

# How exclusive is exclusive breastfeeding? A comparison of data since birth with current status data

Clara Aarts, Elisabeth Kylberg, Agneta Hörnell, Yngve Hofvander, Mehari Gebre-Medhin and Ted Greiner

<b>Background</b>	There is no accepted and widely used indicator for exclusive breastfeeding since birth. Indeed, the difference between 'current status' data on exclusive breastfeeding and data on 'exclusive breastfeeding since birth' is rarely recognized. We used data from a longitudinal study to examine this issue.
<b>Methods</b>	A descriptive longitudinal, prospective study design was used in which 506 mother-infant pairs were included. The mothers completed daily recordings on infant feeding during the first nine months after birth. A research assistant conducted fortnightly home visits with structured interviews. The resulting data on breastfeeding patterns are presented in two different ways: analysis of 'current status' data based on a single 24-hour recording of infant feeding at 2, 4 and 6 months of age, and analysis of data 'since birth', i.e. data on infant feeding for every day, starting from birth until the ages of 2, 4 and 6 months.
<b>Results</b>	A wide discrepancy between the results obtained from the two analyses was found. The difference in the exclusive breastfeeding rate was over 40 percentage points at both 2 and 4 months of age (92% versus 51% at 2 months and 73% versus 30% at 4 months) and 9 percentage points at 6 months (11% versus 1.8%).
<b>Conclusions</b>	Current status indicators based on a 24-hour period may be inadequate and even misleading for many purposes. We propose that in many studies an indicator called 'exclusive breastfeeding since birth' could be added.
<b>Keywords</b>	Breastfeeding definitions, breastfeeding indicators, exclusive breastfeeding, Sweden
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In 1990 WHO and UNICEF jointly adopted the Innocenti Declaration, On the Protection, Promotion and Support of Breastfeeding.<sup>1</sup> This declaration urges all governments to develop national breastfeeding policies and set appropriate national targets. Governments should establish a national system for monitoring the attainment of their targets, developing indicators such as the prevalence of exclusively breastfeeding infants at discharge from maternity services and at 4 months of age.

In Sweden data on breastfeeding are gathered and reported annually by the government. These data are based on the child health records from the child health centres, which are attended by virtually all infants. National breastfeeding statistics are available for the ages of 1 week, 2 months, 4 months and 6 months.<sup>2</sup> The terms used are the Swedish equivalents of 'exclusively breastfed' and 'partially breastfed'. Exclusive breastfeeding is defined such that tastes of any food or fluid are

allowed. Partial breastfeeding includes—besides breast milk—infant formula, follow-on formula or other food, and thus there is a 'grey area' between 'exclusive' and 'partial' breastfeeding. The possibility that infants in the exclusive category are given more than tastes of water and water-based drinks, or even occasionally infant formula or solids, cannot be ruled out. The definitions used in Sweden are not the same as those used in this study.

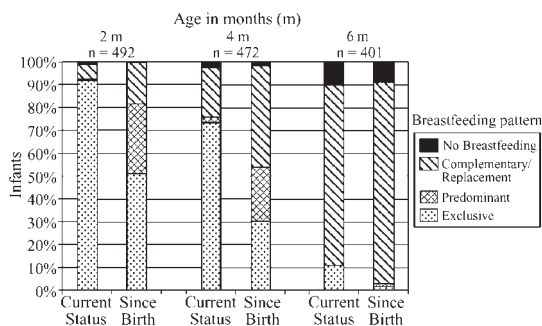
Various authors have pointed out the difficulties in interpreting the results of breastfeeding studies because of the different methods and breastfeeding definitions used.<sup>3–6</sup> A definition system has been designed,<sup>7</sup> and consistency in its usage called for.<sup>8</sup>

To evaluate and monitor breastfeeding patterns and infant feeding behaviour, appropriate study designs are needed, including precise and standardized definitions and indicators. This would allow accurate analyses of events and trends over time as well as inter-country comparisons.

