

Breastfeeding Definitions
For Monitoring The National Health
Outcome Targets In New Zealand

Review of the Evidence and Recommendations

Prepared for
Ministry of Health

Lib Coubrough
February 1999

17B Ngatoto Street
Ngaio
Wellington
Phone: (04) 479 8131
Email: lib@clear.net.nz

Acknowledgements

The following people have been contacted for information:

James Akre, Randa Saadeh **WHO Geneva**

Helen Rankin, Population Health Strategies, Commonwealth Department of Health and Family Services. **Australia**

Gulnara Semenova, Nursing Mothers' Association. **Australia**

RW Wenlock, Nutrition Unit, Department of Health. **United Kingdom**

Marie Labreche Childhood and Youth Division, Health Canada. **Canada**

New Zealand:

Angela Baldwin, Royal New Zealand Plunket Society, Dunedin.

Annette Beasley, Department of Social Anthropology, Massey University.

Siniva Cruickshank, Health Star Pacific.

Denise Dignam, Department of Nursing and Midwifery, Albany Campus

Karen Guilliland, Bronwen Pelvin, Caroline Nye, Aileen Patten, NZ College of Midwives, NZ Breastfeeding Authority.

Riripeti Haretuku, Maori Pacific Department, School of Medicine, Auckland University.

Anne Heritage, Barbara Fletcher, La Leche League NZ.

Winsome Parnell, Department of Human Nutrition, Otago University.

Julia Peters, Health Funding Authority.

Sue Pullon, Department of General Practice, Wellington School of Medicine

Marcia Roberts, National Women's Hospital, NZ Lactation Consultants Association

Julie Stufkens, Canterbury Enhanced Breastfeeding Alliance.

Alison Vogel, Department of Paediatrics, School of Medicine, Auckland University.

Nimisha Waller, National Women's Hospital, NZ College of Midwives.

General Comment:

Those being interviewed requested a copy of the report, as did the researchers who were approached. Many expressed the view that the definitions should be widely publicised. The ethics committee should know of the definitions to guide researchers seeking approval for breastfeeding research.

Literature Review

The aim of the literature review is to explore the health benefits to an infant for the different definitions of breastfeeding by:

- Determining the health benefits derived from a stated degree of breastfeeding
- Exploring the terms 'exclusive', 'full', 'partial'
- establishing the preferred time period used for data collection: point or period prevalence
- determining the appropriate time for introduction of formula feeds based on health benefit to an infant.

The databases searched were: Lois, Index New Zealand, Medline, Embase, CAB Health, Cochrane database and Internet links with a selected subject 'breastfeeding'.

The search terms used were:

breast feeding, breastfeeding,
exclusive, almost exclusive, full, prolonged breast feeding
partial, partly, intermediate, short/brief breast feeding, mixed feeding
formula feeding, infant formula, infant nutrition
degree(s), level, rate, duration, prevalence, incidence,
extent health benefits, benefits, effects health, child development, health
status, mortality, morbidity
disease(s) – prevention and control, infections, disease transmission, risk
factors,
point prevalence, period prevalence.

Table of Contents

Summary

1.	The Benefits of Breastfeeding: a review of the evidence	
1.1	Benefits.....	1
1.2	The ‘Dundee’ prospective infant feeding study.....	1
1.3	Does breastfeeding protect against infection in developed countries?.....	3
1.4	Randomised feeding groups.....	4
1.5	Growth.....	4
1.6	Otitis media, diarrhoeal disease and pneumonia.....	5
1.7	Gastroenteritis and respiratory illness.....	7
1.8	Allergy.....	7
1.9	Diabetes.....	8
1.10	Cognitive Development.....	8
1.11	Duration of breastfeeding and the protective effect.....	9
2.	Collecting Breastfeeding Data: definitions and data collecting methodology.....	11
2.1	Need for consistent breastfeeding definitions.....	11
2.2	WHO Global Databank.....	12
2.3	Labbok and Krasovec definitions.....	12
2.4	Comment on the Labbok and Krasovec definitions.....	14
2.5	Other indicators of breastfeeding.....	15
2.6	Qualitative measures of breastfeeding.....	15
2.7	Breastfeeding definitions used in New Zealand.....	15
2.8	Suggested methodology.....	17
2.9	Confounding reduced between feeding groups.....	17
2.10	Retrospective infant feeding data.....	18
2.11	Recall used to determine an association with infant feeding method.....	18
2.12	Accuracy of maternal recall.....	19
3.	Factors Which Influence Breastfeeding.....	21
3.1	Water and breastfeeding.....	21
	neonatal jaundice.....	21
	water in hot weather.....	21
	water and poor sanitation.....	21
	breastfeeding, water and health outcome.....	22
3.2	Formula feeding.....	23
3.3	Social factors and breastfeeding practice.....	24
	initiation of breastfeeding.....	24
	behaviours as indicators.....	24
	hospital practices and duration of breastfeeding... ..	24
	feeding frequency and duration of breastfeeding..	25
	social factors and duration of breastfeeding.....	25

3.4	Introducing solid foods.....	27
	appropriate time for introducing solids.....	27
	late weaning.....	27
	early weaning.....	27
	effect of solids on breast milk intake.....	28
4.	How Other Countries Collect Data on Breastfeeding.....	29
4.1	United States of America.....	29
	data collection.....	29
	desirable breastfeeding practices.....	30
4.2	United Kingdom.....	30
	definitions.....	31
4.3	Australia.....	32
	national health survey.....	32
	comparing national and state data.....	32
	social characteristics that determine breastfeeding duration.....	33
4.4	Canada.....	33
5.	Interviews with Key Researchers and Health Professionals Working with Breastfeeding.....	34
5.1	Winsome Parnell – Otago University.....	34
5.2	Angela Baldwin – Royal NZ Plunket Society.....	36
5.3	Karen Guilliland, Aileen Patten and Caroline Nye – NZ College of Midwives; Bronwen Pelvin – NZ Breastfeeding Authority; Julie Stufkens – Canterbury Enhanced Breastfeeding Alliance.....	38
5.4	Anne Heritage and Barbara Fletcher – La Leche League...	41
5.5	Riripeti Haretuku – Maori Pacific Unit, University of Auckland.....	43
5.6	Nimisha Waller and Marcia Roberts – National Women’s Hospital.....	44
5.7	Siniva Cruickshank – Health Star Pacific.....	46
5.8	General Practice Department, Wellington School of Medicine.....	47
5.9	Massey University Infant Feeding Group.....	47
5.10	North Health Area.....	48
	Discussion.....	49
	Recommendations for Breastfeeding Indicators	51
	References.....	53
	Appendices	
	Addendum	

Summary

The aim of the project is provide a recommendation to the Ministry of Health of the most appropriate definition of breastfeeding for monitoring the national health outcome targets and the rationale for this recommendation.

The background contains a review of studies which indicate a health benefit for a defined level of breastfeeding. The range of breastfeeding extends from exclusive to no breastfeeding, and includes infants who are partially breastfed by different amounts. Where exclusive breastfeeding is defined sometimes the period or point of time for which it is measured negates the definition. The benefit of collecting data at a given point in time is that it does not rely on a mother's recall. Studies included suggest infant feeding practices can be collected retrospectively with accuracy. It is difficult to assert what effects have brought about a health outcome for infants where the feeding categories are mixed. To help clarify this, the duration of exclusive and partial breastfeeding needs to be recorded. Confounding factors need to be controlled to reduce bias of results. If the feeding groups are clearly defined and do not overlap, then comparable data can be collected.

The opinions were sought of the most suitable definitions of breastfeeding from New Zealanders involved in breastfeeding research. Information on the breastfeeding targets from developed countries; Australia, United Kingdom, United States of America and Canada is included.

The report continues with summaries of in depth interviews with key people in the breastfeeding sector. Their opinion on which indicators they would prefer for measuring breastfeeding outcomes are discussed based on the literature review. Definitions based on those developed by Labbok and Krasovec are most widely used in New Zealand. Qualitative measures are desirable also as breastfeeding has a wider benefit than that derived from the nutritional advantage.

The proposed recommendations include a time for collection of data in order to increase accuracy for measuring targets. Exclusive breastfeeding which includes breast milk and expressed breast milk is collected retrospectively. The other indicators reflect infant feeding within the past 48 hours. Four additional questions are suggested to elicit other infant feeding information. This gives a clearer indication of the time when an infant's feeding behaviour changes.

While these suggested breastfeeding indicators have been developed to measure the national health outcome target on breastfeeding, other groups should be encouraged to use them so a more accurate picture of breastfeeding can be obtained.

The Benefits of Breastfeeding: a review of the evidence

1.1 Benefits

The compelling advantages to infants, mothers, families and society from using breast milk for infant feeding include health, nutritional, immunological, developmental, social, economic and environmental benefits.

There is evidence from developed countries that breastfeeding decreases the incidence and or intensity of diarrhoea, lower respiratory disease and otitis media (AAP 1997). Breastfeeding possibly offers a protective effect against hypertension and insulin dependent diabetes.

Increasing the incidence and duration of breastfeeding offers health gains and cost savings. Breastfeeding is less likely to occur in socially and educationally disadvantaged groups.

Exclusive breastfeeding is recommended by WHO from birth to 4-6 months of age, after which the child should continue to be breastfed, while receiving appropriate and adequate complementary foods for up to 2 years of age or beyond (WHO WGOIG 1995).

In industrialised countries the distribution of breastfeeding is linked to social and economically advantaged conditions and to higher levels of education and occupational opportunities (Pollock 1994). While many authors are adjusting for this social bias it is still difficult to compare similar infant feeding groups unless the definitions of infant feeding are very specific. Infant feeding practices used in studies often include, in addition to breastfeeding status, such measures as: frequency of breastfeeding in the prior 24 hours; age of introduction of, type of, and frequency of infant formula; as well as weaning practices (Fawzi et al 1997).

The frequency and severity of illnesses in a young infant is often inversely related to the proportion of the diet which comes from breast milk (Chen et al 1988).

It has been suggested that when 25 to 50% of a baby's energy comes from breast milk the milk will protect the baby from environmental pathogens (Riordan and Auerbach 1993).

Colostrum composition changes over the first few weeks as lactation becomes established. But the total dose of components, such as immunoglobulins, which the infant receives from breastmilk, remains relatively constant throughout lactation regardless of the amount of breastmilk provided by the mother (Riordan and Auerbach 1993: 106). This happens because concentrations increase as total volume diminishes.

1.2 The 'Dundee' prospective infant feeding study

Infant feeding data from the first two years of life were collected prospectively to 1989 as part of the Dundee infant feeding study. In a seven year follow up researchers determined the relation between infant feeding practice and childhood health (Wilson

et al 1998). Outcome measures were episodes of respiratory illness and measurements of growth, body composition and blood pressure.

The data collected prospectively during the first two years of infant life from 674 infants included duration of breast and formula feeding and the time of introduction of formula feeds and solids. The milk and solid feeding groups were identified to reflect current infant feeding practices in the UK thereby allowing comparisons.

These groups were:

- Exclusive breastfeeding for at least 15 weeks
- Partial breastfeeding (milk supplements before 15 weeks, mean duration of breastfeeding 9.5 weeks)
- Exclusive bottle feeding
- Solids introduced before 15 weeks
- Solids introduced after 15 weeks

The estimated probability of respiratory symptoms ever occurring differed significantly between the milk feeding groups. The estimated probability was lower in the children who had received breast milk exclusively for 15 weeks or more. Estimated probability was 17 percent for exclusive breastfeeding, 31 percent for partial breastfeeding and 32.2 percent for bottle feeding.

Children who had been given solids before 15 weeks were significantly heavier than those given solids 15 weeks or later.

Blood pressure was not available for 373 (55 percent) of the original cohort but distribution of the children among the feeding groups and social class categories was proportionally similar to that for respiratory data. Systolic blood pressure in the children was related to the milk feeding groups. Children exclusively bottle fed had a higher systolic blood pressure mean 94.2mmHg in those who were bottle fed, 90.9 mmHg in those who were partially breastfed and 90.3mmHg in those who were exclusively breastfed. The mean difference between the bottle fed and breastfed group was 3 mmHg with an increase of 3mmHg for each standard deviation score rise in body mass index. When results were analysed using breastfeeding as a continuous variable results were similar. A longer duration of breastfeeding was associated with a reduction in systolic blood pressure in children.

This study shows that exclusive breastfeeding for at least 15 weeks is associated with a significant reduction in respiratory illness during the first seven years of life. That exclusive formula feeding is associated with a significantly higher blood pressure at the age of 7, and that early solid feeding is associated with increased weight, percentage body fat, and risk of wheezing in childhood. The results were continuous indicating a dose response effect. (the author advises caution in interpreting the reported statistical relations as they may be due to factors that were not included in the study). The study indicates that in an industrialised society exclusive breastfeeding for at least 15 weeks and the avoidance of solid foods before 15 weeks in healthy term infants may confer long term health benefits on the child.

A similar finding of a lower incidence and prevalence of acute respiratory infection in fully breastfed infants than infants fed formula from birth to 16 weeks, was found in a study in a slum neighbourhood in Mexico (Lopez-Alarcon et al 1997). The infant feeding method was very precisely defined. Mothers were interviewed by trained health workers using a standardized 24 hour recall questionnaire every two weeks.

1.3 Does breastfeeding protect against infection in developed countries?

The first analysis of the Dundee infant study concluded that breastfeeding during the first 13 weeks of life confers protection against gastrointestinal illness that persists beyond the period of breastfeeding itself (Howie et al 1990). There was no consistent protective effect of breastfeeding against ear, eye, mouth or skin infections, infantile colic, eczema or nappy rash.

The sample used by Howie met the methodological criteria set by Leventhal and others who had earlier challenged that breastfeeding protects infants in developed countries (Leventhal et al 1986). They had pointed to the lack of control for potentially confounding factors such as, low birth weight, parental smoking, crowding, sanitation and other characteristics of socioeconomic status (Riordan and Auerbach 1993: 116-118).

The methodologic difficulties, which could contribute to the conflicting results of protection of breastfeeding against infections, include failure to:

- collect data prospectively at frequent intervals for active surveillance of the detection of infections and of feeding practice.
- control for confounding variables such as social class or the presence of siblings
- clearly specify what was meant by infectious illnesses and breastfeeding
- apply appropriate statistical strategies to a population in which both feeding and exposure to illness change over a period of time (Rubin et al 1990).

Leventhal and others in a case control study to determine if breastfeeding protects against infections in infants less than three months of age, defined breastfeeding if the infants were fed either breastmilk exclusively or breastmilk plus less than one bottle of formula per day. Similar results were apparently found when breastfeeding was less strictly defined to the taking of any amount of breast milk per day (Leventhal et al 1986). The type of feeding was defined as that which the child had been receiving just prior to the onset of the illness that led to hospitalization. This was chosen to eliminate any bias that might result from changes in the mode of feeding that occurred during illness.

Infant feeding data was collected from hospital charts and telephone interview with the mother. These interviews were conducted when the infants were from eight to 15 months of age. To check on the accuracy of the mother's recall about the feeding history during the first three months of life, information from the interview was compared to the charts. In 111 cases, only one discrepancy occurred in how the infant's feeding was classified.

The breastfed group had fewer infections although such an advantage disappeared when severity of illness was controlled. So the authors suggest that breastfeeding protects infants from hospitalization rather than from infections.

The criticism of this study is that the exclusively breastfed group was combined with a mixed fed group. The artificially fed group was not defined at all (Auerbach et al 1991). So how many infants in this 'non breastfed' group, at some time in their lives, had been breastfed?

1.4 Necrotising enterocolitis

Randomisation of breast milk intake was possible in a prospective multicentre study on the effect of breast milk in preventing necrotising enterocolitis in preterm infants. Lucas and Cole found that the disease was 6-10 times more common in formula fed babies as compared to babies exclusively fed with breast milk (Lucas and Cole 1990). It was 3.5 times higher in exclusively formula fed infants than in those fed breast milk and formula combined.

