EVALUATION OF AN EXCLUSIVE BREASTFEEDING PROMOTION PROGRAMME IN AN INFORMAL SETTLEMENT IN DURBAN

By

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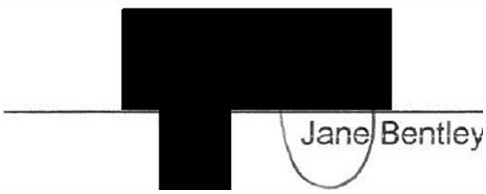
DECLARATION

This study represents the original work by the author and has not been submitted in any form to another University. Where use was made of work of others it has been duly acknowledged in the text.

The research described in this study was carried out in:

- The Department of Paediatrics and Child Health, School of Clinical Sciences; under the supervision of Professor Anna Coutsoudis.



I hereby certify that the above statement is correct.

_____
Prof. Anna Coutsoudis

As the candidate's supervisor I have approved this thesis for submission:

Signed:_____ Name:_____

Date: _____

Publications

- A paper has been submitted to the Bulletin of the World Health Organisation, entitled:

"Breastfeeding promotion and infant feeding practices
in South African women living in an area of high HIV prevalence"

Co-authors included:

A Coutsoudis

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As a result of experience gained in training community workers in breastfeeding counselling, two manuals have been developed and copyrighted:-

- Bentley J, Coutsoudis A. Training Manual: Breastfeeding Counselling for community health workers. University of Natal, 2002, ISBN 1-86840-465-X.

- Bentley J, Coutsoudis A. Resource Manual for use in Breastfeeding Counselling Sessions (Zulu Version). University of Natal, 2002, ISBN 1-86840-467-6.

- Bentley J, Coutsoudis A. Resource Manual for use in Breastfeeding Counselling Sessions (English Version). University of Natal, 2002, ISBN 1-86840-467-6.

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ABSTRACT

Aim: To assess the effect of peer counsellors, and a breastfeeding promotion campaign, in the promotion of exclusive breastfeeding in an informal settlement, and determine the effect of non-exclusive breastfeeding on the prevalence of diarrhoea

Methods: Mothers of infants younger than 6 months of age in an area of Durban, South Africa, were interviewed about their feeding practices before, and after the introduction of an exclusive breastfeeding promotion campaign. Similar assessments were made in a control area where there was no intervention.

Main Findings: The breastfeeding rate did not change significantly over time, but use of formula increased significantly in the control site ($P<0.05$). The view that formula is good for the baby increased in both sites ($P<0.05$), probably as a consequence of the introduction of a new policy for the distribution of free formula milk to HIV infected mothers. Exclusive breastfeeding increased in the intervention site ($P<0.05$), but did not change in the control site. Exclusive breastfeeding significantly reduced the reported episodes of diarrhoea in the 2 weeks prior to the questionnaire ($P<0.001$).

Conclusions: It is possible to increase exclusive breastfeeding rates, thereby improving child health, but information must be consistent, and the approach should be multi-faceted.

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INTRODUCTION

"Breastfeeding is not just about nutrition – it is a process, an act of culture, and a social experience" Mabila [quoted by Richter (1998)].

Humans, as mammals, are defined by their ability to feed their infants with milk produced by the mother, and yet it seems that many people have lost the art of breastfeeding, and resort to 'modern methods' to feed their children. These 'modern methods' have changed through the ages, and, while developing and improving, none are able to simulate the unique properties of breastmilk. Yet they have gained in popularity in every population group, throughout the world.

The aim of this study was to investigate how women feed their infants in a peri-urban informal settlement, the reasons why women choose to feed their infants as they do, and how this affects the health of their infants. Exclusive breastfeeding was promoted in one community, and the influence of this promotion campaign was evaluated through comparing feeding practices in the intervention site, with those in a similar site, where no active intervention took place.

1. BACKGROUND

1.1. History of Breastfeeding

The idea of natural breastfeeding is a myth because everywhere and at all times, breastfeeding has been culturally defined. Since breastfeeding, or lack thereof, is associated with cultural, and societal norms, practices have been different in different cultures, and have changed along with beliefs, and improved knowledge.

Most ancient cultures discarded colostrum, and instead fed the infant with various herbal teas in the interim period. Initiation of breastfeeding was associated with specific rituals, according to tribal beliefs. Methods of breastfeeding varied from sitting to standing over a supine baby, or carried on the mothers back, and swung around to the breast for feeding (Lawrence 1994 page 6).

Throughout Europe, infant feeding cups with spouts have been found in infant graves from about 2000 BC. In about 1800 BC, writings from Hammurabi's code described regulations for wet nursing. Contrary to other cultures, Spartans expected the mother to breastfeed her eldest son, even if she was the queen. Plutarch reported that a second son of King Themistes inherited the kingdom of Sparta because he was breastfed by his mother; the eldest son was breastfed by a wet nurse, and was therefore rejected as king. The father of medicine, Hippocrates is said to have written the following about breastfeeding: "one's own milk is beneficial, others' harmful" (Lawrence 1994 page 7).

Wet nursing was prevalent amongst the upper classes of European society from the middle ages to the 19th century. From the 11th century, many noble

and wealthy families employed wet nurses while poorer women breastfed their own children. This was associated with a strong taboo in sexual relations during breastfeeding 15-18th century. It was believed that intercourse would weaken the milk, and a new pregnancy could cause death to the nursing child through poisoning. The church recognised that men would stray if they were expected to remain celibate during the breastfeeding period, and therefore recommended wet nursing, rather than risking the man's immortal soul (Makhlouf Obermeyer & Castle 1997).

it was also believed that women of the upper class were fragile, and less able to sustain lactation. The lower classes were more robust and able to feed both their foster child, and their own. Reasons not to breastfeed included perceived adverse effects of breastfeeding on health, and looks, restraints of dress, fear of nipple damage, and lack of milk (Makhlouf Obermeyer & Castle 1997).

Wet nursing also contributed to the higher fertility in the aristocracy, where a wife's main function was to produce heirs. Women chose not to breastfed as this would "spoil their figures, and make them old before their time". Husbands were very influential regarding infant feeding practices (Lawrence 1994 page 7). In England, wet nursing peaked in 17th century, and the small number of women who chose to breastfeed their own children were seen as examples of self-sacrificing motherhood. A special bond was seen to exist with breastfed children – usually mentioned on a mother's tombstone – and the children often received a greater inheritance from their father (Makhlouf Obermeyer & Castle 1997).

The Dowager Countess of Lincoln was one woman who recognised the benefits of breastfeeding. She wrote on the "duty of nursing, due by mothers to their children" in 1662. She had had 18 children of her own, all of whom had been fed by a wet nurse. Only one child survived. When her son's wife had a child, and breastfed, she realised her error. She wrote: "...be not so unnatural as to thrust away your own children; be not so hardy as to venture a tender babe to a less tender breast; be not accessory to that disorder of causing a poorer woman to banish her own infant for the entertaining of a richer woman's child, as it were bidding her to unlove her own to love yours." (Lawrence 1994, page 8).

Towards the end of the 18th century, use of wet nurses decreased. This decrease was multifactorial. Factors that contributed to the down fall of wet nursing included anxiety over the transmission of syphilis through breastmilk, fear that the nurse might suffocate the child by lying on it, or may give it drugs, increased awareness of increased mortality in infants fed away from home, the opinion that free lying-in hospitals, and orphanages were encouraging illegitimacy, and condoning immorality, and the fact that women were making more decisions about how to feed their infants (Makhlouf Obermeyer & Castle 1997, Lawrence 1994 page 8).

In France, hiring of wet nursing continued to be practiced by most wealthy, and middle-income women. Breastfeeding was considered "not the custom", and women wished to "guard their beauty and freshness". In 1718 Dionis wrote: "today, not only ladies of nobility, but yet the rich and the wives of the least of the artisans have lost the custom of nursing their infants". In 1705 the law required

wet nurses to register, and allowed them to breastfeed a maximum of 2 infants in addition to their own, stipulating that there must be a crib for each infant, to prevent the wet nurse from sleeping with them in her bed, where she might suffocate them (Lawrence 1994 page 9).

The demise of wet nursing did not lead to a general return to breastfeeding, but rather the development of artificial infant feeds during this time. Wet nurses were replaced by cereals, or a bread gruel, and the death rate in orphanages approached 100% (Lawrence 1994 page 7).

From mid 19th century, commercially available breastmilk substitutes became widely available. By 1883 there were 27 brands on the market. Child welfare vigorously promoted formula, and the first milk depot was established in the UK in 1899, and by 1930, 13% of the budget was spent on food distribution – mostly cod liver oil and dried milk (Makhlouf Obermeyer & Castle 1997).

The British started large-scale distribution of dried skimmed milk in the 1920's in response to the widespread protein deficiencies in the colonies. Dried skimmed milk was used as an incentive to get mothers to the clinics. Supplementary milk powder therefore emerged as a scientifically prepared product, actively endorsed by health personnel. The greatest declines in breastfeeding occurred in areas where distribution was most extensive.

There was a rapid increase in popularity of breastmilk substitutes, and this can be attributed to various factors:

1. Formula providers were seen as more socially powerful and prestigious than recipients – mothers were perceived as ignorant as to how best to feed their infants
2. Men supported formula feeding as bottle feeding had a superior status, and they could resume intercourse earlier in those societies where taboos were still in place
3. There was a market for the product – mothers had experience of supplementing breastmilk, and were unconfident about their own breastmilk supplies (Makhlouf Obermeyer & Castle 1997).

The pervasive lack of confidence in breastmilk supply was typified (and perhaps, encouraged) by a quotation from 'Parents' magazine in 1938: "You hope to nurse him, but there are an alarming number of young mothers who are unable to breastfed their babies, and you may be one of them..." (Lawrence 1994 page 11).

"The commercialisation, and medicalisation of infant care established an environment that made artificial feeding not only acceptable, but also natural, and necessary. A combination of the ideology of scientific motherhood, confidence in the medical profession, and shrewd media presentation altered the relationship between mothers and physicians, and encouraged mothers to seek out commercial and medical solutions to the problems of infant feeding. Despite the renewed interest in breastfeeding, the legacy of scientific motherhood lives on" (Lawrence 1994 page 11).

Throughout history, breastfeeding has always been more common, and of longer duration in the stable, hard working eras, and more rare in the periods of 'social dazzle' and lower moral standards (Lawrence 1994 page 9).

1.2. Advantages of breastfeeding

Since breastfeeding is inextricably linked to the role of the woman within the home, societal norms, and cultural beliefs, breastfeeding practices have been many, and varied, and replacement of breastmilk has been practised for many centuries, for different reasons (Makhlouf Obermeyer & Castle 1997).

Retrospectively, it was noted by McLaren (1979; cited by Makhlouf Obermeyer & Castle 1997) that in the 18th century in Oxfordshire, the lower classes where women breastfed had a lower infant mortality than the upper strata, where infants were not usually breastfed. These findings were similar to those of Germany in the 19th century, where Knodel (1986; cited by Makhlouf Obermeyer & Castle 1997) observes that the highest mortality rates were found in Bavarian villages where breastfeeding was rare, as compared to villages where breastfeeding was common.

When comparing mortality rates between breastfed, and artificially fed infants, large differences were evident, especially before the benefits of sterilisation were realised in the late 1800's (Table I).

Table I. Mortality rates in breastfed, and artificially fed infants per 1000 live births.

Study Area	Date	Breastfed	Artificially fed
Berlin, Germany	1895-1896	57	376
Paris, France	1900	140	310
Derby, England	1900-1903	70	198
Amsterdam, Netherlands	1904	144	304
Liverpool, England	1905	84	134
Cologne, Germany	1908-1909	73	241
Hanover, Germany	1912	96	296
Boston, USA	1911	30	212
8 USA cities	1911-1916	76	255
Chicago, USA	1924-1929	2	84
Liverpool, England	1936-1942	10	57
Great Britain	1946-1947	9	18

Adapted from Lawrence 1994, page 28.

After the development of modern sterilisation techniques, many studies found the health benefits of breastfeeding to be equivocal, particularly in developed countries (Kovar 1984, Bauchner 1986). The studies were seriously criticised for methodological flaws, including: very few randomised, controlled trials, or at least trials where the investigators were blinded to the feeding methods; small sample sizes; failure to avoid detection biases, such as potentially different health-seeking behaviour in mothers who are formula feeding, as compared to mothers who are breastfeeding; failure to adjust for confounding variables, imprecise definitions of

the outcome event; and imprecise definitions of breastfeeding (Kovar 1984, Bauchner 1986).

Since then, studies have been more carefully designed, and various studies have found that breastmilk is advantageous over formula feeding in terms of infant health, mother-child bonding, as well as being advantageous to the health of the mother.

1.2.1. Breastfeeding and Infant Morbidity and Mortality

Breastmilk has unique anti-infective properties, which have been shown to be protective. It has antibacterial, and antiviral substances (secretory immunoglobulin A, lactoferrin, oligosaccharides, macrophages, lymphocytes, neutrophils, and xanthine oxidase), which modulate the infant's immune system. Breastmilk also contains bifidus factor, that inhibits colonisation by Gram-negative bacteria, and nucleotides, that promote intestinal growth and development (Victora 1999, Hanson 1997, Newburg 1997, Xanthou 1997, Ebrahim 1998, Hasselbalch 1996).

Colostrum is particularly high in anti-infective immune cells, and has been shown to be effective in reducing morbidity within the first few days of life. In The Gambia, infants who were given feeds other than breastmilk in the first few days of life were found to have a significantly higher risk if mortality (OR 3.4) (Leach 1999). This study included 1254 recorded neonatal deaths, and used a case-control method, whereby the case was matched for date, residence, and number of infants delivered, to 2 control children who had survived the neonatal period. Controls were selected from birth surveillance data. This study includes all

recorded deaths in the population, and could therefore be considered representative of the factors influencing neonatal mortality. It may have over-estimated the true risk, because many of the infants who died after 7 days of age, had been considered ill since birth, and may have been cared for differently. However, a combination of adverse effects of replacement feeding, and lack of immunological properties of colostrum could have reduced the infant's chances of survival.

Necrotising enterocolitis (NEC)

In Europe, a multi-centre prospective study showed that the mortality due to necrotising enterocolitis (NEC) was 6 times higher in exclusively formula fed preterm newborns and double in infants fed breastmilk and formula, as compared with newborns fed exclusively with human milk. In preterm infants, NEC was 20 times more common in exclusively formula fed infants. In formula fed, but not breastfed infants, delayed onset of feeding was associated with a lower risk of developing NEC (Lucas & Cole, 1990). After adjustment for factors commonly associated with NEC, infants fed formula only were 10 times more likely to develop NEC than breastfed infants (Lucas & Cole, 1990). This is an important study, as it was conducted in a developed country, where risks of formula feeding are often considered inconsequential because of increased hygiene standards. A consideration for this study is that it actually combined 2 studies, the first looking at a comparison between donor breastmilk, and preterm formula, both used with, or without the addition of mother's milk, and the second study, comparing the effects of standard formula, with the preterm formula, again, with, or without the addition of maternal breastmilk. Since the studies had similar objectives, were run

concurrently, and the incidence of NEC was similar amongst infants fed breastmilk from different sources, and the different formula groups also had a similar incidence of NEC, combining the data was possible, but did not result in equally distributed numbers. The majority of infants received a combination of breastmilk and formula, while a smaller number received either breastmilk only, or formula only. Since the groups fed only one type of milk were more closely matched numerically, they can be compared more easily. While data for formula fed infants was collected from 5 sites, breastfeeding data were only collected from 3 sites. This may have influenced the findings. This study reported 'confirmed' cases of NEC, and 'unconfirmed' cases. It is unclear why the same diagnostic criteria were not used for all cases, as this reporting causes some confusion. For the sake of this thesis, only results from the 'confirmed' cases are reported.

Very Low Birth Weight Infants

In a study observing infants born less than 1000g in Malaysia, the only factors significantly associated with survival included higher birth weight, continuous positive airway pressure for respiratory distress syndrome, and feeding expressed breastmilk (Boo, Puah, Lye 2000). This study compared 103 infants who had died with 49 infants who had survived. This is a big difference in actual numbers, and could have affected statistical significance. Infant feeding would have been affected by the infant's clinical condition, and 98% of those who survived received expressed breastmilk, as compared to 27.2% of those who died. It is unclear whether the remaining infants were receiving formula, or intravenous feeding.

Diarrhoea

Diarrhoea contributes significantly to infant morbidity and mortality. In the Philippines, Popkin et al (1990) found that infants 0-2 months of age who were fed anything other than breastmilk had significantly increased risk of diarrhoea. Infants fed non-nutritious liquids were 3 times more likely to develop diarrhoea than those exclusively breastfed, and those fed nutritious liquids had a relative risk of 13.3, which was not significantly different to those that were never breastfed (RR 17.3).

Popkin (1990) obtained prospective data from 3080 women, who were interviewed in their sixth or seventh month of pregnancy, after delivery, and bimonthly thereafter, to 12 months of age. The study controlled for a wide range of variables, including socio-economic conditions, birth weight, growth velocity and nutritional status. Because of the extensive control of variables, these data are likely to be able to be generalised to other populations.

In another prospective study from Mexico, infants were followed biweekly in the first 6 months of life to determine relative risk of diarrhoea and pneumonia in infants. Non-breastfed infants had a relative risk of 2.28, and partially breastfed infants had a relative risk of 1.94 as compared to fully breastfed infants (López-Alarcón 1996). The study population was from a slum neighbourhood on the outskirts of Mexico City, where tap water, sewerage, and electricity are common. Mothers were recruited during their third trimester, but the selection process is unclear. At delivery, only singleton, healthy full term infants weighing more than 2500g were eligible. Mothers completed a daily record sheet, which was collected

biweekly by study nursing staff, who also measured the infants, and interviewed the mother. Maternal education, marital status, crowding, number of siblings, and socio-economic level were not found to correlate significantly with risk of illness, and so no corrections were made for these potential influencing factors.

Protection against diarrhoea is not limited to the developing world. In Canada, breastfed infants less than 6 months of age had relative risk of diarrhoea of 0.53, as compared to infants who were not breastfed (Beaudry 1995). The study was conducted in the province of New Brunswick, which was divided into clusters, some of which were randomly selected for inclusion into the study. All pregnant primiparous women who gave birth during 1982 and 1983, who lived in the randomly selected clusters, and met the criteria, were invited to join the study. Women were eligible if their infants were at least 36 weeks gestation, healthy, and weighed more than 2500g. Infant feeding was classified as 'any breastfeeding' or 'no breastfeeding'. The amount of breastmilk, or other feeds given was not determined. All infants had had at least one bottle of cows milk, or formula. The authors used an 'incident density ratio' to determine relative risk. The incidence of illness in breastfed infants was determined by the 'number of illnesses' divided by the total number of 'breastfeeding weeks', and similarly, the incidence of illness for formula feeding was calculated by the 'number of illnesses' divided by the total number of 'formula feeding weeks'. The incidence density ratio was then determined by dividing the rate of illness in breastfed infants by the rate of illness in formula fed infants. This study showed a significant difference in morbidity in a developed country, even using poorly defined breastfeeding practices i.e. 'any', or

'none'. The results would have been more convincing if breastfeeding had been more accurately determined.

The results of this study were similar to results from the United States of America, where breastfed infants had half the incidence of diarrhoea as compared to formula fed infants (Dewey 1995, Raisler 1999). In California, mothers kept daily records of any symptoms, and were contacted weekly for data capture (Dewey 1995). Breastfed infants received breastmilk as the main milk source, and consumed less than 120ml of formula per day. Formula fed infants received breastmilk for less than 1 month. The results were only given for the first year of life, so it is interesting that the results were similar to those of other studies, which mostly report on the first 6 months of life.

Raisler (1999) analysed the results of the National Maternal and Infant Health Survey (NMIHS), including 7092 infants, with a birth weight of at least 1500g, and whose mothers had completed the relevant section of the survey. This constituted 71% of the survey. Full breastfeeding was defined as 'all breast' – assuming exclusive breastfeeding. Other breastfeeding categories included 'most' breast, where infants consumed more breastmilk than other feeds; 'equal' breast, where the volume of breastmilk was approximately equivalent to other feeds; and 'less' breast, where other feeds made up the majority of the infant's energy intake. Protection against illness was found to be relative to the 'dose' of breastmilk received. In most situations, only 'full' and 'most' breastfed infants had significantly reduced risk of infectious illness as compared to formula fed infants. 'Less' breastmilk was not protective against illness. This study controlled for many

factors that could have influenced risk of illness – maternal age, race, education, socio-economic status, birth weight, siblings, day care, age, maternal and household smoking, house crowding, and maternal recall interval. Mean maternal recall interval was 17 months. While this study covers a large sample, it relies heavily on maternal recall of intake, and illnesses per month, over a fairly long period. It is unclear how maternal recall was controlled for.

Breastfeeding has been shown to continue to protect the infant against diarrhoea into the second year of life (relative risk 1.4 in 1 year olds, and 1.67 in 2 year olds) (Mølbak 1994). This study was conducted in Guinea-Bissau, where 301 houses were randomly selected, and all children under the age of 3 living in these homes were eligible for the study. Data on diarrhoea and feeding patterns were collected weekly for 15 months, and thereafter data were available as this was part of a larger study. It is unclear how often data were collected after the first 15 months. Despite the finding that breastfed children were consistently more malnourished than the weaned children, the latter had a 3.5 times increased risk of mortality. It was suggested that mothers who have malnourished children breastfeed for longer, rather than prolonged breastfeeding being the cause of the malnutrition, as the nutritional status of the children did not change after cessation of breastfeeding (Mølbak 1994). This study made adjustment for confounders, but these were not described, nor was the study method adequately described, as it was part of a larger study reported elsewhere.

Pneumonia

Another illness that contributes significantly to infant morbidity and mortality is pneumonia. In a nested case-control study of hospital admission for pneumonia, non-breastfed infants were 17 times more likely to be admitted to hospital as compared with infants who were breastfed without the addition of formula. The relative risk of admission for infants under the age of 3 months was 61, and decreased to 10 thereafter (César 1999). In this study, a sample of infants, whose mothers had been interviewed soon after delivery, were followed, and interviewed again at 1, 3, and 6 months of age. These children served as the control population. The authors then identified infants who had been admitted to a hospital for pneumonia. These cases were matched with the longitudinal cohort for age, but were not individually matched. Variables found to be significant, including social class, family income, maternal schooling, age, parity and weight gained during pregnancy, were controlled for in the analysis. Reverse causality (changing breastfeeding patterns because of illness) was avoided by considering infants who had stopped breastfeeding less than 2 months prior to admission as still breastfed, if breastfeeding had stopped because of respiratory illness. Since the mothers were expected to remember feeding practices over roughly 3 months, there may have been recall bias. In 32 infants who were both cases and controls, there was good concordance in 26 of the cases. In 6 infants where concordance was poor, breastmilk intake was over-estimated in 5 instances, and underestimated in 1 instance. This may have affected the risk ratios of the study. The 32 infants were both cases, and controls, as they were followed in the community, but also admitted to hospital for pneumonia. This was an interesting study, as usually the intervention group is followed, and the controls sought from a

healthy population. In this study, the controls were followed, and thereafter matched to the cases.

Infant Mortality from infectious Diseases

In an extensive review of the risk of infant mortality in southern Brazil, a case-controlled study of infant mortality in the first 11 months of life found that infants who were not breastfed had 14.2 and 3.6 times the risk of death from diarrhoea, and respiratory infections respectively (Victora 1987). The authors visited hospitals, coroners, health authorities, and registries weekly to collect information on the any infant deaths (0-6 months of age). A physician, blinded to feeding practices, visited the parents of the deceased infants to determine causes of death. In a separate interview, a detailed feeding history was obtained from the mother, or primary caregiver. For each case, 2 of the closest neighbours were selected as controls, the first aged 7-364 days, the other aged 7-182 days. The mean age for both groups was 4.3 months. This was a thorough case-controlled study, controlling for variables, including; socio-economic status, birth weight, type of housing, availability of piped water, birth interval, maternal education, family income, and age of infant.

Similarly, in Peru, infants who died from infectious diseases were 15.4 times more likely to have not been breastfed (Lu 2000). The authors conducted a study with a very similar design, the difference being that they specifically chose 2 control infants of the same age range as the case infant. Also, there may have been recall bias, as the mothers of the deceased infants were contacted up to a year

after the infant's death, while the mother of the control infants had a maximum recall period of 7 months.

In a recent meta-analysis, based on studies from 3 countries (Brazil, Pakistan, and Philippines), the risk of death due to infectious diseases among non-breastfed children under two years of age was reviewed. The review showed that infants younger than two months of age and not breastfed presented a six-fold increase in the mortality due to infectious diseases. The protection declined steadily with age (World Health Organization 2000).

Otitis Media

In the first 2 years of life, breastfed children have been shown to have a significantly lower risk of otitis media (19% lower than non-breasted infants), and a lower risk of prolonged (>10 days) episodes of otitis media (80% lower than non-breastfed infants) (Dewey 1995). These findings have been substantiated by Aniansson (1994), studying Swedish infants, who found that in the first 3 months, 1% of breastfed children had experienced an episode of otitis media, as compared to 6% of the non-breastfed infants, increasing to 4% between months 4-7 in the breastfed infants, and 14% in the non-breastfed infants. In the 8-12 month age group, no breastfed infants experienced otitis media, as compared to 20% of the non-breastfed infants. This prospective study aimed to include all newborn infants in the study area. The infants were recruited at their first clinic visit, at about 2 months of age. Each child was examined at 2, 6 and 10 months of age, and the mother interviewed using a standard questionnaire. The mother was expected to remember practices over a period of about 4 months, which could have influenced

recall bias. All children were breastfed initially, but by 2 months of age, 9% had stopped breastfeeding. This increased to 32.75% at 6 months, and 76.5% at 10 months. There was a considerable difference in the numbers in each group, over time, and this difference between the groups may have influenced statistical results. The breastfeeding categories were ill-defined, with groups including: mostly breastmilk, where the parents negated other feeds, mixed breastfeeding – including any breastmilk with the addition of other feeds, and weaned, or no longer receiving any breastmilk. It may have been useful to use more accepted definitions, separating the addition of other milks from added water, and non-nutritional feeds, and solids.

Infant Growth

Not only does breastfeeding protect the infant against illness, but it has been shown to reduce the duration of illness (Launer 1990), and may assist in the reduction of weight loss during illness. Appetite for non-breastmilk foods has been shown to decrease during illness, while the intake of breastmilk remains relatively constant (Brown 1990).

In Mexico City, amongst underprivileged infants, breastfeeding was found to positively affect growth by averting illnesses, and improving nutrient intake during infections (Villalpando 1999). At 6 months of age, breastfed infants were heavier, and tended to be taller than infants fed formula. The cumulative 6-month weight increments were negatively related to the number of episodes of diarrhoea, and positively related to duration of breastfeeding. Never-ill infants had a better weight, and length than infants who suffered from 1 or more episode of diarrhoea,

and weight and length gain of infants who had suffered at least 1 episode of diarrhoea was positively associated with breastfeeding, and socio-economic status (Villalpando 1999). This study included 170 healthy infants born in a maternal and childcare unit serving a slum neighbourhood in Mexico City. The infants were enrolled consecutively if they were term, singleton, birth weight between 2500 and 4000g inclusive, and whose mothers were literate, and agreed to participate in the study. Mothers were interviewed, and infants measured at 2-week intervals, alternating between home and clinic visits, until the infant was 6 months of age. Mothers kept a daily grid to record infant health. A physician, blinded to feeding method assessed illness as recorded by the mother, according to standard definitions. Infant feeding was defined as fully breastfed (no other milks), partially breastfed (breastmilk and other milks), and formula fed (no breastmilk). Variables controlled for in the analysis of weight and length included incidence and prevalence of diarrhoea, and acute respiratory infections, maternal age, education and parity, crowding, and socio-economic status. The analyses were conducted with all infants at each 2-week interval, reducing bias of those infants who did not complete the study. The study clearly showed that in an underprivileged environment, fully breastfed infants grow better than those who are formula fed.

Breastfeeding has been shown to continue to protect children from malnutrition and death into their third year of life in Bangladesh (Briend 1988). Every year, the international centre for diarrhoeal disease research maintains a monthly surveillance system in rural Bangladesh. For 6 months, the women collecting data, collected additional data on breastfeeding and illness, and measured mid-arm circumference of children between 18-36 months. Children were classified as

partially breastfeeding, or weaned, as below 1 year of age, less than 2% were not receiving any breastmilk. Children aged 18-36 months who were not breastfed, had a 3-fold risk if death. Children whose mid-upper arm circumference was less than 111mm had a relative risk of dying of 22.1 times that of other children. A significantly higher proportion of weaned children had an arm circumference below 111mm (7.7% v 4.9%). This study did not control for socio-economic status, as it was argued that the poorer families, with a higher risk of mortality, generally breastfeed for longer, and adjusting for socio-economic risk might have underestimated the risk of death associated with weaning. Weaning in critically ill children was not considered, as there was no peak in death or illness just after weaning. Although these arguments may have a valid element, it precludes the generalisation of these findings, and they need to be considered specific to rural Bangladesh.

Sudden Infant Death Syndrome

A perplexing syndrome in infancy is sudden infant death syndrome (SIDS). The exact aetiology has not yet been determined, and appears to be multifactorial, and interlinked. Prone sleeping position, maternal smoking, formula feeding, and excessive bedding or clothing have all been linked to SIDS. A combination of these factors increases the risk, but no definitive risk, or odds ratios have been established (Lindgren 1998, Mitchell 2000, Hoir 1998).

1.2.2. Risks of illness later in life

Not only has breastfeeding been found to be protective against illness for longer than infancy, breastfeeding continues to provide protection against ill health, long after breastfeeding has ceased.

Diabetes

Feeding infants non-human milk has also been associated with increased risk of childhood-onset insulin dependent diabetes mellitus (Mayer 1988), risk of adult adiposity (Martorell 2001), and increased risk of raised blood pressure (Singhal 2001), all conditions that can lead to serious health risks later in life.

In a retrospective study on the risk factors for insulin dependent diabetes mellitus (IDDM), cases were selected fro the Colorado IDDM Registry, and the Barbara Davis Centre for Childhood Diabetes, Denver (BDC). The cases were less than 18 years of age (Mayer 1998). Two control groups were recruited from physician's offices throughout Colorado, and through random-digit dialling in the Denver area. Eligibility for the Colorado Registry included: 1) <18 years at diagnosis; 2) diagnosis after 1 January 1978; 3) initiation of insulin within 2 weeks of diagnosis, 4) resident of Colorado at time of diagnosis; 5) diabetes not secondary to other conditions. Eligibility for the BDC Registry included: 1) ineligibility for Colorado registry due to age, residence, or date of diagnosis; 2) never previously received Colorado registry questionnaire; 3) current Colorado address; 4) born on or after 1 January 1970. In 1984, questionnaires were mailed to all persons on the 2 registries, and those responding were used as the sample of cases. There was an overall response rate of 65.5%. A questionnaire with the same infant feeding

information was sent to the control group for completion. The proportion of cases and controls that were ever breastfed were 50% and 62.4% respectively. Breastfed infants had an odds ratio of 0.7 ($P<0.05$) of developing diabetes. Birth year was also found to be significant, but this was probably related to the incidence of breastfeeding, which increased with each successive year. Four time points were identified, and at each time point, cases were less likely to be breastfed than controls. The results show that breastfed infants are less likely to develop childhood IDDM, as compared to formula fed infants, but more controlled studies are required. A prospective, controlled study would be more convincing. No other variables were shown to be significantly associated with diabetes, and were not controlled for. These included race, annual family income, maternal education, maternal age, sex.

Blood Pressure

A prospective, randomised control trial was conducted to determine whether infants feeding practices influence blood pressure later in life (Singhal 2001). Blood pressure was measured in a cohort of 13-16 year old children who were born prematurely, and had participated in 2 randomised controlled trials, including a comparison of the benefits of breastmilk versus formula, and preterm formula versus term formula. At 8 years of age, there was no significant difference in systolic, or diastolic pressure between the groups. At 13 to16 years of age, mean arterial pressure, and diastolic pressure were both significantly lower in children assigned breastmilk as compared to those assigned preterm formula, even after adjustment for sex, mean daily sodium intake in infancy, and current body-mass index. After adjustment for variables, there was no significant difference in blood

pressure in those children who had consumed term formula as compared to preterm formula. In those infants who had consumed both breastmilk and preterm formula, mean arterial pressure, and diastolic pressure were related to the amount of breastmilk consumed. This remained significant after controlling for age, sex, body-mass index, duration of gestation, and social class. This study suggests that postnatal nutrition may be more important than fetal nutrition as a long-term predictor of blood pressure.

