

## The International Code is twenty-five years old

*The International Code of Marketing of Breast-milk Substitutes* was adopted on 21 May 1981 by the 34<sup>th</sup> World Health Assembly (WHA) and is today 25 years old. Like its conception and delivery, its infancy, childhood, adolescence and now its adulthood, have not been free of trouble:

- It has not been put fully into effect by all governments through legislation, regulations or other suitable measures (article 11.1). By August 2005, 61 out of 192 countries had not yet passed a law derived from the Code, while many other countries have adopted measures that do not take into account all of its provisions.<sup>1</sup> For example, in most countries of the European Union, national legislation is based on a EU Directive of 1991<sup>2</sup> (when the Code was 10 years old!), and does not apply to feeding bottles and teats and to many breastmilk substitutes (baby teas, juices, follow on milks, milks for older infants and young children). Globally, only 34 out of 192 countries have so far put into effect all the provisions of the Code.
- Few governments have set up regular systems for monitoring the application of the Code (article 11.2). The same can be said of manufacturers and distributors: they have not bothered to monitor their marketing practices and to take adequate steps to correct them (article 11.3). When they pretend to have done so, they use their own interpretation of the Code, stating for example that it applies only to infant formula, or only to developing countries - interpretations aimed at protecting their profits more than protecting breastfeeding.
- Concerned non-governmental organizations (NGOs), professional groups, institutions and individuals that carried out monitoring and drew the attention of governments, manufacturers and distributors to systematic violations of the Code (article 11.4) were often ignored.

As a consequence, breastfeeding is still not as protected as it should be. In some countries, manufacturers and distributors still market their products through direct contact with mothers, in others they go back to the old practice of providing free samples and supplies of infant formula to maternity hospitals. They use all kinds of promotion in different media everywhere, and devise new marketing techniques such as internet baby clubs to promote their brands and products.<sup>3</sup> This systematic lack of compliance with the Code is confirmed by independent research conducted in different countries and published in prominent medical journals.<sup>4,5</sup> WHA Resolutions also periodically draw the attention of the international community to the fact that companies do not abide by the Code and that governments need to reinforce their action.

Despite all these difficulties, the Code remains a powerful instrument in the hands of those committed to the protection of breastfeeding. For example, if all health professionals really knew the Code and subsequent relevant WHA Resolutions, they could say **no** when:

- representatives from the industry offer free samples, equipment, gifts, etc. (article 6);
- industry proposes to sponsor attendance at conferences (Resolution WHA 49.15 of 1996);
- industry offers money for research (Resolution WHA 58.32 of 2005).

By saying **no**, their decisions regarding infant feeding would be free from conflict of interest and less likely to undermine the nutrition and health of the infants and young children they care for. It is clear, however, that much more work needs to be done to disseminate this knowledge among health professionals.<sup>6</sup> Also, the public at large knows little or nothing about the Code and its role in the protection of breastfeeding and of child rights. It is only by developing and enforcing national laws and regulations based on the Code as a minimum in all countries, that real progress can be made. WHO and UNICEF should not loosen their hold and relax; on the contrary, they should recognize and support governments and concerned NGOs, institutions and associations in order to fill the gaps and loopholes and enhance measures that have already been taken.

Is the Code adequate to cope with current and future challenges? Yes and no. If its spirit were properly understood and applied, the Code and subsequent WHA resolutions would help governments to force manufacturers and distributors to accept their responsibility with regards to consumer safety. These producers would do so by putting clear warnings on labels saying that dried infant formula is not a sterile product, that it may be intrinsically contaminated with *Enterobacter sakazakii*<sup>7</sup> and other potentially dangerous pathogens. They would also clearly state in their instructions that rigorous methods of reconstitution, preparation, administration and storage of artificial feeds are indispensable. Such clear warnings would emphasize the value of breastmilk and lead parents of formula fed infants to recognize the risks of bottle feeding. The Code could also be used to develop and strengthen measures to ban the use of nutrition and health claims about breastmilk substitutes, a new and powerful marketing tool that manufacturers and distributors are using with increasing and worrying frequency. Despite a clear statement in WHA Resolution 58.32 of 2005, such a ban has not been endorsed yet at Codex Alimentarius and such nutrition and health claims may therefore creep into national and supranational regulations (EU Directives, for example).

The Code would be inadequate, however, to deal with new challenges, such as the need to protect younger and older children from the threat posed by the marketing of sweet soft drinks, sweet and salty snacks, fat and fried foods - the so-called junk foods. It is now recognised that this marketing is one of the most important factors behind the global epidemic of obesity in children.<sup>8</sup> The Code protects the right of infants and young children to be breastfed but despite the good start it does not protect them from growing obese.