The frequency of necrotising enterocolitis was examined among a randomised diet group stratified according to whether the mother provided breast milk for her own infant. In the main analysis necrotising enterocolitis was examined in three non randomised enteral feed groups: human milk only (donor or donor plus mother's milk), formula (term or preterm) as a supplement to mother's milk, and formula only. The donor breast milk was pasteurized and frozen. Mother's milk was not pasteurized and was fed untreated or after a period of refrigeration or freezing.

The incidence of necrotising enterocolitis was not affected by the type of breast milk consumed. While it is desirable to have randomisation, this study was performed in a very particular circumstance and it is difficult to generalise the results to wider sections of the population (Pollock 1994).

1.5 Growth

The normal growth pattern of breastfed infants differs from formula fed counterparts. Infants who are breastfed grow and gain weight slightly faster than their bottle fed peers during the first 2 to 3 months of life (Rider et al 1996; Fawzi et al 1997). However this growth advantage disappears after 3 months of age and by 6 months breastfed infants weigh significantly less than bottle fed infants. The breastfed infants also record shorter lengths (Cohen et al 1995). This variation continues through the end of the first year of life and is unaffected by the time of introduction of solids.

All studies conducted for the World Health Organization's working group on infant growth showed that even with safe weaning foods, there were differences in growth patterns between breast and formula fed infants which were most notable after 4-6 months. The deviations in length were less than those for weight gain in breastfed infants compared with bottle fed infants. There was no apparent morbidity associated with these anthropometric differences. The current NCHS-WHO reference is used as a standard for the adequacy of feeding practices and this presents a problem when maximum length is taken as a reflection of optimum health. The standard growth charts used by WHO were derived from the Fels longitudinal study conducted in Yellow Springs Ohio 1929 to 1975. Few of these children were breastfed and the

population was not demographically representative of world populations (WHO WGOIG 1995).

Clinicians evaluating growth in breastfed infants after 4 months should assess if the infant has followed a pattern of good weight gain until 3 months of age, is feeding well both from the breast and with complementary foods, and is healthy. If these criteria are met then the mother should be encouraged to continue breastfeeding with the use of supplementary solid foods rather than beginning formula (Rider et al 1996).

1.6 Otitis Media, Diarrhoeal Disease and Pneumonia

In studying whether there is a protective relationship between breastfeeding and otitis media researchers asked several questions: Is the effect seen when breastfeeding is supplemented or only when it is exclusive? What duration of breastfeeding is required to have an effect? If breastfeeding does protect, is the protection independent of other recognized risk factors for otitis (Duncan et al 1993).

One thousand two hundred and forty six newborns were followed prospectively for the first three years of life. The feeding data was obtained from two sources: 74 percent of the information was obtained prospectively from health supervision visits at 2, 4, 6, 9 and 12 months. Twenty six percent of the information was obtained retrospectively from questionnaires completed by parents when children were 12 and 15 months old. There was 90 percent accordance between the data and where there was disagreement, priority was given to the prospective data. The breastfeeding categories were:

- 1). No breastfeeding (n=169)
- 2). Breastfeeding for less than 4 months (n=296)
- 3). Breastfeeding for 4 months or more but supplemented with formula or food prior to 4 months (n=200).
- 4). Breastfeeding for 4 months or more with supplementation beginning between 4 and 6 months (n=199).
- 5). Exclusive breastfeeding for 6 months or more (n=154).

With statistical analysis the odds ratios for the breastfeeding category of less than 4 months did not differ significantly from those of the reference group which was the no breastfeeding group. Therefore these two groups were combined to form the reference category of no breastfeeding to less than 4 months breastfeeding.

Infants exclusively breastfed for 4 or more months had half the mean number of acute otitis media episodes as did those not breastfed at all, and 40 percent less than those infants whose diet was supplemented with other foods prior to 4 months. The suggested protection afforded by exclusive breastfeeding for four or more months from single and recurrent episodes of otitis media was independent of the risk factors considered.

Advantages of this study were the sample size, multivariate techniques used to adjust for the possible risk factors, and that exclusive breastfeeding was defined

prospectively. Factors not taken into account were the feeding position of the infant, or whether the breast milk was fed from the breast or the bottle.

'DARLING' Study

The Davis Area Research on Lactation, Infant Nutrition, and Growth (DARLING) study was designed to evaluate morbidity difference in infants either fully breastfed or formula fed through out the first year of life matching the groups for as many potentially confounding variables as possible. The data was collected longitudinally by continuous, frequent monitoring (Dewey et al 1995). The comparisons were made during the first two years of life between matched cohorts of infants who were either breastfed (n = 46) or formula fed (n=41) until at least 12 months of age. Human milk was the major milk for breastfed infants throughout the first year, except for occasional bottles of cow's milk or formula (<120 ml/day). Mothers in the formula fed group had decided prenatally not to breastfeed (n = 11), or to terminate breastfeeding by 3 months (n=30); all used an iron fortified cow milk-based formula, and nearly all introduced formula within the first 4 weeks. Neither breastfed or formula fed infants received solid foods before they attained 4 months of age.

There was no significance difference in incidence or prevalence of respiratory illness between breastfed and formula fed infants up to 12 months or from 12 to 24 months of age. The incidence of diarrhoeal illness among formula fed infants was twice that of breastfed infants during the first year of life. Diarrhoeal morbidity during the second year of life did not differ significantly between groups. The prevalence of otitis media was low in the first six months but the incidence of otitis media differed significantly between breastfed and formula fed infants during the first year of life.

The results add to the evidence of other reports that breastfeeding in combination with small amounts of formula during the first year of life is protective against diarrhoeal illness and otitis media , even in a relevantly affluent, highly educated population.

1981 Health Interview Study

In 1990 Ford and Lobbok used a national household survey (the Child Health Supplement of the 1981 Health Interview Study) to identify socioeconomic, demographic, and maternal and infant health selection factors among breastfeeding women in the United States (Ford and Lobbok 1993).

The survey is based on nationally representative samples of the US population living in households. The supplement collected information on the health of 15,000 children under 18 years of age.

Logistic regression was the main statistical method, and the paper only presented the coefficients of the infant feeding variables. With respect to infectious diseases, the results show breastfeeding offers some protection against pneumonia and otitis media but the results were not uniform in size or significance. The authors contend that earlier US studies have found conflicting results in this area, not only because of differences in methodology, but also because effects may be small in the US. Also the duration of breastfeeding may have a different effect on different diseases. Many studies have only asked if a child was ever breastfed without establishing duration. They give as an example the cautious findings of their study that a short duration of breastfeeding (3 months) may protect against pneumonia, while longer durations of

lactation may help to prevent ear operations. They found that for pneumonia breastfeeding was protective for children breastfed for a short time with no effect for longer (beyond 3 months) breastfeeding. Early introduction of formula (before three months), and early introduction of solids (before three months) was also associated with an incidence of pneumonia.

1.7 Gastroenteritis and Respiratory Illness

Danish study

In a prospective study in Denmark there was found to be no significant relationship between type of feeding and the incidence of gastroenteritis or respiratory illness (Rubin et al 1990). In this study breastfed infants were defined as those whose mothers provided more human milk than formula. Formula fed infants were those who were provided with more formula than breast milk. In other studies this would be interpreted as infants being mixed fed being represented in each group. The study was conducted in a largely middle class, urban population in a developed country. The feeding history was collected monthly by means of a mailed questionnaire, thereby relying on recall. If the author had kept the two exclusively breastfed and formula fed categories it might have produced a different result.

1.8 Allergy

Reports on the protection of breastfeeding and atopic disease are conflicting. Studies have been conducted with exclusively breastfed, partially breastfed and totally formula fed infants with different results. After conducting an analysis of 22 original research reports on infant feeding and atopic disease, Kramer decided that errors in research methods preclude definitive conclusions (Kramer 1988).

Akre reports that prolonged breastfeeding and timely introduction of carefully selected solids contribute to the prevention of food allergies, particularly in predisposed infants (Akre 1989).

Marini conducted a prospective case control study to assess an allergy prevention programme in children up to 36 months of age (Marini et al 1996). The study only included infants with a high (biparental) risk of developing atopic disease. The majority of studies evaluating the effect of allergy prevention programmes have included infants with a variable family predisposition to allergic disease. The study did not include an open or blind challenge because the study design was for preventive, not therapeutic purposes.

When human milk could not be given exclusively for six months and the infants were switched after one to three months to hydrolysed formula, the preventive effect was no less than in infants exclusively fed on breast milk. The authors conclude that even small amounts of breast milk appear to be of value in preventing allergies in these high risk babies, confirming that every effort should be made to encourage breastfeeding.

A long term prospective study in Finland started in 1975 showed a positive influence of breastfeeding in prevalence of atopic disease up to 17 years of age (Saarinen and Kajosaari 1995). The study groups were based on the duration of exclusive breastfeeding: short or none, <one month; intermediate, one to six months; prolonged, six months or longer. The presence of manifest atopy throughout follow up was

highest in the group who had little or no breastfeeding. According to their follow-up data, breastfeeding for six months or longer is required for prophylaxis of atopic eczema for the first three years of life. Whereas exclusive breastfeeding for longer than one month seems beneficial in preventing food allergy with its prevalence peak at three years, and respiratory allergy with the prevalence peak at 17 years. For substantial atopy at the age of 17 years, greatest benefit was achieved by prolonged breastfeeding.

The importance of breastfeeding in the first month of life for prophylaxis against atopic disease is consistent with the immaturity of the human organs and their functions in the neonatal period (Saarinen and Kajosaari 1995; Marini et al 1996).

1.9 Diabetes

Since 1984 many studies have reported that breastfeeding has a protective effect on the risk of insulin dependent diabetes (IDDM), and early exposure to cows milk or dairy based products is involved in the development of IDDM. (Rider 1996).

An association between breastfeeding and non insulin dependent diabetes (NIDDM) was examined in the Pima Indians, a population with a high prevalence of the disorder (Pettitt et al. 1997). A questionnaire given to mothers was used to classify infant feeding practices for the first two months of life into three groups: exclusively breastfed, some breastfeeding, and exclusively bottle fed. Data were available for 720 Pima Indians aged between 10 and 39 years. The infant feeding data was collected by means of a detailed questionnaire administered by trained interviewers to the mothers in 1978 irrespective of the health status of their offspring and before most had developed diabetes. Thus it was not biased by subsequent outcome. Among those who were exclusively breastfed, formula feeds were started at four months.

When the results were analysed for the two subsets that only included the two exclusive groups the result was similar to that calculated from the full model. The rate of diabetes increases with age, and within each age group is lower in exclusively breastfed people. The odds ratio for diabetes between people who were exclusively breastfed and those who were exclusively bottle fed was 0.41 (0.18-0.93, $p=0.032$), adjusted for age, sex, birth date, parental diabetes, and birth weight. Exclusive breastfeeding for at least two months is associated with a lower rate of NIDDM in Pima Indians aged 40 years or less.

The authors offer an interpretation that the increase in prevalence in NIDDM in some populations may be due to the concomitant decrease in breastfeeding. An argument has also been put forward that over this same period breastfeeding rates in the USA dropped but that the women who breastfed were better educated and more likely to participate in health promoting behaviours than other women.

1.10 Cognitive development

Studies to estimate the benefit of breastfeeding in terms of higher IQs and enhanced cognition are criticised because of the difficulty of separating out the effects of parenting on the child's later intellectual and cognitive development (Riordan 1997).

Children who were breastfed have often been shown to perform better in terms of tests of development or cognition, verbal ability or school performance (Morley 1998).

Results have been similar in children born at term and preterm. There are two major sources of confounding:

- the intimacy of breastfeeding may be important for infant development
- Mothers who choose to breastfeed are generally different from mothers who choose not to.

When Lucas controlled for confounders of mother's education and social class in a study of breastfed and formula fed preterm infants, children whose mothers chose to provide milk but failed to do so had the same IQ scores as those whose mothers elected not to provide breastmilk (Lucas et al 1992).

In the Christchurch Health and Development Study the association between duration of breastfeeding and childhood cognitive ability and academic achievement was examined over the period from 8 to 18 years (Horwood and Fergusson 1998). The data was collected during the course of an 18 year longitudinal study of a birth cohort of 772 to 1064 New Zealand children. After adjusting for confounding factors, children who were breastfed for 8 months or longer showed significant but small increases in cognitive ability and educational achievement over those who were not breastfed. The breastfeeding data was established from mothers when the children were 4 months and 1 year of age. Maternal reports were supplemented by evidence on breastfeeding practices recorded in the developmental records completed by health workers. Breastfeeding information from birth was also available from the records in the maternity unit. The duration was classified into four groups:

- child was not breastfed
- child was breastfed for <4 months
- child was breastfed for 4 to 7 months
- child was breastfed for 8 months or longer.

The second measure was duration in months of exclusive breastfeeding. This was defined as the number of months, to age 4 months, that the child was reported to have been breastfed without receiving any additional cow's milk, milk formula preparation, or solid food. Although the two measures of breastfeeding were derived independently and used different criteria, they proved to be highly correlated ($r = 0.84$; $P < .001$).

The authors conclude that patterns of infant feeding were consistently related to levels of educational attainment from middle childhood to the point of young adulthood.

The increases in cognitive ability probably reflect the effects of long chain fatty acid levels, particularly docosahexanoic acid (DHA) levels on early neurodevelopment (Morley 1998).

1.11 Duration of breastfeeding and the protective effect

Exclusive breastfeeding of shorter duration than the recommended 4-6 months has a protective effect which extends beyond the period of breastfeeding itself (Howie et al 1990).

In a Swedish case control study short duration of 'exclusive breastfeeding' was defined as 0-12 weeks and long duration as 13 weeks or more (Silfverdal et al 1997). Short duration of 'any breastfeeding' was defined as 0-20 weeks and long duration as 21 weeks or more. The authors found a decreased risk for invasive Haemophilus Influenzae infection with long duration of breastfeeding, evident after 13 weeks of exclusive breastfeeding or 21 weeks of any breastfeeding and this benefit was found to last for months and years. The duration was measured in weeks for precision, and the findings indicated a dose response relationship.

Collecting Breastfeeding Data: definitions and data collecting methodology

2.1 Need for consistent breastfeeding definitions

It is difficult to compare data internationally and targets nationally because of the lack of consistency with defining breastfeeding (Morrow and Barraclough 1994; Dewey et al 1994).

In 1991 Auerbach, Renfrew and Minchin reviewed the feeding group definitions used and the findings that were derived from 43 research studies taken between 1934 to 1990. Surveys, case studies and case control studies were included. They concluded that in the majority of studies any relationship between infant feeding groups and morbidity and mortality could be challenged because the studies were methodologically flawed (Auerbach et al 1991). Some of the criticisms they reported include:

- Including partially breastfed infants with those who are exclusively breastfed or bottle fed masks the differences between breastfed and bottle fed infants.
- Supplementary feeds that are offered change in type and proportion with breastfeeding over time, but their intake or analysis is rarely taken into account. This includes the presence or absence of water.
- Bias needs to be considered
- Comparison of feeding groups is flawed when it is based on one time period without taking into consideration any changes in feeding patterns which have occurred over time.
- Duration for all types of feeding needs to be obtained.

The authors state that when exclusively breastfed infants are included in studies, the findings consistently demonstrate an advantage to breastfed infants.

