>
<td>Similar to WHO complementary feeding definition except non-human milks are not allowed. More specific than IAGB partial breastfeeding definition.</td>
</tr>
<tr>
<td></td>
<td>Breast milk + Non-Human Milks + Solid Foods (BM+NHM+SO)&lt;sup&gt;e&lt;/sup&gt;</td>
<td>Infant consumes BM, NHM and (semi-) solid foods ≥2 times/week during the month. Other liquids also allowed</td>
<td>Similar to WHO complementary feeding definition except non-human milks are specifically included. More specific than IAGB partial breastfeeding definition.</td>
</tr>
<tr>
<td>Fully weaned (FW)</td>
<td>Non-Human Milk ± Solid Foods (NHM±SO)</td>
<td>Infant does not consume BM. Infant consumes non-human milks with or without solid foods. Non-milk liquids allowed.</td>
<td>This complements WHO breastfeeding definition. It measures number of infants who are not breastfeeding.</td>
</tr>
</tbody>
</table>

<sup>a</sup> Breast milk.<br>
<sup>b</sup> Interagency Group for Action in Breastfeeding.<br>
<sup>c</sup> These infants are classified as PB/M or partially breastfed and consuming other milks in this study.<br>
<sup>d</sup> These infants are classified as PB/S or partially breastfed and consuming solid foods in this study.<br>

Note: Infants in this study were classified according to their mothers' reported usual feeding practice during a month-long period. WHO feeding rates defined in Table 1 are based on feeding practices during a 24-hour period.

Overall differences in monthly weight gain by feeding practices were evaluated using one-way analysis of variance. Models did not adjust for potential confounding variables, such as monthly prevalence of diarrhoea, because the purpose was to assess whether infants classified according to internationally-recommended feeding definitions have different weight outcomes without looking at more proximate determinants of their growth. P-values < 0.004 (0.05/12) were considered to be statistically significant. This level was selected because comparisons were performed for the same infants at 12 different ages. Bonferroni t-tests were used to test for differences in mean gains between pairwise feeding categories when overall F-tests were significant. Relative risks of being underweight at 12 months (defined as < −2 SD from the NCHS gender-specific reference median weight) for infants following different early feeding practices were also calculated.

Breastfeeding intensity and infant growth. Infants who were partially breastfed during any month were differentiated according to their mothers’ reported frequency of breastfeeding per 24 hours during that month because data on the total number of all feeding episodes per day, which was recommended by the IAGB, were not coded. Categories were determined by the quartiles of the monthly reported frequencies. Quartile cutoffs were the same at each month, permitting a single set of definitions for varying levels of breastfeeding intensity throughout the year. Infants were classified as (i) token breastfeeders if their mothers reported nursing 1–3 times/day during the previous month (5th percentile); (ii) low intensity breastfeeders if their mothers reported nursing them 4–6 times/day (5–25th percentiles); (iii) medium intensity breastfeeders if their mothers reported nursing them 7–9 times/day (25–75th percentiles); and (iv) high intensity breastfeeders if they were nursed ≥10 times daily. Average monthly weight gains
of partially breastfed infants, classified by reported breastfeeding intensity, are presented.

In addition to the above, the reported breastfeeding intensity data were compared to information obtained during the 12-hour dietary observations. This comparison also permitted recommendations on ways to classify partially breastfed infants.

RESULTS

Monthly Feeding Practices and Infant Growth

The average weight gains of study infants by feeding practice during the month are given in Table 3. Only weight gain from birth to one month was significantly related to feeding practices \((P < 0.0014)\). During this month, exclusively breastfed (EXBF) infants gained an average of 1100 g and predominantly breastfed infants \((BM+OL)\) gained 894 g, compared to only 628 g for partially breastfed infants who consumed non-human milks \((PB/M)\). These partially breastfed infants had among the lowest gains in each of the first 5 months of infancy.

Although not statistically significant, several growth patterns are worth noting in these comparisons. The EXBF infants gained more than 1 kg/month, on average, during their first three months but their weight gain decelerated rapidly in the fourth month. This pattern of growth has been observed among EXBF infants in several populations worldwide. Early weight gains were not as high among infants who also consumed non-milk liquids, suggesting that the EXBF infants’ distinctive growth pattern might be obscured when they are combined into the group ‘fully breastfed’.