Cancer

Not breastfeeding has been associated with an increased risk of cancer, particularly lymphoma, and leukaemia in children under the age of 15 years (Infante-Rivard 2000, Perrillat 2002).

In a population based case-control study in Québec, Canada, all cases of acute lymphoblastic leukaemia diagnosed between 1980 and 1993 and aged between 0-9 years at time of diagnosis, were identified (Infante-Rivard 2000). An identical number of healthy controls matched for age, sex and region of residence at time of diagnosis were identified from the latest census. Children who were adopted, or fostered, who spoke neither French nor English, or whose parents were not available to be interviewed were excluded from the study. Eighty-four, and 86% of parents for the cases and controls respectively were interviewed within 10 years of the case's diagnosis. Telephonic interviews were conducted. Breastfeeding was defined as only one category. This study required a long recall period, but is likely to be accurate because either the infant was breastfed, or not – something mothers are likely to remember.

A more recent retrospective study found that the reduction in risk of developing acute leukaemia was correlated with the duration of breastfeeding – at least 6 months of breastfeeding was required before a protective effect is apparent (Perrillat 2002). This hospital-based case-control study in France required the children to be aged 15 or less, reside in the hospital catchment area, and have a recent diagnosis of acute leukaemia (diagnosis between 1995 and 1999). The controls were children hospitalised in the orthopaedic or emergency wards, residing in the hospital catchment area. Many different diagnostic categories were included to avoid selection bias. Recruitment was matched for age, gender, hospital, hospital catchment, and ethnic origin. Breastfeeding for at least 6 months was associated with an odds ratio or 0.5 after adjustment for birth weight, length of pregnancy and number of pregnancies. Again, recall period was long, but the mother had to recall whether she breastfed or not, and the duration of breastfeeding.

Asthma and Allergies

Prolonged breastfeeding has also been associated with reduced risk of asthma (OR 2.39) and wheeze (OR 1.54) in a Canadian population based study (Dell 2001). A cohort of children (n=2184) from the National Longitudinal Survey of Children and Youth, who were between the ages of 12-24 months was used. Breastfeeding was defined as 'any breastmilk'. Risk factors for not breastfeeding were smoking, ante-and post-natally, prematurity, low birth weight, low maternal education, and low income, and these were used as the confounding variables. Children who were breastfed for less than 9 months were found to be at increased risk of asthma (OR 2.39) and wheeze (OR 1.54). A dose-response effect was

observed with breastfeeding duration. The study was limited, as breastfeeding was not categorised, nor was the duration recorded as a continuum, but was useful as it included a large number of children, controlled for appropriate variables, and used clinician-diagnosed asthma as an outcome event, although wheeze as defined by the mother.

1.2.3. Cognitive Development

Breastfed children have been found to have higher levels of cognitive function than their non-breastfed counterparts. Low birth weight infants may particularly benefit from breastfeeding. In a meta-analysis of 20 studies, the increased increment of cognitive function was 2.66 points for normal weight infants, and 5.18 points for low birth weight infants. Higher levels of cognitive function were seen in breastfed infants at 6-23 months, and the difference was stable across successive ages (analysed up to 15 years) (Anderson 1999).

Pollock (1994) found that breastfeeding was particularly associated with higher English picture vocabulary test scores at 5 years of age, and pictorial language test, word definitions, and similarities at 10 years of age. The cohort followed was from the 1970 British Birth Surveys, and those infants for whom a detailed feeding history in the first year of life was available were eligible for inclusion. The cohort was divided into those who had exclusively breastfed, or bottle-fed. The infants were traced at 5 years of age, and again at 10 years of age. To minimise selection bias, the following mothers were excluded: maternal age <17 years; gestational age $\leq$36 weeks, or suspect; birth weight less than 2538g; placed in an incubator in first week; separated from mother for at least 24 hours after birth;

signs of 'cerebral irritation'; mother reported feeding difficulties in the first 6 months at the 5 year follow-up; mother reported the father 'absent', or not supportive of the family. Variables controlled for in the analysis included: age father left full-time education; age mother left full-time education; maternal education; smoking during pregnancy; attendance of antenatal classes; infant's place of birth. This study relied on a 5 year recall of feeding practices for the first 3 months, except for the first 7 days. While the researchers excluded any women whose recall was incompatible with the records during the first week of life, this would not have guaranteed accurate recall. While 90.8% of the infants were formula fed, only 9.2% were breastfed, which may be the reason why the difference between the 2 groups was small, with such a huge discrepancy in numbers. Because the population was so highly selective, it is unlikely to be representative of the population, and therefore, although interesting, it has very specific relevance only.

1.2.4. Benefits for the Mother

Benefits of breastfeeding for the mother begin directly after delivery, with a reduction in the risk of haemorrhage, because of the release of oxytocin. Although all women are routinely given oxytocin intravenously at delivery, breastfeeding women are protected thereafter, particularly in the next 24-48 hours (Dermer 1998).

Continued full breastfeeding protects the mother against the return of menses, at least in the first 6 months after delivery. The delayed return of menses reduces iron loss, and together with increased iron absorption associated with breastfeeding, reduces the risk of iron deficiency.

Another important benefit of delayed return of menses is delayed return of fertility. Delaying a new pregnancy allows the mother to recover her nutritional status, and allows the child more attention from the mother (Van Landingham 1991).

Long-term benefits for the mother include reduced risk of breast (Newcomb 1994), ovarian (Gwinn 1990), and uterine cancer (Rosenblatt 1995).

A recent meta-analysis, including 47 epidemiological studies in 30 countries determined the relative risk of breast cancer was reduced by 4.3% for every 12 months of breastfeeding, in addition to a 7% reduction in risk for each birth (Collaborative Group on Hormonal Factors in Breast Cancer 2002). The study included 50 302 women who had invasive cancer, and 96 973 controls. This was a very large meta-analysis, including women from developed, and developing countries. The decline in the risk of breast cancer did not vary significantly between developing, and developed countries, or by age, menopausal status, ethnic origin, the number of births the woman had, or any of 9 other personal characteristics examined. While this study was large, and therefore likely to excellent statistical power, breastfeeding was poorly defined. Most studies included in this meta-analysis did not differentiate between exclusive, and mixed breastfeeding, and studies varied on definitions of breastfeeding. Some studies included women in the breastfeeding arm if they had every given at least 1 breastfeed, while other studies required the women to have breastfed for a defined period of time before inclusion into the breastfeeding arm. This would have skewed the results towards being more conservative. Many studies also divided breastfeeding duration into 6-month intervals, which might not accurately reflect

breastfeeding duration. There were also few women who had breastfed for longer than 30 months, so there were limited numbers with substantial breastfeeding exposure.

Breastfeeding has been shown to facilitate bonding (Dermer 1998), and result in decreased rates of child neglect (Nylander 1991).

1.2.5. Benefits for Society

The reduced morbidity in breastfed children results in decreased medical expenditure for the family, and the government. Reduced illness also results in less absenteeism from work, resulting in increased productivity. Breastfeeding can save individual families significant amounts of money, as compared with formula feeding, and can reduce environmental pollution associated with discarding cans, bottles, and other equipment used in bottle feeding (ACOG 2001).

It has become obvious that breastfeeding is more beneficial than formula feeding for protection from illness in both the infant, and the mother, for optimal development of the infant, as well as contributing significantly to the economy. While breastfeeding is beneficial, it would appear that all breastfeeding practices are not equal, and these require further investigation.

Summary of Studies Supporting Breastfeeding

Clinical outcome	Author, and Place	Study design	Results
Neonatal mortality	Leach (1999) The Gambia	Retrospective, Case-controlled Prelacteal feeds vs BF	Prelacteals:OR=3.4
NEC	Lucas & Cole (1990) United Kingdom	Multi-centre prospective FF vs MBF vs EBF	FF vs EBF RR=10 MBF vs EBF RR= 2
VLBW (<1000g)	Boo (2000) Malaysia	Retrospective, Compared infants who had survived with those that did not	98% of survivors received EBM compared to 27.2% of those that died
Diarrhoea	Popkin (1990) Philippines	Prospective Bimonthly visits Risk in 0-2 months age group	EBF: RR=1 NNL: RR=3 NL: RR=13.3 NBF: RR=17.3
	Beaudry (1995) Canada	Prospective ABF vs NBF	NBF: RR=1 ABF: RR=0.53
	Dewey (1995) California (USA)	Prospective Weekly follow-up BF vs NBF	BF: RR=1 NBF: RR=2.2
	Raisler (1999) USA	National Maternal and Infant Health Survey (NMIHS) BF vs NBF	FullBF: OR=0.54 MostBF: OR=0.83 EqualBF: OR=0.87 LessBF: OR=0.95
	Mølbak (1994) Guinea-Bissau	Random selection Children <3 yrs Weekly visits for 15 months	BF: RR=1 Wbf: RR=1.4 at 1y Wbf: RR=1.67 at 2y Wbf: mortality RR=3.5
Diarrhoea and Pneumonia	López-Alarcón (1996) Mexico	Prospective Biweekly visits 0-6 months	EBF: RR=1 MBF: RR=1.94 NBF: RR=2.28
Pneumonia	César (1999) Brazil	Nested case-control Hospital admission Control visits: 1,3,6 months OBM vs NBF	OBM: RR=1 NBF: RR=17 Age <3 months NBF: RR=61 Age 3-6 months NBF: RR=10

Summary of Studies Continued....

Clinical outcome	Author, and Place	Study design	Results
Infant mortality (0-11 months of age)	Victora (1987) Brazil	Retrospective Case-control OBF vs NBF	OBF: RR=1 Diarrhoea NBF: RR=14.2 Respiratory illness NBF: RR=3.6
Infant mortality (0-6 months of age)	Lu (2000) Peru	Retrospective Case-control EBF vs NBF	EBF: RR=1 NBF: RR=15.4
Infant mortality (0-2 months of age)	WHO (2000) Brazil, Pakistan, Philippines	Meta-analysis BF vs NBF	BF: RR=1 NBF: RR=5.8
Childhood mortality (18-36 months)	Briend 1988 Bangladesh	Prospective Visits: monthly 6-36 months	Wbf: 3-fold risk of death.
Otitis Media	Aniansson (1994) Sweden	Prospective Visits: 2, 6, 10 months MBF vs NBF	Age 1-3 months MBF: 1% NBF: 6% Age 4-7 months MBF: 4% NBF: 14% Age 8-12 MBF: 0% NBF: 20%
Infant Growth	Villalpando (1999) Mexico City	Prospective Visits: 2-weekly to 6 months	OBF: heavier and taller than NBF and MBF
Insulin Dependant Diabetes Mellitus	Mayer (1998) Colorado (USA)	Retrospective	BF: OR= 0.7 NBF: OR=1
Blood Pressure	Singhal 2001 United Kingdom	Prospective Randomised control trial BF vs NBF PreF vs TermF	Age 13 to16 BF intake inversely related to mean arterial pressure
Cancer	Infante-Rivard (2000) Québec, Canada	Retrospective Case-control BF vs NBF Diagnosed at age <4yrs	NBF: OR=1 BF <6mo: OR= 0.61 BF >6mo: OR=0.68
	Perrillat (2002) France	Retrospective Case-control NBF vs BF (<6mo) NBF vs BF (>6mo)	NBF: OR=1 BF(<6mo):OR=1.1 BF(>6mo):OR=0.5

Summary of Studies Continued....

Clinical outcome	Author, and Place	Study design	Results
Asthma and Allergies	Dell (2001) Canada	National Longitudinal Survey of Children and Youth, aged 12-24 months BF <9mo BF >9mo	Asthma BF >9mo:OR=1 BF<9mo:OR=2.39 Wheeze BF >9mo:OR=1 BF<9mo:OR=1.54
Cognitive Development	Anderson (1999)	Meta-analysis of 20 studies BF vs NBF	Normal weight BF: 2.66 points higher Low birth weight BF: 5.18 points higher
	Pollock (1994) United Kingdom	Prospective EBF vs NBF	EBF: 2.6-3.5 points higher
Maternal Breast Cancer	Collaborative Group on Hormonal Factors in Breast Cancer 2002	Meta-analysis, of 47 epidemiological studies in 30 countries	RR reduced by 4.3% for every 12 months of breastfeeding

KEY

RR = relative risk

OR = odds ratio

NEC = necrotising enterocolitis

BF = breastfed

EBF = exclusive breastfeeding

MBF = mixed breastfeeding

NNL = non-nutritious liquids

NL = nutritious liquids

NBF = non-breastfed

OBF = breastmilk as only source of milk

FullBF = full breastfeeding

MostBF = more breastmilk than other feeds

EqualBF = approximately equal amounts of breastmilk and other feeds

LessBF = less breastmilk than other feeds

Wbf = weaned off breastfeeding

1.3. Mixed verses Exclusive Breastfeeding

In the previous chapter, the advantages of breastfeeding over formula feeding were evident. That the benefits of breastfeeding were dose dependant was alluded to (Raisler 1999, Popkin 1990), and this will become clearer in the following chapter.

The inconsistent use of infant feeding method definitions has, in the past, resulted in a diluted understanding of the benefits of breastfeeding, because of this dose-related effect (Kovar 1994, Bauchner 1986, Rubin 1990).

1.3.1. Breastfeeding Definitions

Breastfeeding is categorised according to the amount of breastmilk the child is estimated to be receiving, and is categorised as follows:

Definition	Description
Exclusive breastfeeding	Breastmilk only. Breastmilk may be from the mother, or wet nurse, or expressed breastmilk. Only prescribed medications, vitamins, and minerals are allowed in addition to breastmilk
Mixed breastfeeding	Liquids, solids, over-the-counter, or traditional medicines are give in addition to breastmilk
• Full breastfeeding	Small volumes of liquids/solids are given infrequently
• Partial breastfeeding	Liquids/solids are given regularly to the infant. This category can be further divided into high, medium and low breastmilk intake
Token breastfeeding	Minimal, occasional, irregular breastfeeds

Adapted from Labbok (1990).

1.3.2. Infant Morbidity and Mortality

In Europe, a multi-centre prospective study showed that the mortality due to necrotising enterocolitis among preterm newborns receiving a mixture of formula and human milk was double that of newborns fed exclusively with human milk (Lucas & Cole, 1990).

Diarrhoea and Pneumonia

Popkin (1990) found that the addition of even non-nutritious fluids increased the risk of diarrhoea 3 times in infants 0-2 months of age. The addition of solids to the diet resulted in 13 times increased risk of diarrhoea, and was not significantly different from the incidence of diarrhoea in infants who were not breastfed. These findings were similar to those of Raisler (1999), who found that while full breastfeeding was associated with the lowest rates of infant illness (particularly diarrhoea, cough and wheeze), minimal breastfeeding did not confer any protection to the infant.

In Western Ethiopia, infants less than 6 months old who were partially breastfed were 3.3 times more likely to have had diarrhoea in the previous 2 weeks than those that were exclusively breastfed (Ketsela 1990). This study was part of a larger survey in which the authors divided the area into clusters, and randomly selected clusters for survey. In each cluster, 100 children aged under 5 years were eligible for inclusion. Infants under the age of 6 months were interviewed for this study, of which there were 331. This was a cross-sectional survey to determine the effect of infant feeding on diarrhoea morbidity in the 2 weeks prior to the survey. Feeding categories were: exclusive breastfeeding, partial

breastfeeding, and weaned. Because the study was cross sectional, it could have over-estimated the incidence of exclusive breastfeeding, affecting the relative risk attributable to mixed feeding. It is unclear as to how the feeding practices were determined – whether it was recall since birth, or a 24-hour recall. The only variable controlled for in this data analysis was age of the infant, as socio-economic status, and social class, was determined to be homogeneous. This limits a wider application of the results.

However, similar findings were reported from West Bengal, India, where infants who were mixed breastfeeding were 3.02 times more likely to develop diarrhoea in the first year, as compared to infants who were exclusively breastfed for longer than 3 months (Mondal 1996). One hundred and forty-eight healthy infants, who were born full term via normal vaginal delivery were prospectively studied, for 1 year. Data were collected weekly. For analysis, infants were divided into 2 groups: those who were exclusively breastfed for at least 4 months, and those who were not exclusively breastfed. In the latter category, 4 (2.7%) of the infants were not breastfed from birth, and at the end of the first year, 10.3% were not breastfeeding. Variables that were controlled for in this study included birth order, birth spacing, gender, mother's age and literacy, family size and family income. This was a small study, and the feeding categories had to be collapsed into 2 categories to be able to be interpreted as statistically significant.

Exclusive breastfeeding for 4 or more months has not only been found to be protective against diarrhoea and pneumonia during the exclusive breastfeeding period, but is protective for at least the following 6 months after exclusive

breastfeeding has ceased (Perera 1999). This hospital-based study included all infants who were admitted to hospital during March 1997 for acute illness. In total, 285 infants who had been admitted to hospital, and 58 healthy controls from surgical wards, immunisation clinics, and well-baby clinics were included. The infants were divided into 3 main feeding groups for analysis: those who were exclusively breastfed for 3 months or less, those who were breastfed exclusively for 4 months or more, and those who were never breastfed. The authors were interested in 3 time periods: during exclusive breastfeeding; the three months after exclusive breastfeeding had ceased; and the three months thereafter (i.e. 3-6 months after discontinuation of exclusive breastfeeding). There was no significant difference in the incidence of diarrhoea, or respiratory illness during exclusive breastfeeding, but in the following 6 months, those infants who had been exclusively breastfed for more than 4 months had significantly fewer episodes of diarrhoea, and hospital admission for diarrhoea, or respiratory illness. This study showed that exclusive breastfeeding for at least the first 4 months benefits the infant for a longer period than just the exclusive breastfeeding period. Unfortunately, the study did not control for the age of the infant at time of illness, and it would be expected that a younger infants was more susceptible to diarrhoea or respiratory infections than an older one. Therefore, if an infant had only been exclusively breastfed for 1 month, the first 3 months after termination of exclusive breastfeeding would be months 2-4. An infant who was mixed feeding during months 2-4 would be expected to have less illness than an infant who was mixed feeding between ages 5-7 months (if the infants had been exclusively breastfed for 4 months). Not controlling for age therefore mainly adds evidence to the

increased risk of illness if the infant is mixed fed, rather than confirming a prolonged effect of exclusive breastfeeding.

Prolonged effects of exclusive breastfeeding were, however, confirmed by Wilson (1998), in a follow-up study of children 7 years of age. The 674 children had detailed infant feeding data collected prospectively in the first 2 years of life, and those who had been exclusively breastfed for at least 15 weeks, had had significantly fewer episodes of respiratory illness in the previous 12 months (17% vs. 31%), as compared to children who had been mixed feeding before 15 weeks of age. Introduction of solids before 15 weeks was significantly associated with increased wheeze during childhood. Interestingly, no significant relation with maternal or paternal smoking was found after adjustment for the effects of solids. This study relied on the maternal recall of diarrhoea and respiratory illness over a period of 7 years.

Asthma and Allergies

In Australia, the addition of milk other than breastmilk to the infants' diet before 4 months of age has been shown to significantly increase the risk of asthma and atopy in children aged 6 years (Oddy 1999). The duration of exclusive breastfeeding, rather than any breastfeeding was the major factor in determining the risk of asthma, and atopy. This study recruited 1598 pregnant women at antenatal clinics, and followed them, and their children through to 6 years of age. The infant was seen at birth, and the parents kept a diary of their child's health for the first year. When the child was 1 year old, the parents completed a standard questionnaire, and the child attended a clinical assessment. Shortly before the

child was 6 years old, another questionnaire was sent to the parents, and skin prick tests were done on the children. In the analysis, gender, gestational age, smoking in the home, early child-care, Aboriginal descent, maternal education, and family income were all controlled for. This study relied on parental return of the mailed questionnaires, and may have therefore been biased to parents who were more interested, or actively involved in their child's well being. Recruitment was also mainly through a tertiary obstetric hospital, and included a small excess of premature infants, but, because of controlling for gestational age, this should not have affected the outcomes. The illness morbidity outcomes were clearly defined, but the duration of exclusive breastfeeding was not used appropriately, as it was defined, as the age at which other milks were added to the child's diet. This may have resulted in an under-estimation of the protective effect of exclusive breastfeeding, as other fluids, or foods may have been added prior to the introduction of alternative milks, negatively influencing the outcome. Never-the-less, this study was effective in determining the risk of asthma in mixed breastfed children (OR 1.25) as compared to exclusively breastfed children.

Other findings for a protection of exclusive breastfeeding against allergy include a meta-analysis of 6 prospective studies, which found that exclusive breastfeeding for at least 3 months after birth was protective against allergic rhinitis (OR 0.74) in children with, or without a family history of atopy (Mimouni Bloch 2002). Exclusion criteria for the studies were: non-prospective, prolonged maternal recall, extensive loss to follow-up, and the extensive addition of other foods during the first 3 months of life.

In another meta-analysis of 18 prospective studies, exclusive breastfeeding during the first 3 months was associated with lower rates of atopic dermatitis, especially in children with a family history of atopy (Gdalevich 2001). Inclusion criteria for the meta-analysis included: Maternal recall up to 1 year; blinding of the investigators to outcome during infant feeding assessment; strict diagnostic criteria provided by authors; duration of exclusive breastfeeding at least 3 months; blinding of investigators to feeding method during assessment of outcome; control for age, socio-economic status, family history of atopy, and parental smoking; and separate assessment of children at high risk of atopy, and therefore the results can be considered as representative for the population.

Meningitis

Exclusive breastfeeding has been found to be protective against *Haemophilus influenzae* (HI) meningitis in Swedish pre-school children – protection increased with each additional week of breastfeeding, with less than 13 weeks of exclusive breastfeeding being significantly associated with increased risk (OR 3.6) (Silfverdal 1997). This case-control study included all cases of invasive HI infection recorded in the county in children under the age of 6 years. For each case, 3 controls were selected from the child health centre of the patient, matched by closest age, and gender. In total, there were 54 cases, and 139 controls who participated, as 3 cases, and 23 invited controls declined participation. A parent was interviewed using a standard questionnaire. HI infection was determined by a positive culture from a normally sterile location (blood, cerebrospinal fluid, bone, or joint fluid). Breastfeeding was described as either 'exclusive' (0-12 weeks, or $\geq$ to 13 weeks in duration), or 'any' breastfeeding (0-20 weeks, or $\geq$ 21 weeks).

Mean age for the cases was 21.6 months, and mean age for the controls when interviewed was 23.6 months. While the maternal recall period is shorter than many breastfeeding studies, it relies on the mother recalling feeding practices from about 2 years previously, but the 13 weeks is a convenient cut-off point, being 3 months of age. In a random sample of 15 cases, and 42 controls, 77% agreement was found between the breastfeeding data supplied by the mother, and child health records for cases, who tended to overestimate the duration of breastfeeding. In the controls, there was 72% agreement – mothers tended to underestimate the duration of breastfeeding. This recall bias may have led to an underestimation of the protective effect of breastfeeding. It is unclear whether the child health records contained information of exclusivity of breastfeeding. This study did not control for any variables in the analysis.

Coeliac Disease

In many European countries, coeliac disease has emerged as a public health problem (Ivarsson 2000). In Sweden, during the 1980's the incidence increased sharply, before declining again in the early 1990's. Ivarsson (2000) followed the Swedish national statistics – relating the trends in incidence of coeliac disease, to the reported infant feeding practices. Infant feeding practices were determined from national breastfeeding surveys, and by the reported annual sales of all products used in infant feeding. Average daily consumption of these foods was then calculated. A total of 4 408 816 retrospective, and 4 500 685 prospective person years of follow-up were included in this analysis. This analysis found that from 1981-1983 the average daily intake of wheat, rye and barley doubled, relating to a sharp increase in the incidence of celiac disease in 1984-1985. From 1989,

breastfeeding rates increased consistently each year. National recommendations included the delay of introduction of gluten from 4 to 6 months of age, but this was not reflected in infant feeding practices until 1995. In 1995 the average daily consumption of gluten decreased by one third, and the incidence started to fall sharply in the same year.

While the population trends may indicate that there is a relationship between gluten intake, breastfeeding practices, and the incidence of celiac disease, a prospective, case-controlled trial would need to confirm these observations, which might be incidental.

Infant Mortality

Exclusive breastfeeding has also been shown to be more protective against infant mortality than mixed, or partial breastfeeding. In a population-based case-control study of infant mortality in Brazil, infants who were given other milks in addition to breastmilk had 4.2 and 1.6 times the risk of death from diarrhoea and respiratory infections respectively, as compared to infants who received breastmilk as the only milk source (Victora 1987). Similarly, in Peru, it was found that infants who died from an infectious disease were 3 times more likely to have been exclusively breastfed for less than 1 month (Lu 2000).

In a meta-analysis of breastfeeding, and infant mortality rates, Betrán (2001) estimated that in Latin America, and the Caribbean, at least 55% of the infant deaths from diarrhoea and acute respiratory illness could have been prevented by exclusive breastfeeding for the first 3 months. This translates to 52 000

preventable deaths per year in this region. The breastfeeding data were obtained using recent nationally representative surveys from 16 countries in Latin America. Country level breastfeeding averages were calculated for infants 0-3 months, and 4-11 months. Data on infant morbidity and mortality were obtained from regional estimates, and these estimates were assumed to be applicable nationally. The attributable risk was used to calculate the fraction of deaths from diarrhoea and acute respiratory infections that could be prevented by exclusive breastfeeding in the first 3 months, and partial breastfeeding from 4-11 months. Relative risks were obtained from reanalysis of published data to match the age groups analysed. This analysis assumed maximal effect – i.e. if all infants were exclusively breastfed for the first 3 months – possibly an unrealistic scenario, but certainly one worth aiming for. The regional data on breastfeeding, and infant morbidity and mortality may not be reflective of the national average, and the relative risk of the mortality may also not be nationally applicable – there was no controlling for confounding variables such as socio-economic status, and sanitation, which have been shown to adversely affect infant morbidity and mortality. However, this is an interesting study, and emphasises the relative importance of the promotion of exclusive breastfeeding at a national level.

A recent study in Durban has shown that there is also a possibility that exclusive breastfeeding may protect breastfed infants against vertical HIV transmission (Coutsoudis, 2001). At six months of age, the rate of HIV transmission in the exclusively breastfed infants was the same as the never breastfed infants, 19.4%. The infants who had been mixed breastfed, had a transmission rate of 26.1%, which was significantly higher than that in the exclusively breastfed infants. The

main objective of this study was to investigate the effects of supplemental vitamin A on mother-to-child transmission (MTCT) of HIV. Women were counselled on infants feeding choices, and those who chose to breastfeed were encouraged to breastfeed exclusively. Infants were seen at 1 week, 6 weeks, 3 months, and 3 monthly thereafter until 15 months of age. If breastfeeding continued after 15 months of age, blood was drawn at least 3 months after breastfeeding had ceased. The analysis included 551 mother-infant pairs, 157 of whom chose to formula feed. Of the remainder, who initiated breastfeeding, 103 breastfed exclusively for at least 3 months, and a further 15 women were exclusively breastfeeding when they were lost to follow-up, so they were included in the exclusive breastfeeding category. A total of 276 women were mixed breastfeeding before the infant was 3 months of age. Since the women were not randomised into feeding methods, as this was considered unethical, the groups were not of equal sizes, which may have affected statistical calculations. The women did not differ significantly in any other risk factors associated with MTCT transmission of HIV, including preterm delivery, mode of delivery, duration of membrane rupture, maternal CD4:CD8 cell ratio, CD4 count, serum retinal level, or maternal plasma HIV-RNA levels. Since formula feeds were purchased by the mothers, socio-economic differences would be expected between those who chose to formula feed, and those who breastfed. Between the 2 breastfeeding groups, there was no significant difference in socio-economic status. This was a very important study, as it was the first to distinguished a difference in risk of HIV transmission according to breastfeeding type, and duration. This association is being tested further in several large studies in Zambia and South Africa (Coutsoudis 2001).

A recent WHO meta-analysis concluded that "it will be difficult, if not impossible to provide safe breastmilk substitutes to children from underprivileged populations" (WHO Collaborative study 2000), and this new information could facilitate safer infant feeding for those women for whom replacement feeding is unaffordable, and unsafe. Where exclusive breastfeeding is promoted in a community in which the population cannot afford to formula feed safely, the promotion of exclusive breastfeeding will improve the health of the whole infant population, irrespective of HIV status.

1.3.3. Infant Growth and Development

Infant growth and development is inextricably linked to feeding practices, and morbidity. Feeding breastmilk has been associated with significantly improved health in infants, and therefore, growth and development.

In the slums of Dhaka, infants who were exclusively breastfed in the first 3-5 months of life showed the best growth rate, which was still detectable at 12 months of age (Arifeen 2000). Partially, or non-breastfed infants grew at a significantly slower rate. The sustained effect on growth was even more beneficial for smaller infants (Arifeen 2000). This study included 1654 infants enrolled within the first 13 days of life, who were singletons. The infants were followed prospectively at 1,3,6,9 and 12 months, when they were weighed, measured for length, and a feeding history for the past 7 days was obtained. The infants were classified as either exclusively breastfeeding; predominantly breastfeeding (non-milk liquids included); partially breastfeeding (other milks and solids added); or not breastfed. This study controlled for a variety of variables. In this thorough,

prospective study in a slum area, exclusive breastfeeding was shown to have a prolonged positive effect on infant growth, independent of health status.

Similar results were found in Peru, where breastfed infants who consumed other milks during the first month of life gained less weight than exclusively, or predominantly breastfed infants. Infants who consumed breastmilk and other milks, and those that were fully weaned at 4 months were more likely to be underweight at 1 year. Weight gain in token breastfeeders was similar to that of fully weaned infants (Piwoz 1996). The prospective study enrolled 156 full term, singleton infants whose birth weight was $\geq$ 2500g, and had no congenital defects. Birth weights were measured by trained anthropometrists at, or within 1 week of birth, and were measured monthly thereafter for the first year of life, when a description of feeding practices was also obtained. This study had a small sample size, and only gathered feeding information once a month. The data were analysed in 2 different ways: infants were classified according to feeding method in the first 4 months, and kept in these categories as growth was plotted to the end of the first year. This was done to determine whether early feeding practices have a prolonged affect on growth patterns in a population of term, low birth weight infants. The second analysis classified the infants in their current feeding practices, meaning that the infants may move in and out exclusive, and mixed breastfeeding. In both analyses, those infants who were partially, or mixed breastfed showed a slower growth velocity than those who were exclusively, or fully breastfed. This study further showed a difference in growth patterns for those infants who are mixed fed with the addition of solids, or those mixed fed with the addition of other milks.

There has been considerable debate regarding the appropriate age of introduction of solids. In a randomised trial in Honduras a cohort of 97 low-income primiparous mothers who had exclusively breastfed for 4 months were randomly assigned to continue exclusive breastfeeding (n=50), or introduce solids provided by the research team, and either continue to breastfeed at the same frequency (n=44), or breastfeed ad lib (n=47) (Cohen 1994). Women were visited weekly in their homes, and on 3 occasions, stayed for 3 days at the lactation centre (16, 21, 26 weeks). During this time, maternal and infant anthropometric measurements were taken, and infant breastmilk intake was measured. In addition, observers visited mothers for 12 hours at 19 and 24 weeks to document infant feeding practices in the home. At 6 months, total energy intake, and growth were not significantly different in the groups, and weight gain was comparable to those of the affluent USA population. The researchers concluded that breastfed infants self-regulate their total energy intake when other foods are introduced, and therefore introducing complementary foods before 6 months gave no growth advantage, and might increase risk of illness through the introduction of contaminated foods.

In a second study with the same design, in a population of infants born small for gestational age (SGA: birth weight 1500-2500g), researchers assisted mothers to exclusively breastfed for the first 4 months, and then randomised them to either continue exclusive breastfeeding (n=59), or introduce complementary foods (provided to participants) (n=60), while continuing to breastfeed at their usual frequency (Dewey 1999). Infants were weighed weekly, while length and head circumference was measured monthly. A subsample of mother-infant pairs stayed overnight in a central facility at 16, and 26 weeks, in which time breastmilk intake

was measured by 24 hour test weighing. Breastmilk samples were taken to measure energy content. At 6 months of age, there was no significant difference between the 2 groups in weight gain, and therefore it was concluded that there was no growth advantage to the infant to introduce solids before 6 months of age.