A lactation consultant, Armstrong, states it is a common error to record only duration of any breastfeeding, without regard to its exclusivity or intensity (Armstrong 1991). If a group of exclusively breastfed babies is not included in research then there is not deemed to be a control group. Similarly infants 'ever' fed, put to the breast, can not be considered to have been breastfed. Three studies are sited, including the Dundee prospective study, where an exclusively breastfed group was not distinguished, but persistent anti-infective effects of breastfeeding were still found despite combining exclusively and less fully breastfed infants (Howie 1990). Armstrong contends that the protective effect would have been more dramatic had their studies distinguished the group of exclusively breastfed babies.

Auerbach, Renfrew and Minchin outlined guidelines for defining feeding categories that should be considered by investigators when designing studies that compare different

feeding groups. These included: detailed information about all types, combinations, volume and frequency of any substance ingested by an infant; the method of feeding (eg. bottle, type of nipple) and identification of the feeder (mother or nurse). This is similar to the schema and framework suggested by Labbok and Krasovec (Labbok and Krasovec 1990).

Consistent and valid definitions are needed for policy makers to reach accurate conclusions. The Labbok and Krasovec definitions of breastfeeding were first stated in 1988 and have continued to be promoted for use in research and education to provide a standardized nomenclature (Coffin et al 1997).

2.2 WHO Global Databank

The WHO Global Data Bank definitions used internationally but not commonly in New Zealand are:

exclusive breastfeeding

breast milk including milk expressed or from a wet nurse. It allows the infant to receive drops, syrups, vitamins, minerals and medicines.

Predominant breastfeeding rate

Breast milk as the predominant source of nourishment. It allows water, water based drinks, fruit juice, ritual food and drops or syrups.

Bottle feeding

Any liquid or semi solid food from a bottle with nipple/teat. It allows breast milk by bottle and any non human food or liquid.

The exclusive breastfeeding rate indicator is used to measure the WHO recommendation that all infants should be fed exclusively from birth to 4 to 6 months, particularly where breastfeeding may be a matter of life or death for babies (WHO 1996). In calculating exclusive breastfeeding rates WHO asks if the infant was exclusively breastfed in the past 24 hours (WHO 1994).

The predominant rate was developed in an attempt to identify infants whose predominant source of nourishment is breast milk. This rate allows evaluation of the positive health benefits of breast milk when feeding a baby with other non milk fluids. It was developed because the global rates of breastfeeding are not particularly high.

2.3 Labbok and Krasovec definitions

In 1988 the Interagency Group for Action on Breastfeeding met to develop and agree upon a set of definitions that could be used as standard terminology for the collection and description of cross-sectional information of breastfeeding behaviour (Labbok and Krasovec 1990). The schema and framework that were decided to assist researchers and agencies in their efforts to accurately describe and interpret breastfeeding practices included:

- Distinguishing full from partial breastfeeding
- Subdividing full breastfeeding into categories of exclusive and almost exclusive breastfeeding
- Differentiating among levels of partial breastfeeding
- Recognizing there can be token breastfeeding with little or no nutritional impact.

The resulting definitions are:

Full breastfeeding

Exclusive: No other liquid or solid is given

Almost exclusive: vitamins, minerals, water, juice, or ritualistic feeds given infrequently.

Partial breastfeeding

High:		>80% of feeds are breastfeeds
Medium:	20-80%	
Low:		<20%

Token

Minimal, occasional, irregular.

The definitions were to be limited to breastfeeding, not infant feeding in general. Patterns of breastfeeding and research on the influence of breastfeeding on infant nutrition, health and fertility were considered. The schema and framework decided were to be used in describing infant consumption at a single point in time. (No reference or reason was provided for this in the article). If researchers were interested in information on previous breastfeeding behaviour, such as use of colostrum or timing of first supplement, the framework could be applied at separate points in time. Researchers may also take into account how long it has been since an infant entered a certain category.

‘Exclusive’ was defined very strictly on the basis of no other liquid or solid entering the infant’s mouth. It was separated from ‘almost exclusive’ on the basis of water alone as this increases the risk of diarrhoea (Labbok and Krasovec 1989). They reasoned that at later stages of data analysis ‘exclusive’ and ‘almost exclusive’ could be combined under the term ‘full’ breastfeeding, but to combine them from the beginning may obscure potentially important relationships.

Their reason for selecting three levels of ‘partial breastfeeding’ was based not on science but a logical division to account for the possible differences in health, nutrition, and fertility impacts on women and infants. While some studies have shown a dose response between morbidity and mortality outcomes it is not clear at what level significant immunological changes may occur. Therefore the authors use at least three categories in studies of breastfeeding and illness as they may yield a better basis for analysis.

‘Token’ breastfeeding occurs when the breast is used primarily for infant or child comfort and not for nutritive purposes. It is distinguished from ‘low partial’ by the

irregular and minimal nature of the breastfeeding. Policy makers have been confused and national and international data has been misinterpreted when token has been counted along with all others as 'breastfeeding' (I assume the authors mean in a nutritive sense). How can the various levels of partial and token breastfeeding be determined under home conditions? This needs to be specified and Armstrong suggests some possibilities eg. use breastfeeding episodes (counting all reattachments within a five minute period as part of the same episode) as adequate indicators of breastmilk intake (Armstrong 1991).

Simply describing a pattern, as *high partial* for instance, is inadequate for defining breastfeeding behaviour.

Additional schema can be added eg. frequency or duration of breastfeeds to give an adequate description of breastfeeding behaviour. Together the schema and framework may be used to define breastfeeding behaviours of an individual or groups, or used in the development of guidelines for describing ideal behaviours at different ages of the infant.

A suggested expanded list of information that can be included in studies on breastfed infants:

- The age of the infant
- The frequency of breastfeeds
- The duration of breastfeeds (minutes per feed)
- The length of intervals between feeds (including night feeds)
- The use of other things to suck on (pacifiers)
- The expression of breast milk
- The type, timing and amount of other feeds
- Observation of actual behaviour to record sucking and positioning (Armstrong 1991; Labbok and Krasovec 1990)

2.4 Comment on the Labbok and Krasovec definitions

The Labbok and Krasovec schema does not describe the breastfeeding situation for preterm infants and their mothers in the United States (editorial comment 1997). While it is appropriate for term infants, as milk consumed by the infant at the breast is distinguished from artificial milks taken by bottle or by alternative methods, preterm infants frequently are not fed at the breast although they may receive their mother's expressed milk. Researchers may have to deviate from these definitions when they are describing breastfeeding practices for special populations.

The difficulty of these definitions is the changing status of the breastfeeding women. Because the definition is taken at the point of contact, a woman can be low breastfeeding one day and exclusive the next. The original intention for research purposes was to offer this snap shot at contact. Clinically it is less useful. Exclusive without any other substances provides a diagnostic criterion for ruling out allergic responses to medications etc. or water borne specific diseases. If the measure is changeable then you need to review the entire breastfeeding history as it is not

possible to assume that the infant may not have been exposed to other substances (Dignam, personal communication 1998).

Data for monitoring the breastfeeding target is a public health tool for a population measure. The way breastfeeding is defined for monitoring a national target will not necessarily be consistent with an individual clinical diagnostic need.

2.5 Other indicators of breastfeeding

'Any' breastfeeding is sometimes used synonymously with 'token'. However it can also be used as a description of a combination of all categories of breastfeeding including exclusive and partial breastfeeding (Ford et al 1996).

Frequency, duration and exclusivity of breast or bottle feeding are the most commonly mentioned items that need to be considered when collecting data for studies of infant feeding practice.

2.6 Qualitative measures of breastfeeding

Breastfeeding is often recommended primarily for its nutritional benefits. In New Zealand and Australia, policy to promote breastfeeding is included in dietary guidelines. Although breastfeeding targets are a quantitative measure there is an increasing demand for qualitative data to be collected (Lennan 1997). Qualitative methodologies generate an understanding of the 'meaning' that human values, beliefs, practices or life experiences and events have for individuals (Hewat 1993: 573-595). Qualitative data could provide the reasons for not meeting the breastfeeding target and would give information needed to modify breastfeeding policy. It would give an understanding of the non nutritional benefits of breastfeeding which are important in developing relevant social policy. Breastfeeding can be considered in one of two ways; an activity or process, or the means of obtaining a product. Breastfeeding as a 'product' is the approach industrialised countries have adopted. For successful breastfeeding the action and cultural beliefs around it need to be considered (Riordan and Auerbach 1993).

Attitudinal factors unique to each woman, and the impact of social trends are the most significant determinants of a woman's decision to breast or bottle feed (Post and Singer 1983: 349-66). Although attitudinal variables are probably closer to the true causal determinants of infant feeding practice, demographic variables are easier to incorporate into questionnaires (Report task force 1984).

To succeed with exclusive breastfeeding for 4 months there needs to be early onset of breastfeeding, frequent feeding and night time feeds. The support of other women and some experience of breastfeeding in the mother herself or her relatives are other factors which contribute to successful lactation (Poskitt 1998).

2.7 Breastfeeding definitions used in New Zealand

Royal NZ Plunket Society, NZ College of Midwives

The definitions used by the Royal NZ Plunket Society and the NZ College of Midwives were developed by Labbok and Krasovec for research purposes. The Labbok and Krasovec definitions specify the amount of breastfeeding at a single point in time. The exclusive breastfeeding definition has been modified by the NZ groups

to exclude vitamins and minerals and to state that the measure should be taken from birth. The full breastfeeding definition is then synonymous to the almost exclusive Labbok and Krasovec definition. This and the other breastfeeding definitions used by the NZ groups stipulate at the time of contact (last 48 hours) (Appendix).

National Women's Hospital

The indicators used by National Women's Hospital for babies on discharge from the main unit and the Special Care Baby Unit follow (appendix 1997):

Full

Exclusive of any other liquid or solid, or almost exclusive with medicines given from time to time.

Partial

High >80% feeds are breast milk (equivalent to one bottle of formula in 3 days stay)

Medium 20-80%

Low <20%

Artificial feeds

No breast feeds at all

The hospital policy is that water should not be given to breastfed infants so water is not needed in the definition. The data relates to the babies entire hospital stay, not the last 24 hours or the mother's intentions.

Description of infant feeding

The 'main type' of feeding is the term used by many health workers in asking mothers to describe how they feed their infants (personal communication from interviews with breastfeeding sector July 1998). The health worker records the type according to the response.

The main type of feeding in the last 24 hours is the description between breast, bottle and breast, and bottle that was given to elicit infant feeding patterns in Canterbury in 1991-1992 (Ford et al 1995).

Although there is no consistent definition of breastfeeding or method of collection most groups or people collecting data in New Zealand make some distinction between 'exclusive' and 'partial' breastfeeding.

Summary of viewpoints

Data should be comparable in New Zealand. Because the NZ Plunket Society data is collected using definitions developed from the Labbok and Krasovec definitions, these appear to be most widely used by researchers in New Zealand. One researcher believes the best tool for clinical or epidemiological evidence is the Labbok and Krasovec definitions. Clear definitions to determine breastfeeding, in particular the Labbok and Krasovec definitions, are favoured by the project group in *Review of Survey Methods for Infant Care Practices, 1998*.

If the data that is collected is to meet New Zealand's reporting requirements for the World Health Organization, then definitions should resemble those used in the *WHO*

Global Databank on breastfeeding. These differ from Labbok and Krasovec in allowing the infant which is exclusively breastfed to receive 'drops and syrups'.

Definitions should be consistent with international definitions to enable NZ to participate in international studies. Internationally exclusive breastfeeding is accepted as being the desirable feeding behaviour for infants to 4 – 6 months of age. The difficulty is that there is a wide variety of understanding of 'exclusive' breastfeeding.

To be clinically significant data needs to reflect if breastfeeding status has changed. This is important for substances that are allergenic to an atopic child. To overcome this, some research studies word definitions as 'have you ever offered', and then use the Labbok and Krasovec definitions as a total period of feeding indicator (Dignam, personal communication, June 1998). With this requirement, if an infant has ever been given medication or water it can not be classified as having been exclusively breastfed.

2.8 Suggested methodology

Golding looked at the methodology and summary of results from literature reviews and recommended that the best method of identifying health effects of breastfeeding are longitudinal cohort studies, preferably on geographically identified populations (Golding et al 1997). If the studies record prospectively the breastfeeding history of the child they are likely to produce more accurate estimates of subsequent health problems and growth deficits. Such longitudinal studies need to be analysed using rigorous statistical techniques such as logistic regression, and appropriate confounders need to be taken into account.

2.9 Confounding reduced between feeding groups

Randomising infants to different feeding methods is not possible in most circumstances (See 1.4). An alternative strategy to randomisation is to undertake a more general population study by careful selection of cases, together with a rigorous adjustment for confounders and precise definitions of each feeding group.

This method was used by Pollock, selecting subjects from the 1970 British Births Survey (BBS) which covered all births occurring in the United Kingdom during seven consecutive days. The attending midwife used clinical records and interviewed the mother after the first week postpartum. At five years of age the children were traced through the National Health Service registration records. A health worker questioned the mother about early feeding patterns of the child. The cohort was traced at 10 years of age through the educational system.

The BBS contained full details on how each infant was fed on each of the seven days after delivery. At the five year follow up, the mother was asked whether the child had been breastfed, bottle fed, or both for less than one month, for one to two months, or for more than three months. The cohort was then divided into those mothers who reported that they had exclusively breastfed the child for at least three months and those who had exclusively bottle fed the child over the same period. Only those subjects whose feeding records over the first week were consistent with the five year retrospective recall of infant feeding were included in the study.

Of the sub sample of 7800 mothers, 7271 (93.2%) wholly bottle fed their infant for at least three months and 529 (6.8%) wholly breastfed their infant for at least three months. To minimise the selection of a disadvantaged bottle fed group, certain cases displaying characteristics most likely to influence the potential for breastfeeding the infant, were excluded from analysis. The aim of the selection was to create a cohort whose mothers were best placed either to breastfeed or bottle feed their infants, had had no feeding difficulties and were assumed to therefore be managing their babies feeding as a matter of choice.

In this study, when only clinically advantaged groups of children were considered, no clinical, medical or health implications were determined. This result is different from studies which report an association between breastfeeding and gastrointestinal disease, and lower respiratory disease (Howie et al 1990; Chen et al 1988).

The control for confounders in Pollock's study focused on differences between the infant feeding groups and not on factors which contributed to the outcome being assessed. More usually studies adjust for factors that potentially confound for associations between infant feeding and later events.

Because duration of breastfeeding is correlated with maternal education levels, socioeconomic levels and child experience, studies that trace developmental outcomes of breastfeeding need to control for factors partially predictive of breastfeeding itself. In his article Pollock reviews five studies employing different cohorts which trace the developmental outcome of breastfeeding.

2.10 Retrospective infant feeding data

A limitation of collecting retrospective data is recall bias. Chen and Leventhal both found that recall was accurate for parents reporting feeding behaviour (Chen et al 1988; Leventhal et al 1986).

The 1989-90 National Australian Health Survey of Australia and the Ross Laboratories National Mother Survey in USA both relied on self completed questionnaires to elicit retrospective feeding behaviour. This information was used to determine national trends.

2.11 Recall used to determine an association with infant feeding method

A study by Chen et al in 1981 of 1,058 infants in Shanghai, People's Republic of China. looked at the association between type of feeding and hospitalization during the first 18 months of life (Chen et al 1988). The study relied on parent recall of feeding behaviour.

The infants were divided into two feeding groups: a completely artificially fed group which consisted of infants who had never been breastfed and a group of breastfed infants which consisted of those who were fully or partially breastfed at any time in the first 18 months of life. That is, ever and never breastfed groups. The information was collected as a self administered questionnaire completed by the parents or guardians when the child reached 18 months.

Artificial feeding was consistently associated with a higher admission rate for respiratory infections independent of demographic characteristics and

socioeducational status. The breastfeeding group consisted of infants between two extremes: those who were completely breastfed during the first 10 months of life and some who received only a few feedings of human milk. Therefore the authors contend that the results of the survey may be conservative.