Feeding Patterns in the First Four Months and Infant Growth

Data on feeding practices during each of the first four months were available for 140 study infants. Of these infants, 29 (20.7%) were characterized as fully breastfed \((FB)\) throughout the first 4 months, 18 (12.9%) were partially breastfed and consuming only non-human milks \((PB/M)\), 85 (60.7%) were partially breastfed and consuming solid foods \((PB/S)\), and 8 infants (5.7%) had stopped breastfeeding and were fully weaned \((FW)\) by their 4-month birthday. The median duration of breastfeeding in this group was 2 months.

Some characteristics of the infants classified by their early feeding patterns are summarized in Table 4. Early feeding patterns were not statistically associated with any of the family socioeconomic variables examined, but FW infants tended to have older, more educated mothers and to live in larger households with higher per capita incomes than other infants.

Birthweight, daily estimated energy intake, and average monthly prevalences of diarrhoea and fever significantly varied among infants in different feeding groups. Birthweights \((P < 0.001)\), age, and monthly prevalences of diarrhoea \((P < 0.01)\) and fever \((P < 0.001)\) were greatest among the FW infants. The average ages of non-human milk and solid food introduction were also significantly different, but this was expected because of the way the feeding categories were defined.

Weight gains by infants following different early feeding patterns varied significantly from 0–1 \((P < 0.0001)\) and 1–2 months \((P < 0.0001)\) (Figure 1). As illustrated by the slopes of the lines in Figure 2, FB infants gained weight more rapidly, on average, than other infants during the first 5 months of life. Although their weight gains fluctuated relative to other infants’ gains during the rest of the year, infants who were FB for at least 4 months had the highest annual cumulative weight gain of all study infants.

On the other hand, FW infants had the opposite growth pattern. They gained the least weight during the first 5 months, and the most weight each month from 5 to 9 months. After 9 months, however, they once again grew more slowly than other infants. Infants who consumed a mixed milk diet in the first 4 months \((PB/M)\) gained more weight from birth to 3 months than infants who received early solid foods \((PB/S)\). After 3 months, however, PB/S infants gained more weight each month than the PB/M infants (Figures 1 and 2).

At 12 months of age, PB/M infants were 3.3 times more likely to be underweight \((95\% \text{ confidence interval: } 1.4–8.1)\), and FW infants were 5.7 times more likely to be underweight \((95\% \text{ confidence interval: } 2.7–12.4)\) than FB and PB/S infants, who were grouped together because they had similar rates of underweight \((14\%)\).

The influence of past growth on early feeding patterns must be kept in mind in the interpretation of these results. Previous analyses indicated that mothers changed their early feeding practices in response to low weight gain. Most changes involved the addition of non-human milk and solid food, but in some cases also included complete weaning (particularly for infants who had the lowest birthweights). Thus, the relatively poor weight gains of the PB/M, PB/S, and FW infants during the first 4 months may in part be the result of poor growth that occurred when they were following a different feeding practice (i.e. when they were fully or partially breastfed). Differences in weight gain after 4 months are likely to be due to differences in rates of infection (Table 4) and dietary responses to illness, such as reduced consumption of energy from non-breast
### Table 3  Infant weight gain (g) by feeding practices during the month and age

<table>
<thead>
<tr>
<th>Age at end of month</th>
<th>Fully breastfed</th>
<th>Partially breastfed</th>
<th>Weaned</th>
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<tbody>
<tr>
<td></td>
<td>EXBF</td>
<td>BM+OL</td>
<td>BM+NHM</td>
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<tr>
<td>1&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1100</td>
<td>894</td>
<td>628</td>
</tr>
<tr>
<td></td>
<td>(374)&lt;sup&gt;c&lt;/sup&gt;</td>
<td>(438)</td>
<td>(365)</td>
</tr>
<tr>
<td></td>
<td>(12)&lt;sup&gt;d&lt;/sup&gt;</td>
<td>(53)</td>
<td>(40)</td>
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<td>2</td>
<td>1011</td>
<td>1058</td>
<td>952</td>
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<td>(271)</td>
<td>(322)</td>
<td>(378)</td>
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<td>(572)</td>
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<td>(249)</td>
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<sup>a</sup> See Table 2 for definitions of feeding practices.  
<sup>b</sup> F value = 5.56 (3,104 d.f.); R<sup>2</sup> = 0.14; P < 0.0014.  
<sup>c</sup> Standard deviation.  
<sup>d</sup> No. infants.

milk sources, for infants following different feeding practices.  