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2. European Commission. Directive 91/321/EEC. EEC, Brussels, 1991.
3. IBFAN. Breaking the rules, stretching the rules 2004. IBFAN, Penang, 2004.
4. Taylor A. Violations of the International Code of Marketing of Breast-milk Substitutes: prevalence in four countries. *BMJ* 1998;316:1117-22
5. Aguayo VM, Ross JS, Kanon S, Ouedraogo AN. Monitoring compliance with the International Code of Marketing of Breast-milk Substitutes in West Africa: multisite cross sectional survey in Togo and Burkina Faso. *BMJ* 2003;326:127
6. Waterston T, Tumwine J. Monitoring the marketing of infant formula feeds. *BMJ* 2003;326:113-4
7. Gurtler JB, Kornacki JL, Beuchat LR. Enterobacter sakazakii: a coliform of increased concern to infant health. *Int J Food Microbiol* 2005;104:1-34
8. National Academy of Sciences Committee on Food Marketing and the Diets of Children and Youth. Food marketing to children and youth: threat or opportunity? National Academies Press, Washington DC, 2006.

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## Breastfeeding why...

### Defective formula

Fattal-Valevski A, Kesler A, Sela BA et al. Outbreak of life-threatening thiamine deficiency in infants in Israel caused by a defective soy-based formula. *Pediatrics* 2005;115:233-8

Between October and November 2003, several infants with encephalopathy (vomiting, lethargy, irritability, abdominal distension, diarrhoea, respiratory symptoms, developmental delay, failure to thrive) were hospitalized in paediatric intensive care units in Israel. Two died of cardiomyopathy. Analysis of data showed that all had been fed the same brand of soy-based formula, specially manufactured for the Israeli market. Detailed history revealed that the formula was deficient in thiamine. The product was pulled from the shelves, and the public was alerted. The Ministry of Health screened 156 infants who had been fed the soy-based formula, were already being fed alternative formulae and solid food supplements, and had begun oral thiamine treatment. Abnormal results were noted in eight infants, all more than 1 year old.

contribution to the achievement of the child survival millennium development goal; 16% of neonatal deaths could be saved if all infants were exclusively BF from day 1 and 22% if BF started within the first hour.

Bahl R, Frost C, Kirkwood BR et al. Infant feeding patterns and risks of death and hospitalization in the first half of infancy: multicentre cohort study. *Bull World Health Organ* 2005;83: 418-26

To determine the association of different feeding patterns with mortality and hospital admissions during the first half of infancy, the authors of this paper carried out an analysis of data from a multi-centre randomized controlled trial on immunization-linked vitamin A supplementation. Altogether, 9,424 infants and their mothers (2,919 in Ghana, 4,000 in India and 2,505 in Peru) were enrolled when infants were 18–42 days old in two urban slums in New Delhi, a peri-urban shanty town in Lima, and 37 villages in the Kintampo district of Ghana. Mother-infant pairs were visited at home every 4 weeks from the time the infant received the first dose of oral polio vaccine and diphtheria-pertussis-tetanus at the age of 6 weeks in Ghana and India and at the age of 10 weeks in Peru. At each visit, mothers were asked what they had offered their infant to eat or drink during the past week. Information was also collected on hospital admissions and deaths occurring between the ages of 6 weeks and 6 months. There was no significant difference in the risk of death between children with exclusive and predominant BF. Non-BF and partially BF infants had a 10-fold and a 2.5-fold higher risk of dying, respectively, when compared with exclusively and predominantly BF infants. There are two major implications of these findings. First, the extremely high risks of infant mortality associated with not being BF need to be taken into account when informing HIV-infected mothers about options for feeding their infants. Second, the finding that the risks of death are similar for exclusively and predominantly BF infants suggests that in settings where rates of predominant BF are already high, promotion efforts should focus on sustaining these high rates rather than on attempting to achieve a shift from predominant to exclusive BF.

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### Mortality in low and high income countries

Edmond KM, Zandoh C, Quigley MA et al. Delayed breastfeeding initiation increases risk of neonatal mortality. *Pediatrics* 2006;117:380-6

This study, conducted in rural Ghana, assessed the impact of the timing of initiation and of the type of breastfeeding (BF) on neonatal mortality. In 10,947 BF singleton infants born between July 2003 and June 2004 who survived to day 2, BF was initiated within the first day of birth in 71% of infants and by the end of day 3 in all but 1.3%; 70% were exclusively BF during the neonatal period. The risk of neonatal death was 4-fold higher in children given milk-based fluids or solids in addition to breastmilk. There was a marked dose response of increasing risk of neonatal mortality with increasing delay in initiation of BF from 1 hour to day 7; late initiation (after day 1) was associated with a 2.4-fold increase in risk. The authors conclude that promotion of early initiation of BF has the potential to make a major

Chen A, Rogan WJ. Breastfeeding and the risk of postneonatal death in the United States. *Pediatrics* 2004;113:e435-9

This paper evaluates the effect of BF on postneonatal mortality in the United States using the 1988 National Maternal and Infant Health Survey data. Samples of 1,204 infants who died between 28 days and 1 year from causes other than congenital anomaly or malignant tumor, and of 7,740 control children who were still alive at 1 year were included. Overall, children who were ever BF had a 21% lower risk of dying in the postneonatal period compared to never BF children. The reduction of risk varied between 41% for injuries and 16% for sudden infant death syndrome. Assuming causality, promoting BF has the potential to save or delay approximately 720 postneonatal deaths in the United States each year.