The authors verified the times and causes of hospitalisation of 72 infants in a review of medical records. The re-questioning data on the type of feeding showed a 97 percent concordance with the data originally obtained. The major source of information bias would be expected to be random error in recall of breastfeeding data when such data is obtained by self-administered questionnaire 18 months after birth. Random measurement error generally leads to an under estimation of true association (Kramer 1988).

Kramer comments that the alternative, which is to base the analysis on duration of breastfeeding, runs the risk of selection bias. Infants will continue to be breastfed only so long as they remain healthy and well nourished. When they fail to thrive or become ill they are often placed on artificial feeding. Artificially fed infants, however, cannot be placed on the breast if they fail to thrive or become ill. Consequently, children who are breastfed exclusively for a prolonged period of time represent a selected group and are likely to be extremely healthy.

Therefore the choice for researchers is to either define breastfeeding as 'ever' or 'never' with its risk of information bias and tendency to underestimate the true association between infant feeding and health outcome, or have selection bias which is inherent in comparing children with prolonged breastfeeding to those who receive only artificial feeding or to those who are partially breastfed. Kramer discusses confounding bias and the methods for controlling for confounding which include: matching, stratification, and multivariate statistical techniques. The latter method was chosen by Chen et al. Kramer also discusses reverse causality bias where infant health can affect infant feeding. By defining breastfeeding as 'ever' or 'never' reverse causality is not a problem in the Chen et al study.

Chen states the need for further investigation to understand why one third of the mothers did not breastfeed their infants and how to improve this situation in Shanghai. Editorial comment supports the authors putting their study to practical use in planning public health programmes to promote breastfeeding in China (Kramer 1988).

2.12 Accuracy of maternal recall

Recall bias can occur when interviews take place long after the behaviour occurred. The delay can also influence mothers to recall events based on convenient ages eg. whole months or linked to desirable practices, eg. weaning at six months. Cross sectional surveys can eliminate these problems but they require large samples (Report task force 1984).

Launer et al examined the accuracy of maternal recall of past infant feeding events, specifically the infant's age when breastfeeding was stopped and formula feeding and solid foods were introduced (Launer et al 1992).

The sample consisted of 318 Arab women who were part of a larger cohort participating in a prospective study of infant health. Data from interviews conducted at 12 and 18 months postpartum were compared to the standard data collected six months postpartum.

As length of recall increased there was a small increase in the mean difference between the standard and recalled age when breastfeeding was stopped and formula feeding and solid foods were started. Recall on formula feeding was less accurate than recall on solid foods and breastfeeding. The authors concluded that retrospective data based on maternal recall of events up to 18 months in the past can be used with confidence in epidemiological studies.

Period or point prevalent?

In a cohort study of 351 mothers with healthy babies at the North Shore hospital that were followed for one year, rates for exclusive breastfeeding at 2 – 3 months differed depending on whether the data was collected as point or period prevalence (Vogel, personal communication, June 1998). The provisional results suggest at least a ten percent reported increase in exclusively breastfed infants recorded at point prevalence compared with period prevalence at one month. This percentage difference increases at two and three months of age as you might expect.

Factors Which Influence Breastfeeding

3.1 Water and breastfeeding

Water is offered to infants for different reasons but an exclusively breastfed infant does not need water. Infants who receive supplementary fluids have a lower intake of breast milk than if they are exclusively breastfed. They are also most likely to be breastfed for shorter periods (Sachdev 1991). If a large amount of water is taken by the infant then it is less likely to get sufficient breast milk to meet its energy needs. A diminished production of breastmilk also reduces the contraceptive effect of breastfeeding (France 1996).

Neonatal jaundice

Breastfeeding is frequently supplemented with water following birth to reduce the incidence of neonatal jaundice. Supplementing is an undesirable practice as it reduces the infant's thirst response and therefore intake of breast milk. Several studies have shown that water supplementation is associated with increased bilirubin levels, and those infants who were exclusively breastfed had the lowest bilirubin levels (Nicoll et al 1982; De Carvalho et al 1985).

Although bilirubin production appears to be the same in infants regardless of what they are fed, bilirubin clearance is slower in breastfed, compared with formula fed infants (Guthrie R, Auerbach K. 1993: 335-7). As breastfed babies increase their stool output, they excrete more stool bilirubin and have lower serum bilirubin concentrations. This supports the need for early and frequent breastfeeding in newborn infants (Lawrence 1994; Salariya 1993).

Water in hot weather

In developing countries many mothers supplement their milk with water or teas from the first weeks of life (Ashraf et al 1993). In Lahore a community based study was conducted to investigate whether or not it was necessary to give water to breastfed infants in the hot season. Healthy two to four month old breastfed infants receiving non-nutritive feeds of water and herb water were included. The exclusion criteria were: breastfed infants who were given nutritive supplements of animal milk or infant formula, and infants or mothers who had diarrhoea or fever. Each infant was followed for 15 days. Water was not allowed from day one to day eight but was permitted ad libitum from day eight to 15. Haematocrit and serum sodium levels did not differ significantly between the two periods, which indicated that the infants were not dehydrated when water was withheld. The urine specific gravity levels indicated that infants could concentrate urine when water was restricted. It was concluded that two to four month old breastfed, healthy infants showed no signs of dehydration if additional water was not given during the hot season.

Water and poor sanitation

In areas with poor sanitation supplementing breastmilk with water or teas in the first 6 months significantly increases the risk of diarrhoea (Martines 1992). Each additional daily feed with these fluids substantially increased the risk of death from diarrhoea in a case control study of a group of Brazilian infants. The infants who were offered water and teas in addition to breast milk in the first days of life were twice as likely to stop breastfeeding before the age of three months. In the Cebu area of the Philippines infants who were not breastfed had a two to three times greater risk of diarrhoea than

breastfed infants, and a three to five times greater risk than those who were exclusively breastfed (VanDerslice et al 1994). Exclusively breastfed infants benefit most from the protection that breastfeeding offers against diarrhoea.

There are two mechanisms through which breastfeeding protects infants from enteric infection: it reduces or eliminates exposure to food or waterborne pathogens, and breast milk contains several compounds eg. secretory IgA, which can improve the infant's ability to resist infection. Several studies confirm that the protective effect of breastfeeding is greatest where sanitary conditions are poorest.

Breastfeeding, water and health outcome

In a prospective study of 1963 infants in Cebu City of the Philippines data was sought to answer questions about infant feeding, environmental sanitation conditions and diarrhoeal morbidity (Vanderslice 1994). Infants were classified at each bimonthly period over six months, as either exclusively breastfed, breastfed and given only non-nutritive liquids (NNL), mixed fed or completely weaned, based on a 24 hour recall. For analyses the exclusively breastfed and the breastfed + NNL infants were combined into a 'fully breastfed' category indicating that the infants received all nutrition through breastfeeding and that they were not exposed to potentially contaminated weaning foods.

By two months of age, 38 percent of the infants were mixed fed, 19 percent were completely weaned and another 20 percent received non nutritive liquids in addition to breast milk. The proportion of infants who were fully breastfed dropped to less than 10 percent by the end of the first six months.

The proportion of children who experienced diarrhoea in the week preceding the interview rose from 7 percent to 20 percent over the first six months. There was a clear relationship between feeding practices and diarrhoeal disease. Both breastfeeding and environmental sanitation were important determinants of diarrhoeal disease during the first six months. The protective effect of full breastfeeding relative to no breastfeeding was large and statistically significant. Mixed feeding had a smaller, yet statistically significant effect. Poor environmental conditions were strongly associated with the risk of diarrhoeal disease. Consumption of contaminated water significantly increased the risk of diarrhea independent of the type of feeding.

Exclusive breastfeeding and full breastfeeding supplemented with uncontaminated water were associated with the lowest risk of diarrhoea. But supplementing fully breastfed infants with even small portions of contaminated water nearly doubled the risk of diarrhoea. Mixed fed infants consume much greater quantities of water and as a result face much greater risks when their water is contaminated (WHO 1992).

Another study in the Philippines supports findings that for children under 12 months of age breastfeeding experience and sanitation are the key determinants of nutritional status as measured by growth (Magnani et al 1993). After the first year socioeconomic household factors (food availability and education) become more important determinants. Wider development to alter socioeconomic effects are needed if the benefits from breastfeeding are to be sustained into childhood and beyond in poorer environments.

Healthy infants who consume enough breast milk to satisfy their energy needs receive enough fluids to satisfy their requirements, even in hot and dry environments (Akre 1989).

3.2 Formula feeding

The intake volume of breastfed infants is relatively stable between one and four months (Akre 1989). By contrast infants fed only infant formula increase their intake volume during the same period by an average of an additional 200 ml per day. The metabolic consequences of this are unknown.

Infant formula has been developed to emulate the composition of human milk and for formula fed infants to match the biochemical and physiological values observed for breastfed infants. The human milk model can not be applied precisely in the design of infant formula because:

- The bioavailability of many nutrients in human milk is superior to that in infant formulas. eg calcium, iron, nutritional protein.
- Human milk composition varies significantly eg. fore and hind milk, time of day, mothers' diet, prematurity.
- The low levels of vitamins D and K in human milk are considered inappropriate for infant formula.
- The non-nutrient substances in human milk may not influence the well being of infants ie. Proof of benefit should be demonstrated before adding these to formulas (Wells 1998).

The 1996 UK Department of Health Guidelines on the Nutritional Assessment of Infant formulas included a recommendation that the healthy infant exclusively breastfed for 4 –6 months represents the 'gold standard' for outcome in studies of artificial diets (Williams 1998). Earlier recommendations were based on the composition of human milk whereas now the basis is on the outcome of breastfeeding. This recognises that the bioavailability of nutrients in a formula may be very different from that of the same nutrient in breast milk, and that the mere addition of a breast milk constituent does not guarantee benefit.

Riordan and Auerbach have a well referenced summary of the costs of not breastfeeding in their book *Breastfeeding and Human Lactation* (Riordan and Auerbach 1993: 16-17).

Iron-enriched infant formula should be considered for use after the infant is six months old if there are concerns about the adequacy of iron in the diet. Breastfed infants without adequate iron from other sources are at risk of becoming iron deficient by six months old (Pizarro et al 1991).

3.3 Social factors and breastfeeding practice

Initiation of breastfeeding

Successful initiation of breastfeeding is associated with a longer duration of breastfeeding. It is hard to state a time when breastfeeding has been successfully initiated and then established. These periods are dependent on indicators that affect breastfeeding such as first suckling following birth and rooming in (WHO 1996). For this reason definitions of breastfeeding can not successfully be used in isolation but should serve as a guideline for describing behaviours.

Most infants have regained their birth weight by two weeks although about 10 percent of breastfed infants may not have done so (Neifert 1983: 273-301). Infants often experience their first growth spurt at about three weeks. Lactation is usually established by two months postpartum.

Behaviours as indicators

To initiate breastfeeding successfully, infants should be allowed to breastfeed within an hour of birth when both their reflexes and their mother's sensitivity to tactile stimuli of the areola and nipple are strongest (Akre 1989). Desirable behaviour rather than a time is given to indicate if breastfeeding has been successfully initiated and later established. To establish breastfeeding successfully, factors that decrease the duration, efficiency and frequency of infant suckling should be eliminated as far as possible. These factors include limitation of feeding time, scheduled feeds, poor positioning, and use of other oral objects, and giving the infant other fluids. In 1992 the New Zealand Paediatric Society recommended desirable practices that paediatricians should follow to facilitate the initiation of breastfeeding in line with the WHO/UNICEF Baby Friendly Hospital Initiative (NZ Paediatric Society 1992). The 'Ten Steps to Successful Breastfeeding' are part of the Baby Friendly Hospital Initiative.

Hospital practices and duration of breastfeeding

Breastfed babies in hospitals should be given no other food or drink unless medically indicated. The Infant Feeding Surveys in the UK have consistently shown that breastfed babies given bottles in hospitals are less likely to be breastfeeding at 2 weeks of age: 60 percent of mothers will stop, but only 9 per cent of those given no bottles will stop (Williams 1998).

Infants who received glucose solutions in the first three days of life received twice as many formulae during the first month and had a shorter duration of any breastfeeding in a study in Spain (Matin-Calama et al 1997). The percentage of infants receiving formula was significantly different between groups only in the first month postpartum. Almost half of the glucose water infants had received formula during this period, while less than 20 percent of the non glucose water group had been given formula. By 20 weeks the majority of infants in both groups had received formula.

In Arizona, in a study to assess the impact of hospital practices on the duration of breastfeeding, 192 and 392 postpartum women were interviewed in 1990 and 1993 respectively, regarding how they were feeding their infants and feeding practices in the hospital. The duration of breastfeeding was longer for women who did not receive

formula in hospital and who roomed in more than 60 percent of the time (Wright et al 1996).

The infants were classified as being either fully breastfed, partially breastfed or formula fed only, at one and four months. These classifications were based on answers to four questions asked in the interview when the child was four months old.

1. Whether the infant was still being breastfed
2. If not, when had the mother stopped breastfeeding
3. Whether the infant had ever received formula
4. If so, when had this first occurred and whether the infant was still being given formula.

The ages at stopping breastfeeding and at the first regular use of formula were calculated based on these questions.

Feeding frequency and duration of breastfeeding

Early initiation of breastfeeding and frequent feeding contributes to longer breastfeeding duration. A study conducted by Salariya et al in 1978 showed that the group most likely to be breastfeeding at six and 12 weeks had begun breastfeeding within 10 minutes of delivery and had continued to do so at two hourly intervals (Salariya et al 1978). The group least likely to be breastfeeding had a first breastfeed four to six hours after delivery and continued breastfeeding thereafter only every four hours. The authors concluded that feeding every two hours reduced the need of complementary feeds. Two hourly feeding induced lactation at least 24 hours earlier than did four hourly feeding. However all groups were given water feeds at night if required, and complemented with formula if required. Fewer in the two hourly feed group required formula, and fewer had water feeds but this was not significant.

The recommendation is to put the baby to the breast as soon as possible after delivery followed by two hourly feeds until lactation is well established after which feeding on demand should continue.

Social factors and duration of breastfeeding

A Copenhagen cohort study of 251 infants described breastfeeding patterns and social and biological factors influencing duration of breastfeeding (Michaelson et al 1994). It confirmed that younger mothers with short school education were less likely to continue breastfeeding.

Formula supplements given to 73 percent of infants in the maternity wards during the first three days after delivery were associated with a shorter duration of breastfeeding. Their definition of exclusive breastfeeding allowed supplements of water, chamomile tea and vitamins. Also included were three infants who received one or two meals per week of formula or solids when the mother was away from home. Infants were classified as partially breastfed as long as they were fed from the breast at least once daily.

Data from the 1988 National Maternal-Infant Health Survey in America that looked at duration of breastfeeding in a sample of 2372 women found that social status was correlated with breastfeeding for longer than six months (Piper and Parks 1996).

Predictors of longer duration of breastfeeding were mothers who fully breastfed during the first month, were non smokers, were of higher parity, were consistent in their prenatal intent to breastfeed fully or partially and in their postpartum behaviours, participated in childbirth education classes and delayed their return to work beyond 16 weeks postpartum. The authors used Labbok and Krasovec's framework to define patterns of breastfeeding as full or partial (Labbok and Krasovec 1990). Full breastfeeding during the first month postpartum was defined as no formula or cow's milk. Partial breastfeeding was defined as more than one time per day in conjunction with either formula or cow's milk.

In 1990 Ford and Labbok used a national household survey (the Child Health Supplement of the 1981 Health Interview Study) to identify socioeconomic, demographic, and maternal and infant health selection factors among breastfeeding women in the United States (Ford and Labbok 1993).

The survey is based on nationally representative samples of the US population living in households. The supplement collected information on the health of 15,000 children under 18 years of age.