When the 2 studies were combined, the infants exclusively breastfed to 6 months were crawling sooner (in both studies), and were more likely to be walking at 1 year (term, low birth weight infants), indicating earlier development of motor skills (Dewey 2001). While the 2 studies are small, they were carefully designed to select only those women who were exclusively breastfeeding after 16 weeks, and excluded any women who defaulted from the allocated feeding method. By providing the complementary foods to the mothers, the authors ensured that the infants received hygienic, nutritionally dense foods in addition to breastmilk, providing the 'best case scenario' for complementary feeding. Despite this, there was no advantage to early introduction of complementary foods.

Not only has exclusive breastfeeding been shown to be beneficial for the development of motor skills, but also cognitive ability at 5 years of age (Rao 2002). In a study of 220 infants born small for gestational age (SGA) in Sweden, infants exclusively breastfed for > 12 weeks had an 11-point IQ advantage over those breasted for 12 weeks, as opposed to a 3-point IQ advantage for 299 children born appropriate for gestational age (AGA) with similar durations of breastfeeding. The IQ of infants born SGA and breastfed for more that 12 weeks was not different to infants born AGA. Women were recruited antenatally, with a random 10% of all women attending the antenatal clinic being recruited as a control population, and

90% of the study group selected amongst women with at least 1 risk factor for delivery an SGA infant (smoker, previously delivered a premature infant, previous perinatal death, or low pre-pregnancy weight). Women who were not enrolled during pregnancy, but delivered an SGA infant were enrolled on the day of delivery. Following a detailed examination at birth, infants were evaluated during routine preventive care visits at 6 weeks, and at 3, 6, 9, and 13 months of age. During these visits, a detailed feeding history was obtained. At the 13 month visit, the child was examined, and a study paediatrician obtained information on any acute infections that were serious enough to warrant a visit to a physician. At 5 years, the children were traced, and assessed by psychometrists, and a paediatrician evaluated motor abilities. Individuals doing the assessment were blinded to SGA status, and breastfeeding history. This study effectively removed the researcher bias by blinding the assessors to the feeding practices in infancy. The study shows that infants at risk of lower IQ points can catch up the developmental delay through breastfeeding exclusively.

Exclusive breastfeeding is therefore required for optimal infant health and development. Water, juices, and other liquids or solids dilute the nutritional, and immunologic effects of breastmilk, and introduce contaminants and allergens, and are therefore not recommended. Exclusive breastfeeding is recommended for 6 months, with complementary foods being added thereafter (Cohen 1994; Dewey 1999; Greiner 1996).

Studies Supporting Exclusive Breastfeeding

Clinical outcome	Author, and Place	Study design	Results
Diarrhoea	Ketsela (1990) Ethiopia	Cross-sectional EBF vs MBF Aged <6 months; Diarrhoea in last 2 weeks	EBF: RR=1 MBF: RR=3.3
	Mondal (1996) West Bengal, India	Prospective Visits: weekly for 1 yr. EBF <4mo vs EBF ≥4mo	EBF≥4mo: RR=1 EBF<4mo: RR=3.02
	Perera (1999) Sri Lanka	Case control Hospital admission for diarrhoea after EBF stopped EBF <3mo vs EBF ≥4mo vs NBF	1-3 mo after EBF EBF ≥4mo: 4.3% EBF <4mo:26.6% NBF: 42.9% 4-6 mo after EBF EBF ≥4mo: 4.3% EBF <4mo:22.7% NBF: 57.1%
Respiratory Illness	Wilson (1998) Scotland	Follow-up of children aged 7 years EBF ≥ 15 weeks vs MBF	Ever EBF≥15wks: 17% MBF: 31%
Asthma and Allergies	Oddy 1999 Australia	Prospective EBF >4 months vs MBF	Asthma EBF>4 months: OR=1 MBF: OR=1.25
	Mimouni Bloch (2002)	Meta-analysis of 6 prospective studies EBF ≥3mo vs MBF	Allergic rhinitis EBF ≥3mo: OR=0.74 MBF: OR=1 Irrespective of family history of atopy
	Gdalevich 2001	Meta-analysis of 18 prospective studies EBF ≥3mo vs MBF	Atopic dermatitis EBF ≥3mo: OR=0.68 MBF: OR=1 Family History EBF ≥3mo: OR=0.58 MBF: OR=1

Studies Supporting Exclusive Breastfeeding Continued...

Clinical outcome	Author, and Place	Study design	Results
Meningitis	Silfverdal (1997) Sweden	Case control EBF < 13 weeks EBF ≥ 13 weeks Preschool children	EBF<13wks: OR=3.6 EBF≥13wks: OR=1 Protection increased with each additional week of breastfeeding
Infant Mortality	Victora (1987) Brazil	Case-control OBF vs BF	Diarrhoea OBF: RR=1 BF: RR=4.2 Respiratory infections OBF: RR=1 BF: RR=1.6
	Lu 2000 Peru	Retrospective Case control EBF vs MBF	EBF: RR=1 MBF: RR=3
	Betrán (2001) Latin America, and the Caribbean	Meta-analysis	Estimated that 55% of deaths from infectious disease could be prevented by EBF for the first 3 months
HIV Transmission	Coutsoudis (2001) South Africa	Prospective EBF >3 mo vs MBF vs NBF	Aged 6 months MBF: 26.1% EBF>3mo: 19.4% NBF: 19.4%
Growth and Development	Arifeen (2000) Bangladesh	Prospective Visits: 1,3,6,9,12 months EBF vs MostBF vs LessBF vs NBF	EBF infants grew best, and this was sustained at 12 months of age
	Piwoz (1996) Peru	Prospective	EBF infants grew best, and those that were fully weaned at 4 months were more likely to be underweight at 1 year. Weight gain in token breastfeeders was similar to that of fully weaned infants

Studies Supporting Exclusive Breastfeeding Continued...

Clinical outcome	Author, and Place	Study design	Results
Growth and Development cont...	Cohen 1994 Honduras	Prospective EBF for 4 months Randomised EBF to 6months vs MBF at 4mo Visits: weekly	BF infants self-regulate total energy intake and introducing other foods before 6 months gave no growth advantage, and might increase risk of illness through the introduction of contaminated foods
	Dewey 1999 Honduras	Prospective: SGA As above	As above
	Dewey 2001	Combined 2 studies above	EBF to 6 months crawled sooner, and were more likely to be walking at 1 year
Cognitive ability at 5 years of age	Rao (2002) Sweden	Prospective SGA EBF > 12 weeks BF AGA EBF > 12 weeks BF	SGA EBF>12wks: 11 points higher AGA EBF>12wks: 3 points higher

KEY

RR = relative risk

OR = odds ratio

SGA = small for gestational age

AGA = appropriate for gestational age

BF = breastfed

EBF = exclusive breastfeeding

MBF = mixed breastfeeding

NBF = non-breastfed

OBF = breastmilk as only source of milk

MostBF = more breastmilk than other feeds

LessBF = less breastmilk than other feeds

Wbf = weaned off breastfeeding

1.4. Obstacles to Exclusive Breastfeeding

While exclusive breastfeeding for the first 6 months is required for optimal infant growth and development, it is rarely practised. Infant feeding is inextricably linked to cultural, societal, economic, family dynamic, and personal considerations, and any attempt to change feeding practices requires an in depth understanding of the issues surrounding a mother's decisions (Makhlouf Obermeyer & Castle 1997).

1.4.1. Cultural Beliefs and Practices

Exclusive breastfeeding from birth requires that breastfeeding is initiated on the first day, and is continued uninterrupted, to the exclusion of all other liquids or solids, except multivitamins, and western medicines that are medically indicated.

Many cultures do not accept that colostrum is important, or sufficient as a food source (Haider 1999, Semega-Janneh 2001). In the past, in The Gambia, colostrum was been likened to pus, and called 'bad milk', 'hot milk', 'dark milk', or 'first milk'. Colostrum was not usually fed to newborn infants, as it was believed to cause diarrhoea. Expressed colostrum was not thrown on the ground, as it would cause the breasts to dry up. It was thrown on the roof, or walls. A wet nurse breastfed the infant until the mother's milk came in. Colostrum has however, become more acceptable, and is used by about 88.6% of mothers. However, many mothers who gave colostrum did so because there was nothing else to give the infant – the implication being that had there been anything suitable, they would not have fed colostrum (Semega-Janneh 2001).

In Bangladesh, although 93% of the respondents to a survey considered colostrum to be good, only 8% fed colostrum as the first food (Haider 1999). Honey, or sugared water was given to give the infant a 'sweet voice', and mustard oil was given to 'clean the mouth, throat and stomach'. This survey was conducted in a random sample of 1100 lower middle class mothers who had infants under the age of 6 months, to determine the influence of a breastfeeding campaign on mother's awareness and perceptions of messages, and the resultant effect on breastfeeding practices. It was clear that the messages were not sufficiently specific that colostrum alone was sufficient to satisfy the infant's needs. Breastfeeding promotional messages were more commonly heard on the radio, and infrequently from doctors.

In Nigeria, in a survey of 411 mothers of infants 4-28 months of age, most infants (99.8%) were given water after birth, while fewer (86.9%) were breastfed (Osundu Nwankwo 2002). In the first week of life, plain water was given to assuage thirst, glucose water to supplement food, for strength, and to prevent illness, and herbal teas to supplement food, and to prevent illness. Infant formula was given to promote growth. Most women were advised by the health care workers to supplement with water. While the recall period was quite long for the older children, most mothers could be expected to remember approximately when they initiated breastfeeding, and what they gave before breastmilk (Osundu Nwankwo 2002).

An earlier study in Nigeria, including focus group discussions with various homogenous groups of grandmothers, lactating mothers, pregnant women in their

third trimester, husbands, and community leaders, found exclusive breastfeeding was almost unanimously considered dangerous, as the baby has obligatory requirement for water, and herbal teas (Davies-Adetugbo 1997). Expressed breastmilk can also be used to poison, harm, or bewitch mother or infant, so would not be used by a mother who was separated from her infant. Early introduction of water, herbal teas, and complementary foods are designed to enhance child survival – in direct conflict with the WHO/UNICEF rationale that early exposure to contaminants increases morbidity and mortality (Davies-Adetugbo 1997).

The Nigerian women would not consider exclusive breastfeeding, as the infant would 'suck the mother dry', affecting the mother's health, and nutritional status. The baby would also be unsatisfied and cry a lot (Osundu Nwankwo 2002).

Similar concerns were voiced in Honduras, where mothers felt they lost too much weight during exclusive breastfeeding (Cohen 1999). These mothers were part of focus group discussions held at the end of a study where they had been encouraged to breastfeeding exclusively for 4, or 6 months. The focus group discussions were held to investigate the barriers to exclusive breastfeeding.

1.4.2. Insufficient Milk Syndrome

Globally, perceived insufficient milk is the most common reason for supplementation with other liquids, or solids (Makhlouf Obermeyer & Castle 1997).

Mother- and infant-related reasons have been given for this perception of insufficient milk.

In the Netherlands, infant-related reasons for supplementation usually include crying, perceived hunger, and colic, while physical problems, return to work, doubt about the sufficiency of breastmilk, and feeling restricted by breastfeeding were mother-related reasons for termination/supplementation (Bulk-Bunschoten 2001). This cohort was followed by doctors at well baby clinics across the country, and included 4438 newborns, who first visited the well baby clinic within the first month of life. The mothers visited the clinics on average once a month, where the infant's feeding practices were recorded. A minimum of 2 visits was required within a 4 month period, and a maximum of 8 visits were recorded. This study is interesting, but standardisation amongst the 121 participating doctors was not discussed. Higher education was significantly associated with exclusive breastfeeding.

These reasons did not differ from mother's perceptions in Honduras, who experienced perceived low milk production, infant colic, breast/nipple pain, poor latch-on, and pressure from relatives, and neighbours to supplement breastmilk (Cohen1999).

In Bangladesh, despite counselling, 25% of the mothers whose infants had been admitted to a diarrhoea ward, failed to exclusively breastfeed, and although they generally complained of insufficient milk, various factors such as domineering grandmothers, lack of financial support from their husbands, too much housework, or disinterest, also emerged as contributing factors (Haider 1997). These women had had intensive counselling in the ward, and were followed up 2 weeks later at home. It was evident that despite their infant's illness, and counselling and

support in the hospital, exclusive breastfeeding was not perceived as important enough, or feasible for these mothers.

The perception of insufficient milk seems to be linked to maternal confidence, and support from others. In focus group discussions, it was found that women often lacked knowledge about the mechanics of breastfeeding, and provision of general support, and timely information, can reduce the risk of supplementation (Marchand 1994).

1.4.3. Social Support

Women have a need for one-to-one support in order for breastfeeding to succeed (Kyenkya-Isabirye 1990). As so aptly put by Popkin "Infant feeding is not simply a biological process in response to the metabolic demands of the infant. It is also a complex web of behaviours involving the actions and reactions of other people" [quoted by Richter (1998)]

Most women decide how they want to feed their infant early in the pregnancy, or, before becoming pregnant. The earlier the decision to breastfeed is made, the longer the duration is likely to be (Losch 1995, Ozturk Ertem 2001).

Information regarding infant feeding is frequently obtained from husbands, or partners, siblings, mothers, friends, co-workers, and health care providers. Mothers who have active support from the infant's father, or another significant person are 3 times more likely to breastfeed than those who don't have support (Raj 1998). Positive attitudes, and confidence in ability to breastfeed have been

found to be more important predictors of initiation of breastfeeding than knowledge (Losch 1995). Women with moderate to poor social support have been found to be most likely to discontinue breastfeeding (Hoddinott 2000).

Hoddinott (2000) followed 279 consecutive births in 3 general practices in inner London. Health visitors collected data at 10-14 days post delivery, and at the immunisation visit at 3-4 months. Stepwise logistic regression was conducted on the 160 women who initiated breastfeeding to determine factors predicting outcome at 3 months. Young women, and those with moderate to poor emotional support were less likely to still be breastfeeding at 3 months. White women who left full-time education at, or before 16 years of age were least likely to be breastfeeding at 3 months.

The importance of emotional support was further verified in a recent study in the United States of America, where it was found that, while knowledge and problems during lactation were not associated with breastfeeding duration, a mother's confidence regarding her ability to breastfeed was significantly associated with duration of breastfeeding (Ozturk Ertem 2001). The 64 women in this study were eligible for the Women, Infants and Children Program (WIC), a feeding programme for low-income families. The women were enrolled into the study if they spoke English, and were eligible for WIC, delivered a healthy, term, singleton infant, planned to bring their infant to the hospitals primary care centre, and initiated breastfeeding within the first 24 hours. The women were interviewed telephonically at 1 week postpartum, personally interviewed at 2 weeks postpartum at the well baby visit, and data were collected from their medical

records at 2 and 4 months. At 2 weeks postpartum, most mothers reported having experienced difficulties with breastfeeding. These included cracked and painful nipples, infant vomiting, infant fussing, insufficient milk, breastfeeding was tiring, and prevented mother from going out, and jaundice, and maternal illness. Maternal age <20, and lack of confidence about continuing breastfeeding until 2 months of age were significantly associated with discontinuation of breastfeeding at 2 weeks, and by 2 months. Those mothers who lacked confidence were almost 12 times more likely to discontinue breastfeeding by 2 months (Ozturk Ertem 2001).

Descriptions of social discomfort often cited as reasons for rejecting breastfeeding include embarrassment, 'leaking breasts', fear of pain or discomfort, limitations on freedom and social life, and concerns that the father will not be involved in the feeding process (Losch 1995). If nutritional, and bonding aspects do not outweigh the perceived embarrassment, inconvenience, and insecurity of breastfeeding, then bottle feeding is chosen (Marchand1994).

1.4.4. Health Care Workers

Most mothers come into contact with health care workers at some stage during pregnancy, delivery, or post-natally. Advice from health care workers can be considered of primary importance (Guerrero 1999, Ozturk Ertum 2001) or of secondary importance (Marchand 1994), but since health care workers have contact with pregnant women, and new mothers, their attitudes can play a role in feeding decisions made by mothers.

However, health care workers have been found to give conflicting information (Losch 1995), and give significantly less positive encouragement than trained lactation consultants (Humenick 1998). Health care workers often have not remained abreast of changes in breastfeeding recommendations, and have been found to be the ones giving incorrect information (Osondo Nwankwo 2002).

In the Philippines, antenatal care from a doctor, and delivering in a hospital was found to be significantly associated with mixed breastfeeding, and reduced rates of breastfeeding (Abada 2000). Data for this analysis were used from the Philippines National Demographic Health Survey, and the Integrated Survey of Households, and included 1659 women, who had participated in both surveys, which was representative of the general population.

In hospitals where the health care workers have been specifically trained to encourage and support mothers to breastfeed exclusively, women are more likely to exclusively breastfeed (Perez-Escamilla 1995). This study included hospitals in Brazil, Honduras, and Mexico. Subjects were recruited in maternity wards before discharge, and followed up twice at home in the first 4 months. At least 2 hospitals in each country participated in the study, and at least one of the hospitals had breastfeeding promotional programmes in place. The target population in all hospitals was women in a low-income bracket. Unfortunately the practices were not standardised in the 3 countries. Brazil excluded low birth weight infants, but they were not excluded in the other countries, and the second follow-up visit ranged from 2-4 months. The breastfeeding promotion programmes were not the same, and were at various stages of development. The questionnaires were,

however, standardised across the 3 countries. Women who planned to breastfeed exclusively were more likely to do so in practice. This study is interesting, but had serious methodological flaws because of the inconsistent application of enrolment criteria, breastfeeding promotion programmes, and follow-up periods.

In a survey of the thoughts and experiences of the mothers who had been part of a study to determine the optimal duration of exclusive breastfeeding, mothers stated that their main motivation to exclusively breastfeed came from the help, support and advice received from the study staff (Cohen 1999).

Studies researching hospital practices have found that when hospital staff have been specifically trained in lactation management, exclusive breastfeeding rates increase dramatically, as compared to hospitals where no breastfeeding intervention is implemented (Kramer 2001, Valdés 1993, Valdés 2000, Barros 1995, Haider 1996, Westphal 1995, Cattaneo 2001).

To promote breastfeeding, and ensure that hospital practices do not continue to negatively affect breastfeeding rates, the Baby-Friendly Hospital Initiative was developed jointly by the World Health Organisation (WHO) and the United Nations Children's Emergency Fund (UNICEF) in 1991 (Philipp 2001). A set of criteria was developed, culminating in the 10 steps required to be present in order for a hospital to be accredited as 'Baby Friendly'. These 10 steps include the following:

Ten Steps to Successful Breastfeeding

1. Have a written policy that is routinely communicated to all health care staff
2. Train all health care staff in skills necessary to implement this policy
3. Inform all pregnant women about the benefits and management of breastfeeding
4. Help mothers initiate breastfeeding within half an hour of delivery
5. Show mothers how to breastfeed, and how to maintain lactation if they are separated from their infants
6. Give infants no food or drink other than breastmilk unless medically indicated
7. Practice rooming-in – allow mothers and infants to remain together 24 hours a day
8. Encourage breastfeeding on demand
9. Give no artificial teats or pacifiers to breastfeeding infants
10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or clinic.

In an evaluation of failed breastfeeding promotions, Stokamer (1990) noted that lack of administrative support, and its consequences, significantly reduce the effectiveness of breastfeeding promotion. The attitudes of staff and administration towards breastfeeding will decide the outcome of the promotional efforts, before they begin.

Integration of a breastfeeding project into a larger project has been found to be ineffective, and it is strongly recommended that breastfeeding is promoted without an additional agenda, to ensure that sufficient time and energy is used to concentrate of specific breastfeeding issues that affect the target population, rather than generalised, non-specific messages (Greiner 1999). Where messages are general, or non-specific, changes in breastfeeding patterns do not occur (Haider 1999).

1.4.5. Knowledge, and Past Experience

Although knowledge may not influence the decision to continue breastfeeding, it may influence certain behaviours. Most women choose to breastfeed because it is perceived to be good for the infant, and protective against illness. As already mentioned, timely intervention regarding the mechanics of breastfeeding can help a woman to continue exclusive breastfeeding confidently (Cohen 1999, Marchand 1994).

In Bangladesh, a significant relationship was found between knowledge, and practice of giving colostrum (Ahmed 1999). Those who knew that the first food should be colostrum were 3 times more likely to give colostrum. A total of 1787 married women who had delivered within a year of the survey were interviewed using a standard questionnaire, and the mean maternal age was 25 years. Women between the ages of 20-24 were more likely to give colostrum to their infants, but the likelihood decreased with mother's education. This age group may be significant, as they may have been more receptive to modern messages, and old enough to make their own decisions, and have their own social network.

Older women would have already had children, and be more set in their ways, while teenagers might be too young, and depend on their elders for guidance. It has been found that younger women are most likely to discontinue breastfeeding early (Hoddinott 2000).

Women who have had previous positive breastfeeding experiences are more likely to breastfeed their second child, while breastfeeding rates decreased rapidly when mothers had breastfed their previous child for less than 3 weeks (Humenick 1998). Mothers were recruited antenatally, and followed until the infants were weaned, or aged 20 weeks, whichever came first. Women were recruited if they were primiparae, or giving birth to their second child. One third were recruited because they were predicted to be at low risk of perceived insufficient milk, and two thirds were predicted to be at high risk of insufficient milk. The basis for these predictions was not described. Telephonic follow-up was conducted at 2,4,6,8,12,14,16,and 20 weeks by one of 2 women who gave no information or support, and had no health background. Multiparae breastfed according to previous breastfeeding experiences, irrespective of the advice they received, while primiparae responded rapidly according to the advice given.

1.4.6. Socio-economic Status

While women around the world have the same need for social support, encouragement, appropriate information for health care workers, and have similar experiences during breastfeeding, socio-economic factors influence the women's decisions differently in the developed, and the developing world.

In the developed world, young women, with a lower socio-economic status, who have a not attended college, and delivered a low birth weight baby are less likely to breastfeed than their more affluent, better educated counterparts who had a baby of normal birth weight (Hendershot 1984, Ryan 1991, Hoddinott 2000, Bulk-Bunschoten 2001).

In a meta-analysis of 4 national fertility surveys in the United States, Hendershot evaluated breastfeeding practices from 1965 to present day trends. In this thorough analysis, demographic, and socio-economic data were collected in addition to infant feeding data. Similarly, Ryan (1991) compared the national fertility studies to an independent study by Ross Laboratories, and found similar trends between 1955 and 1987.

In developing countries, maternal education has been found to be the most important determinant of breastfeeding duration – they are inversely related (Pérez-Escamilla 1993, Grummer-Strawn 1996, Abada 2000). Women with a better education are more likely to be employed away from the home, encouraging the use of formula. Being unemployed has been positively associated with exclusive breastfeeding (Pérez-Escamilla 1995).

Pérez-Escamilla (1993) conducted a meta-analysis of 9 Latin American and Caribbean countries using the Demographic and Health Surveys. Due to inconsistencies on data reporting, the proportion of infants breastfeeding at 0-2 months was used as a proxy for breastfeeding initiation, and breastfeeding referred to any infant who received breastmilk. Data were not collected

concurrently, and ranged from 1986-1989. An inverse relationship was found between breastfeeding and birth attendance by health care workers.

In a larger meta-analysis, Grummer-Strawn (1996) included 6 Latin American countries, 3 Asian/Pacific countries, and 6 African countries to determine the effect of changes in the population characteristics on breastfeeding trends. All the countries had taken part in 2 major survey programmes, which were similar, and conducted about 1 decade apart. The World fertility survey (WFS) was conducted in the late 1970's, and the Demographic and health survey (DHS) was conducted in the late 1980's. For each time point, the average number of women participating per country was 5000. Maternal education was the most important determinant of continued breastfeeding – the odds that a child would still be breastfeeding at any given age were 1.9 times greater than those of a child whose mother had at least 7 years of education. Children in homes of higher socio-economic status were significantly less likely to be breastfed. In every country, urban children were breastfed for shorter durations than rural children, and women who used modern methods of contraception were less likely to breastfeed.

Women with a higher socio-economic status are also more likely to formula feed (Grummer-Strawn 1996, Pérez-Escamilla 1995). In developing countries, bottle feeding is a symbol of status, and considered 'good' (Semega-Janneh 2001).

1.4.7. Maternal Characteristics

"Women initiate and continue breastfeeding, and introduce supplementary foods and drinks, for reasons which are sound to them, even if they lack a scientific basis or are contrary to medical opinion" King and Ashworth (1987) [quoted by Richter (1998)].

Early supplementation with formula, or other liquids, or solids, has been found to reduce the duration of breastfeeding. The later formula is introduced to the breastfed infant, the longer the duration of breastfeeding (Abada 2000). Similarly, the use of a pacifier has been negatively associated with breastfeeding duration (Hörnell 1999). Hörnell (1999) studied exclusive breastfeeding among 506 infants in Sweden, based on daily recordings by the mother, and fortnightly visits by a research assistant, until the mother's second menstruation postpartum, or a new pregnancy. The mothers had previously breastfed for at least 4 months. Exclusively breastfed infants using a pacifier frequently at 2 weeks had a mean duration of breastfeeding of 8.1 months, as compared to the 9.7 months in non-users.

Exclusive breastfeeding is often considered time - consuming, and women complain that they do not have enough time to attend to all their chores (Cohen 1999).

In an attempt to quantify time required for different methods of infant feeding, Cohen (1995) conducted a study observing women for 12 hours in their homes, calculating the time spent on infant feeding at 19 and 24 weeks postpartum.

Women who were exclusively breastfeeding were compared to women who were giving breastmilk, and other supplemental foods. The total time devoted to breastfeeding was similar in both groups, averaging at about 75 minutes per 12 hours, but significantly more time was spent by the mothers who were giving other foods as well as breastmilk. All women spent on average 2-3 hours 'free' – resting, watching television, or chatting. Of the group who were giving supplemental feeds, 60% of the mothers said that breastfeeding was very demanding, and other feeds were given to extend the time between breastfeeds. It was obvious from this study that time constraints were not a barrier to exclusive breastfeeding, but may be a perceived barrier.

In developing countries (Guinea Bissau, West Africa), women commonly cease breastfeeding due to illness in the child, or mother (Jakobsen 1996). Illness of the child, new pregnancy of the mother, and maternal illness were associated with a significantly shorter lactation period, compared with children who were weaned because they were 'healthy' or 'old enough'. The study population included 945 children followed every second month until breastfeeding ceased. Average age of weaning was 22.6 months. Maternal education, birth order, number of dead siblings, and maternal age all influenced the duration of breastfeeding, but the mother's reason for cessation was found to be independent of these socio-economic factors.

1.4.8. Urbanization

Urbanization has been found to have a significant effect on breastfeeding – reducing both initiation, and duration (Perez-Escamilla 1994). Breastfeeding patterns in Africa, Latin America, and the Caribbean region were compared to determine the role of urbanisation. An inverse relationship was found between urbanization, and breastfeeding initiation, and duration, with varying effects among regions with different socio-economic backgrounds, and cultures (Perez-Escamilla 1994).

Urbanisation frequently occurs synonymously with increased employment opportunities for women, which in turn often impacts negatively on breastfeeding. Returning to work frequently disrupts breastfeeding due to lengthy separation. Fein (1998) found that in the United States, breastfeeding initiation and duration was not affected in mothers who were employed on a part time basis, but full time employment significantly affected initiation, and duration of breastfeeding. This study used mail response questionnaires, inviting women in their third trimester of pregnancy to enrol. Questionnaires were sent twice in the first month, monthly from months 2-7, and again at 9, and 12 months. For this analysis, the antenatal, and the 1and 3 month questionnaires were used. Mothers with more than 6 weeks of leave were more likely to initiate breastfeeding than non-working mothers. Mothers with no maternity leave breastfed for as long as those who did not work, but any amount of maternity leave was associated with a significantly shorter duration of breastfeeding. Breastfeeding initiation was positively associated with maternal education, maternal age, having friends who breastfed, parents having been breastfed as infants, and complications during pregnancy.

Negative associations with breastfeeding included expectation about embarrassment at nursing, time until mother held the infant, having a physician as a birth attendant, cigarettes smoked during pregnancy. Mothers with one or more children who had not been breastfed were less likely to initiate breastfeeding. The use of mailed questionnaires restricts the study population to women who are literate, and motivated to fill in a questionnaire, thereby creating a bias. These same women may be more interested in infant health, and more motivated to breastfeed, creating further bias. Socio-economic factors were not controlled for, and this might influence the type of work the woman is engaged in, as well as her motivation to breastfeed.

Women returning to work less than 6 weeks postpartum were significantly less likely to initiate breastfeeding in the United Kingdom, and older, more highly educated women who had attended antenatal classes, who were breastfed themselves, who did not smoke, and were giving birth to their first child were significantly more likely to breastfeed (Noble 2001). This study recruited over 14 000 pregnant women through a self-completed questionnaire at 32 weeks gestation, and another one at 4 weeks postpartum. Complete questionnaires were available for 8665 women, and these were used in the analysis. While 83.5% of the women who planned to work postpartum initiated breastfeeding, only 75.2% of the women not planning to work initiated breastfeeding. This difference was significant ($p=0.001$). Women who planned to commence work less than 6 weeks after delivery were significantly less likely to initiate breastfeeding compared to women not intending to work. The mother was more likely to initiate breastfeeding if she was older, and had a higher education, and she planned to

attend child birth classes. Initiation was less likely if the mother smoked during pregnancy, or gave birth to her second, or subsequent child. Again, this study required participation by motivated, literate women, thereby creating bias, and reducing the application to a wider population.

In a meta-analysis of data from 15 developing countries, Hight-Laukaraan et al (1996) found that most women with babies under the age of 6 months are not employed, or take their babies to work with them. Employment was not the main determinant of breastmilk substitute use.

As the population becomes more urban, and more developed, mass media play a larger role in influencing behaviour. In Britain, television programmes and newspaper articles were assessed to determine the media portrayal of infant feeding. Bottle feeding was shown more often than breastfeeding, and was presented as being less problematical. Bottle feeding was associated with ordinary people, while breastfeeding was associated with middle class, or celebrity women. The health risks of formula milk, and health benefits of breastmilk were rarely mentioned (Henderson 2000).

Barriers to exclusive breastfeeding are "...inextricably linked to the construction of the family, gender and motherhood at different historical times, and in different parts of the world, and the prevention of early discontinuation of breastfeeding requires a better understanding of the issues and cultural context. Perceptions of infant growth and infant crying are one of the main reasons that determine supplementation before 4 months. Women, in bottle feeding, give up the

impossible task of compensating with their own bodies for the shortcomings of a social and material environment which is hostile to women and children, and attempt to offload some of the burden of parenting and food production onto men. Thus, involvement of the father in parenting may be one of the important cultural factors in the insufficient milk syndrome. Most importantly, all these measures will only succeed to the extent that they are accompanied by social and economic measures to counteract the factors underlying insufficient milk – namely poverty, sexism, and powerlessness." (Makhlouf Obermeyer & Castle 1997)

1.5. HIV and Infant feeding

One of the tragedies in the HIV pandemic is the fact that life-saving breastmilk can transmit HIV.

The first case of MTCT transmission of HIV was reported by Ziegler in 1985, who based the report on a breastfeeding mother who had been infected with HIV soon after delivery through a blood transfusion with infected blood. Since this discovery, many papers have attempted to determine the risk of HIV transmission through breastmilk.

The first meta-analysis was conducted using studies that either identified mothers who were infected with HIV through blood transfusion soon after delivery, provided they were identified before suspicion of infection in the child, or repeat serological testing of a cohort of mothers who were seronegative at delivery (Dunn 1992). This meta-analysis identified 4 such studies, and determined a risk of transmission of 29%. These 4 studies included very small numbers – in total only 42 women. This meta-analysis could only determine the risk of transmission when the mother had been newly infected, and would therefore be at a higher risk of transmission due to high serum viral loads. The delay of 6-8 weeks - window period where the HIV virus load would be too small for detection – might have further complicated analysis, as some infants may have still been breastfeeding at their last negative HIV test.

When analysis included the additional risk of breastfeeding in already HIV-infected women, the risk was calculated as the difference in rate of infection in infants who

had been breastfed, as compared to those who were bottle fed. Six studies were identified, which had very small numbers of breastfed infants, and large numbers of formula fed infants. A weighted average was calculated to be 14% excess risk. There was a range in the duration of breastfeeding, from 2 weeks, to more than 9 months. One study did not record duration of breastfeeding.