**Breastfeeding Intensity and Infant Growth**  
Table 5 presents the monthly weight increments for partially breastfed infants classified by their mothers' reported breastfeeding intensity during that month.  

Differences in weight gain by reported breastfeeding intensity (RBFI) were statistically significant from 10–11 months (P < 0.002), and suggestive from 0–1 months (P < 0.05), 1–2 months (P < 0.006) and 7–8 months (P < 0.02).  

Although not statistically significant in a study of this size, the relationship between RBFI and weight
Table 4 Selected characteristics of study infants and their families

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Feeding practices (0–4 months)</th>
<th>Full breastfeeding (FB) (N = 29)</th>
<th>Partial breastfeeding/milk (PB/M) (N = 18)</th>
<th>Partial breastfeeding/solids (PB/S) (N = 85)</th>
<th>Fully weaned (FW) (N = 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother’s age (years)</td>
<td></td>
<td>25.3 (4.4)*</td>
<td>26.8 (5.4)</td>
<td>26.4 (6.1)</td>
<td>32.0 (4.5)</td>
</tr>
<tr>
<td>Mother’s education (years)</td>
<td></td>
<td>4.7 (3.1)</td>
<td>5.7 (3.7)</td>
<td>5.4 (3.0)</td>
<td>6.4 (3.5)</td>
</tr>
<tr>
<td>Family size</td>
<td></td>
<td>4.1 (1.7)</td>
<td>4.3 (1.8)</td>
<td>4.7 (2.0)</td>
<td>5.8 (2.4)</td>
</tr>
<tr>
<td>Per capita income ($)/year</td>
<td></td>
<td>331 (248)</td>
<td>374 (278)</td>
<td>293 (204)</td>
<td>546 (754)</td>
</tr>
<tr>
<td>Birthweight (g)*</td>
<td></td>
<td>3270 (325)</td>
<td>3075 (386)</td>
<td>3350 (401)</td>
<td>2800 (216)</td>
</tr>
<tr>
<td>Age of NHM\textsuperscript{b} introduction (months)**</td>
<td></td>
<td>7.2 (1.7)</td>
<td>1.7 (0.8)</td>
<td>2.8 (2.6)</td>
<td>1.1 (0.4)</td>
</tr>
<tr>
<td>Age of SO\textsuperscript{c} introduction (months)**</td>
<td></td>
<td>5.4 (0.6)</td>
<td>5.3 (0.6)</td>
<td>3.3 (0.9)</td>
<td>3.4 (1.3)</td>
</tr>
<tr>
<td>% Still breastfeeding at 8 months</td>
<td></td>
<td>100 (100)</td>
<td>93 (85)</td>
<td>92 (89)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>% kcal from BM\textsuperscript{d}***</td>
<td></td>
<td>87 (8)</td>
<td>65 (27)</td>
<td>69 (25)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Average daily energy intake (kcal)\textsuperscript{**}</td>
<td></td>
<td>560 (56)</td>
<td>609 (97)</td>
<td>604 (109)</td>
<td>797 (175)</td>
</tr>
<tr>
<td>Average mo prevalence (%) \textsuperscript{*}</td>
<td></td>
<td>11.2 (10.3)</td>
<td>13.4 (9.9)</td>
<td>15.9 (14.9)</td>
<td>30.2 (15.7)</td>
</tr>
<tr>
<td>Diarrhoea*</td>
<td></td>
<td>7.8 (5.0)</td>
<td>11.4 (5.3)</td>
<td>8.5 (5.5)</td>
<td>16.9 (9.4)</td>
</tr>
<tr>
<td>Fever**</td>
<td></td>
<td>11.8 (8.5)</td>
<td>16.1 (10.8)</td>
<td>14.6 (13.2)</td>
<td>22.7 (8.7)</td>
</tr>
<tr>
<td>Anorexia\textsuperscript{f}</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Standard deviation.
\textsuperscript{b} NHM = non-human milk.
\textsuperscript{c} SO = solid foods.
\textsuperscript{d} BM = breast milk.
\textsuperscript{e} Appetite that was reported by the mother to be less than usual.
\textsuperscript{f} P < 0.01; ** P < 0.001; *** P < 0.0001.