The authors report that few studies take into account different definitions of breastfeeding and patterns of infant feeding. No US study allows comparison of infants who are exclusively breastfed with infants who are exclusively bottle fed where the largest differences in incidence of infectious diseases are likely to be found.

Ford and Labbok's paper focuses on children aged 1-2 years because detailed information on introduction of formula and solids was available for this age group. For all children selected for interview, the infant feeding questions were: 'Was the child ever breastfed? And if breastfed, 'How old was the child when he or she completely stopped breastfeeding?' Additional questions for children under three included the age at which the child first began eating solid food, and was first given infant formula or milk.

Logistic regression was the main statistical method, and the paper only presented the coefficients of the infant feeding variables. With respect to infectious diseases, the results show breastfeeding offers some protection against pneumonia and otitis media but the results were not uniform in size or significance. The authors contend that earlier US studies have found conflicting results in this area, not only because of differences in methodology, but also because effects may be small in the US. Also the duration of breastfeeding may have a different effect on different diseases. Many studies have only asked if a child was ever breastfed without establishing duration. They give as an example the cautious findings of their study that a short duration of breastfeeding (3 months) may protect against pneumonia, while longer durations of lactation may help to prevent ear operations. They found that for pneumonia breastfeeding was protective for children breastfed for a short time with no effect for longer (beyond 3 months) breastfeeding. Early introduction of formula (before three months), and early introduction of solids (before three months) was also associated with an incidence of pneumonia.

3.4 Introducing solid foods

Appropriate time for introducing solids

Interrelated factors which influence the time for introduction of complementary foods are: the mother's health and nutritional status, particularly her iron stores; the quality and quantity of milk produced (and possibly the type of milk, human or formula); the infant's birth weight and current body size and growth rate, gestational age and maturity, gender and health (Morgan 1998).

Current advice is that 'the majority of infants should not be given solid foods before the age of four months, and a mixed diet should be offered by the age of six months' (Public Health Commission 1995, HMSO 1994).

Solids given with breast milk can reduce the absorption of nutrients in the milk and there may be advantage if a diverse diet is introduced only when the infant is ready to eat solids in amounts large enough to compensate for any associated reduction in the bioavailability of nutrients.

Late weaning

Late weaning has been associated with low iron intake and possibly iron deficiency anaemia, low vitamin D intake and a delay in psychomotor and emotional development (Morgan 1998). Late weaning in breastfed infants may result in growth faltering because breast milk output can not meet the infant's energy and nutrient requirements. As infants grow they need more total energy and it becomes increasingly difficult to consume the volumes of formula or breast milk required to meet this energy need (Morgan 1998).

Similar guidelines about when to wean apply to infants fed infant formula, although the intake of several nutrients and their bioavailability from infant formula are significantly different from breast milk (HMSO 1994).

Early weaning

Early weaning in the developed world may be associated with obesity, infection, adverse reaction to foods, respiratory illness and to the risk of cardiovascular disease (Morgan 1998). Some babies are introduced to solids earlier than the recommended 4 months.

Reports from Australia, USA and UK all confirm that formula fed infants are weaned earlier than breastfed infants. Modern day formula fed infants appear to require more energy (and are fatter) than breastfed infants with these differences being most marked at 3-6 months of age (Morgan 1998). There appear to be differing energy and nutrient needs in formula fed and breastfed infants and this raises the question of whether the age infants are weaned should be different for breastfed and formula fed infants.

In 1995 in the United Kingdom, breastfeeding mothers (both exclusively and in conjunction with infant formula) tended to introduce solid food later than others. At four months, when the vast majority who were not breastfeeding had introduced solids (93%), only 84% of exclusively breastfeeding mothers had done so (Foster 1997).

Studies show that breastfeeding mothers were less likely to give solids very early. Introducing solids before 15 weeks was associated in a Scottish prospective study with an increased probability of wheeze during childhood, 21 per cent to 9.7 per cent (Wilson et al 1998).

Effect of solids on breast milk intake

In the DARLING study, an observational study, breastfed infants given solids before 6 months of age consumed less breast milk at 6 and 9 months of age than those given solids at or after 6 months old. The total energy intake therefore, did not differ (Heinig et al 1993). This replacement of milk source by solid foods was not seen in formula fed infants, even though feeding frequency declined. The frequency of day time nursing was reduced in the breastfed infants who were given solids early. The differences were no longer significant at 9 and 12 months of age. Age of solid food introduction was not related to the frequency of night feeds at any time point.

A similar finding of a reduced intake of breast milk with the introduction of solid foods was found in a study comparing the growth patterns of Honduran infants with those of breastfed infants in the United States (Cohen et al 1995). The three groups were:

- women exclusively breastfeeding to six months
- adding hygienically prepared and nutritionally adequate solids at four months along with continued breastfeeding
- adding the solids as above without maintaining breastfeeding.

Because the breast milk intake reduced with the introduction of solids, the total energy intake was similar among the three groups. Infants weight and length gain from 4 to 6 months was also similar, regardless of the age of introduction of solids. The authors conclude that there was no advantage to complementary feeding before 6 months with regard to infant growth or energy intake.

Among breastfed infants no significant relationships were found between timing of solid food introduction and morbidity, activity and time sleeping. This contrasts with less developed countries where termination of exclusive breastfeeding is associated with an increased risk of morbidity.

Within the formula fed group there was no associations between age of solid food introduction and growth, intake, activity, time sleeping or morbidity.

How Other Countries Collect Data on Breastfeeding

4.1 United States of America

A national goal for health promotion and disease prevention set by the US Department of Health and Human Services (1990) and stated in Healthy People 2000 is to increase the rates of breastfeeding initiation and duration (AAP 1997). The target is to:

‘increase to at least 75 percent the proportion of mothers who exclusively or partially breastfeed their babies in the early postpartum period and to at least 50 percent the proportion who continue breastfeeding until their babies are 5 to 6 months old.’

Nowhere in this publication is breastfeeding defined (Coffin 1997).

These health goals were first published in 1978. In 1984 the Surgeon General convened a workshop to address the barriers which kept women from beginning or continuing to breastfeed their infants, and to devise a plan to reach the breastfeeding goals (Lawrence 1994). The Surgeon General’s office conducted a national survey to explore ideas and feelings about breastfeeding.

In the special Supplemental Nutrition Program for Women, Infants and Children (WIC) of the US Department of Agriculture, breastfeeding is defined as one breastfeed a day.

In 1995, 59.4 % of women in the United States were breastfeeding either exclusively or in combination with formula feeding at the time of discharge; only 21.6% of mothers were nursing at six months and many of these were supplementing with formula (Ryan 1997). At one month of age 49% of new mothers are exclusively breastfeeding according to the 1995 Ross Laboratories Mothers’ Survey (Riordan 1997).

Data collection

Problems with conducting epidemiological research on breastfeeding is confounded in the United States which lacks a national registry of central data source for infant mortality and morbidity data (Riordan 1997). The only reliable data on the rates of breastfeeding are from a formula company. The Center for Disease Control publishes data on selected diagnoses but much of the reported data are categorised according to age groups that do not separate out the first or second year of life, the years when breastfed infant morbidity can best be compared with those of formula fed infants.

The Ross Laboratories Mother’s Survey is the only national study in America that includes sampling of all women who give birth in the 50 states (Lawrence 1994: 1-35). Questionnaires mailed quarterly in the 1950 to 70s are now mailed monthly with special efforts to assure participation of low income and less educated mothers. In 1991 175,000 surveys were returned. The data documents initiation and duration of breastfeeding as well as infants fed infant formula, evaporated milk and cows milk. The validity of the questionnaires requesting mothers to recall their feeding behaviour months later has been questioned . A study of maternal recall of infant feeding events demonstrated that recall is accurate up to 18 months later when breastfeeding is the

mode. Data on formula feeding recall were not as accurate as those for breastfeeding and solid food feeding (Launer et al 1992).

Desirable breastfeeding practices

The World Health Organization's International Code of Marketing of Breast-milk Substitutes was vetoed by USA in 1981. Different states have varying policies on commercial promotion of infant formula, gifts of discharge packs, television and magazine advertising, and media portrayal of bottle feeding as normative.

In 1997 the Academy of Pediatrics revised their position on breastfeeding and recommended desirable breastfeeding practices which include:

- giving no supplements (water, glucose water, formula) to newborns unless a medical condition exists
- Supplements and pacifiers should be avoided and if used at all only after breastfeeding is established
- Formal evaluation of breastfeeding performance should be undertaken at 24 to 48 hours after delivery and again at the early follow-up visit, 48 to 72 hours after discharge
- Exclusive breastfeeding is ideal nutrition and sufficient to support optimal growth and development for approximately the first six months after birth
- It is recommended that breastfeeding continue for at least 12 months, and thereafter for as long as mutually desired
- In the first six months water, juice, and other foods are generally unnecessary for breastfed infants.

No monitoring criteria were suggested but the emphasis was on exclusive breastfeeding without water (AAP 1997).

4.2 United Kingdom

In the UK a quinquennial infant feeding survey is conducted (Foster et al 1997). One of the aims of the UK Infant Feeding Survey is to establish how infants born in that year are being fed and to provide national figures on the incidence, prevalence and duration of breastfeeding. Other aims include the factors associated with mother's feeding intentions and with the feeding practices adopted in the early weeks. They also want to establish the age at which solid foods are introduced and to examine weaning practices up to nine months.

Definitions

The definitions have been used in five national surveys covering 25 years. They are;

Breastfed initially refers to all babies whose mothers put them to the breast at all, even if this was on one occasion only.

Incidence of breastfeeding is the proportion of sampled babies who were breastfed initially.

Prevalence of breastfeeding refers to the proportion of all sampled babies who were wholly or partially breastfed at specified ages.

Duration of breastfeeding is the length of time for which breastfeeding continued at all, regardless of when non human milk and other drinks or foods were introduced.

The approximate age of the babies at the different stages of the survey are:

stage 1: babies aged 6 to 10 weeks

stage 2: aged 4 to 5 months

stage 3: aged 8 to 9 months

stage 4: 12 months (not reported)

The key definitions are *breastfed initially* and *prevalence of breastfeeding*. Wholly breastfeeding is giving breast milk and nothing else but water. The duration of breastfeeding combines mothers who are wholly breastfeeding with those who are breastfeeding but giving something else as well. This includes mothers who are giving bottle feeds as well as breast milk prior to weaning (Wenlock. Personal communication 1998).

Mothers and infants are selected from registration details but are only included in the survey if they respond to the first questionnaire giving their permission. Subsequent questionnaires are sent at the stages 2 –4. Mothers are visited by an interviewer only if the questionnaire is not returned after two reminder letters.

The questionnaire asks for infant feeding behaviour as ‘at the moment’ or ‘at present’. That is it is asking for point rather than period prevalence. It does not specify a time such as in the past 48 hours.

Currently in the UK 64 percent of infants are breastfed initially with only 19 percent still being breastfed at four months of age (Foster 1997).

4.3 Australia

In 1986 as part of Health for All by the year 2000, Australia set a goal 'to increase the prevalence and duration of breastfeeding'. The proposed targets (Nutbeam et al 1993):

Babies up to 2 months:

To increase to 90 percent those who are breastfed following discharge.

Babies up to 3 months:

To increase to 60 percent those who are fully breastfed

To increase to 80 percent those who are partially breastfed.

Babies up to 6 months:

To increase to 50 percent those who are fully breastfed

To increase to 80 percent those who are partially breastfed.

National Health Survey

The data from the National Health Survey (NHS) 1989–90 suggest that 77 percent of infants are breastfed at hospital discharge. This Australian Bureau of Statistics (ABS) was the first survey in a planned series of quinquennial National Health Surveys. The NHS data on breastfeeding are collected through a self administered questionnaire, from a supplementary women's health form inviting female respondents aged 18-64 to reply (ABS 1996). Mothers aged 18-50 years who were still breastfeeding or had a breastfed child (or children) aged five years or less at the time of the interview were asked to provide information on the ages (in months) and the duration of breastfeeding (in months) for each breastfed child.

No instructions were issued to distinguish between partial and full breastfeeding for reporting the duration of breastfeeding. Because an interviewer was not available to explain the questionnaire, because the age of the child and duration of breastfeeding was rounded in months, and because of the lack of clear definitions of breastfeeding, the data does not provide breastfeeding prevalence rates according to the age of the child and are therefore inadequate to monitor progress towards national targets (Lund-Adams and Heywood 1994).

Comparing National and State data

The data on breastfeeding at discharge from hospital is similar to that collected by the Nursing Mother's Association of Australia for the state of Victoria. For infants aged three months and older the data is no longer comparable for two reasons. The 1989-90 NHS data are retrospective and the Victorian data are prospective. Also the NHS data do not differentiate between full and partial breastfeeding. The NHS data indicate much higher proportions of breastfeeding at three and six months.

Data differentiating full and partial breastfeeding will be available from the 1995 NHS survey (ABS 1996). At the present time Australia does not have either consistent breastfeeding definitions or a national system to monitor breastfeeding rates (H. Rankin, Population Health Strategies, personal communication June 1998).

Social characteristics that determine breastfeeding duration

There is considerable variation, in Australia, in duration of breastfeeding by specific characteristics of the mothers. Older mothers tend to breastfeed their children for longer periods than younger mothers. Other factors positively correlated with a longer duration of breastfeeding are: mothers living in rural areas, second born children, married mothers, indigenous mothers in traditional communities, and mothers with higher levels of

education. Because of the social influences on breastfeeding Morrow and Barraclough contend that breastfeeding should not be treated primarily as a nutritional issue by policy makers and only included into dietary guidelines. More effective strategies could be developed if the interrelationship between infant feeding and social, economic and environmental factors was strengthened (Morrow and Barraclough 1994).

4.4 Canada

For over two decades Canada has been gathering data to assess the initiation and duration of breastfeeding. Two longitudinal surveys: the National Population Health Survey (NPHS) and the Longitudinal Survey of Children and Youth (NLSCY) commenced in 1994 and will be conducted every second year. The NLSCY follows a representative sample of children from across Canada and provides information on the influence of environmental factors as well as data on physical, behavioural, social, learning and emotional well-being outcomes.

Data from the 1994 surveys show national breastfeeding initiation rates of 73 percent with regional differences across the country. The continuation rates were consistent with previous studies and report about 60 percent breastfeeding at 3 months and 30 percent at 6 months (*Breastfeeding in Canada – an Update and Review* in publication). The information is also consistent with findings from a qualitative study conducted on attitudes related to breastfeeding (Marie Labreche, personal communication, June 1998).

Definitions

In the qualitative study exclusive breastfeeding was defined as completely breastfed, and mixed defined as with formula / bottle feeding such that the formula feeds accounted for no more than 1/3 of the infant's regular feedings.

Interviews with Key Researchers and Health Professionals Working with Breastfeeding

Thirteen people were interviewed on the 7, 8 and 21 July 1998 either individually or as a group (list appended). The questions (appended) and a draft copy of the 1998 Health Outcome report on breastfeeding targets had been sent to them to consider a week before the interviews. Those being interviewed were also asked to comment on whether it would be desirable to include breastfeeding behaviours, as identified by Labbok and Krasovec, in any survey gathering data for monitoring the breastfeeding target (appended).

5.1 Winsome Parnell - Otago University

Definitions

Preferred:

1. Full breast milk. Vitamins, medicine, water, juice and ritualistic feeds given infrequently.

Vitamins and minerals are an unusual inclusion in developed countries. Vitamin K is still administered orally in some hospitals in New Zealand to newborns and at six weeks.

Full is a realistic definition. The ideal is no formula.

2. Mixed feeding The overall amount of formula. Include when formula is being given.

This information is needed to be able to set achievable breastfeeding goals. People who breastfeed but also give one or two bottles of formula a day should be included in goals and targets on breastfeeding because of the acknowledged benefits from some breast milk. The question on mixed feeding would need to be open ended and written to reflect this benefit.