In an international multicentre pooled analysis of infants prospectively studied, who were HIV uninfected, confirmed DNA PCR (Leroy 1998). Data from Ivory Coast, Rwanda, Kenya, Europe, France, Switzerland and the USA was analysed, where breastfeeding ranged from 1-100%. A cut-off point of 2.5 months was determined to ensure no infants who had been infected during delivery were included. The date of the first DNA-PCR negative result was used as the date of entry into the study. The contribution of the breastfeeding period was extended 2 months after cessation, to allow for occurrence of seroconversion. Median length of breastfeeding exposure was 15.5 months, and the cumulative risk of late postnatal transmission as calculated as 0.7% at 6 months, 0.95% at 9 months, 2.5% at 12 months, and 9.2% at 36 months.

While this study noted that the duration of breastfeeding affects transmission rate, it may have excluded too many infants. Subsequent to this study, postnatal transmission is accepted as transmission after 6 weeks. Any infants who were infected between 6 weeks, and 10 weeks would have been omitted by this study. The transmission rate was much lower than that of Dunn (1992), and some of this difference may be accounted for by this omission. There was no mention of the use of antiretroviral drugs in the developed countries.

In Malawi, a prospective cohort study followed 672 infants in the first 2 years of life (Miotti 1999). Infants had to be negative at their first postnatal visit (median age: 1.7 months). The risk of HIV transmission per month was calculated as follows: 0.7% for months 1-5, 0.6% for months 6-11, 0.3% between 12 and 17 months, and 0.2% between 18-23 months. No mothers received antiretroviral drugs. The cumulative risk of breastfeeding was 10.3% at the end of 23 months, which was still lower than the findings of Dunn et al (1992).

In a recent study from Durban, it was found that not only duration, but pattern of breastfeeding is important to consider when determining the risk of transmission through breastmilk (Coutsoudis 2001). In this prospective study, women who chose to breastfeed were counselled and encouraged to practice exclusive breastfeeding for up to 6 months. At 6 months, the rate of transmission was the same in the infants who were formula fed and those who had been exclusively breastfed for at least 3 months: 19.4%. Transmission in the mixed breastfeeding group was much higher at 26.1%. At 15 months the transmission rate remained lower among those who had been exclusively breastfed $\geq$3 months than among the other breastfeeders 24.7% verses 35.9%.

Support for exclusive breastfeeding has also come from preliminary results from a recent study in Kisumu, Kenya (Taren 2000). In this study, the incidence of HIV infections was greater for infants who started mixed breastfeeding before 120 days compared with those who started after 120 days ($P<0.05$). However, the effects of viral load and severity of maternal illness were not factored into the results.

Infants who are born with HIV, i.e. those infected with HIV during pregnancy and delivery, have been found to have a later onset of AIDS, less Pneumocystis carinii Pneumonia (PCP) and less chronic diarrhoea, in a small, observational study in Los Angeles (Frederick 2000). Similarly, HIV-infected infants in the formula feeding arm of the Kenyan study had a significantly increased risk of hospitalisation between 9 and 12 months of age, as compared to those who were breastfed (hazard ratio 8.7; P=0.05) (Mbori-Ngacha 2001).

The mechanism associated with the protection against HIV infection in exclusively breastfed infants is unclear, but there are several postulated reasons, including:

a) The reduction of dietary antigens and enteric pathogens, that might damage the gut mucosa, or cause inflammatory responses

b) Promotion of beneficial intestinal microflora that may increase resistance to infection, and modulate immune responses

c) Specific antiviral activities within the breastmilk

d) Maintenance of the mammary epithelial integrity that may reduce the viral load in breastmilk (Smith 2000).

In developing countries, where the infant mortality rate is high, the risk of HIV transmission through breastmilk must be balanced against the risk of death from not breastfeeding.

A meta-analysis (Brazil, Pakistan, Philippines) conducted by the World Health Organisation (WHO) calculates the mortality from diarrhoea, acute respiratory infections, and other infectious diseases to be 5.8 times that of breastfed infants in

the first 2 months of life. Risk of mortality due to infectious diseases decreases with age (WHO 2000). The authors of this WHO collaborative study concluded: "Our results suggest that it will be difficult, if not impossible, to provide breastmilk substitutes to children from underdeveloped populations."

In 1997, a joint statement by WHO, UNICEF, and UNAIDS read as follows: "When children born to HIV-infected women can be assured of uninterrupted access to nutritionally adequate breastmilk substitutes that are safely prepared and fed to them, they are at less risk of illness and death if they are not breastfed. However, when these conditions cannot be met – in particular in environments where infectious diseases and malnutrition are the primary causes of death during infancy – then artificial feeding substantially increases children's risk of illness and death." (WHO. HIV and Infant Feeding. *Guidelines for Decision Makers.* Geneva: WHO, 1998).

The only prospective, randomised trial on infant feeding and HIV transmission took place in Kenya (Nduati 2000). Women were randomised to breastfeed, or formula feed, and data were analysed on an 'intent to treat' basis, irrespective of the actual feeding practices of these women. There was 96% compliance in the breastfeeding arm, and 70% compliance in the formula feeding arm. Women were not encouraged to breastfeed exclusively, and median duration of breastfeeding was 17 months. Mothers randomised to formula feeding received free formula, and extensive instruction regarding preparation. Eligibility criteria included being a resident in Nairobi, and having access to municipal water for the duration of the study. There were 401 mother-infant pairs that were included in the analysis. The

estimated risk of breastfeeding transmission was 16.2% for 2 years of breastfeeding. While HIV-free survival was significantly higher in the formula fed infants (58% vs. 70%; P=0.02), there was no significant difference in the overall 2-year mortality rates (24.4% in breastfeeding arm vs. 20.0% in the formula feeding arm; P=0.3).

Mbori-Ngacha (2001) included 371 of these infants for a more intensive examination of morbidity and mortality rates. Pneumonia was the most common cause of death (53%), followed by failure to thrive (41%), diarrhoea (39%) and sepsis (10%). During the first 3 months of life, infants in the formula fed arm had an increased risk of diarrhoea (RR 2.7), dehydration (RR 11.9), and upper respiratory infections (RR 1.3). The cumulative risk of mortality at 3 months was higher in the formula fed infants (6.4%) than the breastfed infants (4.1%). When the non-HIV infected infants were analysed separately, cumulative mortality was 5% in the formula fed infants, as compared to 0.8% in the breastfed infants at 6 months of age. Breastfed infants had significantly better nutritional status over the 2-year period than formula fed infants. Malnutrition occurred in 15% of the formula fed infants, and 9% of the breastfed infants. This study is the only randomised controlled trial available, but there are serious flaws in it. The study presents the worst-case scenario for breastfeeding –prolonged, mixed breastfeeding; and the best case scenario for formula feeding – sufficient free formula to meet the infant's nutritional needs, municipal water, extensive education regarding mixing formula, and quick access to clinic facilities should the infant become ill (living in town, and therefore close to the hospital; and on a study therefore receiving better medical treatment than is generally available at

government facilities). These luxurious facilities are rare in Africa. The mortality rate in the formula feeding arm (infants who would have represented a higher socio-economic status because of access to clean water, and sanitation) was 4.9 times that of the national average mortality – unacceptably high. The findings of this study seriously question the wisdom of providing free formula to women in developing countries. While there is a huge expense in the provision of formula, in the ideal situation of clean water, extensive counselling, and easy access to medical care, there are no health benefits, specifically, no reduced mortality.

Mathematical modelling draws similar conclusions, when calculations are made with seroprevalence similar to that found in South Africa (Walley 2001). In low income settings, use of antiretrovirals were calculated to result in approximately 360 deaths avoided per 100 000 live births when the seroprevalence is 25%, while the addition of free formula would reduce the gain to only 30 deaths avoided, due to the increased risk of death from infectious diseases. In a middle income area, where formula feeding would be more accessible, there would be a net increase of 1080 child deaths per 100 000 live births, due to the 'spill over' effect, whereby non-HIV infected women would also formula feed, because formula is given out in clinics, and therefore considered superior to breastmilk.

The effects on breastfeeding of provision of milk powder by clinics was notable from the early 1930's (Makhlouf Obermeyer & Castle 1997). Distribution of free formula results in the product being seen as actively endorsed by health personnel, who are more socially powerful and prestigious. The higher the

prevalence of HIV, the more formula will be distributed, and the more visible the activities will be.

Recent evidence of the displacement of breastfeeding can be found in the assessment of the PMTCT programme in Botswana, where the package includes provision of free infant formula (UNICEF, 2002). In clinics where there is a PMTCT programme, breastfeeding rates in HIV-uninfected women have decreased by 20%. Exclusive breastfeeding, while rare, has decreased markedly in the PMTCT sites. In urban areas, non-PMTCT sites have an exclusive breastfeeding rate 3 times that of PMTCT sites, while in rural areas, exclusive breastfeeding is almost 6 times more prevalent in non-PMTCT clinics, compared to those who have initiated the PMTCT project. Not only has breastfeeding been reduced, but the safest form of breastfeeding has all but disappeared in the PMTCT sites.

In an evaluation of the PMTCT programme in the Western Cape, South Africa, it was evident that there is still considerable confusion regarding issues of infant feeding in the context of HIV (Chopra 2002). The programme recommended that HIV positive women avoid breastfeeding. Of the 11 HIV positive mothers who were interviewed, all had formula fed. While the mothers had been informed of the risk of HIV transmission through breastmilk, none had been informed of the risks of not breastfeeding. Only 6 of the 11 reported receiving any advice on how to correctly prepare formula, and the information was very limited. None were advised on how often to feed the formula. Nearly all the participants complained about running out of formula, and they either bought more themselves, or fed the

infant sugar water, or sweetened fruit drinks. All mothers limited milk feeds per day to conserve milk. Of the 11 health workers interviewed, only 1 could accurately define exclusive breastfeeding, and only 2 knew how a mother could increase her milk supply. While all health workers reported telling HIV-infected women not to breastfeed, 8 felt uncomfortable doing so. Although small, this study highlights several important aspects regarding PMTCT. Most importantly, is that the nursing staff are ill-equipped to counsel women on infant feeding choices. Women did not receive balanced counselling of the risks and benefits of feeding options, but were rather 'told' to formula feed. This denies women their constitutional right to knowledge, and free choice. The nursing staff did not know the risk of transmission through breastmilk. The nursing staff either did not know, or did not perceive the importance of counselling regarding formula preparation, nor were they equipped to help a breastfeeding woman to continue breastfeeding, as they were unaware of how to deal with the most prevalent difficulty faced by breastfeeding women – insufficient milk. Insufficient formula was provided to the women, which may well have led to malnutrition in the infants. This aspect was beyond the scope of the study, but highly relevant, considering the findings of Nduati (2000) that 15 % of the formula fed infants were malnourished.

The relative risk of death from infectious disease is dependant on easy access to safe water, an uninterrupted supply of sufficient formula to meet the infant's nutritional needs, intensive counselling and training and home follow-up regarding preparation methods, good hygiene, a supportive home environment, and frequent clinical follow-up with intervention for growth faltering (Humphrey 2001).

The relevance of these factors to conditions in South Africa are of paramount importance in policy development for PMTCT programmes.

Easy access to safe water

In South Africa, only 38.7% of the population has access to piped water within the home (South African Health Report 2001). Without easy access to clean water, the risk of feed contamination is high. In 2000, South Africa experienced a cholera epidemic, mainly because there is insufficient access to safe water. Between August 2000 and January 2002, there have been 109 645 reported cases, and 23 025 case fatalities.

Uninterrupted supply of sufficient formula to meet the infant's nutritional needs

Despite provision of formula to women in the formula feeding arm of the Kenyan study (Nduati 2000), 15% of the infants were malnourished at 2 years of age.

In the study by Chopra (2002), all mothers complained about the insufficient milk given to the infants. These mothers limited the milk intake, and supplemented the infants with sugar water, and fruit concentrates. These are not nutritionally appropriate. With an official unemployment rate of 23.3%, and expanded unofficial rate of 36.2% in 1999, there is a large portion of the population who will not be able to supplement the supplied milk with additional milk.

In South Africa, the governmental policy is to provide formula for 6 months. Circumstances seldom change substantially within 6 months, so those mothers who could not afford formula when the infant was born are unlikely to be able to

afford formula after 6 months, and may cease giving milk altogether. This would seriously worsen the already serious level of malnutrition in South Africa (stunting: 22.9%; underweight: 9.3%; wasting 2.6%) (SAVACG 1994).

Intensive counselling and training and home follow-up regarding preparation methods

Half the women on the study (Chopra 2002) received a small amount of information regarding preparation of infant feeds. The other half received no information.

There is a vast lack of information regarding HIV and infant feeding, as demonstrated by the nursing staff who had been working in the PMTCT site, and were therefore already at an advantage. This matter needs to be urgently addressed to enable nursing staff to give clear, accurate information to mothers.

Knowledge regarding correct lactation management is as important as formula preparation, to ensure those women who chose to breastfeed are not discriminated against.

Good hygiene

Hygiene practices are closely related to water availability. In South Africa, 9.4% of the population do not have access to a toilet, but washing hands thereafter is more difficult, due to the low numbers of households that have piped water.

In 1998, South Africa had an infant mortality rate (IMR) of 45/1000 live births, rural IMR being higher than urban, 52.2/1000 and 32.6/1000 respectively. This increased to 54/1000 in 1999 (South African Health Report 2001).

A supportive home environment

HIV in South Africa is still associated with significant stigma (Chopra 2002). In structured interviews with care-givers, people did not want to have any contact those who were infected with HIV, and reportedly gossip and laugh at them. Of the HIV positive women who were interviewed, all, but one had disclosed their status to a partner or family member, and while 2 partners had left, the others had been supportive.

Farquhur (2001) found that infant feeding choices were significantly associated with disclosure to the partner, and concluded that in societies where breastfeeding is the norm, it may be difficult for women to decide to use formula without spousal consent.

Frequent clinical follow-up with intervention for growth faltering

There is no consistent follow-up of infants at clinics, or in homes at present.

There will always be a percentage of women for whom the risks of formula feeding will be outweighed by the risks of breastfeeding. These women will include those who have piped water, and sanitation in their homes, facilities to ensure adequate hygiene standards are maintained, and who live in a supportive home environment. These women are certainly eligible for formula feeding, but

will probably be able to afford to purchase formula for themselves. They will need to evaluate the risk of HIV transmission through breastmilk compared to the risk of death from infectious diseases due to formula feeding. According to the Kenyan study the risk will be almost equal (Nduati 2000).

Those women who do not have piped water and sanitation in their homes are less likely to maintain adequate hygiene levels due to the water availability, and are the ones more likely to unable to purchase formula for themselves. The infants in these homes have an increased risk of mortality because of the hygiene standards, and the provision of formula may exacerbate this. The risk of HIV transmission through breastfeeding as compared to the risk of death from infectious diseases due to formula feeding has not been evaluated.

Exclusive breastfeeding for the first 6 months of life, when the infant is most vulnerable to infectious diseases, will benefit the entire infant population, irrespective of HIV status. This method of feeding has been shown to significantly reduce the risk of transmission of HIV through breastfeeding, and allows at least 2 options at 6 months of age, when additional foods are required to maintain optimal nutritional status. The mother can abruptly wean the infant off the breast, and continue with formula feeding, or alternatively, the mother can express and heat treat her milk to kill the HIV virus. The latter method is more cost –effective, and maintains 80% of the biological value of the milk, but in most cases, requires disclosure of the mother's status.

The provision of free formula for 6 months is a short term solution, which then leaves the under-resourced mother with a huge dilemma when the baby is 6 months old. She no longer has any breastmilk, and is unlikely to be able to afford sufficient milk to sustain adequate growth and development in her infant. If the mother has not disclosed her status, she is more likely to mixed breastfeed. Nduati (2000) reported 70% compliance with the formula feeding arm of the study, but non compliance might have been as much as 60% (Coutsoudis 2001).

Not only does provision of free formula affect the mother who is infected with HIV, but has significant spill over effects for the HIV-negative mother. The cost of the 'free formula' to the government will therefore not only be the cost of formula, but the additional burden of illness, and the required medications, on the health budget, and the loss of productivity for those mothers who work, and must take time off to care for a sick infant.

It is a woman's constitutional right to have access to unbiased, accurate information regarding the health and well-being of her child. When a mother is counselled in an unbiased manner regarding the risks and benefits of each feeding method, she will make a decision that is appropriate for her social, economic, and personal situation. Her decision should be supported by the counsellors, and she should be helped, and encouraged to develop the appropriate skills to make her feeding choice as safe as possible. Where free formula is handed out, the woman's judgement may be clouded – formula is an expensive commodity (Coutsoudis 2002).

1.6 Breastfeeding Trends in the last Century

1.6.1. The United States of America and Canada

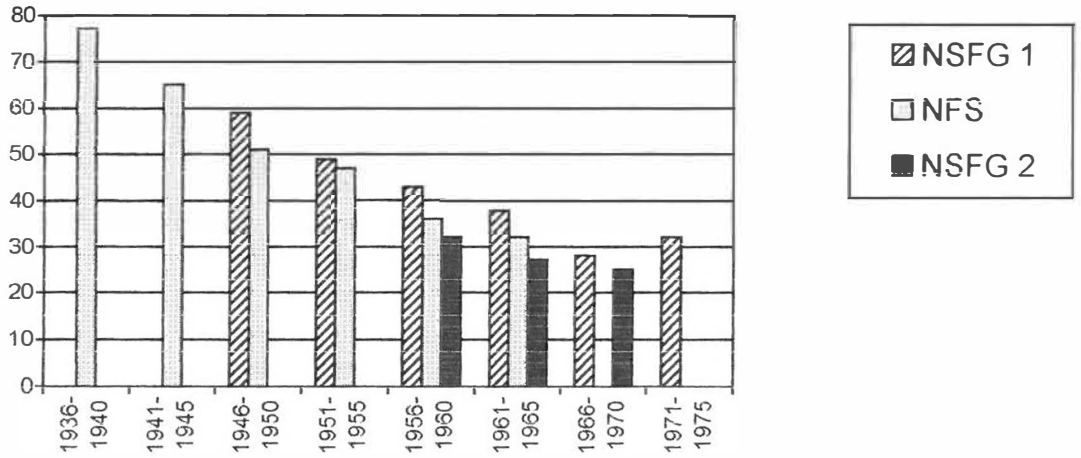
In the last century, breastfeeding rates plunged from more than 70% of women initiating breastfeeding in the 1940's, to a low of around 25% initiating breastfeeding in the 1970's (Hendershot 1984).

There have been several long term national (or representative) studies collecting data regarding breastfeeding in the United States, and consequently there is plenty of data on breastfeeding practices since the turn of the century. Major studies contributing to breastfeeding data are national fertility studies, and long term infant feeding studies – primarily collected by private companies who manufacture formula. The National Fertility Studies were designed to collect data on marriage, pregnancy, contraception, fecundity, reproductive health services, and socio-economic characteristics. Breastfeeding rates were recorded due to the interest in lactational amenorrhoea, and it's effect on fertility. These studies were carefully calculated to be representative of the population, but are limited in that they mainly collected data on married women. In1965, data were collected on married women only, while in 1970, data included 'ever married' women – a larger portion of the population, but still not representative of all women who bore children. However, they included all the children born to the married women – whether they were born in-, or out- of wedlock. The surveys in 1982 and 1988 were representative of all women, irrespective of marital status.

National Surveys of Family Growth in 1973 and 1976 included women with children, irrespective of marital status, but the sample size was small. A significant

disadvantage of these surveys, however, is that there were many years between infant feeding, and the survey, and this could have resulted in recall bias, but the survey also just ask whether breastfeeding was ever initiated. Figure 1 below shows the breastfeeding trends over time, according to these data.

Figure 1. Breastfeeding Trends In The United States of America (Adapted from Hendershot 1984)



NFS: National Fertility Studies

NSFG 1: National Surveys of Family Growth (1973)

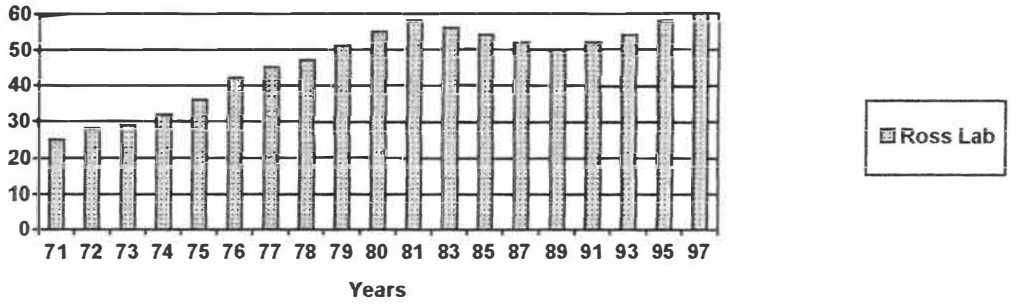
NSFG 2: National Surveys of Family Growth (1976)

In 1958, women who had not attended high school, or who had attended college were equally likely to breastfeed, while women who had attended high school were less likely to breastfeed. During the 1950's and 1960's, disadvantaged mothers were as likely to breastfeed as advantaged mothers, but the subsequent decline was more rapid in disadvantaged mothers, and by the end of the 1960's, advantaged mothers were more likely to breastfeed than disadvantaged mothers (Hendershot 1984).

From its nadir in the early 1970's, there was a resurgence of breastfeeding until the mid-1980's, where there was another decline in the breastfeeding rates (Wright 2001). Declines in breastfeeding were most noticeable in the following circumstances: family income less than $15 000; maternal education only including grade school; maternal age <25 years; mother unemployed; and African-American women. The breastfeeding rates were reported from the Ross Laboratories Mother's Survey.

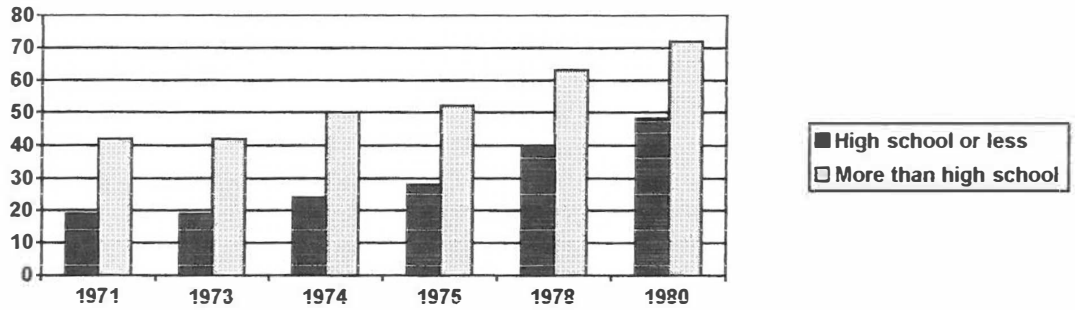
Ross Laboratories, a private company producing infant formula has conducted surveys of infant feeding practices since1955 (Ryan1991, Wright 2001). The sample is drawn from a list of infants recently delivered in hospital – the list includes 70% of all infants born in hospital. A questionnaire is mailed to the mothers, and because it is dependent on their response rate, poorly educated mothers are under-represented in the sample. In 1980, the responses from these mothers were weighted to try to accommodate this sampling error, but this assumes that the mothers who responded had the same feeding practices as those who did not respond – not necessarily an accurate assumption. While this survey is completed within 6 months of delivery, and therefore more accurate, it excludes single mothers, and non-hospital births.

Figure 2. Percentage of Women Initiating Breastfeeding in the United States of America (Adapted from Wright 2001)



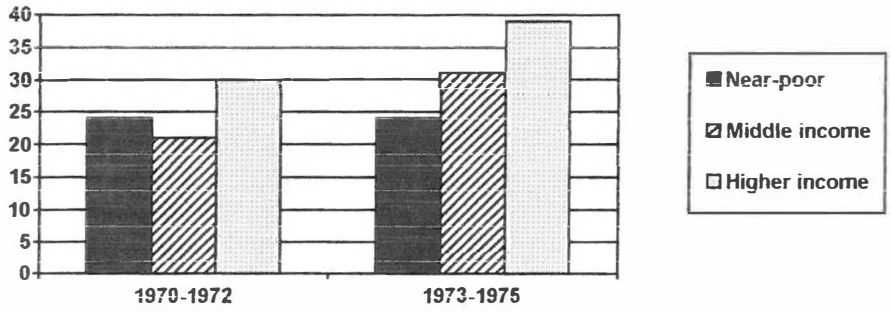
As noted, there was a difference in breastfeeding initiation according to maternal education. Those mothers who had higher education were more likely to breastfeed than those who had not completed tertiary education (Ryan 1991). Breastfeeding was relatively high among white, older, college educated, urban women living in the western regions who had an infant of normal birth weight, while Black women, with less than college education, living in the rural, southern regions, who were younger, and had a infant with lower birth weight were least likely to breastfeed (Ryan 1991).

Figure 3. Education and Breastfeeding: Percentage of Infants Ever Breastfed According to Maternal Education (Adapted from Ryan 1991).



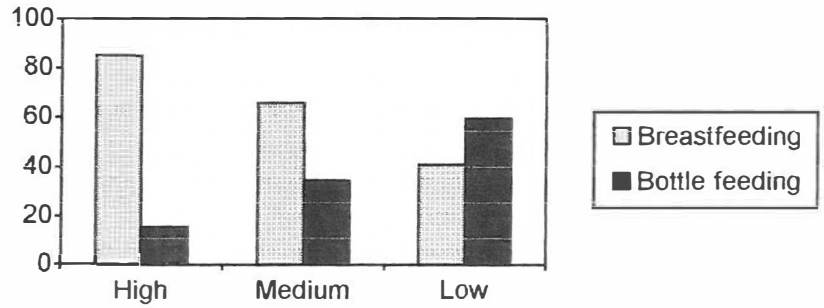
Often associated with, or a determinant of maternal education is income, which has also been associated with different breastfeeding rates. The Survey of Family Growth (Hendershot 1984) found a noticeable difference in income at the time of the survey, and breastfeeding practices. It should be noted that income at the time of the survey may not have been similar to income at the time of the infant's birth.

Figure 4. Percentage of Women Who Ever Breastfed, According to Income at Time of Survey (Hendershot 1984)



These results were similar to those of Beaudry (1995), who found that Canadian women of high socio-economic status were more likely to breastfeed than women on low socio economic status. In this study, breastfeeding was defined as 'any breastmilk', while bottle feeding was defined as 'no breastfeeding'.

Figure 5. Breastfeeding, and Bottle-feeding in Mothers of Different Socio-economic Status (Adapted from Beaudry 1995)

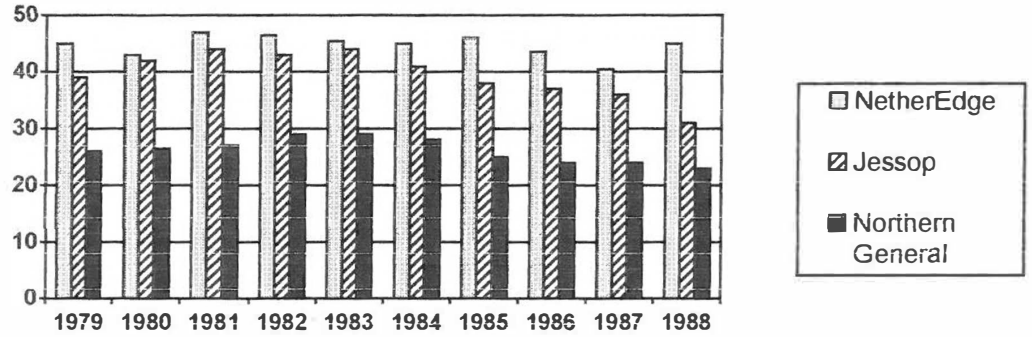


1.6.2. The United Kingdom

Similarly, in the United Kingdom, breastfeeding initiation has been documented to vary according to socio-economic status (Emery 1990).

While national statistics were not obtained, breastfeeding rates in Sheffield were recorded over 10 years, from 1979 to 1988, as part of the Sheffield Child Development Study. There are 3 main maternity units, in which over 98% of all infants are delivered. Nether Edge Hospital is on the west, close to the more affluent areas of the city, Northern General Hospital, on the south side of the city, serves the inner city and the east, and Jessop Hospital serves the university campus, and contains the main neonatal intensive care unit (Emery 1990). Breastfeeding initiation declined in all 3 hospitals, but was most obvious in Jessop Hospital, with a concentration of small infants, and mothers with obstetric problems. Between 1987 and 1988, breastfeeding initiation continued to decline in the other 2 hospitals, but increased in Nether Edge Hospital, consistent with trends in the United States of America reported by Wright (2001), and the socio-economic trends reported by Hendershot (1984).

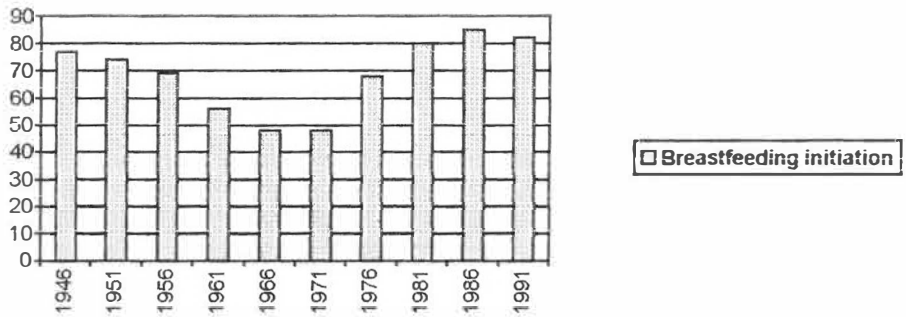
Figure 6. Breastfeeding Initiation According to Hospital in Sheffield, UK (Adapted from Emery 1990)



1.6.3. Australia and New Zealand

New Zealand suffered the same post-war decline in breastfeeding that the other developed countries experienced, but they had a system of Plunket Nurses, who conduct home visits, from 2-3 weeks, to about 6 weeks postpartum (Essex 1995). Plunket family centres have also been established. These are free day centres staffed by Plunket nurses, trained in lactation management. Breastfeeding educational programmes have also been introduced into schools for 13-14 year olds. In 1991, over 80% of the infants seen by Plunket nurses at 2-3 weeks, were breastfed.

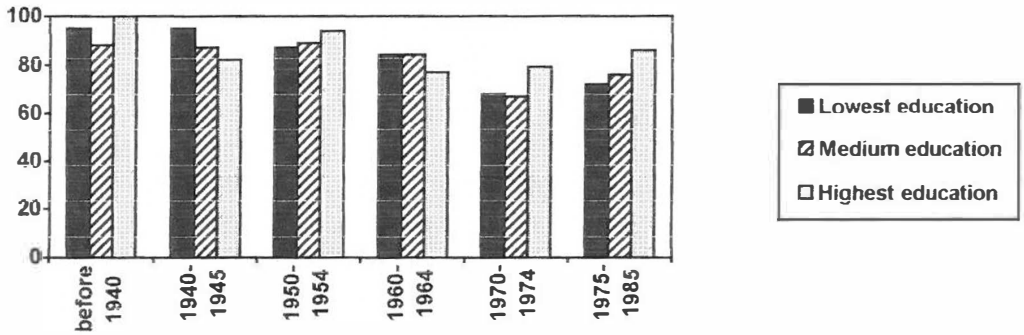
Figure 7. Breastfeeding Practices in New Zealand (Adapted from Essex 1995)



Although Australia also experienced a drop in breastfeeding during the 1970's, the breastfeeding prevalence has remained remarkably high, as compared to other

developed countries (Siskind 1993). The survey was conducted between 1982-1985, and data were collected as part of a case-control study of breast cancer in relation to breastfeeding and diet. Mean age at interview was 54.8 years, which may have seriously affected the mother's ability to recall breastfeeding duration accurately, but they would probably have remembered whether or not they initiated breastfeeding. Breastfeeding trends relating to educational status also emerged, with mothers in the highest educational category the ones who led both the decline, and incline in breastfeeding prevalence, as shown in figure 8.

Figure 8. Infant Feeding Trends in Queensland, Australia, in Relation To Educational Level (Siskind 1993)



1.6.4. Latin America and the Caribbean

In developing countries, the effect of socio-economic status is reversed. More affluent mothers, with a higher education are less likely to breastfeed. A strong inverse relationship was found between births attended by health care workers, and mean duration of breastfeeding (Perez-Escamilla 1993).

This analysis included 9 developing countries in Latin America, and the Caribbean. All the countries had participated in 2 major survey programmes, the World Fertility Survey (WFS), and the Demographic and Health Survey (DHS). Both

studies were nationally representative in all countries, used cross sectional data, included mothers in a similar age range, and were conducted between 1986 and 1989.