The WHO has developed a set of definitions and indicators of infant feeding patterns that can be applied in assessing breastfeeding practices in household surveys<sup>9</sup> (Appendix). They are intended for application to surveys using the 24-hour recall

Section for International Maternal and Child Health, Department of Women's and Children's Health, Uppsala University, Sweden.

Reprint requests: Clara Aarts, Section for International Maternal and Child Health—IMCH, University Hospital, Entrance 11, S-75185 Uppsala, Sweden. E-mail: Clara.Aarts@kbh.uu.se



**Figure 1** Comparison of breastfeeding patterns based on data obtained from a single 24-hour recording (current status) and from daily record-keeping (since birth), in the same infants

methodology; e.g. all mothers with children less than 24 months of age would be asked the current age of the child and the kind of foods given during the previous 24 hours.

Nationally representative data on levels of exclusive and predominant breastfeeding were virtually unavailable before the mid-1980s. The main sources of such data since then have been the Demographic and Health Surveys (DHS), which so far have been completed in at least 47 countries.<sup>10</sup> However, the sample sizes have often been too small to provide reliable estimates of feeding patterns by month of age. For this reason, all infants under a certain age, commonly 4 months, are usually combined into a single group. Thus, the 'exclusive breastfeeding rate at less than 4 months' is defined on the basis of the proportion of infants currently less than 4 months old exclusively breastfed in the 24 hours prior to the interview.<sup>9</sup> Indeed, this is the indicator recommended by WHO. However, this fails to take into account the possibility that many infants who were exclusively breastfed the day before the interview may have received other foods before that. This will not provide data of adequate precision for studies relating feeding patterns to infant morbidity and mortality. In addition, it will result in an overestimation of the prevalence of exclusive breastfeeding, leading in turn to a lack of awareness of the need to promote exclusive breastfeeding from birth. In the present study we compared the breastfeeding pattern that emerged by analysing infant feeding data obtained from Swedish mothers from a single 24-hour period ('current status') at different ages, with the pattern obtained by analysing the infant feeding data for every day up to these different ages, starting from birth.

## Material and Methods

The present study was part of the comprehensive collaborative WHO project 'A multi-centre, longitudinal study of the duration of lactational amenorrhoea in relation to breastfeeding practices'.<sup>11,12</sup> The project was carried out between 1989 and 1994. The Swedish part of the project was organized by the former Unit for International Child Health, Department of Paediatrics, Uppsala University. In the present study only Swedish data from this main project were used.

The study had a longitudinal prospective design. Mother-infant pairs were followed up from the first week (within 3–7 days) after delivery until the mother's second menstruation post-partum or

a new pregnancy. All mother-infant pairs included in the study were recruited from the University Hospital, where all deliveries in the county take place and where 15 189 infants were born during the study period, between May 1989 and December 1992. Of the 10 511 mother-infant pairs whose case sheets were checked, 1164 pairs were eligible, but 658 mothers did not want to participate, mostly because too much work was involved. The final study population consisted of 506 infants, 270 male and 236 female. Some of the inclusion criteria were: mother healthy, parity 2–4, vaginal delivery at  $\geq 37$  weeks of gestation, previously breastfed at least one child for  $\geq 4$  months, infant singleton and infant birthweight  $\geq 3$  kg. The study methodology is described in more detail elsewhere.<sup>13</sup>

The mean age (standard deviation) of the mothers in the study was 30.7 (3.7) years. The mean duration of the mothers' formal education was 14.2 (2.9) years; 91.5% had  $\geq 11$  years and all mothers had  $\geq 9$  years of formal education. The mean weight (standard deviation) of the girls at birth was 3.7 (0.4) kg and their length was 50.9 (1.8) cm, and those of the boys were 3.8 (0.4) kg and 51.8 (1.8) cm, respectively. Most of the infants (76%) were put to the breast within one hour of delivery and an additional 18% within 2 hours (range 0–18 hours). The mean duration of participation in the study was  $8.7 \pm 3.4$  months, median 8.8 months.