‘**When** do you give formula.’ ‘**How much** formula do you give.’ From this information it will be possible to establish a distribution of mixed feeding. This is needed to set realistic targets and develop relevant policy.

3. ‘Any’ A useful definition at six months when solids are appropriately being introduced.

Other definitions

Exclusive not useful because Ministry of Health *Guidelines for Healthy Infants and Toddlers* condones water and prescribed medicines.

Ages for data collection

- 2 weeks
- 3 months
- 4 months
- 6 months

Historically data has been collected for 3 months rather than 4. Because the introduction of formula frequently relates to women returning to work, the normal time for maternity leave for predominantly women professions needs to be established (usually three months).

It is not necessary to establish the time of introduction of solids as a more detailed monitoring of which solids, what sequence etc. is required for the information to be meaningful.

Collection period

Cross sectional data collected for the past 24 hours is ideal if the sample is large enough. Because many mothers are mixed feeding at three months, collecting breastfeeding data for the past 24 hours will reflect breastfeeding accurately.

Retrospective data collection is flawed because it relies on memory, unless it is being taken from records. Historical data is particularly confusing in mothers who have had more than one child. The exception is 'ever fed' information which can be retrospective. 'Was the baby ever put to the breast?'

Who should collect the data

Plunket nurses or health workers will not be given accurate or impartial responses on breastfeeding by mothers whom they also advise on infant feeding.

Other breastfeeding indicators (see appended schema)

'Interval' between feeds or the longest interval between breastfeeds might help with looking at the amount of other feeds. For these other feeds, which will be identified by the mixed feeding question, information on the brand and type eg casein whey ratio of infant formula, would be useful information to know for establishing the pattern of formula use in NZ.

'Ever' fed only gives information on whether breastfeeding was ever initiated and is not necessary.

'Any' at 6 months is useful as at this stage breastfeeding still confers benefits to an infant.

'Pacifiers' and their use at 2 weeks can have an impact on the initiation of breastfeeding. Their use also affects the contraceptive effect of breastfeeding. Generally this information is not needed in NZ where there are other safe methods of contraception.

5.2 Angela Baldwin - Royal NZ Plunket Society

Plunket breastfeeding data collection

Plunket nurses collect data at every scheduled contact, as stated in the Well child schedule, which is five to six times within the first year. Data is not collected at discretionary visits. The breastfeeding data is collected as part of a total picture of the whole infant care. It is collected by age and ethnicity.

It is collected to provide a better service to the client by:

- Monitoring trends
- Improving practice and breastfeeding rates
- Planning

The new definitions have been used since 1996 and are being analysed to show where more support is needed. (Plunket definitions appended)

Definitions

Preferred

1. **exclusive** breast milk and prescribed medicine. To include vitamin K.

This was separated from 'full' in 1996 when previously information on 'full' breastfeeding was collected. There was wide consultation in deciding to use the term 'exclusive'. It was needed for

- Research purposes
- To determine how well the advocated ideal was being met
- To assess its impact on long term breastfeeding.

Exclusive breastfeeding is asked as a periodic question for every age

2. **full** includes water.

Its use is supported because it reflects changes in individual practice. It is breastmilk, not just breastfeeds. That is infants who are fed breastmilk by a cup or bottle will be included in the fully breastfed category.

3. **partial** shows some commitment to breastfeeding which is desirable behaviour. It is important the words are understood by the client.

Further questions should follow to determine what type of mixed feed:
Infant formula, brand, type, cow's milk, solids.

Other

Partial breastfeeding broken down into percentages is only useful for practitioners to observe changes in a person's practice. It is not necessary for national monitoring.

Partial removes the need for 'any'.

'Predominant' suggests something other than 'full'. 'Exclusive' is diminished by 'almost exclusive'.

Ages for data collection

If collected in a survey the timing would need to fit in with other schedules. That is the basis of the following recommendation.

- Discharge, 5 days or 2 weeks. Determine a formal consistent way of assessing initiation of breastfeeding. ('Two weeks' is possibly too far on for the first assessment as a mother might not be exclusively breastfeeding at this time. This is likely to have an impact on the duration of breastfeeding.)
- 6 weeks. This is the formal postnatal checking time for both mother and baby so it a logical time for data collection.
- 3 months. Preferred over 4 months as data shows breastfeeding drops off at about 3 months. (The actual Plunket time for collection ranges from 10 – 15 weeks so almost encompasses 4 months.)
- 6 months. Reflects the ideal practice.
- 12 months. To monitor practice advocated in Ministry of Health guidelines.

Collection Period

Exclusive breastfeeding data needs to be collected retrospectively.

All other breastfeeding data should be collected at point of contact. This can be 24 or 48 hours.

Who should collect the data

If information is collected at expedient times of an infant's development a health worker will be collecting the data.

There is value in a practitioner working with breastfeeding collecting the information to best reflect any qualitative reporting. If the information collected is only for monitoring Ministry of Health targets then an independent person should collect the data.

Other breastfeeding indicators

The quantitative data for monitoring the target should be demographic. It should expand on ethnicity: Maori, Pacific Island, Asian, Pakeha etc. and socioeconomic indicators. If the data can be identified regionally then qualitative questions via focus groups or in depth interviews can be asked of a sample selected from identified low and high breastfeeding regions.

Most qualitative data can be obtained through the *Health and Development record* of an infant.

The breastfeeding behaviours suggested by Labbok and Krasovec would only be useful for individual monitoring, not for a cross sectional sample.

Plunket would be interested to know how many people choose breastfeeding. Therefore they want breastfeeding reported at birth or two weeks which will reflect the initial incidence. If this data could be collected regionally, then qualitative research could follow comparing high and low breastfeeding regions to establish why women are not choosing to breastfeed, or to monitor the influences that have a negative impact on breastfeeding initiation. Questions should include influences in pregnancy as feeding decisions are usually made then. Information on exclusive breastfeeding at this time might be able to show if there is an impact on the longer continuation of breastfeeding. This data could provide the evidence to make a difference to the breastfeeding rate.

The data collected for the suggested times and definitions would determine the prevalence and duration of breastfeeding.

5.3. Karen Guilliland, Aileen Patten, Caroline Nye - NZ College of Midwives and Bronwen Pelvin - NZ breastfeeding Authority

The purpose of this new organisation is to establish the Baby Friendly Initiative (BFI) in NZ maternity institutions and with maternity service providers. Currently the operating structure is being established. Regional groups, such as CEBA, will drive the national strategy for establishing and auditing BFI.

Julie Stufkens - Canterbury Enhanced Breastfeeding Alliance (CEBA)

Data Collection by NZ college of Midwives

The interest in collecting data is in:

- how many babies are exclusively breastfed.
- What percentages of babies are not being fed exclusively
- Why are babies not being fed exclusively
- How long are women breastfeeding babies

The definitions are the same as those used by Plunket (appended). The period of collection used to be to when the infant is age 2 weeks but with alterations to the legislation (section 51) this can now increase to age 4 or 6 weeks, when infant care shifts to child health.

An attached baby summary sheet shows what breastfeeding data is collected at 2 weeks and at discharge (appended).

Definitions

Preferred

1. Exclusive breastfeeding with prescribed medicine. This covers vitamin K and removes the need for vitamins and minerals to be in the definition.
2. fully includes water. Picks up people who are predominantly breastfeeding. This enables later studies on the reason why people are giving the infant water. The age the water is being given is relevant to the impact on breastfeeding behaviour.
3. partial breastfeeding can give good information on the other type of feeding as long as 'other' simple information is collected. eg infant formula, cows milk, solids. 'Partial' is preferred wording to 'mixed feeding' as this suggests approval of an alternative method of feeding. Therefore a 'partial breastfeeding' definition needs a series of three boxes which can be ticked to show whether infant formula, cows milk or 'solids' are being offered in addition to breastmilk..
4. not breastfed preferred wording to 'artificially fed' because breastfeeding is the culture that should prevail. This wording communicates that breastfeeding is the preferred option. This information is important at 4 to 6 weeks because it can indicate an earlier decision (possibly in pregnancy) not to breastfeed.

Others

Nationally the percentage of feeds as breastmilk, (low 20%- high 80%) are not seen to be important. They are a more relevant tool for health workers monitoring an individual's practice.

Many women who are exclusively breastfeeding introduce solids in addition to breastmilk as a normal progression of the infant's development. At six months they would be in this 'partial' category. To know that the statistics are not indicating a reduction in breastfeeding status but are reflecting an infant's development, a separate question is needed 'when were solids first introduced?'

Ages for data collection

- 4 weeks. Data is routinely collected at this age as most infants go from maternity to child health care. For some infants this might be delayed to 6 weeks. This age would be useful for midwives as it will show how their practice impacts on initiation of exclusive breastfeeding.
- 3 months. This coincides with the well child provider check. Women are often returning to work. Infants are often no longer being exclusively breastfed from then on.
- 5 months. Routine vaccinations therefore breastfeeding could be monitored at the same time.
- 6 months. Infants should be exclusively breastfed to this age.
- 15 months. Another vaccination time when breastfeeding data could be collected. It is important to signal through data collection that it is appropriate and desirable to still be breastfeeding to two years.

Collection period

Exclusive breastfeeding is retrospective.

All other data is at point of contact. At that time the question will be the mother's assessment of the main method of feeding in the last while. Twenty four or 48 hours is not seen to be representative of feeding behaviour. The understanding of point of contact is that at that point the mother will be asked 'How would you describe your level of breastfeeding since you were last asked to assess it – choose which definition best describes how you feed your baby'. How did you feed in the last 24 hours is perceived to be theoretical and inaccurate because it might not reflect the normal practice of feeding the infant.

Who should collect the data

The collection times have been suggested for the greatest infant contact with the health system. Therefore a health worker will most likely be asking the questions. It will not necessarily be the person who most often gives infant feeding advice.

Other breastfeeding indicators

Initiation of breastfeeding is important because successful initiation reflects ongoing breastfeeding behaviour. Breastfeeding at 4 weeks would be this indicator.

'Predominant' breastfeeding is not favoured as a term.

'Any' as an indicator is rejected. 'Partial' would include 'any' breastfeeding.

The Ministry of Health policy recommends breastfeeding for the first 12 months therefore it would be desirable to ask this at the 9 or 15 month child health check

- Discharge to give hospital initiation rates.
- 28 days. On transfer from the maternity service to the Wellchild service.
- 6 weeks at mother's postnatal check. Babies often feed more frequently at this stage and therefore come to LLL attention at this time.
- 3 months (12 weeks). Babies feed more, parents return to work, 12 week parental leave bill before Parliament.
- 4 months could be excluded but it would be interesting to know if solids are introduced at this stage.
- 6 months. Needs to be asked no later than 6 months as many infants will move from being fully to partially breastfed at this stage. Detailed questions relating to solids are for the individual, they are not within the scope of monitoring national targets.
- 1 year. Need to know how many breastfeed at 12 months as this is the desirable stated policy.
- 2 years. International recommendations from the W.H.O. and LLL advocate breastfeeding for the first two years. 'Any' breastfeeding is the likely definition at this stage.

Collection Period

Exclusive breastfeeding is collected retrospectively.

Other breastfeeding indicators are collected over the past 24 hours to reflect what the mother assesses to be the picture of breastfeeding now.

Mothers assess or define how they are feeding their infants. If a mother overcomes feeding difficulties in the past, it is important that she can state she is fully breastfeeding now, irrespective of any feeding behaviour of the past. Otherwise women can not be supported or helped to successfully breastfeed. Definitions at all retrospective can be manipulated by health professionals to reflect favourably on their own practice.

Other breastfeeding indicators

Other indicators or behaviours can be sought after data is collected using clear definitions.

LLL do not have the resources to collect breastfeeding statistics themselves. They are usually seen as the ambulance at the bottom of the cliff and would like to deal with fewer emergencies. They would prefer to channel energy into giving women information and support and helping professionals to improve their practice. Clear definitions should help paint a clearer picture and then the problems can be addressed.

5.5 Riripeti Haretuku - Maori Pacific Unit, University of Auckland

Data collection

Clear indicators are needed for monitoring successful breastfeeding on a national basis. Then the mechanism for being proactive in identifying problems and barriers to breastfeeding will emerge. When clear definitions have been stated and data collected, Maori will use that information.

The Maori Midwives Collective use the same definitions as the NZ College of Midwives for collecting quantitative breastfeeding data.

Definitions

Preferred

1. exclusive breast milk and prescribed medicine
2. predominant breast milk, prescribed medicine and water.
Synonymous with 'fully' but predominant (as used by W.H.O.) is the preferred word usage.
3. partial breast milk, water, infant formula, solids.
If partially breastfed then need to ask 'How many bottles of formula given'
And 'how many times was baby fed on the breast in the past 24 hours'
If partial then the type of feed needs to be identified; infant formula, solids, other.
4. 'occasional' the breast offered as a comfort. It will reflect the infant older than 6 months who at one year is still being offered the breast.

Ages for data collection

- 4 weeks. It often takes this long for breastfeeding to be fully established and it is reasonable for exclusive breastfeeding to be indicated at this time.
- 3 months. There is a 2 month gap between data collection. The infant will have developed, problems will have emerged, mothers might have reasons why they don't wish to continue breastfeeding, mothers return to work and at three months there is a reduction in breastfeeding.
- 6 months. Infant is being weaned.

Collection period

All breastfeeding data should be collected at point of contact for 24 or 48 hours to establish a standard.

Qualitative data is necessary for the first 4 weeks to determine the indicators for successful breastfeeding. Successful breastfeeding is what should be measured.

Other breastfeeding indicators

- Would like additional infant feeding data on type of formula and solids.

- Would like to know the frequency of usage of pacifiers and artificial nipples as an infant care practice.
- Expression of breast milk. The incidence of bottle or cup feeding EBM and if this affects successful breastfeeding.

5.6 Nimisha Waller, Marcia Roberts - National Women's Hospital Auckland

Data collection at National Women's hospital

The definitions used are different from those used by Plunket in that full breast feeding encompasses exclusive and almost exclusive with medicines being given from time to time (Appended). The data is collected retrospectively from charts so it does not reflect the mother's assessment and is not a 24 hour cross section collection. Actual statistics and comparisons with other northern hospitals are appended.

Definitions

Preferred

1. exclusive breast milk and prescribed medicines.
This includes EBM because it provides the same nutrients as breastfeeding.
2. partial breast milk and formula
Need to ask 'How many bottles' to differentiate for improving practice.
National Women's differentiates high, medium and low breastfeeding according to the number of bottles given.

Other

'Fully' meaning breast milk with water is not in use as water is not given in National women's.

Ages for data collection

- Discharge. Taken from when mothers go home, not when infants in special care units go home. These infants need to be included in breastfeeding statistics.
- 6 weeks. The regular postnatal well child check. Breastfeeding should be fully established at this stage. Earlier, 2 – 4 weeks, breastfeeding is not established and too many confounding problems appear.
- 3 months. Frequently solids are being introduced from 3 months or 16 weeks although the recommendation is 4 – 6 months. If an infant is exclusively breastfed now, it will not necessarily be so at 6 months.
- 6 months. Need to establish what is being given in addition to breast milk. Could ask 'is the next largest food item infant formula or solids?' This will show if infant is:
 - a.) fully breastfed
 - b.) breastfed with solids added
 - c.) partially breastfed with additional infant formula and solids.

- 12 months. Needed because of the nutritional value of breast milk and that it is advocated for the first 12 months.
- 2 years. By asking about breastfeeding at this stage health professionals are acknowledging to the community that it is acceptable to keep breastfeeding to this age.

Collection period

In hospital data can be retrospective because it is taken from charts.