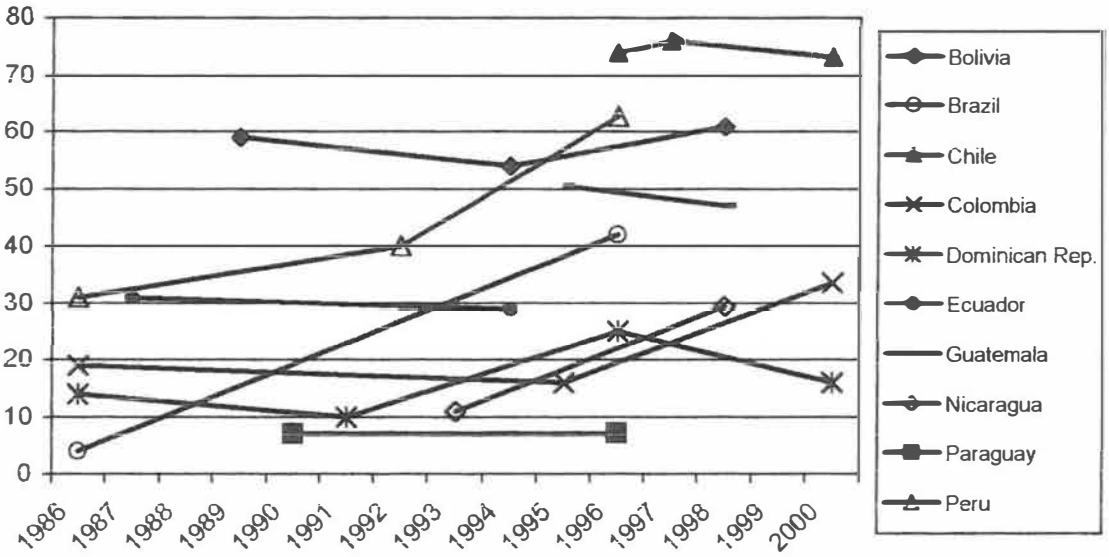
Similar findings were reported from the Philippines (Abada 2001), where consulting a doctor for antenatal care was associated with an increased risk of 1.964 for early cessation of breastfeeding. Women with tertiary education were 1.53 times more likely to stop breastfeeding early compared to women with no education. The later infant formula was introduced to the infant's diet, the longer the duration of breastfeeding. These data were collected as part of the National Demographic Health Survey, conducted in 1993. A representative sample of the population was surveyed.

An analysis of breastfeeding trends in 15 developing countries in Latin America, the Caribbean, and Africa, compared breastfeeding duration as reported by 2 major survey programmes, the World Fertility Survey (WFS), and the Demographic and Health Survey (DHS), which had been conducted approximately 10 years apart. Both studies were nationally representative in all countries, and included approximately 5000 women per country (Grummer-Strawn 1996). The mother's level of education was an important determinant of continued breastfeeding – a mother with no education was 1.9 times more likely to breastfeed than a mother with more than 7 years of education. Children in homes with a lower socio-economic status were substantially more likely to be breastfed, and rural children were more likely to be breastfed than urban children. Most countries showed an increase in breastfeeding duration during the decade, except

Sri Lanka, Thailand, Morocco and Tunisia. Breastfeeding initiation was not presented.

Unfortunately, all these studies focussed on duration of breastfeed, and did not report specifically on breastfeeding initiation, although prevalence was given at 1 time point in the first meta-analysis (Perez-Escamilla 1993), this was insufficient to identify trends. The latest data available is that of exclusive breastfeeding rates in infants under 3 months of age, from UNICEF (UNICEF 2002).

Figure 9. Breastfeeding Trends in Latin America, and the Caribbean – Exclusive breastfeeding 0-3 months of age (UNICEF 2002)



1.6.5. Africa and Asia

There is very little data on breastfeeding trends in Africa, but the latest information from UNICEF is represented in graphical format in figures 10 to 12.

Figure 10. Breastfeeding Trends in Sub Saharan Africa – Exclusive breastfeeding 0-3 months of age (Adapted from UNICEF 2002)

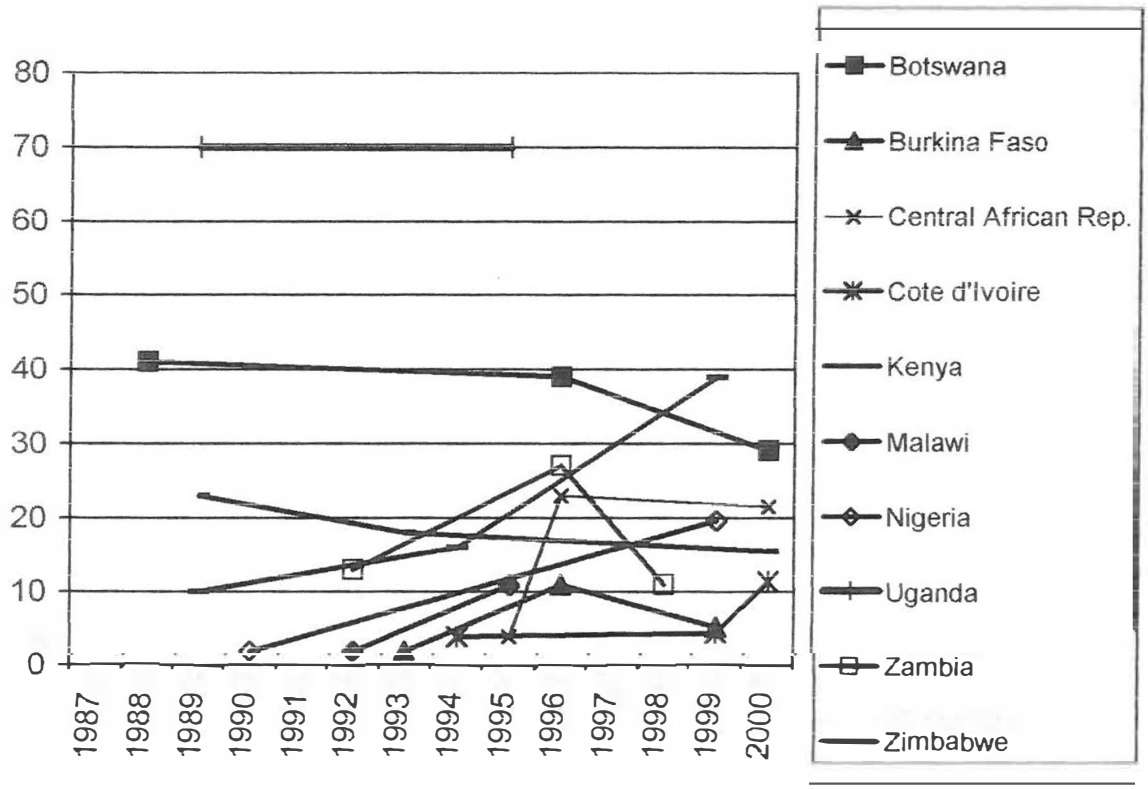


Figure 11. Breastfeeding Trends in Asia – Exclusive breastfeeding 0-3 months of age (Adapted from UNICEF 2002)

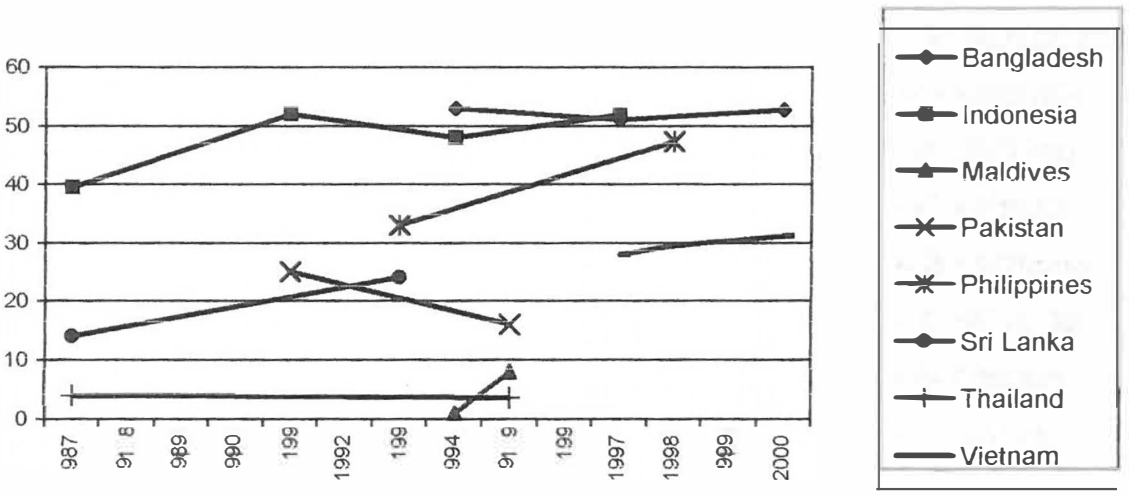
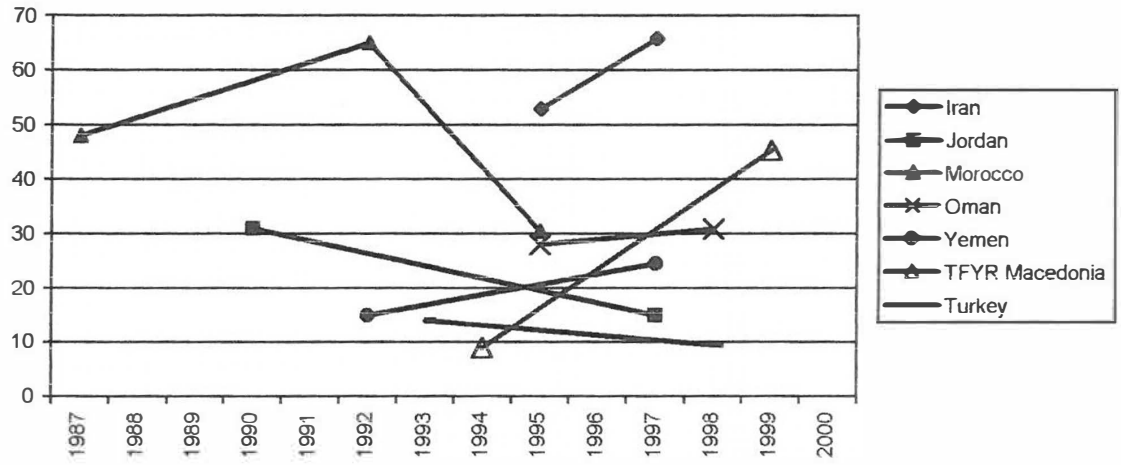


Figure 12: Breastfeeding Trends in the Middle East and Northern Africa – Exclusive breastfeeding 0-3 months of age (Adapted from UNICEF 2002)



While most developed countries are experiencing increasing breastfeeding trends, there are many developing countries in which breastfeeding is declining. It is interesting to note that breastfeeding has declined most in those countries that have been torn by strife, or hit hardest by HIV. This could be due to the fact that women are under extreme pressure, and have no support during war, and there is little encouragement for breastfeeding in the face of the HIV pandemic.

1.7. Breastfeeding Practices in South Africa

There is very little national data on breastfeeding in South Africa. The latest figures from the Demographic Health Survey (1998) was that exclusive breastfeeding is very rare in South Africa –only practiced by 10.4% of the mothers with infants under 3 months of age (UNICEF 2001).

In 1994, the South African Vitamin A Consultative Group (SAVACG) conducted a National Vitamin A survey, including serum assessments, anthropometric measurements, and collected socio-economic, and health data on a standardised questionnaire. Data were collected on children between the ages of 6 and 71 months. This study found that 91% of rural children and 83% of urban children were ever breastfed. Overall, 5% (range 2%-11%) of the children had been breastfed for fewer than 3 months, with more urban mothers breastfeeding for a shorter period (8% of urban children vs. 4% of rural children breastfed for less than 3 months). There was a tendency for the younger children to have been breastfed for fewer months than the older children (less than 3 months). While employment did not significantly affect breastfeeding prevalence, a significantly higher percentage of well educated mothers breastfed for less than 3 months. The survey collected a vast array of data and was not designed to collect specific information on breastfeeding. There was no data on exclusive breastfeeding.

Most other reports on breastfeeding have been area-specific, and will be described, and then summarised at the end.

The only study reporting trends over time was from KwaZulu Natal (KZN) (Ross 1983). This study included 4 groups, of women. Group A consisted of 309 women attending the child welfare clinic in KwaMashu in 1977, and Group B included 491 women attending same clinic in 1981. Group C included 706 women attending 9 different child welfare clinics scattered throughout KZN, and Group D included 293 women attending rural clinics 6 scattered throughout KZN interviewed by clinic sisters. Women were interviewed within 24 weeks of delivery. Most women initiated breastfeeding (89%-99%). By 13-24 weeks, 98% of rural women were still breastfeeding, but 17-25% of the urban women had discontinued breastfeeding. Group A had the lowest rate of breastfeeding at 1-2 weeks postpartum, and they experienced the most rapid decline, with only 11% of the infants being fully breastfed at 10-13 weeks. Reasons given for introducing supplementary feeds included: 'not enough milk', 'baby not satisfied', or returning to work. In Group A only 64% of the women remembered receiving advice regarding breastfeeding antenatally, while 99% remembered receiving advice in 1981. The use of supplemental feeds in the immediate postpartum period was more common in Group A, where 50% of the women gave some form of supplement, as compared to 34% of the women in Group B. Initiation of breastfeeding occurred later in Group A, where 49% reported delayed initiation, while in Group B, 48% breastfed within 6 hours of birth. This study shows an improvement in breastfeeding practices by 1981 in KwaMashu, through improved clinic practices – more antenatal education, and reduced time between delivery, and initiation of breastfeeding. As has been found in other studies, rural women practiced breastfeeding for longer than urban women. It is unclear when the data were collected from the outlying clinics – there is no date given. The study did not

consider type of breastfeeding, but rather only whether the mother was breastfeeding, or not.

In 1999, 99% of women in rural KZN were still initiating breastfeeding (Faber 1999). This study took place 60km north of Durban, in a rural community (Ndunakazi), and aimed to assess nutritional status and dietary practices of 4-24 month old children in rural South Africa. All children attending growth monitoring posts were recruited - 115 children in all. The mean age was 14.5 months. At the time of the interview, 80% of infants 4-12 months, and 56.9% of infants in 12-24 months were breastfed. More than 60% of infants were introduced to water within 1st month of life - 46.5% within 1 week. Most (96%) of the infants had started solids by 4 months. The most commonly used first food was maize porridge. Commercial infant cereals were eaten by 11% of the population. Unfortunately, this study did not use age points that were consistent with other studies, making comparisons difficult. There is a low rate of cessation of breastfeeding in this population, compared to urban women in 1981 (Ross 1983).

In Gauteng, breastfeeding practices were found to be similar to those reported by Ross (1983). Ransome (1988) interviewed 200 randomly selected mothers who had infants of approximately 12 months of age, and lived in the suburbs surroundings Coronation Hospital. While 97% of the mothers initiated breastfeeding, by 4 weeks, 20% had introduced formula. Only 50% were still breastfeeding at 20 weeks postpartum, and most mothers (80%) had introduced solids by 12 weeks of age. Commercial infant cereal was used by 83,5% of the mothers as the first food, and pureed fruit or vegetables was used by the rest of

the mothers. The majority of mothers stopped breastfeeding because the 'baby refused breast', they reported insufficient milk, or were returning to work. Breastfeeding was ill defined in this study, with no mention of feeds other than formula, and solids. The data tables were poorly displayed, and explained.

Delport (1988) reviewed practices in private hospital through interviews with 51 mothers 4-5 days postpartum. None of the mothers stated that professional advice had influenced them to breastfeed. Most mothers decided to breastfeed before becoming pregnant (56.9%), or during pregnancy (39.2%). Some mothers (3.9%) had decided post delivery to breastfeed. No mothers received any factual information on breastfeeding, but 29.4% had had a breast examination as part of routine antenatal care. Most mothers (75.9%) had held their infant immediately postpartum, but only 43.1% of mothers had breastfed during this time, despite the duration being 2.5 hours. Of the mothers who had initiated breastfeeding in this time, 60% had received active support from nursing staff. The infants were then removed for average of 10.4 hours, before being returned to the mother. Mean initiation of breastfeeding occurred after 20.6 hours. This study shows that many opportunities were lost, where health workers could have encouraged mothers to breastfeed. There is no mention of where in South Africa the study took place. While practising breastfeeding was not a criteria for inclusion in this study, the initiation rate was not mentioned, and it is therefore assumed that only breastfeeding mothers were interviewed.

In Bophuthatswana 210 primiparous mothers with children aged 12-23 months were interviewed at home to determine breastfeeding practices in the Gelukspan

Health Ward (Ferrinho 1991). Only 1 child was never breastfed. The median age of cessation was 13 months; married women breastfed for longer than unmarried women, 15.2 months and 11 months respectively. Longer duration of breastfeeding was associated with being married, having a planned pregnancy, and a belief that breastfeeding should be for a long period. The median duration of exclusive breastfeeding was 1 month, and solids were introduced at a median age of 4 months, although 42% of the mothers had introduced solids before this time.

Longer duration of breastfeeding was also noted in the North West Province, where 61% of the mothers breastfed for longer than 18 months (Steyn 1993). In this population of 108 mothers or caregivers, 96% of the mothers initiated breastfeeding, and 90% were still breastfeeding at 6 months of age. However, 10% introduced solids in the first month of life, and 59% had introduced solids by 3 months. Maize porridge was the most common first food used (82%). There was no comment on the use of other liquids such as water, or teas, and breastfeeding was not well defined. There was no mention of exclusive breastfeeding. The mothers were interviewed when their children were 3-5 years of age, and this may have influenced their ability to recall dates accurately.

In Mitchell's Plain, all mothers who delivered babies in December, had a term infant weighing more than 1499g, and agreed to participate were interviewed to determine breastfeeding practices (van der Elst 1989). All mothers who experienced breastfeeding difficulties were referred to the hospital breastfeeding clinic. Mothers were followed up after 6 months, in their homes. A total of 450

mothers were interviewed before leaving the hospital. Most mothers had seen (83%), and held (77%) their infants within 1 hour of delivery. The reported first feeds were breastmilk (54.6%), formula (37.5%), and water (1.1%). Of those who first gave breastmilk, only 10% had breastfed within the first hour. Most mothers breastfed between 1-4 hours after delivery (49%), and 41% breastfed more than 4 hours after delivery. When asked what milk is best for infants, 92% of the mothers responded that breastmilk was, with 4% preferring formula, and 1% unsure. Seventy two percent of the original cohort was traced at 6 months of age, where 50% reported to have breastfed exclusively to 3-4 months of age, and 32% to 6 months. Exclusive breastfeeding was not defined by the researchers, and unlikely to have been used appropriately, as most mothers intended to breastfeed according to a schedule, and give their infants water between feeds. Since other researchers report a rapid decrease in breastfeeding in the first 3 months (Ross 1983, Ransome 1988), or early introduction of solids (Faber 1999, Ferinho 1991, Steyn 1995) it is unlikely that breastfeeding rate would have only decreased by 4%, especially when the mothers had specifically stated that should they experience any problems, they would change to formula feeding.

In a survey of the nutritional status, and feeding practices of infants between 3-7 months of age, breastfeeding initiation in Cape Town was found to be similar to other parts of South Africa (99%) (Croucher 2000). Mothers of 100 apparently healthy infants were interviewed consecutively in a primary health care clinic. No mothers breastfed exclusively, and the majority (86.9%) had stopped by 2 months postpartum. Most mothers, (70%) were using infant formula, of whom only 42.9% prepared the formula correctly, while 42.9% over diluted, and 14.2% over-

concentrated the formula. Water was given by 72% of the mothers, of whom 75% had introduced water before 1 month of age, and 64.2% introduced solids before 4 months, due to 'insufficient breastmilk' (Croucher 2000).

Information regarding breastfeeding was gathered as part of a project to determine health knowledge and practices in mothers attending a child health clinic in Cape Town (van Staden 1995). A random sample of 267 mothers with infants 0-24 months was interviewed, and were divided into the following age categories: 0-1 month; >1-3 months, >3-6 months, >6-9 months, >9-12 months, >12-18 months, and >18-24 months. In the 0-1 month age category, only 56% of the infants received breastmilk as the only milk source, and only 1 infant was exclusively breastfed. A further 22% received formula in addition to breastmilk, and the remaining 22% were formula fed. There was a sharp decline in the use of breastmilk after 3 months, which then remained stable until 1 year of age, declining sharply again. By 1 year of age, 25% of the infants received breastmilk as the only milk source, 22% were feeding breastmilk and formula, and 53% were using formula only. Mothers who were younger than 25 years, single, and delivered a low birth weight baby had the poorest child care knowledge, and either bottle fed, or fed breast and bottle. Older, married, women with a normal birth weight baby, had better child care knowledge, and were more likely to use breastmilk as the only milk source.

Only 1 South African prospective study to determine infant feeding practices has been documented (Bland 2002). This study followed 119 infants for 16 weeks. A further 15 mother-infant pairs were lost to follow-up but were included until the

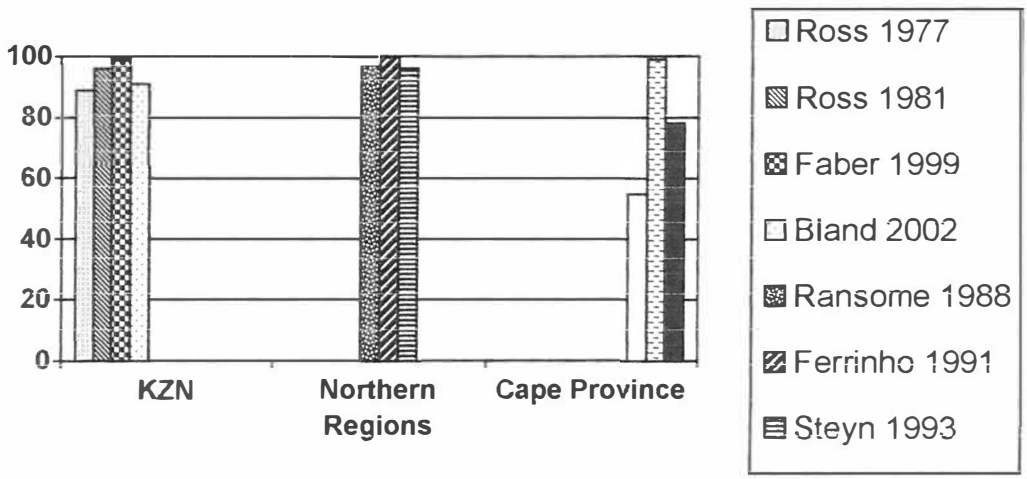
point of departure. Forty seven percent of the infants received other fluids or feeds within 48 hours of birth, and most infants had dropped out of the exclusive breastfeeding category by 2 weeks of life. Only 17% were exclusively breastfed at 2 weeks, 6.9% to 6 weeks, and 2% to 16 weeks of age. Non-prescription medications were commonly given, and 46% of the infants had received over the counter medications by 6 weeks of age, and 75% by 12 weeks. Formula, water, and semi-solids were the most commonly given supplements, mainly for reasons of an 'unsatisfied baby', and 'insufficient milk'.

The authors also conducted a cross sectional study in the same clinics. All mothers attending the clinic, who had infants aged 1 day to 12 months were interviewed. Infants were divided into the following age categories: 0-14 weeks, 15-24 weeks, 25-52 weeks. In the youngest age group, 91% of the mothers were breastfeeding, decreasing to 89% between 15-24 weeks, and 83% between 25-52 weeks. While 66% of the infants under 6 months received formula, 61% of the infants aged 25-52 weeks received formula. Mothers were asked about feeding practices in the previous 48 hours, and the following reported exclusive breastfeeding in this time period: 0-14 weeks: 37%; 15-24 weeks: 19%; 25-52 weeks: 11%.

The longitudinal study was well planned, and executed, but inaccurately reported exclusive breastfeeding, as those infants who had received over-the-counter medicines in addition to breastmilk. The figures given above represent those infants exclusively breastfed without the use of over-the-counter medications.

The cross sectional study used interesting time points, of 0-3 months, 3-5½ months, and 5½-12 months. Since the longitudinal study followed infants to 16 weeks, it might be expected that a similar time point would be used, to compare data. Six months, or 26 weeks would have been a more conventional time point than 24 weeks. However, despite these differences, it is evident that mothers have selective memories, as it is unlikely that breastfeeding practices would have changed so dramatically in a short space of time between the 2 studies, initiated one month apart.

Figure 13. Reported Initiation rates in South Africa



It is evident that in South Africa, the data are inconsistently reported, making comparisons between the studies extremely difficult. The most consistent data are that of initiation of breastfeeding. While it would appear that initiation of breastfeeding had increased, and subsequently decreased in KZN, the latest study (Bland 2002) was conducted in a rural area, at least 200km north of the other studies, and cannot be considered representative of the area. There appears to have been little change in the initiation rates in the Northern Provinces, but all studies represent areas that are far from each other, and therefore should not be readily compared. The 2 areas studied in the Cape Province are in fairly close proximity of each other, and the different rates of initiation cannot be explained. All studies, but 1, used retrospective data collection methods, some of which required fairly long recall period, and few studies made any reference to different breastfeeding types.

In order to establish accurate data for breastfeeding practices in South Africa, data collection methods need to be standardised. Ideally, a prospective study specifically investigating infant feeding practices, should be conducted.

1.8. Promotion of Exclusive Breastfeeding

The promotion of exclusive breastfeeding has been successful in a variety of settings (Kramer 2001). A comprehensive intervention (PROBIT) in Belarus, included 32 polyclinics randomised to either implement policies specifically aimed at promoting and facilitating breastfeeding, or continue standard care, found that polyclinics that promoted and facilitated breastfeeding were much more successful in maintaining breastfeeding for 12 months than those providing standard care (19.7% vs. 11.4% respectively). Intervention sites had significantly more exclusively breastfed infants at 3 months (43.3% vs. 6.4%), and at 6 months (7.9% vs. 0.6%). Risk of gastrointestinal tract infections (9.1% vs. 13.2%) and atopic eczema (3.3% vs. 6.3%) was also significantly reduced in the intervention sites. This study used a comprehensive strategy, in which the chief obstetrician and paediatrician, as well as all midwives, nurses, physicians and paediatricians working with mothers and infants were trained in lactation management. In all, 17046 mother-infant pairs completed the study, having attended appointments at 1, 2, 3, 6, 9, and 12 months. Since the paediatricians could not be blinded to the method of feeding, clinic charts were selected at random at each clinic, and compared to the PROBIT outcomes forms, and mothers interviewed separately. This study clearly showed that consistent support from clinic staff greatly increases the likelihood of exclusive breastfeeding, and prolonged breastfeeding, and thereby improving the health of the infants despite no promotional activities in the community.

The importance of individual counselling to enable mothers to exclusively breastfeed was clearly shown in a hospital setting in Bangladesh (Haider 1996).

Lactation counsellors, trained to re-introduce exclusive breastfeeding to mothers whose babies were admitted to a diarrhoea ward, gave either routine group health education, or individual counselling. Significantly more infants were exclusively breast fed at 1week post discharge when their mothers received individual counselling (60%), as compared to those who received group counselling (6%). When mothers were visited 2 weeks after discharge (when oral rehydration therapy was stopped), the number of exclusively breastfed infants had risen to 75% in the mothers who received individual counselling, as compared to 8% in those who had received group counselling. Twelve percent of the infants whose mothers received group education had a relapse of diarrhoea within 2 weeks of discharge, as compared to 3.2% of the group who were individually counselled. There is no data provided on the rate of mixed feeding at admission, but it is assumed that most infants were mixed feeding, as 80-85% had received prelacteal feeds, and 13.2-14.1% had started complementary feeds at the same time. Houses, and sanitary conditions were similar in the 2 groups, and birth order did not affect exclusive breastfeeding.

In an attempt to reach mothers beyond the hospital environment, Valdés et al (1993) developed a programme involving antenatal promotion of breastfeeding, training in the hospital, and creation of an open out-patient lactation clinic. The obstetrician and paediatrician received training in lactation management, and then ran a 3-day breastfeeding workshop for all health care professionals. Three additional workshops were held to ensure all personnel received the appropriate training. Hospital policies were adjusted to allow early initiation of breastfeeding, and rooming-in. The lactation clinic offered free care from Monday to Friday.

Mothers were enrolled between days 7-10 postpartum, and scheduled for visits at 30, 60, 90, 120, 150 and 180 days postpartum. A control group of 313 women was recruited prior to the introduction of the breastfeeding promotion, and followed as per the same schedule. There were 422 mothers in the intervention group. Early initiation increased significantly, and supplementation decreased significantly after breastfeeding promotion was implemented. At 6 months, 31.6% of the control group, and 66.8% of the intervention group were exclusively breastfeeding their infants. The authors conclude that the most important activity was the training and motivation of the health care providers – the only difference between the 2 groups was that the second group had access to health care workers who were specially trained, and had necessary knowledge to support, and empower the mothers to fully breastfeed, and solve any problems that arose.

In Brazil, Barros (1995) evaluated the effect of the lactation centres on breastfeeding patterns, morbidity and growth. The lactation centres work with women in groups of 4, and solutions are discussed in the group based on previous experience, supervised by a paediatrician. Infants are scheduled to attend once a week in the first month, each fortnight in the second month, and monthly from 3-6 months of life. In a longitudinal study, a cohort of 605 mother-infant pairs was followed from birth to 6 months of age. Mothers were referred to lactation centres, but only about 40% attended. Mothers were visited at home at 1, 4 and 6 months postpartum. Maternal work was not associated with breastfeeding pattern, duration, or attendance at lactation centres. Those who attended these centres were younger, had lower parity, had more antenatal care, were more educated, and had houses with better sanitation conditions than non-attenders. Attenders

had received more breastfeeding advice during pregnancy. Those who attended the lactation centres were significantly more likely to be exclusively breastfeeding at 4 months (43% vs. 18%), and at 6 months (15% vs. 6%) than non-attenders. Variables associated with exclusive breastfeeding, including attendance at antenatal care, receiving information on breastfeeding during pregnancy, and years of schooling were controlled for in the analysis. This clearly shows that lactation centres are effective in promoting exclusive breastfeeding, but perhaps need to be promoted further, as there is insufficient perceived need for them, or perhaps they are not sufficiently accessible for many women.

While education in a health facility is vital, the majority of women do not have regular contact with health facilities, and gather information regarding infant feeding from consultation with family, and peers (Raj 1998). Peer counsellors have been employed to reach mothers in their homes, and to promote general community awareness regarding exclusive breastfeeding. The first randomised controlled trial assessing effectiveness of home-based peer counselling on exclusive breastfeeding rates was conducted in Mexico City (Morrow 1999). The longitudinal study consisted of a control group, who received routine clinic care, and 2 intervention groups, who were visited at home either 3, or 6 times. The rate of breastfeeding was increased in both intervention groups, and was dose-responsive. At 3 months of age, 67% of the women who were visited 6 times were exclusively breastfeeding, while 50% of women who were visited 3 times were exclusively breastfeeding. In the control group, 12% were exclusively breastfeeding, significantly less than the other 2 groups. No variables were found

to significantly influence breastfeeding practices, so none were controlled for. This study shows a definite dose-response relationship to the number of visits received.

In Bangladesh, a more intensive follow-up schedule resulted in a similar prevalence of exclusive breastfeeding, albeit at 5 months of age (Haider et al, 2000). Women were visited twice in the third semester of pregnancy, and then 4 times in the first month, followed by fortnightly visits in months 2-5. A second group, who were not visited by a peer counsellor, served as the control group. Prelacteals were given in 31% of the intervention group, as compared to 89% of the controls. The prevalence of exclusive breastfeeding remained higher in the intervention group throughout the follow-up period, and at the end of 5 months, 70% of the infants whose mothers were exposed to breastfeeding counselling were still exclusively breastfeeding, as compared to 6% of those infants whose mothers did not receive home counselling visits. There were no significant differences in the socio-economic and demographic characteristics of the 2 groups. This more intensive peer counsellor support study showed rates of exclusive breastfeeding at 5 months of age similar to those found at 3 months of age in the study by Morrow et al (1999), suggesting that the frequency, and duration of support is important for continued exclusive breastfeeding.