## Data collection

Data were obtained from daily recordings made by the mother and from fortnightly interviews conducted by a research assistant. The mothers completed two charts during each of these follow-up periods. On one, the daily record chart, the mothers made daily records for 13 days of the number of suckling episodes, the number and category of supplementary feeds (including expressed breast milk and water) and any vitamins/minerals given. The second '24-hour chart', which the mother completed every 14th day, consisted of a 24-hour detailed record of the timing of every suckling episode and the point in time when other feeds were given. Daily recording started on the infants' 4th to 8th day of life. The first 24-hour recording with time taken was made in the infants' third week of life (2 but not yet 3 weeks of age). Subsequently it was carried out fortnightly after the first 24-hour detailed record. Thus each follow-up period was 14 days long, except the first one. During the home visits, the assistant conducted a structured interview and checked the data on both charts. Data on infant feeding during the first days of life, before the daily record-keeping started, were obtained retrospectively by questioning the mother at the first home visit.

In all, 106 (21%) discontinued participation before their infant reached 6 months of age. Of these, 78 mothers reached the end-points of the main study (second menstruation after delivery in 77 mothers, and pregnancy in one) and 28 dropped out of the study for various reasons. Data were missing for 0.7% of the days in the daily record charts and 4% of the fortnightly charts.

## Data analysis

Data were analysed with the computer program Quest<sup>14</sup> and also by manual examination of the charts. The data collected on the 24-hour charts at 2, 4 and 6 months of life and those obtained from daily records were processed separately. The analyses of the breastfeeding patterns were constructed as

**Table 1** Infant feeding patterns in percentage. Comparison of 'current status' data with data from each day since birth for the same infants. Detailed breakdown is given in italics

	<b>2 months (n = 492)</b>		<b>4 months (n = 472)</b>		<b>6 months (n = 401)</b>	
	Current status data	Data since birth	Current status data	Data since birth	Current status data	Data since birth
<b>I Exclusive breastfeeding</b>	92	51	73	30	11	1.8
<b>II Predominant breastfeeding</b>	0.8	30	2.5	24	0	1.2
IIA Breast milk + only taste of water, etc.	0.8	6.4	0.2	4.5	0	0.5
IIB Breast milk + water, etc.	0	24	2.3	19	0	0.8
<b>III Complementary/Replacement feeding</b>	6.5	18	21	44	79	88
IIIA Breast milk + only taste of solids <sup>a</sup>	0.2	0.4	5.1	9.8	6.0	8.2
IIIB Breast milk + solids <sup>a</sup>	0	0	7.4	11	70	76
IIIC Breast milk + formula, but no solids <sup>b</sup>	6.3	18	8.9	24	3.0	3.5
<b>IV Not breastfeeding</b>	1.0		2.8		10	
<b>Stopped breastfeeding</b>		0.6		1.9		9.0
<b>Total</b>	100%	100%	99% <sup>c</sup>	100%	100%	100%

<sup>a</sup> may also have received water, water-based drinks, fruit juice, or non-human milk, including formula.

<sup>b</sup> may also have received water, water-based drinks, fruit juice, or non-human milk.

<sup>c</sup> 99% due to rounding off.

follows: (1) data were obtained from the 24-hour chart at 2 months (on the 56th–62nd day of life), at 4 months (on the 112–118th day of life) and at 6 months of life (on the 182nd–188th day of life), providing our 'current status' data. If the 24-hour chart was missing, the last day of the daily chart was analysed. (2) The daily recordings were analysed longitudinally from birth to 2 months (age 56–62 days), 4 months (age 112–118 days) and 6 months of age (age 182–188 days). This analysis was based on both the daily record charts (13 days) and the 24-hour charts for the first 6-month period. The data for the first 3–7 days of life, before the daily record-keeping started, were obtained retrospectively through an interview with the mother at the first visit.

An infant whose current status was categorized as exclusively breastfed was reported to have received nothing but breast milk during a specific 24-hour period (at 2, 4 or 6 months old); only vitamins, minerals and medicine were allowed in addition. An infant who was categorized as 'exclusively breastfed since birth', based on longitudinal data since birth, had never received anything but breast milk (vitamins, minerals and medicine allowed), up to age 2, 4 or 6 months. As soon as the infant received anything but breast milk, even a teaspoon full of water, he/she was shifted to another category (Appendix).