Nimisha and Marcia would favour collecting breastfeeding data as the practice of the past week rather than the last 24 – 48 hours. If fully breastfeeding for 48 hours this infant might have had infant formula earlier which would mean it was partially breastfed. They suggest a trial is conducted on the definitions for breastfeeding taken in the past 24 hours and the practice in the past week, to see if the data is consistent.

Other breastfeeding indicators

Breastfeeding initially, that is straight after delivery, could be helpful for the practice of successful breastfeeding. This could be recorded as ‘indicate the time the baby had the first breastfeed 2 4 6 8 hours.’

Targets that are set must be realistic, and should not be used for accountability in employment policies.

5.7 Siniva Cruickshank - Health Star Pacific

Data collected by Health Star Pacific

Breastfeeding data is collected according to the Plunket definitions and used for measuring outcomes and improving breastfeeding practice. See attached pamphlet on the services offered.

Definitions

Preferred

1. exclusive breast milk and prescribed medicines.

Historically fully breastfeeding was without water. Pacific Island women are getting used to this now being called exclusive breastfeeding, and the desirable ideal for an infant. It would be confusing to change terminology again.

2. fully breast milk, prescribed medicines and water.

If water is being offered the reason for it being given is sought. The breastfeeding categories are a useful education tool. The mother can see an improvement in her practice by the data being re-recorded at the next scheduled visit and by moving up to the exclusive category.

- 3 Partial

This is useful for a personal rather than national guide to breastfeeding.

Ages for data collection

- 5 days. Problems that emerge have to be dealt with at this stage. It is in the first week and into the second week that many Pacific Island women will resort to formula if they are not seen. There is still a belief, for some, that giving colostrum leads to jaundice. The reasons for giving colostrum need to be given to a mother at this time. Also if the mothers have big babies they often think that their milk supply is not enough before it comes in and is established. Milk production needs to be explained to the mother.
- 8 weeks. Following the postnatal Wellchild check to maintain continuity in monitoring breastfeeding practice.
- 3 months. Any data collection after this, for instance at 4 months, would include mention of solids. It is desirable that breastfeeding data alone is collected now. Early mention of solids would possibly contribute to the pattern of early introduction of solids.
- 6 months. Information relating to solids is always presented in the context of what's best for the health and growth of the child.

- 1 year. It is important for Pacific Island women to know that cows milk should not be introduced before 12 months.

Collection period

All data should be collected at point of contact for the past 24 or 48 hours. This is useful to the women from whom the data is being collected as they have the ability to alter the breastfeeding behaviour. It not only monitors breastfeeding nationally but also encourages better practice.

Who should collect the data

Ideally a health worker so there is the added benefit of advice or support to the mother and infant. If an independent person asked questions then the reason for seeking the information would need to be given. There must be a transparent process with no hidden agenda. If the data collector was not a health worker and this was explained then the person being interviewed would not expect help with breastfeeding .

Other breastfeeding indicators

Expressed breastmilk given by bottle is still recorded as breastfed. It includes premature babies, allows other parents to feed the baby and allows for the need at the time.

Ever fed information not needed.

5.8 General Practice Department, Wellington School of Medicine

Researchers from the General Practice Department of the Wellington School of Medicine favour the terms 'full' and 'partial' breastfeeding as used by Labbok and Krasovec. The use of 'exclusive' in their experience has been too limiting a definition which unnecessarily excludes a lot of people who are almost exclusively breastfeeding (Pullon, personal communication 1998). Partial breastfeeding does not define 'combination feeding' where the breast component is about half or more of the infant's nutritional need. Possibly the terms 'high', medium and low could qualify this.

Quantifying the level of breastfeeding below which an infant derives much less health benefit is considering the nutritional benefit only of breastfeeding. It does not take into account the psychological benefits to the mother of even a little breastfeeding.

When using the 'full breastfeeding' definition, data is collected for the time the question is being asked, that is within a few days for the timing of the question. Pullon believes this is an important requirement, particularly as the baby gets older.

5.9 Massey University Infant Feeding Group

The Massey University Infant Feeding Group (MUIF) recently conducted a qualitative / quantitative survey for infants up to six months of age for which they used the Labbok and Krasovec definitions as a basis for their research (Beasley, personal communication 1998).

- *Full breastfeeding* – the occasional (+/- once a week) use of water or some other substance such as formula in addition to medications (included the use if expressed breast milk offered in a bottle).

- *Partial breastfeeding* – breastfeeding supplemented (more regularly or extensively than stated above) by other fluids and / or solid food.

The MUIF wanted to establish the number of feeding episodes per day and found great difficulty in maternal perception of what constitutes a ‘breastfeed’. This posed a greater problem than the breastfeeding definitions themselves.

The study was prospective and therefore did not have the difficulties of maternal recall which arise with retrospective studies. The data was collected as both point and period prevalence. The researchers asked the question ‘have you ever given your baby anything other than breast milk’ at 2 weeks, 3 months and 6 months (for those still breastfeeding), but also had a 24 hour recall grid where point prevalence was recorded.

Beasley, a qualitative researcher, favours the indicator of ‘full’ breastfeeding over ‘exclusive’ primarily because, in her experience, not many infants come within the exclusive category after the first few weeks. Where women frequently comment on the pressure to breastfeed she is concerned that they will opt for an exclusive category when full is the more accurate definition. Such a discrepancy has the potential to undermine the value of breastfeeding research.

Differentiating solid food from formula as a supplement for breastfed infants would be helpful for researchers in identifying infant feeding patterns. The WHO complementary feeding definition supports this (WHO 1996).

While Beasley endorses the need for precise, standardised breastfeeding definitions for quantitative research, she emphasises that breastfeeding definitions will vary according to the orientation of the research.

5.10 North Health Area

Lennan asked 33 informants for their definition of breastfeeding in her project to determine the current state of breastfeeding in the North Health Area. In a technical way all accepted the definition of breastfeeding as ‘exclusive’ that is the baby receives no other nutrition but breastmilk; no water, juice or formula. The Plunket definitions were seen as being useful for statistical purposes (Lennan 1997). Some informants qualified the difference between breastfeeding and the giving of breast milk, which is further recognition of the importance of breastfeeding for reasons other than nutrition. The WHO data bank definitions include breast milk given by bottle under their definition of bottle feeding.

Discussion

Midwives, lactation consultants, Plunket and other health workers in New Zealand are interested in the rates for exclusive breastfeeding. The accepted policy on infant feeding is that infants should be fed exclusively for the first four to six months of life. This is a requirement of reporting on infant feeding practices by country to the World Health Organization. There is general agreement that the term exclusive breastfeeding is reserved for infants only fed breast milk from birth. This is not always the case in practice, or in studies undertaken to determine the health benefits from exclusive breastfeeding.

Where health workers are involved in collecting data and giving infant feeding advice there is a conflict. The health worker is able to measure good practice by the movement of women between categories of breastfeeding, striving for the best practice which is exclusive breastfeeding. Some health workers will report that a mother is exclusively breastfeeding because she has been giving the infant breast milk only in the past while. In this practice successful breastfeeding is the aim and this is being interpreted as exclusive breastfeeding. The mother is also aware of the achievement and approval that come from successful breastfeeding. For this reason many researchers in New Zealand favour fully breastfeeding which is understood to be a measure of breastfeeding over a recent short period eg 48 hours. The clear advantages are that a mother can move into this category, the data relies less on the mother's recall, and it gives a clearer measure of successful breastfeeding. Full is a more universal and practical measure of breastfeeding than exclusive. The very definition of exclusive implies that breastmilk is the only food the infant has received from birth to the period at interview. An infant can not move from a category of anything less than exclusive to exclusive.

Some infants may be offered expressed breastmilk from a bottle for a period. This separates the food from the art of successful breastfeeding and some health workers would then say that the infant is not being exclusively breastfed. However the infant is still enjoying the immunological and nutritional advantages of breast milk over infant formula, although the delivery is usually from a bottle. In industrialised countries bottle feeding is a safe form of delivery, and evidence of nipple confusion is unclear. Therefore exclusive breastfeeding should include expressed breast milk. The WHO and the Labbok Krasovec definition for exclusive breastfeeding did not include expressed breast milk. The WHO has a separate category called bottle feeding which would include expressed breastmilk.

Vitamins and minerals or herbal teas are not routinely given nor desirable for infants in New Zealand. Including them in a definition can be seen as giving permission to have them. Where vitamin K is still administered to newborns in oral form it will be as a prescribed medicine.

Water or glucose solutions are not necessary for any healthy breastfed infants, even in hot climates. It is also not necessary in most instances of hyperbilirubinaemia, although this has been a common practice. Offering water at early stages of establishing breastfeeding can delay the onset of full lactation. This practice is connected also to a shorter duration of breastfeeding. Small amounts of water can occasionally be offered to an infant when breastfeeding is established, without diminishing the milk supply and therefore the energy intake of the infant. The definition of fully breastfed should include allowance of a small amount of water only.

Partial breastfeeding is a useful tool for health workers for monitoring best practice and the movement of infants from partially breastfed to fully breastfed categories. It is also a goal for mothers to achieve. It is less useful as a research definition because even with adjusting for possible confounding factors it is difficult to attribute the changes that might be evident in health to the presence of breast milk. The amount of breast milk is difficult to quantify as it is usually expressed by the remainder of sustenance an infant would have in relation to a specified amount of infant formula given in 24 hours.

The terms 'token' breastfeeding implies a small amount of breast milk only. Some health workers feel it is a useful term to keep separate from partial breastfeeding. Partial implies the infant will be given infant formula as it is a term that often describes infant feeding within the first six months of life. 'Token' might describe breastfeeding behaviour and it takes into account the non nutritive aspect of breastfeeding. It may fit a description of breastfeeding for an infant who is 12 months of age.

As the purpose of the targets is to monitor breastfeeding some health workers felt that the terms formula fed or artificially fed would not reflect this purpose and the category should be defined as 'not breastfed'. However if the context is the wider one of identifying infant feeding practices then artificially fed includes all infants not breastfed but fed an infant formula or something else. Additional information needs to be obtained to describe the type and the frequency of formula as well as the infant's age at its introduction. If understanding infant feeding practices is the purpose of obtaining breastfeeding information, then the incorporation of solid food in definitions of breastfeeding will need to be further expanded. The age of the infant when solid food is introduced will need to be established. An infant will still only be partially breastfed if it is receiving solids as part of its nutrition in addition to breast milk only. But solids as opposed to infant formula need to be identified.

Breastfeeding data should be collected at a mother's discharge from a maternity unit, and reflect when breastfeeding is initiated. Referral of an infant passes from a maternity to child care giver at two or six weeks. Maternity care providers are contractually obliged to provide services after birth to the mother and baby for a minimum of 28 days under Section 51 of the Health and Disabilities Services Act. The maternity care provider remains responsible for the care of the baby and mother until discharge from the maternity service. Because breastfeeding is often stopped at three months and solids are inappropriately introduced early at three months, data should be collected then. New Zealand policy recommends that all infants should be exclusively breastfed for four to six months of age and breastfeeding should continue for the first 12 months of life. The WHO, in the Innocenti Declaration, extended this

to up to two years of age or beyond recognising that breastfeeding's protective effects continue as long as a child is breastfed. Many health workers favoured data on breastfeeding being collected at two years of age to signal this desirable practice to women and society in general.

A large enough sample of infants is needed to extrapolate to give a population trend of breastfeeding. Many health workers feel that the information will only be useful if it can be used by individuals as a baseline for undertaking additional studies to identify causes for an alteration to the breastfeeding trend. To do this the data needs to be regionally identifiable. To monitor successful breastfeeding, the ultimate goal, qualitative information will need to be gathered. This is beyond the scope of a national monitoring programme but with alterations in policy over time, factors that affect women's ability to breastfeed successfully will be reflected in the national targets. For health workers and policy makers to make a positive difference data must be collected so that regional and demographic differences can be identified.

The following recommendations have been made considering both the adapted Labbok and Krasovec definitions currently in use in New Zealand, and the WHO Global Databank definitions for nation reporting requirements. If the time for collection is incorporated into the actual definition it removes any ambiguity to health workers, interviewers or if information is elicited by self administered questionnaire. Only the recommended exclusive definition of breastfeeding relies on recall. Alternatively the definition for exclusive breastfeeding could pertain to the specific point at time and be accompanied by an additional question to elucidate if any other food has been given to the infant. The WHO, in key breastfeeding indicators derived from households, recommends that the exclusive breastfeeding rate is calculated from infants who were exclusively breastfed in the last 24 hours.

Information to match the terms specified by other countries of 'ever' breastfed, 'predominant' breastfeeding, 'initially' breastfed and duration and prevalence of breastfeeding should be able to be extrapolated from data collected using the following indicators at these stated times.

Recommendation for breastfeeding indicators

Definitions

Exclusive breastfeeding: the infant has never, to the mother's knowledge, had any water, formula or other liquid or solid food. Only breast milk, from the breast or expressed, and prescribed* medicines have been given from birth.

* Prescribed as per the Medicines Act 1981.

Fully breastfeeding: the infant has taken breast milk only, no other liquids or solids except a minimal amount of water or prescribed medicines, in the past 48 hours.

Partial breastfeeding: the infant has taken some breast milk and some infant formula or other solid food in the past 48 hours.

Artificial feeding: the infant has had no breast milk but has had alternative liquid such as infant formula with or without solid food in the past 48 hours.

Recommended data collection times:

Initiation

48 hours following the birth #
2 weeks

Established breastfeeding

6 weeks
3 months #
6 months #

Continued breastfeeding

12 months #
2 years

The priority collection points.

Because international opinion suggests that breastfeeding indicators should not be used in isolation but linked to desirable behaviours and qualitative data, the following recommended questions have been included to elicit other feeding information (WHO 1996; Labbok and Krasovec 1990; Launer et al 1992).

The questions should be asked of the mother or care giver whenever breastfeeding data are being collected.

Questions

Formula feeding: When did you start to give your baby milk from a bottle?

Solid foods: Does your baby eat something in addition to milk? If yes, specify which food and at what age it was first given.

Breastfeeding: How old was your baby when you stopped breastfeeding?

Have you ever given your baby anything other than breastmilk?

The sample questionnaires used in the UK 1995 *Survey of Infant Feeding* are included in the appendix of the report by Foster (Foster et al 1997).

Desirable practice which enhances breastfeeding

The New Zealand Breastfeeding Authority launched earlier in 1998 is actively encouraging maternity institutions and maternity care providers to adopt a Baby Friendly Initiative as recommended by the WHO in the Ten Steps to Successful Breastfeeding. This is included in other Ministry of Health policy documents (*Infant Feeding: Guidelines for New Zealand Health Workers* 1997).

The American Academy of Pediatrics recommend desirable breastfeeding practices in a 1997 statement. These eight points are attached to be considered as policy for promoting excellent breastfeeding behaviour.