In South Africa, some success has been achieved in improving breastfeeding rates in the Northern Province through work by nutrition advisors (Ladzani 2000). A baseline survey was conducted prior to the intervention, and the survey was repeated 2 years after nutrition advisors had been employed to promote optimal nutrition in the area. An adjacent area was used as the control, where no nutrition

advisors were available. The percentage of women who initiated breastfeeding on the day of birth significantly improved from 60 to 90%, and the introduction of solids on day one decreased from 26,5% to 6.3%. Duration of breastfeeding did not change over time. In the study area, 59.5% were still breastfeeding at 1 year, as compared to 78.4% in the control area. This study aimed at improving general nutrition practices, and was not specific to breastfeeding. Exclusive breastfeeding was not evaluated.

In 1987, the effect of home visits on breastfeeding practices was evaluated in the KwaMashu area (Ross 1987). Mothers planning to live in KwaMashu for the first 4 months postpartum, and delivering at night were eligible for the study. Five different groups were randomly selected for the following interventions:

Group A –D were transported home after delivery, and any family members present when they arrived home were asked to encourage the mother to breastfeed exclusively for 16 weeks. Mothers from Group E found their own way home.

Groups A-C were followed twice-weekly for the first month, weekly for the next 2 months, and fortnightly until 16 weeks, or formula was introduced. Mothers were encouraged to breastfeed unsupplemented for at least 16 weeks, while groups D and E were not supposed to receive any encouragement.

A professional nurse followed mothers in group A, a family planning motivator with home visiting experience followed mothers in group B, a lay person with informal

training in counselling and experience gained from various research projects followed mothers in group C. Group D was visited at regular monthly intervals to enquire about breastfeeding, and group E was followed up solely to ascertain breastfeeding status.

At 16 weeks postpartum, Groups A and C had significantly more mothers breastfeeding exclusively; 40% and 76% respectively. Only 5% of the mothers were exclusively breastfeeding in the other intervention group, B.
The control groups, D, and E, had 13%, and no mothers breastfeeding exclusively in the respective groups.

This study showed that intervention can significantly increase the prevalence of exclusive breastfeeding. The poor effect in group B was considered a result of the standard of care by the health worker concerned, but demonstrates that home visits alone, are insufficient to make a difference in breastfeeding rates.

That group C (lay counsellor) did significantly better than group A (professional nurse) is probably reflective of the manner of the respective health workers. The lay counsellor, with no sophisticated training, conducted unhurried visits, took time to establish rapport, and had time to return if the mother was out when she first visited. The fact that group D had a higher prevalence of breastfeeding was because the health worker admitted to have been surreptitiously encouraging the women to breastfeed. Group E reflected the standard care received by the mothers, and showed expected results for mothers who have no support.

It is evident that, while exclusive breastfeeding is rare, promotional efforts are successful. Unfortunately there have been few national initiatives to increase the prevalence of exclusive breastfeeding – most breastfeeding promotional campaigns have been localised. It would be interesting to see how these programmes could be scaled up to national level to maximise the benefits of exclusive breastfeeding.

2. Methods

2.1. Aims

The aims of the study campaign were to assess the rate of exclusive breastfeeding, implement a strategy to promote exclusive breastfeeding, and determine whether a comprehensive promotional campaign would be effective in increasing the rate of exclusive breastfeeding in the community. The efficacy of this intervention in increasing exclusive breastfeeding rates was assessed in comparison with rates in a control area.

Secondary aims included determining the reasons why other foods and drinks are used to supplement breastmilk, and the effect of non-exclusive breastfeeding on the incidence of diarrhoea.

2.2. The population

The intervention site was Cato Manor, an informal settlement on the outskirts of Durban. This settlement, due to recent development of housing and infrastructure, consists of 2 different communities; one community has well-built houses, running water and good sanitation. The other community live in informal housing, with no sanitation, or electricity, and collect water from communal water points. There is a primary health care clinic that services the area, which is open 5 days a week, from 7am to 4pm daily. Women deliver at the nearby referral hospital, (King Edward VII Hospital) which does not have any baby friendly policies, or practices.

The University started working with the Cato Manor clinic staff in October 1998, where the Department of Paediatrics and Child Health set up voluntary HIV

counselling and testing for pregnant women attending the clinic. The study team was working on 2 studies:

1. Vaccine development for HIV
2. Mastitis and the risk of HIV transmission through breastmilk.

Funding was obtained to supply nevirapine to the mothers, and the study clinic was set up as an operational programme for the prevention of HIV transmission from mother to child. Transmission of HIV through breastmilk was a continued element of research. Mothers were counselled to either breastfeed exclusively, or formula feed exclusively.

The community programme promoting exclusive breastfeeding was initiated for 3 reasons. Firstly, many women from the community did not have access to facilities that would make formula feeding safe, thereby requiring the choice to exclusively breastfeed, and secondly, if exclusive breastfeeding was not usual practice within the community, the women would be identified as HIV positive, and they would also find it difficult to believe that exclusive breastfeeding was possible if no-one else in the community was practising this method of feeding. Thirdly, the rate of exclusive breastfeeding in South Africa was found to be extremely low, and the project aimed to improve breastfeeding practices in the area.

Peer counsellors were employed separately to the Prevention of Mother-to-Child Transmission (PMTCT) project, and had nothing to do with these mothers at the clinic. They were not aware of HIV status in any mother unless the mother

revealed it to them herself. The peer counsellors were responsible for visiting pregnant women, and any mother with a child under the age of 6 months that they identified in the community. Mothers near term were identified in the antenatal clinic, and visited at home. The peer counsellors were allocated areas in the community, and they covered these areas on foot, visiting mothers known to them from the antenatal clinic, and also visiting homes where nappies were hanging on the line. Neighbours also frequently referred the peer counsellors to new mothers. While every effort was made by the peer counsellors to visit as many mothers as possible, the community is large, and the 12 peer counsellors were employed on a mornings-only contract. Promotional days, posters, pamphlets, t-shirts, carry bags and newspaper articles were used to try to reach as many people in the community as possible. Nursing sisters were also trained in basic lactation management to ensure that the same message went to the community.

In order to be sure that any change in infant feeding practices was due to the intervention, and not due to time, or information from other sources, the evaluation was completed in a control setting as well. The control site, KwaMashu, is a similar area on the north of Durban, but it is older, and therefore has a more developed infrastructure. KwaMashu has a primary health care polyclinic that is open 24 hours, 7 days a week. There are delivery facilities at the polyclinic, and only complicated cases are referred to a hospital (King Edward VIII Hospital, or RK Khan Hospital). There is no breastfeeding promotion at either hospital, or at the Polyclinic. Seven months prior to the second questionnaire, a PMTCT pilot project was initiated, in which free formula was available and encouraged for mothers who tested HIV positive.

2.2.1. Intervention Strategy

2.2.1.1. Determining the Strategy

To determine the best intervention strategy for the promotion of exclusive breastfeeding, informal focus group discussions were held with lay HIV counsellors, and mothers in the primary health care clinic (Cato Manor clinic). The HIV counsellors had been working in the clinic for at least 6 months, talking to women about feeding choices with regards to their HIV status. Issues discussed included common feeding practices in the community, prejudices that women encountered, beliefs surrounding infant feeding, and care practices. Discussions held with mothers were included in our peer counsellor selection programme, where applicants were divided into groups of 5 women, with a study member in each group. In these discussion groups, common feeding practices in the community, why people chose to do this, who was considered influential, as well as barriers to breastfeeding promotion were discussed. In addition we used information obtained from formal focus group discussions held in the Hlabisa district, a rural area two hours north of Durban (Bland 2002) and reviewed published literature.

2.2.1.2. Training of Trainers (TOTs)

The study staff were trained as trainers to enable them to assist mothers in the clinic with exclusive breastfeeding, and ensure that one message went to the whole community. This course also ensured that the subsequent training for the peer counsellors would be of a high quality, and according to the WHO/UNICEF guidelines.

The UNICEF course was conducted in January 2000 at the University of Natal's Innovation Centre. It is an 80-hour course in which the participants are trained in the management of breastfeeding and are equipped to train others about breastfeeding. The course Director was Penny Campbell from the Department of Health: Nutrition Directorate, and the facilitators were Dr Charles Karamachi from Uganda (President of IBFAN Africa), Mrs. Dikoloti Morewane from Botswana, and Mrs. Maria Zondi from South Africa.

The course included areas such as the advantages of breastfeeding, nutritional value of breastmilk, how to breastfeed successfully, how to deal with difficulties that may arise, breastfeeding during illness, breastfeeding and HIV infection, conditions where breastfeeding is not recommended, and issues surrounding the protection and promotion of breastfeeding. There were 2 hours of practical, which were conducted at King Edward VIII Hospital, in the antenatal clinic, and obstetric wards. Practical sessions were designed to allow participants to learn to discuss breastfeeding issues with new mothers, and to assist the mothers where necessary.

Anna Coutsoudis, Juana Willumsen, Thembi Ngubane (HIV Counsellor), Thanda Mdlalose (HIV Counsellor) and Jane Bentley (Principal Investigator) attended from Cato Manor. The photograph below depicts the Course Trainers, and the newly trained research team.

Photograph 1. Course Trainers and the Research Team

Charles Karamachi (Trainer), Ningi Ngcobo (Department of Health), Anna Coutsoudis, Thembi Ngubane, Jane Bentley, Juana Willumsen, Thanda Mdlalose, Dikoloti Morewane (Trainer)

2.2.1.3. Promotional Material

Promotional materials were designed to complement and reinforce the exclusive breastfeeding message, and to carry the message as extensively as possible within the community. Promotional materials included posters for the clinic, and King Edward VIII Hospital, pamphlets on exclusive breastfeeding, t-shirts, bags and notepads with promotional logos.

Professor Anna Coutsoudis designed large promotional posters for the project. The colours used were similar to colours used by the Department of Health: Nutrition Directorate to promote exclusive breastfeeding, aimed to keep the message consistent, and recognisable in colours. Two different posters were produced: one with a 5 year old girl playing on the beach with large inflatable swimming hoops, with the following message: "I breastfed exclusively for 6

months and now I am healthy, strong and clever". In the second poster, the little girl was pictured on her father's shoulders (on the beach), and the caption is "Exclusive breastfeeding: the best start in life". Some posters were printed in English, and some in Zulu. A peer counsellor is depicted in photograph 2 standing next to a poster.

Photograph 2: Bathabile and Poster

A pamphlet promoting exclusive breastfeeding was also designed. This pamphlet was written in English, and Zulu, and was also colour co-ordinated. The pamphlet was designed in a question-answer format, including 10 commonly asked questions. The pamphlet was initially distributed in the local IZWI newspaper, and then every week to pregnant women attending the antenatal clinic, and to any others who were interested, as well as being freely available on breastfeeding promotional days.

Black canvas bags, t-shirts, and note pads were designed with a logo promoting exclusive breastfeeding. Again, the logo read: "Exclusive breastfeeding – the best start in life".

Exclusive Breastfeeding Logo

2.2.1.4. Cato Manor Training

Although nursing sisters were not expected to play a major role in the promotion campaign, they work with mothers every day, and therefore needed basic training on lactation management to ensure that one message went out to the community, and a course was offered to all interested nursed in the clinic.

From the 6th April, to the 8th June 2000, a breastfeeding course was conducted for the Nursing sisters of Cato Manor clinic. It was conducted in conjunction with the City Health In-service training Sister – Sister Celiwe Bhengu. This course was based on the UNICEF 18 hour course, and was held on eight consecutive Thursday afternoons. The participants were expected to do practicals during the week, while attending to clients in the clinic. This was to encourage them to make discussing breastfeeding an integral part of their work. Each week an assignment was given which should have taken 1-2 hours.

The course was attended by 5 clinic Nursing Sisters, 3 Health Promotion Personnel from the City Health Head Office (who were to facilitate further training within City Health), 3 members of our Study Team; Dolly Naicker (Phlebotomist), Nokulunga Mngqundaniso (HIV Counsellor), Thandi Buthelezi (HIV Counsellor), and the HIV counsellor from HOPE Worldwide, who was working at the clinic. The graduates are pictured in photograph 3 below.

Unfortunately, due to Health Department policy, the nurses were rotated frequently, and the clinic did not necessarily benefit from this training exercise.

Photograph 3. The 'Graduates' from the Clinic Course

The next task was to select peer counsellors from the community.

2.2.1.5. Selection of Peer Counsellors

To find suitable peer lay counsellors, an elaborate selection process was undertaken. Adverts were placed in the clinic, the community library, and at the local Ward Counsellor's offices.

109 application forms and CV's were received. Basic requirements included:

- Have to live in Cato Manor
- Have to have passed Matric (grade 12)
- Have certified copies of the certificates available
- Able to speak, read and write English
- Have to speak Zulu fluently
- Be available for 2 full days of selections, and 3 weeks of training

If any of the above criteria were not met, the person was excluded.

Persons younger than 25 years were excluded as it was felt that it would be very difficult for a younger person to gain credibility within the community.

Persons who had done any further training in any health, or care related subject were short-listed.

Twenty-one people attended 2 days of selection (5th and 6th July 2000). These selection days were designed to test various skills.

After an initial icebreaker to help everyone relax, and get to know one another, the job description was explained, and time was allocated for questions. Thereafter, a series of assessments were conducted.

English Comprehension

To test the ability to assimilate knowledge from a lecture in English, a verbal comprehension was done. A short passage from "Helping Mothers to Breastfeed" by Felicity Savage-King was used as the basis of the lecture, complete with overhead transparencies. The passage was discussed, and time allocated for any questions. Immediately thereafter, a short test was written on the passage.

In a second comprehension, half a chapter from "Helping Mothers to Breastfeed" by Felicity Savage-King was photocopied, and handed out for everyone to read, and ask any relevant questions. The interviewees took the section home to learn, for a short comprehension test the next morning.

Extracts from this book were used, as each peer counsellor would be given a copy of the book for reference.

Role-plays:

Short role-plays were given to the interviewees. They were given a time to prepare the role-play together. Each participant had an opportunity to be a counsellor. Role-plays were simple, and designed to facilitate expression of compassion, or empathy in the counsellor. The counsellor was evaluated on interactive skills, rather than information given.

Group Activities, and team contributions:

The interviewees divided themselves into the neighbourhoods in which they lived, and discussed issues in that area that would affect breastfeeding promotion. We discussed basic living conditions, attitudes, problems in the area, and potential avenues of breastfeeding promotion. This allowed group discussion and interaction, and an opportunity for creativity. There was a selector sitting with each group, to encourage discussion, and observe individuals. Afterwards, someone from each group gave feedback to the whole group.

To end the first day, the group was divided into 4 groups of 5, and they were given a problem solving game in which the team had to work together to solve a problem. This showed leadership potential, lateral thinking skills, and teamwork.

On the second day, the second comprehension was written, followed by individual interviews.

Interviews

Ten minute interviews were conducted through the second day to find out more about the individuals concerned

Twelve women from the community were selected. The women were all of the same ethnic group as the community, speaking the local language, and English fluently. All but one had had previous breastfeeding experience. The one peer counsellor did not have children, but had excellent counselling skills.

2.2.1.6. Training of Peer Counsellors

Training was conducted in the Umkhumbaan Community Hall from the 10th to the 28th July 2000. It was conducted in conjunction with Mrs. Jane Maasdorp of La Leche League, and based on the WHO Breastfeeding Counselling Course. A trained counsellor, Mrs Zanele Myeni gave 2 days of intensive counselling skills training.

The counsellors spent 1 day at the recently accredited Baby Friendly clinic, KwaDabeka, where they were able to learn from very enthusiastic nursing staff about the importance of a baby friendly institution, and the need for active breastfeeding promotion. The team was led by Matron Mdletshe.

Peer counsellors had an opportunity to see practices in the labour ward, maternity section, and the paediatric outpatient department, and interview some waiting mothers.

During the course, the peer counsellors had 1 clinic practical, where they practiced taking a breastfeeding history. After the course had been completed, the peer counsellors spent the following 2 weeks working in the clinic under supervision by the HIV counsellors who had been trained as Breastfeeding TOTs. Practical sessions were organised in the local hospital to learn practical issues regarding expressing breastmilk. They were observed by Mrs. Jane Maasdorp, a La Leche League Leader, and Jane Bentley (TOT). The peer counsellors received ongoing training, and support, and an opportunity to report back once a week at the Cato Manor clinic. At these report back sessions lessons learnt by individuals were shared with the rest of the group.

2.2.1.7. Breastfeeding Week 2000

During International Breastfeeding Week (1-7 August 2000) the peer counsellors worked in the clinic. They started each morning with a breastfeeding message for the whole group, and then worked in the clinic for the rest of the morning, talking to mothers about breastfeeding while they were waiting to be seen by the clinic sisters. The message was conveyed in various ways:

Tuesday 1 August	:	A song
Wednesday 2 August	:	A role play by Lulama and Samu on insufficient milk
Thursday 3 August	:	A song
Friday 4 August	:	A song
Monday 7 August	:	Role-play by Lulama and Samu, and a song.

On the Thursday afternoon there was a special promotional day, planned in conjunction with Sr Kubi Nair. During the week, simple competitions had been

handed to mothers attending the clinic, and to mothers visited in the community, as a way to promote the day, and to promote exclusive breastfeeding. The competitions were in Zulu. An English example can be found in Appendix 1. The Nursing Sister in Charge opened the afternoon proceedings, which was followed by various educational activities by the peer counsellors. The role-play from the previous morning was repeated, due to the interest. Next, Queeneth Mathe gave a short, personal talk on the growth chart, and her breastfeeding experiences as a mother who did not breastfeed exclusively. The City Health In-service training Sister – Sister Celiwe Bhengu talked on 'Breastfeeding: a human right', as it was the chosen theme for Breastfeeding Week. An open time for questions was allocated before the prizes. The prizes used were breastfeeding promotional material. There were t-shirts and bags with our logo "Exclusive breastfeeding: The best start in life", as well as note pads with similar messages. The formal part of the afternoon was rounded off by a song from the peer counsellors, followed by sandwiches and juice for all those who had attended. The afternoon was attended by about 60 mothers, and 1 father.

Photograph 4. Peer Counsellors Singing

Breastfeeding Week culminated in a Graduation Day for the Peer Counsellors on Saturday, 5 August 2000. This was planned as a big promotional day for the community to meet the new peer counsellors, and was launched by the National Secretary of Health, Professor Green-Thompson.

2.2.1.8. Graduation Day

The Umkhumbaan Community Hall was hired for the occasion, and lunch was prepared by the peer counsellors under supervision of a caterer, Carol Nel. Maxwell provided microphones and a sound system to ensure everyone could hear well.

Professor Anna Coutsoudis welcomed everyone and introduced the invited guests. Her speech was translated by Ningi Ngcobo, the Provincial Nutrition Director. Ningi Ngcobo then spoke about 'Breastfeeding – its your right', the theme of Breastfeeding Week, described exclusive breastfeeding, and introduced some mothers in audience, known to the Team, who had exclusively breastfed, or were currently breastfeeding their infants exclusively.

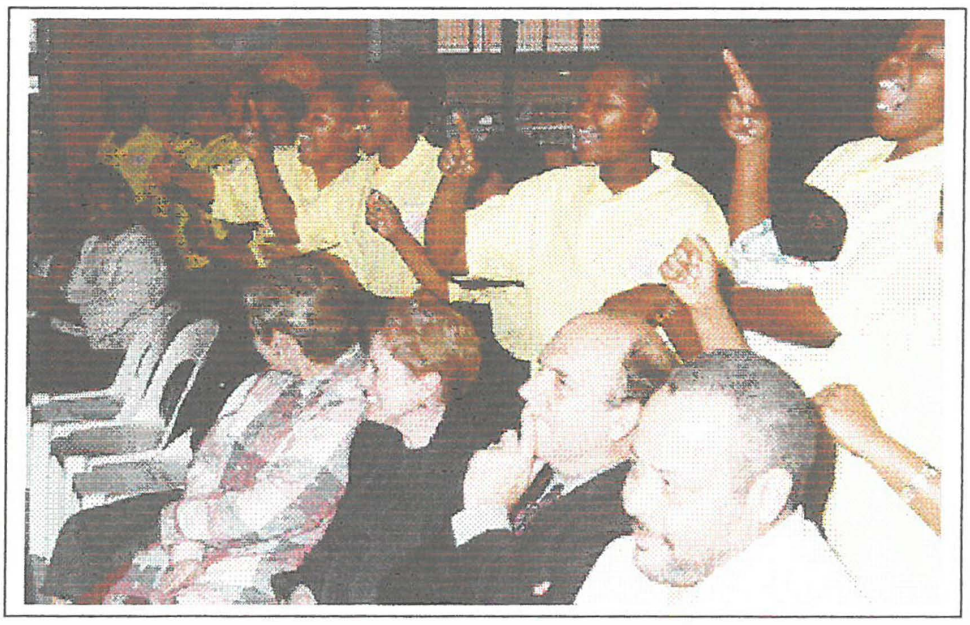
To liven proceedings, the Community Health Workers were invited to sing one of their breastfeeding promotional songs. Professor Green - Thompson gave the main address, speaking on the importance of breastfeeding. Professor Green - Thompson also handed out the certificates to the peer counsellors.

A congratulatory address was presented by Consul General Keuhl, of the American Embassy, representing USAID, who sponsored the Exclusive Breastfeeding Promotional Campaign.

The highlight of the day was the drama written, directed, and performed by the Peer Counsellors. It was representative of the everyday life of people in Cato Manor, but had a strong promotional message of exclusive breastfeeding. After the drama, those who had a special sticker under their chairs were eligible for spot prizes. The prizes included t-shirts and bags with promotional messages on them, as described earlier.

The day was rounded off by a song by the Peer Counsellors, a vote of thanks by Jane Bentley, and a finger lunch. The day was attended by about 200 people.

Photograph 5. Peer Counsellors Singing at Graduation



Peer counsellors singing, with Prof. Green Thompson, Consul General Keuhl, Jane Lucas, and Jane Maasdorp in the foreground

2.2.1.9. Breastfeeding Promotion by the Peer Counsellors

A set of visual aids for each peer counsellor was developed to assist in counselling members of the community. The peer counsellors were responsible for antenatal breastfeeding promotion at the clinic and at home; helping mothers in the local hospital (King Edward VIII) to initiate breastfeeding as soon after delivery as possible, and visiting mothers in their homes to encourage them, and assist where necessary.

Photograph 6.

Bathabile with Visual Aids

There were no standard visiting protocols, but the peer counsellors attempted to visit mothers at least twice in the first month, and then monthly thereafter, if possible. If a mother had difficulties, she was visited as required.

The peer counsellors also developed role-plays, drama, and songs to promote exclusive breastfeeding on special breastfeeding promotional days in the clinic.

The second promotional day was held on Thursday the 31 May 2001, and followed a similar format as the previous one. Competitions were handed out all week by peer counsellors in the clinic, and community, for promotional purposes, and to encourage participation, as spot prizes were to be given for correctly completed competitions.

Thembi Ngubane opened the afternoon with prayer, and a song. This was followed by a song promoting exclusive breastfeeding. Nokuthula Luthuli, and Sindi Mnikathi did a role-play dealing with issues of not enough milk, followed by a

question time, with questions fielded by Bathabile Zungu, Cynthia Shozi, and Mercy Mfeka. Five mothers who had either breastfed exclusively for 6 months, or were currently breastfeeding exclusively, and planned to continue to do so, came up to the front, and either just showed the audience their babies, or briefly spoke about their experiences of exclusive breastfeeding. The nursing sisters sang a song promoting child health, followed by competition spot prizes. After the proceedings, Mpume Fuze thanked everyone for attending the meeting, and invited them to help themselves to juice, and sandwiches, which the team had provided.

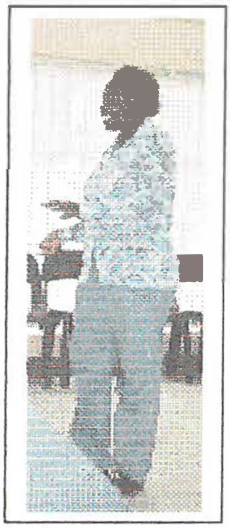
Photograph 7. Role Play by Peer Counsellors

Sindi and Nokuthula

2.2.1.10. Breastfeeding Week 2001 (1-7 August 2001)

Wednesday 1 August	:	Caroline to talk on "not enough milk"
Thursday 2 August	:	Nokuthula to talk on exclusive breastfeeding
Friday 3 August	:	Lulama, Mercy, Mpume and Bathabile to do role play on "Breastfeeding and TB"

Monday 6 August	:	Queeneth to talk on "Expressing and Cup feeding for the working mother" (pictured below)
Tuesday 7 August	:	Zanele to talk with Sr. Tsekiso on "Initiating breastfeeding, colostrum and importance of immunisations"
Wednesday 8 August	:	Sindi to read her poem on "Breastfeeding – the rights of the baby" Everyone to sing a song.



Photograph 7.

Queeneth

2.2.1.11. Staff Shortages

Due to illness, one breastfeeding counsellor was absent between February and May 2001. One breastfeeding counsellor passed away at the end of June 2001 after acute abdominal problems.

2.2.1.12. IZWI Articles

The IWZI newspaper is the local Cato Manor newspaper, with a readership of about 17 000 people. There are about 7 editions every year. The Cato Manor team has also used a page of the newspaper to publish relevant breastfeeding information. In all, four breastfeeding articles were published in English, and Zulu:

1. Babies under 6 months need breastmilk only – discussing the advantages of exclusive breastfeeding.

2. Making enough milk for 6 months of exclusive breastfeeding – covering difficulties of perceived insufficient milk, and the crying baby.
3. Exclusive breastfeeding for 6 months – how to get it right – discussing issues that affect the mother, such as nipple pain, engorgement, mastitis
4. Exclusive breastfeeding for working mothers – discussing expressing, storing, and feeding breastmilk.

2.2.2. Evaluation

An evaluation questionnaire was developed and was piloted in 20 mothers within the intervention clinic before being modified and finalised. The questionnaire was developed as a quick, cross sectional assessment tool, to determine the infant feeding practices of women in the community. Verbal consent for participation was obtained from each participant, before each interview. Please refer to Appendix 2 to see the Questionnaire.

A baseline survey was conducted to determine how women had fed their infants in the last 24 hours, whether they had been away for the infant in the last week, and how the infant was fed in that time. A question was also asked as to whether the infant had had diarrhoea in the last 2 weeks, or had ever been hospitalised for diarrhoea. Information was also gathered about why the mother was feeding her baby as she was, and who had been the main source of information regarding infant feeding requirements. This questionnaire was administered to all eligible women attending the respective clinics, who were willing to participate, until 40 questionnaires were completed in each of the following age categories: 0-2 weeks; 3-6 weeks; 7-13 weeks; 14-18 weeks and 19-26 weeks.

The decision to collect 40 questionnaires per age group was to ensure an even spread of ages in the sample size of 200. The questionnaire relied on the mother's recall of what had been fed to the infant the day before, except in the group aged 0-2 weeks, who were also asked about feeding in the first 24 hours after delivery. The interview was conducted in the local language, by trained counsellors. The interviews were conducted in February and March 2000 at both the intervention site (Cato Manor Clinic), and the control site (KwaMashu Clinic). After 17 months (August 2000 to December 2001) of breastfeeding promotion using the strategy described above, the same cross sectional questionnaire was repeated, to determine whether women in the community had changed their infant feeding practices. The questionnaire was completed at both sites in January 2002. Three additional questions were asked:

1. During pregnancy, did you listen to any talks on breastfeeding?
2. Has any health care worker ever given you any advice on breastfeeding?
3. Have you ever been visited at home by a breastfeeding counsellor?

These questions were added to determine the amount of breastfeeding information available at the 2 sites.

The baseline, and follow-up survey were also conducted in the control area, where no formal breastfeeding promotion occurred. The sample size of 200 was collected in the same way as the intervention group, with the same age categories.

All data was collected through the same structured questionnaire in the local language, by trained counsellors. The study hypothesis could not be hidden from the staff, but they were trained to ask the questions in a standard manner.

2.2.3. Statistical Analysis

Statistical analysis was conducted using 2 Computer programmes; the Statistical Analysis System (SAS) and SPSS. Continuous variables were analysed using t-tests, and associations between categorical variables were analysed using Chi Square tests.

The sample size of 200 was calculated using the following assumptions; it was estimated that according to the DHS survey 10.4% of the women in the intervention site would be exclusively breastfeeding and with the intervention this would increase to 20%. The significance level was set at 0.05 and the power at 80%.

2.2.4. Ethical Approval

Ethical approval was obtained from the Ethics Committee of the University of Natal, and permission to conduct the questionnaire in the clinics was obtained from the local Health Department. Permission for the peer counsellors to work in the area was obtained from the local community leaders.

3. Results

Overall, 849 questionnaires were completed. At baseline, 214 questionnaires were completed in Cato Manor (intervention site), and 217 questionnaires were completed in KwaMashu (control site). After 17 months of breastfeeding promotion in Cato Manor, a further 209 questionnaires were completed in Cato Manor, and 209 questionnaires in KwaMashu. A minimum of 40 questionnaires per age group were collected, as described above.

3.1. Maternal Characteristics

At baseline, mean age of the mother as 25.1 years in Cato Manor (intervention site), and 24.8 years in KwaMashu (control site) (Table II). Mean age was slightly higher in both groups post intervention, but the difference was not significant (26.2 years in intervention site [P=0.542], and 25.7 years in the control site [P=0.163]). In most instances (>90%), the child's mother was the respondent (pre-intervention P=0.257; post intervention P=0.086). There was not significant difference between the groups at either time point (difference in age at pre-intervention P=0.832; at post intervention P=0.297) (Table II).

Table II. Maternal Characteristics

	Intervention site		Control site	
	Baseline N=214	Post intervention N=209	Baseline N=217	Post intervention N=209
Maternal age	25.1 (24.3-25.9)	26.2 (25.1-27.4)	24.8 (23.9-25.6)	25.7 (24.8-26.6)
Mother as respondent	202/213 (94.8%)	197/204 (94.4%)	199/216 (92.1%)	192/207(92.8%)

At baseline, there was no significant difference in educational level attained by the mother (P=0.320), but in the final survey, there was a difference in educational level (P<0.01). More mothers in the control site had between 10 - 12 years of schooling (Table III). Schooling did not affect employment intervention site P=0.126; control site P=0.183), or feeding practices (intervention site exclusive breastfeeding P=0.639; control site exclusive breastfeeding P=0.749; intervention site formula use P=0.121; control site formula use P=0.718).

Table III. Maternal Schooling

	Intervention site		Control site	
	Baseline N=212	Post intervention N=201	Baseline N=203	Post intervention* N=206
Never been to school	7 (3.3%)	5 (2.5%)	7 (3.4%)	8 (3.9%)
Less than 7 years of schooling	33 (15.6%)	28 (13.9%)	30 (14.8%)	23 (11.2%)
Less than 10 years of schooling	69 (32.6%)	67 (33.3%)	54 (26.6%)	37 (18.0%)
10-12 years of schooling	96 (45.3%)	89 (44.3%)	97 (47.8%)	130 (63.1%)
Has a tertiary qualification	7 (3.3%)	12 (6.0%)	15 (7.4%)	8 (3.9%)

* Control site significantly different to Intervention site post intervention (P<0.01)

3.2. Delivery Characteristics

The sites were also different in terms of place of delivery (P<0.001) (Table IV). While most mothers from the intervention site delivered in a hospital (79%), mothers from the control site had the opportunity to deliver at the clinic, and many chose this option (40.9%). Other mothers delivered at other hospitals, clinics, or at home. Post intervention, there was a change in delivery sites, with more mothers in the control site delivering at other hospitals (44%), fewer delivering at the polyclinic (29.2%) and 18.2% delivered at the same hospital as the mothers from the intervention site (P<0.001). The change was not nearly as marked in the intervention site (P=0.167).

Table IV. Place of Delivery

Place of delivery	Intervention Site		Control site	
	Baseline N=214	Post intervention N=206	Baseline* N=216	Post intervention+ N=209
Tertiary Hospital	169 (79%)	155 (75.2%)	64 (29.6%)	38 (18.2%)
Other hospital	27 (12.6%)	40 (19.4%)	43 (19.9%)	92 (44%)
Polyclinic	2 (0.9%)	0	88 (40.7%)	61 (29.2%)
Other clinic	5 (2.3%)	2 (1%)	13 (6%)	6 (2.9%)
Home	11 (5.1%)	9 (4.4%)	8 (3.7%)	12 (5.7%)

* Sites were significantly different at both time points (P<0.001)

+ Post intervention mothers at the control site delivered at different places to pre-intervention (P<0.001)

The place of delivery affected how soon the mother saw her baby for the first time (Table V), and how soon she initiated feeding (Table VI). At the control site, mothers saw their infants, and initiated breastfeeding much sooner than at the intervention site.