Gain appeared to vary by infant age. Infants classified as 'token' breastfeeders gained less weight each month than other partially breastfed infants from birth to 5 months. From one to 4 months their average monthly gains were similar to, if not less than, the weaned infants' gains (Table 3). Token breastfeeders gained more weight from 6 to 12 months than other partially breastfed infants. High intensity breastfeeders, on the other hand, gained well from birth to 5 months, and had low weight gains from 6 to 12 months.

Reported and Observed Breastfeeding Behaviour
Monthly correlations between reported (24-hour) breastfeeding frequency and the number of nursing episodes observed during the 12-hour dietary studies for the same month had positive coefficients ranging from 0.30 to 0.58. Correlations were weaker at the end of infancy because reported breastfeeding frequencies did not decline, on average, with infant age but the average number of nursing episodes observed per day decreased after 9 months. This suggests that mothers...
nursed their older infants more often at night, or that reported 24-hour nursing frequencies were overestimated for older infants.

Correlations between reported breastfeeding frequency and breast milk energy intake and the proportion of total intake derived from breast milk were slightly weaker than those described above, with positive coefficients ranging from 0.20 to 0.52. Average breast milk energy intakes (during the observations) for infants classified as token breastfeeders (using the reported data) were 182 ± 145 kcal/d, compared to 337 ± 146 kcal/d for low, 407 ± 134 kcal/d for medium, and 428 ± 124 kcal/d for high intensity breastfeeders. The proportion of energy derived from breast milk during the dietary observations ranged from 0.29 (± 0.26) for infants who were classified as token breastfeeders to 0.58 (± 0.28) for low, 0.73 (± 0.25) for medium, and 0.77 (± 0.22) for high intensity breastfeeders.

It is interesting to note that when token breastfeeding was defined as <15 min/12 hour (as recommended by the IAGB), estimated average 24-hour breast milk energy intake and the proportion of total energy derived from breast milk were similar to the levels described above (185 ± 167 kcal and 0.30 ± 0.26, respectively), and represent more than nursing for non-nutritive purposes. Use of the 15 min cutoff, however, identified more infants as token breastfeeders (N = 74; 8.2%) than the 1–3 times/24 hours criterion (N = 48; 5.3% for infants who also had dietary intake data).

**DISCUSSION**

Collection of data on infant feeding practices in national surveys provides useful information for nutrition policy and programmes. It is important, however, that the data collected and the definitions used to describe feeding patterns are the same across surveys so that feeding practices, their health implications, and trends over time can be compared.

In 1988 and 1991 representatives of several international agencies met to establish consistent definitions of breastfeeding and other infant feeding practices. This study compares some of the recommended feeding definitions with infant weight gain, as far as was possible given the strengths and limitations of the data.

The major strengths of the data for these comparisons were its longitudinal nature and the existence of
FEEDING PRACTICES AND GROWTH AMONG LOW-INCOME PERUVIAN INFANTS

Figure 2 Average cumulative weight gain (g) by feeding practices in early (0-4 months) infancy

The results of this study suggest the following conclusions with respect to the internationally-recommended feeding definitions:

1. It is important to continue to differentiate exclusively breastfed infants from other infants who are fully breastfed ('almost exclusive' or 'predominantly breastfed') in early infancy.

Data in Table 3 suggest that EXBF infants will appear to have flatter growth curves in early infancy than in fact is true if the consumption of non-milk liquids is allowed in the definition of exclusive breastfeeding.

Previous analyses of data from this study suggest that differences in early growth may be due to contamination of the liquids served in feeding bottles, resulting in higher rates of diarrhoeal and other infections in predominantly breastfed infants as compared to EXBF infants. In addition, the predominantly breastfed infants in this study consumed less total energy per kg...
### Table 5: Mean weight gains (g) among partially breastfed infants classified by their mothers' reported breastfeeding intensity