References

- ABS. 1996. *Breastfeeding in Australia*. Occasional Paper: Demographic, Socioeconomic and Health Correlates of Breastfeeding in Australia – Evidence from the 1989-90 National Health Survey. Canberra: Australian Bureau of Statistics
- Akre J. 1989. Infant Feeding The Physiological Basis. *Bull WHO* 67 suppl 1: 1-108
- (AAP) American Academy of Pediatrics. 1997. Breastfeeding and the use of human milk. *Pediatrics* 100(6): 1035-9
- Armstrong HC. 1991. International recommendations for consistent breastfeeding definitions. (Guest editorial). *J Human Lactation* 7(2): 51-4
- Ashraf RN, Jalil F, Aperia A et al. 1993. Additional water is not needed for healthy breastfed babies in a hot climate. *Acata Paediatr* 82: 1007-11
- Auerbach KG, Renfrew MJ, Minchin MA. 1991. Infant feeding comparisons: A hazard to infant health? *J Human Lactation* 7: 63-71
- Chen Y, Yu S, Li W. 1988. Artificial feeding and hospitalisation in the first 18 months of life. *Paediatrics* 81: 58-62
- Coffin CJ, Labbok MH, Belsey M. 1997. Breastfeeding definitions (editorial). *Contraception* 55: 323-5
- Cohen RJ, Brown KH, Canahuati J et al 1995. Determinants of growth from birth to 12 months among breastfed Honduran infants in relation to age of introduction of complementary foods. *Pediatrics* 96(3): 504-10
- De Carvalho M, Robertson S, Klaus M. 1985. Fecal bilirubin excretion and serum bilirubin concentrations in breastfed and bottle fed infants. *The Journal of Pediatrics* 107: 786-90
- Dewey KG, Heinig HJ, Nommsen LA et al. 1993. Breastfed infants are leaner than formula fed infants at one year of age: the Darling Study. *Am J Clin Nutr* 57: 140-5
- Dewey KG, Heinig HJ, Nommsen LA et al. 1995. Difference in morbidity between breastfed and formula fed infants. *The Journal of Pediatrics* 126: 696-702
- Duncan B, Ey J, Holberg CJ et al. 1993. Exclusive breastfeeding for at least 4 months protects against otitis media. *Pediatrics*. 91: 867-72
- Fawzi WW, Forman MR, Levy AL et al. 1997. Maternal anthropometry and infant feeding practices in Israel in relation to growth in infancy: the North African Infant Feeding Study. *Am J Clin Nutr* 65: 1731-7
- Ford K, Labbok M. 1993. Breastfeeding and child health in the United States. *J Biosoc Sci* 25: 187-194

Ford R, Schluter P, Wild C 1996. Breastfeeding in Canterbury over three decades. *NZ Med J* 109: 343-5

Ford R, Schluter P, Wild C. 1998. *Review of Survey Methods for Infant Care Practices*. Community Paediatric Unit. Christchurch

Ford R, Wild C, Mitchell E et al. 1995. Infant feeding patterns in Canterbury. *NZ Med J* 108: 59-61

Foster K, Lader D, Cheeseborough S. 1997. *Infant Feeding 1995*. London: Office for National Statistics

France MM. 1996. A study of the lactational amenorrhoea method of family planning in New Zealand women. *NZ Med J* 109: 189-91

Golding J, Rogers IS, Emmett PM 1997 Methodology and summary of results. *Early Human Development* 49 Suppl: S1-S6

Guthrie R, Auerbach K. 1993. Jaundice and the breastfeeding baby. In Riordan J, Auerbach K (eds). *Breastfeeding and Human Lactation*. London: Jones and Bartlett Publishers

HMSO. 1994. *Weaning and the Weaning Diet: Report of the working group on the weaning diet of the committee on medical aspects of food policy*. Report on Health and social Subjects 45. London: Department of Health

Heinig MJ, Nommsen LA, Peerson JM et al. 1993. Intake and growth of breastfed and formula fed infants in relation to the timing of introduction of complementary foods: the DARLING study. *Acta Paediatr* 82: 999-1006

Hewat JH. 1993. Research and Breastfeeding. In Riordan J, Auerbach K (eds). *Breastfeeding and Human Lactation*. London: Jones and Bartlett Publishers

Horwood LJ, Fergusson DM 1998. Breastfeeding and later cognitive and academic outcomes. *Pediatrics* 101(1): 9

Howie PW, Forsyth JS, Ogston SA et al. 1990 Protective effect of breastfeeding against infection. *Brit Med J* 300: 11-6

Kovar MG, Serdula MK, Marks JS et al. 1984. Review of the epidemiologic evidence for an association between infant feeding and infant health. *Pediatrics* 74(4): Suppl. 615-638

Kramer MS. 1988. Infant feeding, infection, and public health. *Pediatrics* 81: 164-6

Labbok M, Krasovec K. 1990. Toward consistency in breastfeeding definitions. *Studies in Family Planning* 21(4): 226-30

Lawrence RA. 1994. *Breastfeeding: A guide for the medical profession*. Fourth edition. Missouri. Mosby

- Lennan M. 1997. *Breastfeeding scoping project prepared for North Health*. Auckland: Health Funding Authority.
- Leventhal JM et al. 1986. Does breastfeeding protect against infection in infants less than 3 months of age? *Pediatrics* 78: 896-903
- Lopez-Alarcon M, Villalpando S, Fajardo A. 1997. Breastfeeding lowers the frequency and duration of acute respiratory infection and diarrhoea in infants under six months of age. *J Nutr* 127: 436-443
- Lucas A, Cole TJ. 1990. Breast milk and neonatal necrotizing enterocolitis. *Lancet* 336: 1519-23.
- Lucas A, Morley R, Lister G et al. 1992. Breast milk and subsequent intelligence quotient in children born preterm. *Lancet* 339: 261-4
- Lund-Adams M, Heywood P. 1994. Australian breastfeeding rates: the challenge of monitoring. *Aust J Public Health* 18(3): 337-9
- Magnani RJ, Mock NB, Bertrand WE et al. 1993. Breastfeeding, with water and sanitation, and childhood malnutrition in the Philippines. *J. Biosoc Sci* 25: 195-211
- Marini A, Agosti M, Motta G et al. 1996. Effects of a dietary and environmental prevention programme on the incidence of allergic symptoms in high atopic risk infants: three years' follow up. *Acta Paediatrica* 85: Suppl. 414
- Martin-Calama J, Bunuel J, Valero MT et al. 1997. The effect of feeding glucose water to breastfeeding newborns on weight, body temperature, blood glucose and breastfeeding duration. *J Human Lactation* 13: 209-13
- Martines JC, Rea M, De Zoysa I. 1992. Breastfeeding in the first six months. *Brit Med J*. 304: 1068-9
- Meier P. 1997. Letter to editor. *Journal of Nurse Midwifery* 42(1): 65
- Michaelsen KF, Larsen PS, Thomsen BL et al. 1994. The Copenhagen cohort study on infant nutrition and growth: duration of breastfeeding and influencing factors. *Acta Paediatr* 83: 565-71
- Morgan J. 1998. Weaning: when and what. *BNF Nutrition Bulletin* 23. Suppl 1: 35-45
- Morley R. 1998. Food for the infant's brain. *BNF Nutrition Bulletin* 23. Suppl 1: 65-76
- Morrow M, Barraclough S. 1994. Breastfeeding and public policy in Australia: Limitations of a nutritional focus. *Breastfeeding Review* 11(9): 408-16
- Neifert MR. 1983. Routine management of breastfeeding. In Neville M, Neifert M (eds). *Lactation: Physiology, nutrition, and breastfeeding*. New York: Plenum Press

- New Zealand Paediatric Society. 1992. Statement on Breastfeeding. *NZ Med J* 11 November:461
- Nicoll A, Ginsburg R, Tripp J. 1982. Supplementray feeding and jaundice in newborns. *Acta Paediatr Scand* 71: 759-61
- Pettitt DJ, Forman MR, Hanson RL et al. 1997. Breastfeeding and incidence of non-insulin dependent diabetes mellitus in Pima Indians. *Lancet* 350: 166-8
- Piper S, Parks PL 1996. Predicting the duration of lactation: Evidence from a national survey. *Birth* 23: 1
- Pizarro F, Yip R, Dallman P, et al. 1991. Iron status with different infant feeding regimens: relevance to screening and prevention of iron deficiency. *J Pediatr* 118: 687-92.
- Pollock JI. 1994. Long term associations with infant feeding in a clinically advantaged population of babies. *Developmental Medicine and Child Neurology* 36: 429-40
- Post RD, Singer R. 1983. Psychological implications of breastfeeding for the mother. In Neville M, Neifert M (eds). *Lactation: Physiology, nutrition, and breastfeeding*. New York: Plenum Press
- Public Health Commission. 1995. *Guidelines for Healthy Infants and Toddlers: A background paper*. Wellington: Public Health Commission.
- Report of the Task Force on the Assessment of the Scientific Evidence Relating to Infant Feeding Practices and Infant Health. 1984. *Pediatrics* 74(4) 604-614; 658-61; 674-91.
- Rider E, Samuels R, Wilson K et al. 1996. Physical growth, infant nutrition, breastfeeding, and general nutrition. *Current opinion in Pediatrics* 8: 293-7
- Rubin DH, Leventhal JM, Krsilnikoff PA et al. 1990. Relationship between infant feeding and infectious illness: a prospective study of infants during the first year of life. *Pediatrics* 85: 464-71
- Saarinen UM, Kajosaari M. 1995. Breastfeeding as prophylaxis against atopic disease: prospective follow-up study until 17 years old. *Lancet* 346: 1065-9
- Salariya EM. 1993. Breast versus bottle feeding. *Nutrition and Health* 9: 33-6
- Salariya EM, Easton PM, Cater JI. 1978. Duration of breastfeeding after early initiation and frequent feeding. *Lancet* 2: 1141-3
- Sachdev HP, Krishna J, Puri RK et al. 1991. Water supplementation in exclusively breastfed infants during summer in the tropics. *Lancet* 337: 929-33

Silfverdal SA, Bodin L, Hugosson S et al. 1997. Protective effect of breastfeeding on invasive *Haemophilus influenzae* infection: A case control study in Swedish preschool children. *Int J Epidemiol* 26(2): 443-50

VanDerslice J, Popkin B, Briscoe J. 1994. Drinking water quality, sanitation, and breastfeeding: their interactive effects on infant health. *Bull WHO* 72(4): 589-601

Wells J. 1998. Infant and follow-on formulas: the next decade. *BNF Nutrition Bulletin* 23. Suppl 1: 23-34

Williams A. 1998. Infant nutrition in Britain: where are we, and where should we be going. *BNF Nutrition Bulletin* 23. Suppl 1: 5-11

Wilson AC, Forsyth JS, Greene SA et al. 1998. Relation of infant diet to childhood health: seven year follow up of cohort of children in Dundee infant feeding study. *Brit Med J* 316: 21-5

World Health Organization. 1994. (Draft) *Infant and Young Child Feeding: A Global Approach and Plan of Action*. WHO/NUT/94.2 Geneva: World Health Organization

World Health Organization. 1996. *WHO Global Databank on Breastfeeding. Breastfeeding: the best start in life*. WHO/NUT/96.1 Geneva: World Health Organization

WHO. 1992. *Facts about Infant Feeding*. Issue 1. Geneva: World Health Organization

WHO Working Group on Infant Growth. 1995. An evaluation of infant growth: the use and interpretation of anthropometry in infants. *Bulletin of the World Health Organization* 73(2): 165-74

Wright A, Sydney R, Wells S. 1996. Changing hospital practices to increase the duration of breastfeeding. *Pediatrics* 97(5):669-75

Appendix 1

Questions

As you have been or are currently involved in breastfeeding research in New Zealand I would be grateful if you would answer the following questions.

1. What definitions do you find most useful for collecting data on breastfeeding?

What is the rationale for this choice?

2. As any breastfeeding is deemed to be better than none, have you ever quantified the level of breastfeeding and formula feeding combined below which the infant derives much less health benefit?

What evidence is this based on?

3. If you collect data for exclusive (without water) or full (with water) breastfeeding at different ages do you specify whether the data is point prevalent or period prevalent?
(ie. Whether the data is collected in the past 24 –48 hours or from birth)

Does this requirement vary at different ages of collection?

What evidence is this based on?

Respondents

Annette Beasley, Department of Social Anthropology, Massey University.

Denise Dignam, Department of Nursing and Midwifery, Albany Campus

Winsome Parnell, Department of Human Nutrition, Otago University.

Julia Peters, Health Funding Authority.

Sue Pullon, Department of General Practice, Wellington School of Medicine

Alison Vogel, Department of Paediatrics, School of Medicine, Auckland University.

Appendix 2

Questionnaire for Key individuals in the breastfeeding sector June 30

Purpose

To establish the most appropriate definition for monitoring the national breastfeeding health outcome target. New baseline data from a periodic survey for the monitoring of infant care practices should be available in the year 2000 when the existing target will be reviewed. Clear and consistent indicators need to be established as part of this new survey.

The present indicator for the national breastfeeding health outcome target is the proportion of infants being fully breastfed at three months, and fully or partially breastfed at six months, collected from a nationally representative sample of the population.

The policy is that every infant should be exclusively breastfed for the first four to six months of life.

Please answer the following from the viewpoint of collecting the data yourself or in being interested in having the data available to you.

What breastfeeding data do you collect or are interested in having collected.

What is your purpose in collecting these data

What breastfeeding definitions do you use

Why do you use these definitions

At what ages do you think the Ministry of Health should collect breastfeeding data

What are the reasons for selecting these periods

For the ages should the data be collected at a particular point (eg past 24 –48 hours) or for a period (eg for the past three months)

Would you like to see other infant feeding data eg. use of formula, age of introduction of solids.

Indicate if it is important to measure the:

Incidence: proportion of babies who were put to the breast initially

Prevalence: proportion of babies who were fully / exclusively or partially breastfed at specific ages

Duration: the length of time for which breastfeeding continued at all, regardless of when formula and other drinks or foods were introduced.

Change or expand any words in the above three measures to reflect what you believe is most desirable.

Select from the following the most relevant ages for collecting data on breastfeeding:

discharge

2 weeks

Appendix3 weeks

8 weeks

Appendix3 months

Appendix4 months

Definitions will be used as a basis for collecting data that probably needs to be more physiologically important than ‘academically’ accurate. With this in mind

What is your definition of *exclusive breastfeeding*

- 1. breast milk only , no other liquid or solid given**
- 2. breast milk, vitamins / minerals / medicine**
- 3. breast milk, vitamins / minerals / medicine and water**

Of the definitions available, which one(s) do you want the Ministry to collect data on. Specify the complete definition

- a. *exclusive breastfeeding***
- b. breast milk, vitamins, minerals, medicine, water, juice and ritualistic feeds given infrequently. *Full / predominant / almost exclusive***
- c. breast milk and any food or liquid including non-human milk *partial / complementary***
- d. minimal, occasional, irregular breastfeeds *token / any***

(Definitions have been selected from the WHO Global Data Bank on Breast feeding, Ministry of Health targets, Labbok M and Krasovec K, data currently in use in NZ)

If you have any alternative definitions that you consider to be important please state them with evidence to support them.

Appendix3

People interviewed from organisations in the breastfeeding sector July 1998

Dunedin

Angela Baldwin
National Nurse Advisor, Royal NZ Plunket Society

Winsome Parnell
Senior Nutrition lecturer (infant nutrition), Otago University

Christchurch

Karen Guilliland
National Director, NZ College of Midwives

Bronwen Pelvin
NZ college of Midwives and Secretariat for the New Zealand Breastfeeding Authority

Julie Stufkens
Canterbury Enhanced Breastfeeding Alliance (CEBA)

Caroline Nye
Independent Midwives, lactation consultant, CEBA, NZ College of Midwives

Aileen Patten
Tutoring midwife educator, NZ College of Midwives

Auckland

Anne Heritage
New Zealand Director, La Leche League

Barbara Fletcher
Auckland Northland Area Co-ordinator of professional liaison, La Leche League

Riripeti Haretuku
National Maori SIDS Co-ordinator, Maori Pacific Department, School of Medicine

Siniva Cruickshank
Breastfeeding advisor, Health Star Pacific, Glen Innes

Marcia Roberts
Past President NZ Lactation Consultants Association, lactation consultant National Women's Maternity and Community Services

Nimisha Waller
Clinical curriculum planner, National Women's Hospital. Auckland Regional Coordinator NZ College of Midwives

Addendum

A publication that reviewed the benefits of breastfeeding was not included in the literature review as it arrived at the Ministry of Health after the peer review process was completed. The summary page from this publication is attached.

The reference is:

xxxx 1997. Breastfeeding xxx *Nutrition and Health* 11:4 xxx-47. AB Academic Publishers: xxx.