The category 'predominant breastfeeding' does not allow formula, semi-solids or solids. The recordings of tastes in the present study did not always specify the nature of the tastes: they might have been formula, solids or semi-solids. If there was any doubt about the kind of taste that the infant had received, he/she was included in the category complementary/replacement feeding instead of predominant breastfeeding. Our categories are similar to those of WHO, except for 'Complementary feeding'. To this category we added the words 'Replacement feeding', for several reasons: Firstly, foods and fluids replace rather than complement breast milk when added during the first 6 months of life,<sup>15,16</sup> and secondly, many infants received no solids, but were given infant formula plus breast milk. Many mothers use infant formula explicitly to replace breast milk. Furthermore, the WHO category requires

that the infant receive solid foods, and we do not. In the present study no distinction was made between milk-based infant formula and milk- and starch-based formula.

## Results

According to the daily recordings alone, 68% of the infants were exclusively breastfed from admission to the study (3–7 days after birth) to the age of 2 months. However, according to the retrospective data obtained by questioning the mother at the first visit at 3–7 days of life, 25% of those reported to have been exclusively breastfed had received supplements (21% water and 4% formula), prior to the 3–7 day visit. These retrospective data are included in the following report on the entire feeding pattern since birth.

A comparison between the current status and the entire feeding pattern since birth consistently showed differences in the breastfeeding pattern at all ages (Figure 1). The 'current status' exclusive breastfeeding rate at 2 months was 92%, compared to 51% for 'exclusively breastfed since birth' (Table 1). There was a similar difference (43 percentage points) between the two rates at 4 months (73% versus 30%), and a 9.2 percentage point difference at 6 months (11% versus 1.8%).

The greatest reason for the 41 percentage point difference between the two methods in the exclusive breastfeeding rate at 2 months was that 30% of all infants who were exclusively breastfed at that age had received water or water-based drinks at some previous point in time since birth (Table 1, Predominant breastfeeding). A detailed breakdown at 2 months showed that less than 1% had received tastes of water or water-based drinks during the past 24 hours and none had received more than tastes. Data since birth for the same infants showed that 6.4% had previously received tastes of water or water-based drinks and 24% more than tastes. Similarly, whereas only 6.5% of the mothers gave complementary/replacement food according to the current status data, 18% had done so according to the complete history since birth. According to the detailed breakdown, almost all infants in that category had received only formula in

addition to breast milk, without solids or semi-solids. Solids, when received, had only been given as tastes.

The 43 percentage point difference in the exclusive breastfeeding rate at 4 months is due to the fact that an extra 22% of the infants had received water or water-based drinks at some time since birth, and an extra 23% had received complementary/replacement food at some previous point in time since birth, mostly formula given in addition to breast milk.

The 9.2 percentage point difference in the exclusive breastfeeding rate at 6 months can be explained by the fact that an extra 8.7% of the infants had previously, at some time since birth, received solids and/or formula. Few were placed in the predominant breastfeeding category on the basis of either method of analysis. According to both analyses, about 3% of the infants had received formula in addition to breast milk, but no solids or semi-solids. Six per cent (current status) and 8.2% (since birth) had received only tastes of solids or semi-solids. Thus both analyses showed that the vast majority at this age were given complementary foods.

At all ages the current status analysis slightly overestimated the population that had stopped breastfeeding. This is because some infants were not breastfed during that specific 24-hour period, but were breastfed again at some later time.

## Discussion

The infant-mother pairs included in this study were not representative of the Swedish population, and the present analyses were not meant to describe the breastfeeding situation in Sweden. Nevertheless, the detailed daily recordings by the mothers of how they fed their babies made it possible for us to compare the breastfeeding pattern that emerged by analysing data on infant feeding from a single 24-hour period ('current status') at 2, 4 and 6 months, with the pattern that emerged by analysing the data on infant feeding for every day up to those ages, starting from birth. A large discrepancy between these two analyses was found. The most important differences were observed in the rate of exclusive breastfeeding, with a difference of at least 40 percentage points at both 2 and 4 months of age.