Table V. Hours after Delivery Infant Brought to Mother

Hours	Intervention site		Control site	
	Baseline N=212	Post intervention N=209	Baseline N=217	Post intervention N=209
Within 1hr	3 (7.9%)	13 (31.7%)	35 (81.4%)*	31 (77.5%)#
1- 4 hours	10 (26.3%)	9 (22%)	5 (11.6%)	5 (12.5%)
5-12 hours	18 (47.4%)	14 (34.1%)	1 (2.3%)	2 (5%)
More than 12 hours	5 (13.2%)	4 (9.8%)	1 (2.3%)	2 (5%)
Don't know	2 (5.3%)	1 (2.4%)	1 (2.3%)	0
Missing data	2	0	0	0

* Significance between site and hours waited after delivery at baseline (P<0.001)

Significance between site and hours waited after delivery at post intervention (P<0.01)

Table VI. Hours After Delivery Infant Waited for First Feed from Mother

Hours	Intervention site		Control site	
	Baseline N=40	Post intervention N=40	Baseline* N=42	Post intervention+ N=40
Within 1hr	4 (10%)	8 (19.5%)	22 (52.4%)	21 (52.5%)
1- 4 hours	2 (5%)	13 (31.7%)	9 (20.9%)	12 (30%)
More than 4 hours	23 (57.5%)	16 (39%)	1 (2.3%)	7 (17.5%)
Don't know	11 (27.5%)	4 (9.8%)	10 (23.3%)	0
Missing data	0	0	0	0

* Significant difference between sites in hours infant waited for the first feed from mother (P<0.001)

+ Significant difference between sites in hours infant waited for the first feed from mother (P<0.01)

3.3. Infant Feeding

3.3.1. Milk Feeds

Reported prelacteal feeding was uncommon at both sites, but many mothers did not know if the infant had been fed, or what the infant had been given before being brought to the mother (Table VII). There was a tendency for change at the 2 sites over time, but the change was not significant (intervention site P=0.06; control site P=0.52), and a significant difference between the 2 sites post intervention (P<0.001), but this difference was due to the number of mothers who knew whether or not their infant received prelacteal feeds, and not due to actual change on prelacteal feeds given (P=0.463).

Table VII. Use of Prelacteals

	Intervention site		Control site	
	Baseline N=39	Post intervention N=39	Baseline N=43	Post intervention N=39
Prelacteals given	9 (23.1%)	1 (2.6%)	6 (14%)	5 (12.8%)
Don't know	22 (56.4%)	27 (69.2%)	23 (53.5%)	10 (25.6%)

Most mothers initiated breastfeeding within the first 24 hours. The use of formula feeds decreased significantly in the intervention site, and increased significantly in the control site (Table VIII).

Table VIII. Milk Feeds Given in the First 24 hours

Feeds given in first 24 hours	Intervention site		Control site	
	Baseline	Post intervention	Baseline	Post intervention
Breastmilk	37/40 (92.5%)	40/40 (100%)	40/42 (93%)	34/40 (85%)
Formula	12/40 (30%)	0/40 (0%)#	2/42 (4.8%)	6/40 (15.4%)*

Significantly fewer infants were formula fed post intervention in intervention site ($P<0.01$)

* Significantly more infants were formula fed post intervention in control site ($P<0.05$)

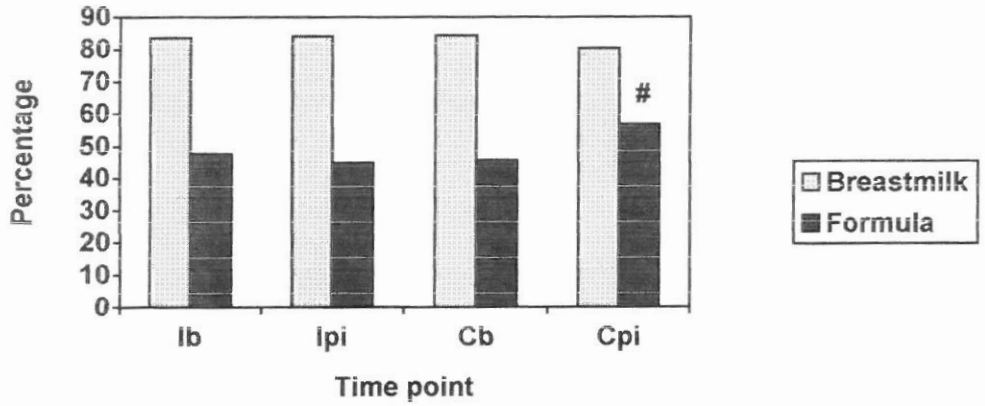
Over time, there was no significant change in the rate of breastfeeding at either site (Table IX; Figure 1). There was, however, a significant increase in the use of formula in the control site, post intervention (Table IX; Figure 1).

Table IX. Feeding milk in the last 24 hours

Milk type	Intervention site		Control site	
	Baseline N=214	Post intervention N=209	Baseline N=217	Post intervention N=209
Breastmilk	179 (83.6%)	176 (84.2%)	182 (84.3%)	168 (80.4%)
Formula	102 (47.7%)	94 (45%)	99 (45.8%)	119 (56.9%)†
Breastfeeding aged <14 weeks	122 (91%)	111 (88.1%)	119 (86.9%)	112 (88.2%)
Breastfeeding Aged 14-26 weeks	57 (71.3%)	65 (78.3%)	63 (79.7%)	56 (68.3%)

†Significant change in use of formula (P<0.05)

Figure 14. Percentage Use of Milk for Infant Feeding in the Previous 24 hours



Ib=Intervention site at baseline

Ipi=Intervention site post intervention

Cb=Control site at baseline

Cpi=Control site post intervention

Significant increase in the use of formula in the control site (P<0.05)

Very few other types of milk were used. One person in the intervention site at baseline used ultra heat-treated milk only. Maas (sour milk) was used by 1 person in the control site at baseline, and 1 person each in the control, and intervention site post intervention.

3.3.2. Exclusive Breastfeeding

In the intervention site, the exclusive breastfeeding rate increased from 13.6% at baseline, to 21.5% after 17 months of breastfeeding promotion ($P<0.05$) (Table X). There was no significant change in exclusive breastfeeding rates in the control site. At baseline in the intervention site, 21.1% of the infants were exclusively breastfed in the first 13 weeks, and 3.75% of the infants were exclusively breastfed between 14-26 weeks. This increased to 32.4% being exclusively breastfed in the first 13 weeks, and 13.8% exclusively breastfed between 14-26 weeks.

The exclusive breastfeeding rates in the different age categories is tabulated in Table XI below.

Infants who were exclusively breastfed were significantly less likely to be using a pacifier ($P<0.05$).

Table X. Exclusive Breastfeeding Rates.

	Intervention site		Control site	
	Baseline	Post intervention	Baseline	Post intervention
Exclusive breastfeeding	29/214 (13.6%)	45/209 (21.5%) †	29/217 (13.4%)	23/209 (11.0%)*
Exclusive breastfeeding [x]	29/179 (16.2%)	45/176 (25.6%) ✞	29/182 (15.9%)	23/168 (13.7%)
Exclusive breastfeeding < 14 weeks [x]	27/122 (21.1%)	36/111 (32.4%)◈	26/119 (21.8%)	19/112 (17%)
Exclusive breastfeeding 14-26 weeks [x]	2/57 (3.5%)	9/65 (13.8%)✦	3/63 (4.8%)	4/56 (7.1%)

[x] Percentages calculated as a percent of breastfed infants

† Significantly more exclusively breastfed infants post intervention in the intervention site (P<0.05)

* Significantly more exclusively breastfed infants in the intervention site post intervention, than in the control site post intervention (P<0.01)

◈ Significantly more exclusively breastfed infants aged <14 weeks in the intervention site, as compared to the control site (P<0.01)

✦ Significantly more exclusively breastfed infants aged >14 weeks post intervention in the intervention site, as compared to baseline in the intervention site (P<0.05)

✞ Significantly more exclusively breastfed infants post intervention in the intervention site (P<0.05)

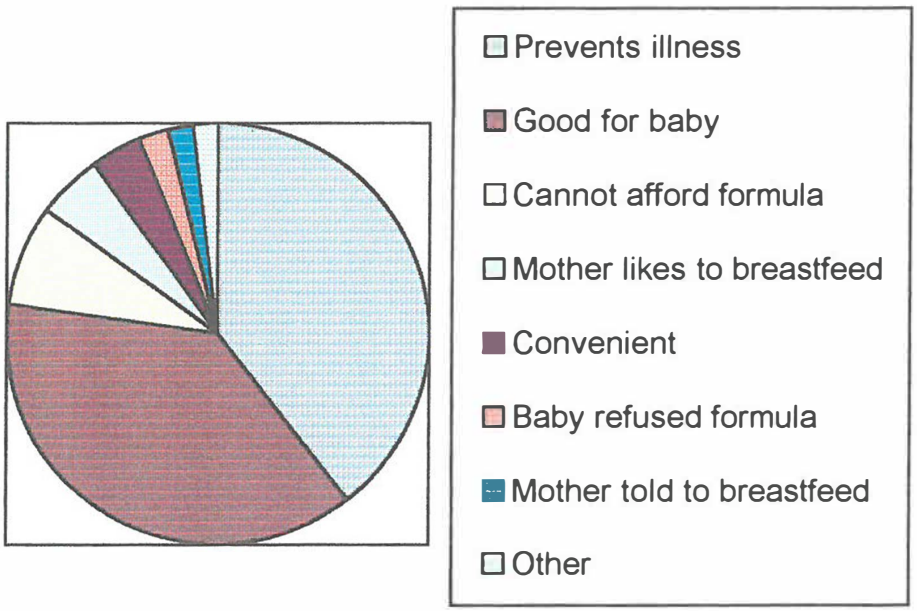
Table XI. Exclusive Breastfeeding According to Age of Infant

	Intervention site		Control site	
	Baseline	Post intervention	Baseline	Post intervention
0-2 weeks	14 (48.2%)	23 (51.1%)	13 (48.1%)	9 (39.1%)
3-6 weeks	5 (17.2%)	7 (15.6%)	8 (29.6%)	7 (30.4%)
7-13 weeks	7 (24.1%)	6 (13.3%)	5 (18.5%)	3 (13.0%)
14-18 weeks	2 (6.9%)	6 (13.3%)	2 (7.4%)	4 (17.4%)
19-26 weeks	1 (3.5%)	3 (6.67%)	1 (3.7%)	0 (0.0%)

3.3.3. Factors Influencing Milk Feeding Decisions

Over time, and between sites, the reasons for breastfeeding did not really change. The reasons were therefore combined, and represented in figure 15.

Figure 15. Reasons Why Mothers Chose to Breastfeed



Other reasons for breastfeeding included:

- Allows bonding
- Makes babies clever
- It is a baby's right to be breastfed
- Don't know how to bottle feed
- Protects the baby from dog, and snake bites

Most mothers decided to breastfeed after advice from a nursing sister, or decided for themselves. Post intervention at the intervention site, there was a significant change in breastfeeding advisors (P<0.001). Breastfeeding counsellors were quoted more often to have been influential in the decision to breastfeed.

Table XII. Advisors Influencing The Decision to Breastfeed

Advisor	Intervention site		Control site	
	Baseline N=177	Post intervention* N=173	Baseline N=176	Post intervention N=162
Nursing sister	103 (58.2%)	46 (26.6%)	76 (43.2%)	66 (40.7%)
Mother decided herself	43 (24.3%)	25 (14.5%)	62 (35.2%)	59 (36.4%)
Grandmother	22 (12.4%)	28 (16.2%)	31 (17.6%)	26 (16%)
Breastfeeding counsellor	0	69 (39.9%)	0	5 (3.1%)
Other	5.1%	2.3%	4%	3.8%

* Site 1 had a significant shift of advisors post intervention (P<0.001).

Other advice came from:

- Aunts
- Doctors
- Fathers
- Radio messages
- Neighbours

There were no significant differences in the reasons for the use of formula in the 2 groups, except for the increase in the perception that formula is as good as breastmilk. This increased significantly in both sites, from 3% (n=3) to 11.7% (n=11) in the intervention site ($P<0.05$), and from none, to 19.5% (n=23) in the control site ($P<0.001$). Reasons for formula feeding at baseline are presented in Figure 16, while reasons for formula feeding post intervention are represented in Figure 17.

Figure 16. Reasons for Formula Feeding at Baseline in the 2 sites

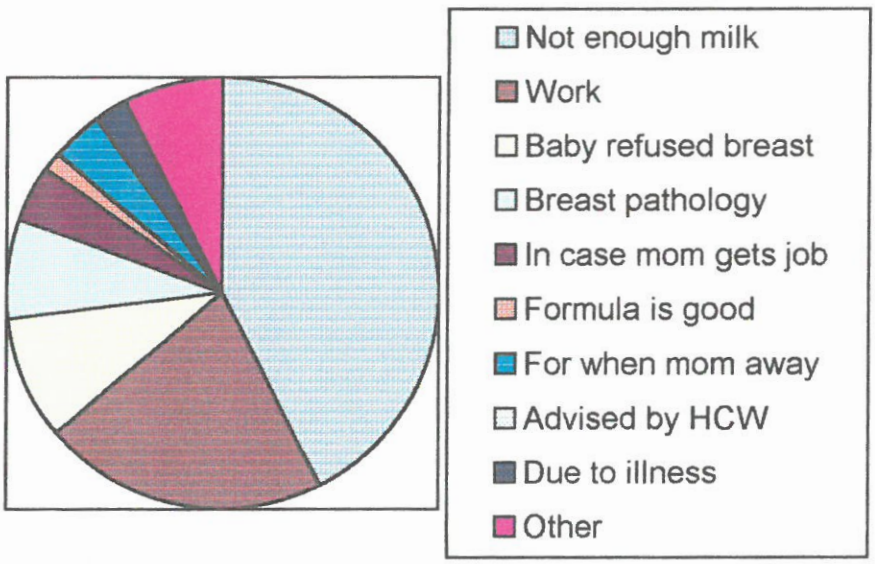
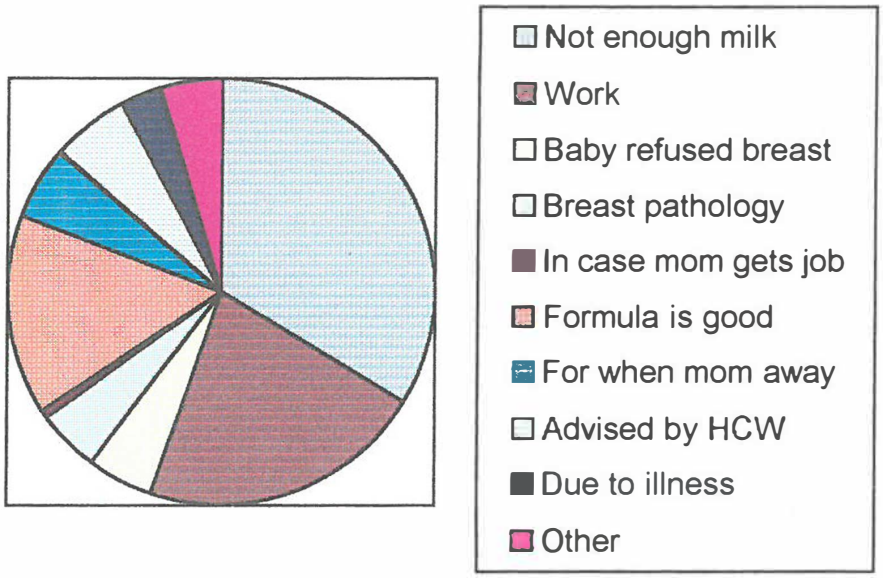


Figure 17. Reasons for Formula Feeding Post Intervention at the 2 Sites



Other reasons why formula was given:

- Traditional healer told mother that an evil spirit was suckling her breast, so she must stop breastfeeding (usually due to cracked nipples)
- Breastfed babies are too thin if formula not added
- Mother wants to stop breastfeeding
- Breasts will lose their shape
- Father advised formula feeding
- Grandmother advised formula feeding
- Formula contains iron
- Mother cannot express enough breastmilk
- It is easier for the baby to suck from a bottle
- Formula is used only to add to food

At baseline in the intervention site, 1mother used ultra heat-treated milk as she did not have enough milk. Maas was used for the same purpose by 1 mother in the control site at baseline.

Post intervention, maas was added to food by 1 mother in the intervention, and was given to 1 baby at the control site 'to get the baby to grow fast'.

Most mothers decided for themselves that they wanted to use formula, with recommendations from the grandmother as the next most frequent source of advice. Over time, there was a significant change in advisors to formula feed (intervention site P<0.001; control site P<0.01). Advice from doctors to formula feed more than doubled at both sites, while advice from nursing sisters almost doubled in the control site, but barely changed in the intervention site.

Table XIII. Advisors Influencing The Decision to Formula Feed

Advisor	Intervention site		Control site	
	Baseline N=95	Post intervention* N=91	Baseline N=98	Post intervention+ N=113
Nursing sister	10 (10.5%)	11 (12.1%)	13 (13.4%)	24 (21.2%)
Mother decided herself	58 (61.1%)	41 (45.1%)	41(42.3%)	47 (41.6%)
Grandmother	16 (16.8%)	17 (18.7%)	27 (27.8%)	18 (15.9%)
Doctor	0	11 (12.1%)	6 (6.2%)	17 (15%)
Other	11.6%	12%	10.3%	6.3%

* Significant change in advisors to formula feed (P<0.001)

+ Significant change in advisors to formula feed (P<0.01).

Other advisors for formula feeding included:

- Infant's aunt
- Father
- Hospital gave baby formula
- Traditional healer
- Neighbour
- Infant feeding counsellor

The infant's grandmother advised the mother to use ultra heat-treated milk at baseline in the intervention site. Maas was recommended by the infant's aunt in the control site at baseline, and by a doctor post intervention.

3.3.4. Use of Other Drinks

A large proportion of the infants were given drinks other than milk (Table XIV). The most common drinks given to infants were over-the-counter medicines, followed closely by water. Post intervention, there was a significant drop in the use of water in the intervention site ($P<0.05$), and a significant increase in use of water in the control site ($P<0.01$). The use of sugar water also increased significantly in the control site ($P<0.05$). In the intervention site, there was a significant reduction in the use of traditional medicines ($P<0.05$), and an overall reduction in the use of drinks in infants aged between 14-26 weeks ($P<0.05$).

Table XIV. Use of Drinks Other Than Milk

Other drinks	Intervention site		Control site	
	Baseline N=214	Post intervention N=209	Baseline N=217	Post intervention N=209
Drinks given	164(76.6%)	146 (69.9%)	163 (75.1%)	150 (71.8%)
Baby <13 weeks	93/134 (69.4%)	83/126 (65.9%)	98/137 (71.5%)	83/127 (65.4%)
Baby 14-26 weeks	71/80 (88.8%)	63/83 (75.9%)□	65/80 (81.3%)	67/82 (81.7%)
Water	70 (32.7%)	43 (20.6%)♠	65 (30.1%)	85 (40.7%)♣
Sugar water	20 (9.3%)	29 (13.9%)	15 (9.2%)	29 (13.9%)
Oral rehydration solution	20 (9.3%)	22 (10.5%)	37 (17.1%)	19 (9.1%)
Juice	19 (8.9%)	17 (8.1%)	21 (12.9%)	18 (8.6%)
Traditional medicines	22 (10.3%)	7 (3.3%)†	5 (2.3%)	1 (0.5%)
Over-the-counter medicines	104 (48.6%)	94 (45%)	88 (40.6%)	94 (45%)
Prescribed medicines	0	0	0	3 (1.4%)

□ Significant decrease in the use of drinks in infants aged 14-26 weeks post-intervention in the intervention site (P<0.05)

† significant decrease in the use of medicines from traditional healer (P=0.01)

x Significant increase in the use of sugar water post intervention in control site (P<0.05)

♠ Significant decrease in the use of water in the intervention site post intervention (P<0.05)

♣ Significant increase in use of water in the control site post intervention (P<0.01)

Other drinks were most often given to the infant using a bottle, or teaspoon (Table XV). Most medicines were given by teaspoon, except oral rehydration solution, which is given more frequently by bottle.

Table XV. Method Used for Giving Liquids

Feeding method	Intervention site		Control site	
	Baseline	Post intervention	Baseline	Post intervention
Thirst	N=92	N=83	N=90	N=108
Bottle	37 (40.7%)	36 (43.4%)	50 (55.6%)	55 (50.9%)
Cup	4 (4.3%)	14 (16.9%)	9 (10.1%)	5 (4.6%)
Teaspoon	40 (44%)	25 (30.1%)	30 (30.1%)	42 (38.8%)
Feeding cup	10 (11%)	8 (9.6%)	1 (1%)	5 (4.6%)
Syringe	0	0	0	1 (0.9%)
Medicines	N=115	N=94	N=89	N=96
Bottle	4 (3.5%)	0	0	1 (1%)
Cup	0	0	2 (2.2%)	0
Teaspoon	111	93 (98.9%)	87 (97.8%)	89 (92.7%)
Feeding cup	(96.5%)	0	0	1 (1%)
Syringe	0	1 (1.1%)	0	5 (5.2%)
Oral rehydration solution	N=20	N=22	N=35	N=16
Bottle	15 (75%)	15 (68.2%)	25 (71.4%)	9 (56.3%)
Cup	0	3 (13.6%)	4 (11.4%)	0
Teaspoon	4 (20%)	4 (18.2%)	6 (17.1%)	6 (37.5%)
Feeding cup	1 (5%)	0	0	1 (6.3%)

Drinks are given for a variety of reasons, but most often for thirst, or as a laxative (Table XVI). Sugar water, and oral rehydration solution are given both as a laxative, and to combat diarrhoea.

Table XVI. Main Reasons for Giving Liquids Other Than Milk

Reasons	Intervention site		Control site	
	Baseline	Post intervention	Baseline	Post intervention
Water	N=68	N=44	N=64	N=83
Thirst	47 (69.1%)	20 (45.5%)	21 (33.3%)	46 (55.4%)
Good for infant	11 (16.2%)	7 (15.9%)	10 (15.9%)	15 (18.1%)
Laxative	7 (10.3%)	14 (31.8%)	25 (39.7%)	13 (15.7%)
Other	3 (4.4%)	3 (6.8%)	7 (11.1%)	9 (10.8%)
Sugar Water	N=18	N=28	N=12	N=27
Thirst	2 (11.1%)	3 (10.7%)	1 (8.3%)	1 (3.7%)
Good for infant	3 (16.7%)	1 (3.6%)	2 (16.7%)	1 (3.7%)
Laxative	7 (38.9%)	19 (67.9%)	5 (41.7%)	15 (55.6%)
Constipation	3 (16.7%)	2 (7.1%)	2 (16.7%)	2 (7.4%)
Diarrhoea	0	3 (10.7%)	0	6 (22.2%)
Other	3 (16.7%)#	0	2 (16.7%)*	2 (7.4%)◆
Oral rehydration solution	N=20	N=22	N=34	N=27
Good for infant	3 (15%)	1 (4.5%)	1 (2.9%)	1 (3.7%)
Laxative	4 (20%)	5 (22.7%)	14 (41.2%)	15 (55.6%)
Constipation	1 (5%)	1 (4.5%)	5 (14.7%)	2 (7.4%)
Diarrhoea	11 (55%)	13 (59.1%)	12 (35.3%)	6 (22.2%)
Other	1 (5%)×	2 (9.1%)●	2 (5.9%)×	2 (7.4%)◆
Juice	N=17	N=17	N=15	N=18
Thirst	11 (64.7%)	14 (82.4%)	11 (68.8%)	9 (50%)
Good for infant	2 (11.8%)	3 (17.6%)	1 (6.3%)	3 (16.7%)
Gives energy	3 (17.6%)	0	2 (12.5%)	2 (11.1%)
Constipation	0	0	2 (12.5%)	2 (11.1%)
Other	1 (5.9%)✚	0	0	2 (11.1%)⁂

Gives energy, helps baby to grow, and 1 respondent did not know why

* There was no milk at home.

◆ To protect the baby, and because it gives energy

× Thirst

● To protect the baby, and there was no milk at home

✚So infant can taste other drinks

⁂ For diarrhoea, and no milk at home

Tea was given very infrequently. It was not given in the intervention site at all, but in the control site at baseline, 1 infant was given tea as there was no milk at home, and another was given tea in anticipation of the mother being away. Post intervention, tea was given as there was no milk at home in the control site. Amahewu (fermented maize drink) was given to 1 infant at baseline in the control site, to provide energy.

Mothers in the control site reported the use of traditional medicines less frequently than those in the intervention area. Most infants were given traditional medicines for purging purposes, or to protect the infant from harm (Table XVII).

Table XVII. Reasons For Use of Medicines from the Traditional Healer

Reasons	Intervention site		Control site	
	Baseline N=22	Post intervention N=6	Baseline N=5	Post intervention N=1
Protect the infant	6 (26.1%)	1 (16.7%)	2 (40%)	1 (100%)
Laxative	9 (39.1%)	4 (66.7%)	3 (60%)	0
Good for infant	3 (13%)	1 (16.7%)	0	0
Other	4 (17.4)✚	0	0	0

✚2 infants were given medicines because they had colic, and 2 because they were crying.

Over-the-counter medicines were given for similar reasons as traditional medicines, as seen in Table XVIII.

Table XVIII. Reasons for Use of Over-the-counter Medicines

Reasons	Intervention site		Control site	
	Baseline N=125	Post intervention N=102	Baseline N=93	Post intervention N=113
Constipation	25 (20.2%)	27 (26.5%)	32 (34.4%)	36 (35.3%)
Laxative	40 (32.3%)	28 (27.5%)	31 (33.3%)	40 (39.2%)
Protect the infant	10 (8.1%)	31 (30.4%)	12 (13.8%)	20 (19.6%)
Good for infant	31 (25%)	7 (6.9%)	2 (2.2%)	3 (2.9%)
Other	19 (15.3%)✚	9 (8.8%)◆	16 (15.7%)●	14 (13.7%)×

✚ diarrhoea, colic, spot on the neck, crying,

◆ diarrhoea, cough, heal the navel, calm the baby

● diarrhoea, colic, hiccups, cough

× diarrhoea, cough

3.3.5. Intake of Solids

The use of solids did not decrease significantly in the intervention site, other than in the older age group, from 14-26 weeks (P<0.01) (Table XIX).

Table XIX. Intake of Solids

Solids	Intervention site		Control site	
	Baseline	Post intervention	Baseline	Post intervention
Any foods	94/213 (43.9%)	85/208 (40.7%)	111/214 (51.9%)	103/209 (49.3%)
Age □ 13 weeks	23/134 (17.2%)	24/125 (19.2%)	41/134 (30.6%)	36/127 (28.3%)
Age 14-26 weeks	71/79 (89.9%)	61/83 (73.5%)*	70/80 (87.5%)	67/82 (81.7%)

* Significantly reduced solids in 14-26 week age group (P<0.01)

The reasons for the use of solids did not change according to age, but were predominantly to satisfy the infant, and because the infant was considered old enough for solids (Table XX).

Table XX. Reasons Why Solids are Given

Reasons for giving solids	Intervention site		Control site	
	Baseline	Post intervention	Baseline	Post intervention
Age □ 13 weeks	N=23	N=24	N=41	N=36
Infant not satisfied	16 (69.6%)	19 (79.2%)	32 (80%)	30 (88.2%)
Infant old enough	2 (8.7%)	0	4 (10%)	2 (5.9%)
Age 14-26 weeks	N=71	N=61	N=70	N=67
Infant not satisfied	30 (43.7%)	45 (76.3%)	38 (56.7%)	51 (93.8%)
Infant old enough	26 (36.6%)	7 (11.9%)	18 (26.9%)	6 (9.2%)

Mothers most often decided for themselves to introduce solids, and grandmothers were the main advisors regarding the introduction of solids (Table XXI).

Table XXI. Advisors Regarding Introduction of Solids

Solids advisor	Intervention site		Control site	
	Baseline N=92	Post intervention N=79	Baseline N=101	Post intervention N=95
Grandmother	27 (29.3%)	21 (26.6%)	46 (45.5%)	47 (49.5%)
Clinic sister	12 (13%)	5 (6.3%)	9 (8.9%)	4 (4.2%)
Mother's decision	43 (46.7%)	41 (51.9%)	36 (35.6%)	32 (33.7%)
Father	4 (4.3%)	4 (5.1%)	2 (2%)	4 (4.2%)
Infant's aunt	4 (4.3%)	0	3 (3%)	4 (4.2%)
Neighbour	2 (2.2%)	6 (7.6%)	2 (2%)	2 (2.1%)
Other	0	2 (2.5%)◆	2 (2%)×	2 (2.1%)#
Missing data	4	2	10	6

◆ doctor, breastfeeding counsellor

× doctor

nanny

The question regarding advisors was not completed in all questionnaires. The missing data were recorded in the table, but excluded from the denominator. The denominator reflects the number of questionnaires completed for this question.

The staple food, maize meal, was frequently given to the infants who were fed solids, but it's use was surpassed by commercial infant foods, where usually more

than 1 type was given, especially commercial infant cereal, and commercial infant fruit (Table XXII).

Table XXII. Foods Most Frequently Given

Solids	Intervention site		Control site	
	Baseline N=94	Post intervention N=81	Baseline N=111	Post intervention N=101
Maize porridge	45 (47.9%)	31/84 (36.9%)	56 (50.5%)	43/103 (41.7%)
Commercial infant cereal	46 (48.9%)	48/82 (58.5%)	74 (66.7%)	74/102 (72.5%)
Commercial infant vegetables	18 (19.1%)	8 (9.9%)	23 (20.9%)	22 (21.8%)
Pumpkin	16 (17%)	9 (11.1%)	15 (13.5%)	6 (5.9%)
Commercial infant fruit	36 (38.3%)	37/83 (44.6%)	32 (28.8%)	39 (38.6%)
Yoghurt	0	3 (3.7%)	0	3 (3%)
Added margarine or sugar	49/94 (52.1%)	31/77 (40.3%)	54/94 (57.4%)	37/100 (37%)

3.3.6. Separation

At baseline, 24.4% of the mothers in Cato Manor were separated from their infants during the previous week, and 35.5% of the mothers in KwaMashu had been separated from their infants. This difference was significant ($P<0.05$). Post intervention, there was no significant difference between the 2 groups (35.6% and 38.4% respectively; $P=0.565$).

An association was found between exclusive breastfeeding, and separation (Table XXIII). Mothers who were exclusively breastfeeding were significantly less likely to have been separated from their infant in the last week. This association was found in the control group at baseline in the control site ($P<0.01$), and post intervention at both sites ($P<0.001$).

Of the mothers who did leave their infants, there was a significant increase in the number of mothers who left expressed breastmilk for their infant while they were away ($P<0.01$). At baseline, in Cato Manor, only 3 mothers (5.8%) left breastmilk, while post intervention, 18 (25%) left breastmilk for their infants. The intervention increased the number of mothers 4.3 times.

In the control site, use of expressed breastmilk also increased from 5 (6.67%) at baseline to 9 (11.39%), an increase of 1.7 times ($P<0.05$).