<table>
<thead>
<tr>
<th>Age at end of month</th>
<th>Breastfeeding intensity</th>
</tr>
</thead>
</table>
|                     | Tokens  
(1–3)* | Low  
(4–6) | Medium  
(7–9) | High  
(10+) |
|---------------------|-------------------------|
| 1                   | 167  
(58)^b | 645  
(401)  
(20) | 621  
(374)  
(19) | 820  
(210)  
(10) |
| 2                   | 440  
(297)  
(5) | 1050  
(363)  
(14) | 968  
(337)  
(37) | 1045  
(357)  
(22) |
| 3                   | 617  
(156)  
(6) | 818  
(208)  
(22) | 800  
(340)  
(36) | 856  
(215)  
(18) |
| 4                   | 513  
(264)  
(8) | 625  
(318)  
(20) | 654  
(164)  
(37) | 646  
(235)  
(28) |
| 5                   | 417  
(248)  
(6) | 436  
(264)  
(22) | 488  
(269)  
(41) | 572  
(209)  
(39) |
| 6                   | 360  
(152)  
(5) | 387  
(344)  
(15) | 368  
(241)  
(41) | 359  
(241)  
(49) |
| 7                   | 475  
(499)  
(4) | 304  
(314)  
(23) | 336  
(270)  
(36) | 246  
(215)  
(41) |
| 8                   | 429  
(111)  
(7) | 335  
(187)  
(20) | 231  
(255)  
(39) | 178  
(240)  
(36) |
| 9                   | 440  
(445)  
(5) | 244  
(179)  
(18) | 230  
(305)  
(37) | 149  
(219)  
(39) |
| 10                  | 240  
(217)  
(10) | 152  
(291)  
(21) | 197  
(209)  
(31) | 97  
(177)  
(34) |
| 11*                 | 357  
(151)  
(7) | 300  
(248)  
(26) | 120  
(202)  
(25) | 150  
(163)  
(32) |
| 12                  | 233  
(167)  
(9) | 158  
(195)  
(19) | 219  
(268)  
(26) | 159  
(193)  
(27) |

*Reported average number of breastfeeds per 24 hours.

bStandard deviation.

^Number of infants.

^Model F-value = 5.55 (3, 86 d.f.); R² = 0.16; P < 0.002.

bodyweight per day and energy from breast milk per kg bodyweight per day during the early months of infancy than the EXBF infants. The impact on growth of including vitamins and medicines in the definition of EXBF was not studied.

2. It is important to distinguish partially breastfed infants who consume only non-human milks (PB/M) from those who also consume solid foods in addition to breast milk (PB/S).

Current IAGB and WHO recommendations do not differentiate between PB/M and PB/S infants. In this study, the 37% of infants who consumed breast milk and non-human milks during the first month of life also had the poorest weight gains during this time...
period (Table 3). Infants who consumed breast and other milks throughout their first 4 months had different weight gain patterns than infants who also consumed solid foods (Figures 1 and 2). Mixed milk feeding is common in the region, and inclusion of a separate feeding category for PB/M infants was also recommended in an earlier critique of WHO feeding indicators using DHS data from Bolivia.\(^3\)

3. It is also useful to distinguish partially breastfed infants according to their breastfeeding frequency or the \% of their total daily energy that comes from breast milk.

This distinction was present in the 1988 IAGB definitions but was not included in the 1991 WHO guidelines. The present analysis suggests, however, that breastfeeding practices vary greatly among partially breastfed infants and these differences affect their growth. Infants classified as token breastfeeders grew poorly in early infancy, and their monthly weight increments were similar to those of weaned infants (Tables 3 and 5). On the other hand, high intensity nurseries had poorer gains than other partially breastfed infants in the second half of infancy.

With regard to how breastfeeding intensity should be defined, the IAGB recommendation of per cent of total feeds was not tested.\(^10\) The use of a 15-minute cutoff for token breastfeeding yielded infants with breast milk intakes similar to those so defined by their mothers' reported daily average nursing frequencies during the preceding month. Although the reported frequency data correlated reasonably well with observed breastfeeding practices, these comparisons suggest that when reported practices cover long periods of time (e.g. one month) they may be biased for some infants (e.g. older infants in this study).

Additional analyses comparing the classification of infants using the observed and reported breastfeeding data are recommended to establish meaningful cutoffs for different levels of breastfeeding intensity. Until this is done, the criterion of three or fewer breastfeeds/24 hours appears to be relevant for the definition of token breastfeeding.

REFERENCES


(Revised version received June 1995)