The validity of data on exclusive breastfeeding based on single 24-hour periods has been questioned earlier.<sup>17,18</sup> The current status data used in this study are not quite comparable to 24-hour recall data obtained through household surveys. Prospective daily recordings provide more detailed and accurate data than can be obtained from surveys based on recall. Also, in the fortnightly interviews in our study, the mother was asked if the child had received anything besides breast milk, a validity check on the mother's recordings. Of course no method can rule out the possibility that the infant has received something from someone else, unbeknownst to the mother.

Data on infant feeding from the first days after delivery were included in the longitudinal analyses even though they were not based on prospective daily recordings, but on retrospective recall by the mother. The recall period ranged from 2 to 7 days. We considered data on such a short period of recall to be reliable and therefore included them in the longitudinal analyses in order to achieve a measure of the prevalence of 'exclusive breastfeeding since birth'. In all, 21% of the mothers had discontinued participation in the study before their child reached 6 months of age. This dropout rate does not influence the

results, as we have compared two ways of analysing the same data, rather than drawing any conclusions based on the rate of exclusive breastfeeding.

Nearly all the infants categorized as receiving complementary/replacement feeding at 2 months of age had actually, according to the mother's response, never tasted solids or semi-solids. They were breastfed and had received infant formula, either regularly or just a few times. This group has no place in the WHO categorization system, which provides only a broad complementary feeding category for all infants who, in addition to breast milk, receive complementary foods with or without non-human milk. Compared with solid foods, non-human milk may more often be intended to substitute for breast milk. Thus, non-human milk is more likely than other supplements to reduce the frequency of breastfeeding, resulting in a decrease in milk production, which in turn can result in a shorter breastfeeding duration.<sup>19</sup> McCann *et al.*<sup>20</sup> and Piwoz *et al.*<sup>21</sup> have called for WHO to issue a revised recommendation providing a category for infants who receive both breast milk and non-human milk but no solids/semi-solids.

Having a special breastfeeding category for non-human milk may be useful for the first 2–3 months of life when solid foods are less commonly given, but thereafter the issue may be adequately dealt with as we have done here, by renaming this broad category 'Complementary/replacement feeding'. This not only includes non-human milk, but also avoids any implication that the investigator is aware of whether the supplement given has a complementary or replacement effect. It would appear that any substantive quantities, be they non-human milk or solids, given before the age of 6 months may have the effect of replacing breast milk.<sup>15,16</sup>

In the present study the definition of 'exclusive breastfeeding' was used very strictly. The material included a wide range of feeding behaviours. Something else besides breast milk had been given to about half of the infants by the age of 2 months and to about 70% by 4 months. At each age, the supplement had been given only a few times in about 20% of the babies. However, as soon as a child had received anything but breast milk, even a teaspoon full of water, he/she was no longer regarded as exclusively breastfed.

The WHO categorization system does not provide information on the frequency or amount of supplements given,<sup>21</sup> although they may be important factors in relation to breastfeeding duration, infant growth, morbidity pattern and the duration of lactational amenorrhoea.<sup>11,12,22</sup> Tastes of water given under good hygienic conditions probably cause little harm. Larger amounts might replace breast milk, particularly when sugar is added, a common practice in many countries. Though ideally at least some information on frequency of supplementation would be highly desirable, monitoring of breastfeeding patterns for public health purposes cannot utilize such detailed assessment methods.

By comparing cross-sectional and longitudinal data, Zohoori *et al.*<sup>18</sup> found a movement between the feeding categories at different ages. They found a 19 percentage point difference in exclusive breastfeeding rates at 4 months, less than half the difference we found. The importance of this difference in the exclusive breastfeeding rates depends on how the data are to be used, whether for research, monitoring of infant feeding practices, or practical feeding recommendations. For example,