Table XXIII. Separation

Separation	Intervention site		Control site	
	Baseline N=52	Post intervention N=73	Baseline N=76	Post intervention N=79
Frequency	52/213 (24.4%)	73/205 (35.6%)	76/212 (35.8%)	79/206 (38.3%)
Duration				
<2 hours	13 (25%)	28 (38.4%)	18 (24.7%)	27 (34.2%)
2-8 hours	36 (69.2%)	31 (42.5%)	44 (60.3%)	37 (46.8%)
< 8 hours	49 (94.2%)	59 (80.8%)	62 (84.9%)	64 (81%)
±12 hours	1 (1.9%)	12 (16.4%)	8 (11%)	9 (11.4%)
>24 hours	1 (1.9%)	2 (2.7%)	3 (4.1%)	6 (7.6%)
Reason for separation				
Work	18 (34.6%)	22 (30.6%)	23 (30.3%)	31 (40.8%)
School	8 (15.4%)	0	10 (13.2%)	5 (6.6%)
Shopping	19 (36.5%)	36 (50%)	30 (39.5%)	35 (46%)
Other	7 (14.9%)	14 (19.4%)	13 (17.1%)	5 (6.6%)
Days per week				
irregularly	23 (44.2%)	42 (58.3%)	43 (58.9%)	38 (49.4%)
1-2 days	8 (15.4%)	14 (19.4%)	4 (5.5%)	3 (3.9%)
□ 3 days	21 (40.4%)	16 (22.2%)	27 (35.5%)	36 (46.8%)

Separation	Intervention site		Control site	
	Baseline N=52	Post intervention N=73	Baseline N=76	Post intervention N=79
Carer				
Grandmother	11 (21.2%)	21 (28.8%)	44 (57.9%)	46 (58.2%)
Aunt	16 (30.8%)	23 (31.5%)	21 (27.3%)	20 (25.3%)
Neighbour	9 (17.3%)	12 (16.4%)	7 (9.2%)	2 (2.5%)
Nanny	1 (1.9%)	6 (8.2%)	0	5 (6.3%)
Creche	2 (3.8%)	3 (4.1%)	0	1 (1.3%)
Other	7 (13.5%)	8 (11%)	4 (5.3%)	4 (6.3%)
Milk given	37 (71.2%)	64 (87.7%)#	64 (84.2%)	76 (96.2%)*
Use of formula [b]	34 (91.9%	48 (76.2%)†	58 (76.3%)	67 (88.2%)
Use of EBM [a, b]	3 (8.1%)	18 (28.6%)◆	5 (7.9%)	9 (11.8%)×
Other drinks given	16 (30.8%)	20 (27.4%)	25 (32.9%)	26 (33.8%)
Water	8 (50%)	11 (40.7%)	6 (24%)	19 (67.9%)
Juice	5 (31.3%)	4 (14.8%)	12 (48%)	10 (38.5%)
Food given	25 (48.1%)	40 (55.6%)	56 (73.7%)	57 (72.2%)
Maize porridge	13 (52%)	13 (32.5%)	21 (38.2%)	25 (43.9%)
Commercial cereals	9 (36 %)	21 (52.5%)	38 (67.9%)	46 (80.7%)
Commercial vegetables	4 (16%)	1 (2.5%)	6 (10.9%)	15 (26.3%)
Pumpkin	4 (16%)	3 (7.5%)	5 (8.9%)	4 (7%)
Commercial infant fruit	7 (28%)	10 (25%)	18 (32.1%)	25 (43.9%)

[a] Expressed breastmilk

[b] Percentage of the mothers who gave milk to their infants

* Increase in the use of milk while mother away ($P<0.05$)

†Decrease in the use of formula while mother away ($P=0.001$)

◆ Increase in the use of expressed breastmilk while the mother away ($P<0.01$)

× Increase in the use of expressed breastmilk while the mother away ($P<0.05$)

3.3.7. Morbidity

Since the groups were very small, all data from both time points was pooled to evaluate the effect of infant feeding on morbidity. Exclusive breastfeeding in the 24 hours preceding the interview was significantly associated with fewer reported episodes of diarrhoea in the 2 weeks prior to the questionnaire (P<0.001). While 4.8% (n=6) of the exclusively breastfed infants had reported diarrhoeal episodes in the previous 2 weeks, 18.7% (n=136) of the infants not exclusively breastfed reportedly had diarrhoea in the previous 2 weeks (RR=3.96 with a 95% CI [1.79, 8.76]). All 6 exclusively breastfed infants who had diarrhoea were less than 14 weeks old, and 40.4% (n=55) of the non-exclusively breastfed infants who had diarrhoea were less than 14 weeks old. When the mixed feeding group was separated from the group not being breastfed, 16.2% (n=94; RR=3.4 with a 95% CI [1.53, 7.59]), of the mixed breastfeeding group, and 29.6% (n=42; RR=6.21with a 95% CI [2.73, 14.12]) of those not breastfed, had had an episode of diarrhoea in the previous 2 weeks.

Although there were no exclusively breastfed infants that were hospitalised for diarrhoea, and there were 19 (2.6%) infants who were not exclusively breastfed hospitalised for diarrhoea, this difference was not significant (P=0.066). Of the 19 infants, 9 (47.4%) were not breastfed. Of all the non-breastfed infants, 9 (6.3%) had been hospitalised for diarrhoea, as compared to 10 (1.4%) of the total breastfeeding population. This difference was significant (P<0.001).

3.3.8. Information from Health Care Workers

There was a significant difference in availability of breastfeeding education/advice at the 2 sites (Table XXIV). More mothers had heard talks on breastfeeding during pregnancy in the intervention site ($P<0.01$), but significantly more mothers had received breastfeeding advice from a health care worker in the control site ($P<0.001$). Less than half of the mothers interviewed in the intervention site had been visited at home by peer counsellors.

Table XXIV. Information from Health Care Workers to All Women

	Intervention site	Control site
Talks during pregnancy	183/208 (88%)*	176/209 (84.2%)
Breastfeeding advice from HCW	99/209 (47.4%)†	176/209 (84.2%)
Home visit by breastfeeding peer counsellor	99/209 (47.4%)	1/209 (0.5%)

* Significantly more women received talks on breastfeeding during pregnancy in the intervention site ($P<0.01$)

† Significantly fewer women received breastfeeding advice from HCW at intervention site ($P<0.001$)

At the intervention site, those women who were exclusively breastfeeding had received more information about breastfeeding than those who were not (Table XXV).

Table XXV. Information from Health Care Workers for Those Women Who Were Exclusively Breastfeeding in the Intervention Site.

	Exclusive breastfeeders
Talks during pregnancy	42 (93.3%)
Breastfeeding advice from HCW	33 (73.3%)*
Home visit by breastfeeding peer counsellor	23 (51.1%)

*P<0.01

4. Discussion

This study assessed the effect of a comprehensive exclusive breastfeeding promotional strategy implemented over 17 months by comparing the intervention site, with a control site, in which no specific promotional activity occurred. It had a cross sectional design, looking at infant feeding practices in the previous 24 hours, and represents an assessment of the efficacy of an intervention on the whole community, whether or not the individual came into contact with the peer counsellors.

Infant feeding practices were collected using 24-hour recall, as used by the World Health Organisation to determine breastfeeding prevalence (WHO 1997). Mothers of infants aged 0-2 weeks, were also asked about feeding practices in the first 24 hours postpartum. Cross-sectional data has been shown to over-estimate the prevalence of exclusive breastfeeding (Kylberg 2000, Piwoz 1994, Bland 2002). This was evident in the current study, as 13.2% (n=7) of the 0-2 week old infants who had been exclusively breastfed in the previous 24 hours, had been fed other fluids in the first 24 hours of life. Although this tool has limitations, the objective of using the tool was to monitor if any change had occurred due to the intervention implemented. The tool was used consistently, and therefore, the results at the 2 time points and at the 2 sites should over represent the exclusive breastfeeders equally, making the results comparable.

This tool, while simple, and easy to use, could be altered slightly to improve data capture, and make this a more appropriate tool. The question 'have you ever given your baby any drinks, foods, or medicines, since birth?' should be included,

as well as information regarding basic socio-economic variables, such as water availability, fuel source for food preparation, household income, and number of siblings. Inclusion of birth weight would facilitate determining whether low birth weight infants are fed differently to normal birth weight infants.

The 2 study sites were similar, but not identical. There was no difference in the age of the mothers, or the number of respondents who were mothers, and the number of women who had not attended high school. However, post intervention, there was a variation in levels of schooling attained in the 2 sites. While there were more women in the control site who had completed 10-12 years of schooling, there were more women in the intervention site who had completed 8-10 years, or tertiary education. Education did not affect feeding practices, and therefore this difference in schooling, while noted, is not considered of great importance. There were significantly more working mothers in the control site at baseline, but, the baseline feeding practices were not different.

Delivery sites were different, and this affected when the mother first saw her baby, and gave the first breastfeed. Most women in the intervention site delivered in a tertiary hospital (79%; n=169), where they waited more than 4 hours before initiating breastfeeding (57.5%; n=23). Most mothers in the control site initiated breastfeeding within the first hour post delivery (52.5%; n=22). Initiating breastfeeding within the first hour of delivery has been associated with longer duration of breastfeeding, and an increased rate of exclusive breastfeeding (Ali 1981). This was not seen in the study sites, and highlights the need for any intervention aimed at improving exclusive breastfeeding needs to include many

aspects conducive to breastfeeding (Kramer 2000) – while the mothers in the control site had an advantage, in initiating breastfeeding early, they had less post natal support, and did not breastfeed longer, or exclusively breastfeed more frequently than the intervention site at baseline.

Since 18.2% (n=38) of the mothers from the control site delivered at the same tertiary hospital as the mothers from the intervention site, they may have been exposed to the breastfeeding counsellors, and the idea of exclusive breastfeeding. One counsellor worked in the hospital Monday to Friday, and an additional 2 breastfeeding counsellors worked in the hospital from Thursday to Sunday, the mothers in the tertiary hospital would have likely been exposed to information on exclusive breastfeeding. In fact, 3% (n=5) of the mothers interviewed at the control site reported the breastfeeding counsellor as the main person influencing their decision to breastfeed.

Most mothers initiated breastfeeding within the first 24 hours (83%; n=705). These findings were similar to those of Ross (1983), Croucher (2000), and Bland (2002) in South Africa. The use of formula significantly decreased in the intervention site ($P<0.01$), and increased in the control site ($P<0.05$). This increase may have been due to the fact that the control site was designated as a pilot site for the prevention of mother-to-child transmission of HIV (PMTCT) 7 months prior to the post-intervention assessment, and free formula was being issued to HIV positive women who chose to formula feed.

Most mothers had breastfed their infants in the previous 24 hours, but few breastfed exclusively. The promotion of exclusive breastfeeding in the community led to a significant increase in the rate of exclusive breastfeeding, despite the fact that only 47.4% (n=99) of the intervention population interviewed had ever been visited at home by a peer counsellor. Exclusive breastfeeding increased from 13.6%(n=29) to 21.5% (n=45) ($P<0.05$). There was no change in the rate of exclusive breastfeeding in the control site. This increase in the intervention site, although an increase of 58%, was not nearly as great as that achieved by Morrow (1999), Haider (2000). This difference is probably due to the longitudinal nature of their studies – both authors reported results from mothers who were visited regularly by peer counsellors. The mothers included in our sample may not have been in the intervention area for the 17 months, and may not have been visited at home by the peer counsellors – only 99 (47.4%) had ever been visited by a peer counsellor.

Overall, the number of women breastfeeding at the time of the interview did not change over time at either site. There was, however, a significant increase in the number of women who were giving formula in the control site (45.8% (n=99) at baseline to 56.9% (n=119) post intervention; $P<0.05$). This means there would have been a net increase in women who were mixed feeding, acknowledged to be the worst feeding method if the mother is infected with HIV (Coutsoudis 2000). This also highlights the probability that where free formula is available for HIV infected women (in settings where is breastfeeding is the cultural norm) it results in a "spill-over" effect resulting in an increase in the practice of mixed breastfeeding

with breast and formula as highlighted by Coutsoudis et al (2002) and by recent evaluation of the PMTCT sites in Botswana (UNICEF 2002).

Reasons for adding formula were mostly related to perceived insufficient milk, and separation due to employment, similar to findings by Cohen (1999), and (Haider 1997). Although employment is often regarded as a major reason for the introduction of artificial feeds, only 15.4% of the women in the intervention site stated that employment was the reason for supplementation, while a larger proportion of women (28.4%) in the control site introduced formula due to work. These findings are in line with those of Hight-Laukaraan (1996), who found, in an analysis of data from 15 developing countries, that employment is not the major reason for the introduction of formula. Although employment was not the main determinant of breastmilk substitute use, it was significantly associated with the use of formula in both sites (intervention site $P<0.01$; control site $P<0.001$). These findings further highlight the need for programmes to spend considerable effort in explaining the hormonal control of breastfeeding and the support needed to encourage women that the insufficient milk syndrome is a perception only

Most women were separated from their infants for 8 hours, or less (87.5% at intervention site, and 83% at control site). This provides an ideal opportunity for the use of expressed breastmilk in the mother's absence, even for women without refrigeration. Valdés (2000) was very successful in promoting the use of expressed breastmilk for working mothers in Chile, albeit in a much more breastfeeding-friendly work environment than that of South Africa.

The use of expressed breastmilk increased significantly in both sites, from 8.1% at baseline in the intervention site, to 28.6% post intervention ($P<0.01$). In the control site, use of expressed breastmilk increased from 7.9% to 11.8% ($P<0.05$). This could be due to the fact that during this period at both sites the Department of Health introduced posters and brochures encouraging expression of breastmilk.

A very disturbing finding was the significant increase in the perception of the mothers that formula is as good as breastmilk. This increased significantly in both sites, but more so at the control site, which became a pilot site for PMTCT seven months prior to the second evaluation. This increase may have been related to the advice from health care workers to HIV positive women to formula feed, as well as the media coverage of the legal battle between the Treatment Action Campaign (TAC), and the government, regarding the distribution of virumine to all pregnant women. The reality is that the distribution of free formula by health workers who are the ones who usually distribute good health services e.g. immunisation, family planning, is seen as an endorsement of the product and can have serious spill over effects as mentioned earlier (Coutsoudis et al 2002). The TAC also advocates the distribution of free formula to all women who receive virumine, the newspapers quoted the TAC saying that the benefits of antiretroviral therapy is negated by breastfeeding (Mail and Guardian 2000). Formula feeding was posed as a safe, and preferable infant feeding option, but was not qualified within the context of HIV, or in terms of overall infant survival. The disadvantages of formula feeding were not mentioned anywhere.

Supplementation with other fluids was mainly for purging the infant ('cleaning the stomach' as a laxative), and for the relief of constipation. The fact that oral rehydration (as given out at the clinic, or purchased at the pharmacy) was given as a purgative, and to counteract diarrhoea is bizarre, and reinforces previous findings that a population will take health messages, and interpret them in a social, and cultural context. Without the recognition of cultural beliefs, and development of appropriate messages within that context, the promotion of exclusive breastfeeding will be less successful (Semega-Janneh 2001).

The addition of solids to the infant's diet before 6 months of age decreased significantly in the age group between 14 and 26 weeks in the intervention site. Foods were mostly added as the infants 'were not satisfied'. Most mothers either decided on the introduction of solids themselves, or had been advised by the infant's grandmother to introduce solids. The clinic sister was the next most frequent advisor on the introduction of solids. It is evident that, despite having the study team working on exclusive breastfeeding, the nursing staff were unconvinced of the importance of delaying the introduction of solids.

Commercial infant foods were the foods most commonly used, followed by maize porridge, the staple food of the local population. Post intervention, yoghurt was added as a new food given to infants, coinciding with a launch of a small sized yoghurt tub, and intensive television advertising. The television advert featured small children, of approximately 1 year of age, and promoted health benefits for 'babies'. The high consumption of expensive commercial infant foods in an area where unemployment is high (over 36%) is an example of the susceptibility of

people to television and other media advertising. Less than half of the mothers increased the energy content of the foods by adding fat, or sugar to the meal, but this probably reflects the high use of commercial products, to which nothing is usually added.

Exclusive breastfeeding was significantly associated with fewer reported episodes of diarrhoea in the 2 weeks prior to the questionnaire ($P<0.001$). While 4.8% (n=6) of the exclusively breastfed infants had reported diarrhoeal episodes in the previous 2 weeks, 18.7% (n=136) of the infants not exclusively breastfed reportedly had diarrhoea in the previous 2 weeks (rr=4 with a 95% CI [0.11, 0.56]). All 6 exclusively breastfed infants who had diarrhoea were less than 14 weeks old, and 40.4% (n=55) of the non-exclusively breastfed infants who had diarrhoea were less than 14 weeks old.

When the mixed feeding groups was separated from the group not being breastfed, 16.2% (n=94) of the mixed breastfeeding group (RR 3.4), and 29.6% (n=42) of those not breastfed, had had an episode of diarrhoea in the previous 2 weeks (rr=6.25 with a 95% CI [0.07, 0.37]). These findings are consistent with figures of morbidity with developing countries around the world (Popkin 1990, Raisler 1999, Wright 1998). Although there were no exclusively breastfed infants that were hospitalised for diarrhoea, and there were 19 (2.6%) non-exclusively breastfed infants hospitalised for diarrhoea, this difference was not significant ($P=0.066$). Of the 19 infants who had been hospitalised, 9 (47.4%) were not breastfed. Of all the non-breastfed infants, 6.3% had been hospitalised for

diarrhoea, as compared to 1.4% of the breastfeeding population (rr=4.63 with a 95% CI [1.92, 11.19]). This difference was significant (P<0.001).

Once again this has important implications for populations in Africa where formula feeding is encouraged as a means of preventing HIV transmission without regard for the converse that formula feeding increases morbidity and mortality (WHO 2000, Latham 2000, Coutsoudis 2002).

The introduction of breastfeeding counsellors to the intervention site may have resulted in shift in the perceived responsibility of the nursing staff. Although most women (88%, n=359) had heard talks on antenatal days about breastfeeding (mostly done by breastfeeding counsellors at the intervention site), only 47.4% (n=99) of the mothers had had any advice on breastfeeding from a health care worker in the intervention site, as compared to 84.2% (n=176) at the control site. Of the women who were exclusively breastfeeding, 73.3% (n=33) had had advice from a health care worker regarding breastfeeding, and 93% (n=42) had listened to a talk on breastfeeding during pregnancy. The consistent, repeated advice from different sources may be the reason why these women were exclusively breastfeeding, as compared to the general population in the community. It is obvious that nursing sisters have significant influence on the feeding practices of women, and should be trained to utilise every opportunity to promote exclusive breastfeeding during their daily interactions with mothers. Unfortunately, this data was not collected at baseline, so no comparison can be made to determine whether the nursing staff had promoted breastfeeding less frequently form the start of the programme, or whether there was a shift in the perceived responsibility.

The study has shown that it is possible to increase exclusive breastfeeding rates, and thus improve child health. It highlights the importance of comprehensive promotional efforts, for better success (Kramer 2001, Valdés 1993, Wright 1998, Barros 1995, Morrow 1999). It is imperative that the whole health care team is seen to be giving the same message to reinforce the message of exclusive breastfeeding. If the health care team is seen to be giving conflicting information, mothers become confused, resulting in ongoing mixed feeding, which has been shown to be detrimental to the health of the future generation.

5. Recommendations

It is evident from this study that nursing sisters without additional training in infant feeding, although claiming to promote breastfeeding, are ineffective in their promotional activities. It may be that they do not have sufficient information, or skills to promote exclusive breastfeeding, and to help a mother with breastfeeding difficulties, or, their message is simply to breastfeed, disregarding the importance of exclusive breastfeeding.

It is therefore recommended that

1. All nursing staff who work with pregnant women, and mothers of small children be trained in lactation management.
2. Regular assessments of breastfeeding practices are conducted, especially in PMTCT sites that distribute free infant formula
3. Infant morbidity, and mortality are carefully recorded and tracked in the clinics, and related to infant feeding practices, to develop a database that will appropriately inform policy makers regarding relative risks of formula feeding in specific areas
4. National programmes are implemented to promote exclusive breastfeeding through mass media, such as television, and the radio, as well as improvement of the practices in hospitals and clinics to make them more baby friendly.
5. South African law should limit more strictly the sale of infant foods, restricting the age recommendations on the foods to starting at 6 months only.

CONCLUSION

The promotion of exclusive breastfeeding through educational materials and support and encouragement by peer counsellors does improve the rate of exclusive breastfeeding.

The increase in the use of supplements, and, particularly formula feeds, may be as a result of promotion of these products by nursing staff, family members, and the media, and a concomitant poor promotion of breastfeeding, particularly exclusive breastfeeding.

If all hospital, and clinic staff are appropriately trained, and exclusive breastfeeding was promoted through the media, so that there was one consistent message, it is likely that the rates of exclusive breastfeeding could be increased significantly.

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Appendix 1

It's a baby's right to be exclusively breastfed because....

_____

_____

_____

It's a mother's right to breastfeed exclusively because....

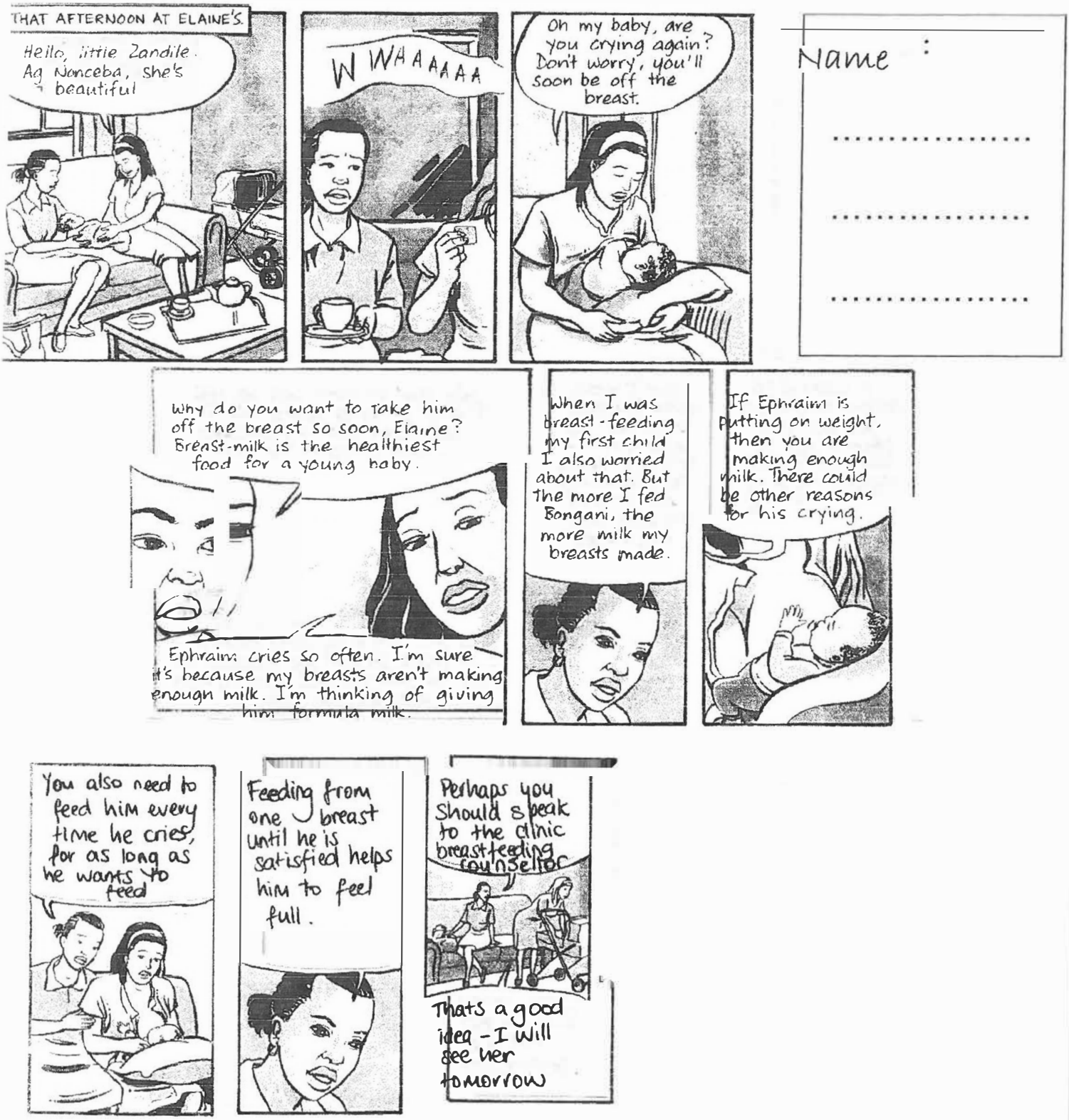
Fill in the missing words from the box below.

Babies that are _____ breastfed for the first _____ months of life are _____, _____ and _____.

Breastmilk contains _____ the baby needs for the first 6 _____, and is good for the baby for at least _____ years.

Giving the baby any _____ , _____ _____ tea, water, or anything else increases the risk of diseases like _____ and _____.

exclusively	diarrhoea	two
everything	six	clever
cereal	strong	other milk
pneumonia	healthy	months



Name :

.....

.....

.....

What can a mother do if she feels she does not have enough milk?

.....

.....

.....

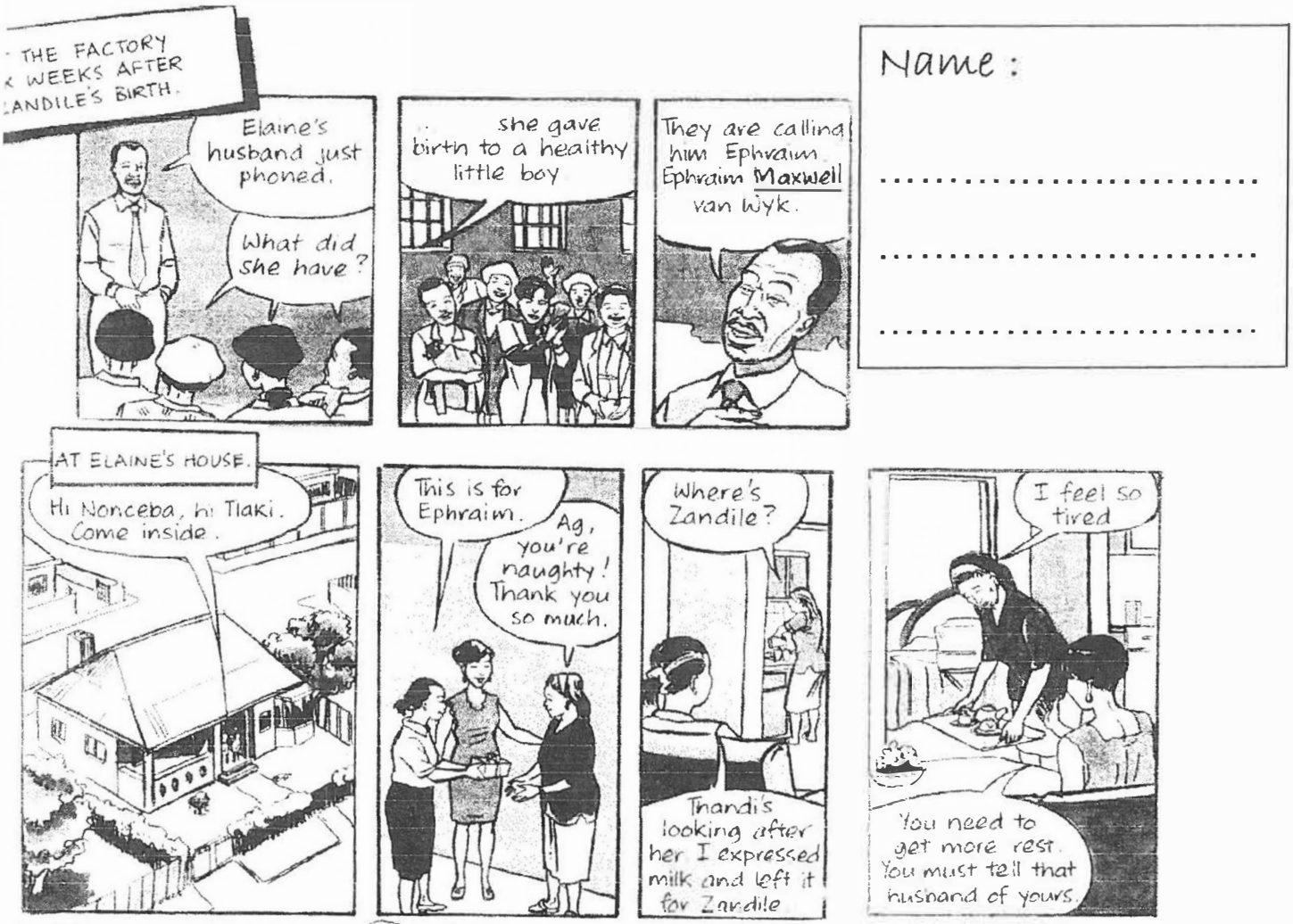
.....

Name :

.....

.....

.....



What can a mother do if her nipples are painful?

.....

.....

.....

.....

Appendix 2. FEEDING QUESTIONNAIRE

1. Date of interview: _____ **Interviewer:** _____

2. Are you the mother of the child? Y_1/N_2 **3. Age of Mother:** _____**yrs**

4. Name of Mother/Caregiver: _____

5. Relation to child if not mother: | Grandmother | Aunt 5 | Neighbou | Other: |

6. Level of schooling: | Never 7 | < Std 5 | < Std 8 | Std 8-10 | Tertiary |

7. Age of baby: _____**weeks** **8. Date of birth:** _____

9. Where was your baby born? | KEH 12 | ADD 13 | Home 14 | |

For Babies ≤ 2 weeks old

10. How many hours after birth was your baby given to you? _____

11. Was your baby given anything to drink before he was brought to you?
Y_1 / N_2 / Don't know$_{99}$

12. How soon after your baby was born did you give any feeds (anything to eat/drink)?

< 1 hour	1-2 hrs	2-3 hrs	3-4 hrs	>4 hrs 19	Don't know

13. What was given to your baby in the first 24 hours?

Breast milk	20	
Formula	23	
Water	21	
Sugar water	22	
Holy water	24	
Juice	25	
Tea	26	Specify:
Muti from trad.healer	27	
Muti from chemist	28	
Other		

14. Did you give any milk to your baby yesterday ? Y_1/N_2 *(if no, go to question 19)*

15. What milk did you give?

Breastmilk	Formula	Cows milk	UHT sterilized milk	Maas	Cremora	Other:
20	23	29	30	31	32	

16. Why do you choose that milk? *(ask reason for each milk)*

Milk 1 : _____

Milk 2 : _____

Milk 3 : _____

17. Who advised you? (relation to child)

Grandmother	Aunt s	Neighbour	Father	Clinic sister

Doctor	Other:

18. Are you giving your baby any other drinks? Y_1 / N_2

19. What did you give your baby to drink yesterday?

21 Water Y_1 / N_2

22 Sugar water Y_1 / N_2

36 ORS Y_1 / N_2

25 Juice Y_1 / N_2

26 Tea Y_1 / N_2

37 Amahewu Y_1 / N_2

24 Holy water (isiwasho) Y_1 / N_2

27 Muti from healer Y_1 / N_2 Specify: _____

28 Muti from chemist Y_1 / N_2 Specify: _____

Other Y_1 / N_2 Specify: _____

ANSWER PROMPTED? Y_1 / N_2

20. How did you give these drinks?

Bottle 38	Cup 39	(T)Spoon 40	Feeding cup with spout 41	

21. Why did you give these drinks yesterday?

81 Thirst W21 S22 O36 J25 T26 A37 MH27 MC28 other _____

82 Diarrhoea W21 S22 O36 J25 T26 A37 MH27 MC28 other _____

83 Constipation W21 S22 O36 J25 T26 A37 MH27 MC28 other _____

84 Good for baby W21 S22 O36 J25 T26 A37 MH27 MC28 other _____

85 Gives energy W21 S22 O36 J25 T26 A37 MH27 MC28 other _____

86 No milk at home W21 S22 O36 J25 T26 A37 MH27 MC28 other _____

87 To protect the baby W21 S22 O36 J25 T26 A37 MH27 MC28 other _____

119 To clean baby's stomach W21 S22 O36 J25 T26 A37 MH27 MC28 other _____

Other: _____ W21 S22 O36 J25 T26 A37 MH27 MC28 other _____

ANSWER PROMPTED? Y_1 / N_2

22. Did you give your baby any foods yesterday? Y_1 / N_2

23. Why did you give foods? _____

24. Who advised you? (relation to child)

Grandmother	Aunt 5	Neighbour	Father 33	Clinic sister

Doctor	O t he r :

25 What foods did you give yesterday?

FOOD	TICK	FOOD	TICK
Porridge	42	Egg	52
Nestum/cerelac	43	Chicken/meat	53
Pronutro	44	Beans/lentils	54
Mashed potato	45	Purity meat/chicken	55
Bread	46		
Purity vegetable	47		
Pumpkin/butternut	48		
Imifino / spinach	49		
Purity fruit	50		
Banana/orange/apple	51		

ANSWER PROMPTED? Y_1 / N_2

26. Did you add margarine or sugar to any foods for your baby yesterday? Y_1 / N_2

27. Do you use a pacifier/dummy? Y_1 / N_2

28. Were you separated from your baby during the last week? Y_1 / N_2 *(if no, go to question 42)*

29. How long were you away?

56 ☐ < 2 hours
57 ☐ < 8 hours
58 ☐ ~ 12 hours
59 ☐ > 24 hours
60 ☐ > 2 days

30. Why were you separated?

Work	School	Shopping	Funeral/weddin	Other

31. On how many days of the week are you separated from your baby?

	1						
Not regularly		2	3	4	5	6	7