knowing only the 'current status exclusive breastfeeding rate' is inadequate to study the relation between infant feeding practice and certain health outcomes, as has been pointed out by several authors.<sup>3-7</sup> For other purposes a more lenient approach toward categorization might be appropriate. For example, mothers who are attempting to follow recommendations regarding exclusive breastfeeding but use a supplement once a week or less, e.g. due to illness or occasional absence of the mother, could be placed in a new category called 'almost exclusively breastfed' or might be included in the category 'predominantly breastfed', even if the supplement was not a water-based drink or ritual food. However, we feel that consistency in definitions is crucial for research to be comparable. If researchers allow 'small' exceptions to be made, studies will not be comparable, because personal judgement will enter into the decisions on placement into different categories. Ten years ago a schema and framework for defining breastfeeding behaviour was published by Labbok and Krasovec<sup>7</sup> which included different levels of partial breastfeeding. In 1997 Labbok and Coffin<sup>8</sup> called for consistency in definitions of breastfeeding behaviours, which they point out would improve precision in research, programme design and policy formulation.

The WHO indicator 'proportion exclusively breastfed at <4 months of age',<sup>9</sup> is beginning to be widely used in household surveys, based on 24-hour recall. In our experience, this measure is widely interpreted to mean 'proportion exclusively breastfed for 4 months'. This interpretation is not appropriate, as infant feeding patterns can shift back and forth during the early months of life,<sup>18</sup> as they did in our study. Furthermore, the inclusion of infants at all ages between 0 and 4 months can be misleading. Exclusive breastfeeding rates tend to be high in the first 1-4 weeks of life and to decline to low levels by 10-12 weeks, and this decline is not linear. A typical pattern for exclusive breastfeeding that emerges from the DHS 24-hour recall data, illustrated by Tanzania<sup>23</sup> and Jordan,<sup>24</sup> is about 40% of infants at 0-1 month, 25% at 2-3 months and <10% at 4-5 months. The rates of exclusive breastfeeding are higher than this in some countries such as Bangladesh,<sup>25</sup> but lower in many others, such as, Zimbabwe,<sup>26</sup> although the pattern of rapid decline is similar in both. The presentation of data on 'proportion currently exclusively breastfeeding' at both 2 and 4 months could help overcome this problem.

More importantly we suggest that breastfeeding surveys should include a new variable, 'proportion exclusively breastfed since birth' at 2 and at 4 months. The data for this variable could be obtained by adding one further question to survey questionnaires: women who say they gave nothing but breast milk to the infant during the past 24 hours could be asked—'Have you ever given water, other fluids, or solids to the baby since he or she was born?' The answer 'yes' could be followed by the question 'Was it given regularly?' The data on 'proportion exclusively breastfed since birth' might then be useful for various purposes, particularly research relating breastfeeding patterns to the incidence of certain diseases and disorders, including diarrhoea, allergy, respiratory illness, diabetes, and HIV.<sup>27-31</sup> One reason for adherence to strict definitions in such studies is our uncertainty as to whether giving something else besides breast milk can affect the gut microflora or affect its mucosal lining.<sup>32</sup>

Current status indicators based on a 24-hour recall may be inadequate and even misleading for many purposes. We

propose that in many studies a variable should be added to indicate at each age the proportion 'exclusively breastfed since birth'. In addition, information on frequency of supplementation is highly desirable for many purposes.

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## Appendix

Definitions used in the study:

*Taste.* ≤10 ml of any liquid or food.

*Exclusive breastfeeding.* The infant receives breast milk (including expressed milk) and is allowed to receive drops or syrups (vitamins, minerals, and medicines). The infant may not receive anything else.

*Predominant breastfeeding.* The infant receives breast milk (including expressed milk) and is allowed non-nutritive liquids (water and water-based drinks, fruit-juice, ORS,<sup>a</sup> ritual fluids), and drops or syrups (vitamins, minerals, medicines). The infant is not allowed to receive anything else (in particular, non-human milk, food-based fluids).

*Complementary/Replacement feeding.*<sup>b</sup> The infant receives breast milk and is allowed any food or liquid, including non-human milk.

*Breastfeeding.* The infant receives breast milk.

<sup>a</sup> Oral rehydration salt.

<sup>b</sup> The terms 'Replacement feeding' and 'non-human milk' are not included in the WHO definition 'Complementary feeding'.