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### Maternity leave

Tanaka S. Parental leave and child health across OECD countries. *The Economic Journal* 2005;115:F7-F28

To better understand the relationship between parental leave and child health, this study examines the aggregate effects of parental leave policies on child health outcomes between 1969 and 2000, using data from 18 industrialised countries with an average of 18.2 weeks of job-protected paid leave (from 12 weeks in the US to 68 weeks in Sweden). The author found that the extension of weeks of job-protected paid leave has significant effects on decreasing infant mortality rates, the largest effect being on post-neonatal mortality rates: a 10-week extension in paid leave is predicted to decrease post-neonatal mortality rates by 4.1%. Non-paid leave does not have the same effect: this suggests that if leave is provided without adequate payment and job protection, parental leave-taking behaviour may not be very responsive and may result in mothers' early return to work. Several mechanisms, which may include prenatal care, BF, leave coverage, and length of leave taken by mothers and fathers, may explain the effects of parental leave on infant mortality and would need to be examined.

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### Human Immunodeficiency Virus (HIV)

Iliff PJ, Piwoz EG, Tavengwa NV et al. Early exclusive breastfeeding reduces the risk of postnatal HIV-1 transmission and increases HIV-free survival. *AIDS* 2005, 19:699-708

The promotion of exclusive BF may substantially reduce BF-associated HIV transmission. This is the conclusion of a study on the postnatal transmission (PNT) of HIV conducted in Zimbabwe within a trial of postpartum vitamin A supplementation. A total of 14,110 mother-newborn pairs were enrolled, randomly assigned to vitamin A or control group after delivery, and followed up for 2 years. At baseline, 6 weeks and 3 months, mothers were asked whether they were still BF and whether any liquids or foods had been given to the infant. A total of 4,495 mothers tested HIV positive at baseline; 2,060 of their babies were alive and HIV negative at 6 weeks. Overall PNT (defined by a positive HIV test after the 6-week negative test) was 12%, 68% of which occurred after 6 months. Compared with exclusive BF, early mixed BF was associated with a 4.03, 3.79 and 2.60

greater risk of PNT at 6, 12 and 18 months, respectively. Predominant BF was associated with a 2.63, 2.69 and 1.61 trend towards greater PNT risk at 6, 12 and 18 months, compared with exclusive BF.

Coutsoudis A, Goga AE, Rollins N et al. Free formula milk for infants of HIV-infected women: blessing or curse? *Health Policy Plan* 2002;17:154-60

Should HIV-infected women in developing countries choose formula or BF for their infants? Formula eliminates HIV transmission but incurs risk of increased mortality, whereas BF has multiple benefits but entails risk of HIV transmission. This article gives reasons against providing free or subsidized formula to HIV-infected mothers: it worsens the disadvantages of formula feeding; it compromises free choice; it targets beneficiaries erroneously; it creates a false perception of endorsement by health workers; it compromises BF; it results in disclosure of HIV status; it ignores hidden costs of preparation of formula; it increases mixed BF, which increases HIV transmission; it requires organization and management of programmes that are complicated and costly; and finally, it increases the spill-over effect into the normal BF population.

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### Respiratory tract infections (RTI)

Chantry CJ, Howard CR, Auinger P. Full breastfeeding duration and associated decrease in respiratory tract infection in US children. *Pediatrics* 2006;117:425-32

The objective of this study was to ascertain if full BF for 6 months, compared with 4 to 6 months, provides greater protection against respiratory tract infections (RTI). Data from 2,277 children aged 6 to 24 months surveyed in the US between 1988 and 1994 were divided into five groups according to BF status. After adjustment for demographic variables, childcare, and smoke exposure, the 223 children fully BF for 4 to 6 months had a 4.27-fold increased risk for pneumonia and a 1.95-fold increased risk for three episodes of otitis media compared with those BF 6 months. These findings support the current WHO recommendations that infants should receive only breastmilk for the first 6 months of life.

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### Urinary tract infections (UTI)

Mårild S, Hansson S, Jodal U et al. Protective effect of breastfeeding against urinary tract infection. *Acta Paediatr* 2004;93:164-8

To assess the possible protective effect of exclusive BF against first-time febrile urinary tract infections (UTI) in children, 200 cases (89M, 111F) aged 0-6 years were enrolled in two children's hospitals and child health centres in Sweden and compared with 336 healthy children (147M, 189F) matched for age and sex. Ongoing exclusive BF gave a significantly lower risk of UTI. A longer duration of BF gave a lower risk of infection after weaning, indicating a long-term mechanism. The protective role of BF was strongest soon after birth, then decreased until 7 months of age, after which age no effect was demonstrated.

## Obesity

Stettler N, Stallings VA, Troxel AB et al. Weight gain in the first week of life and overweight in adulthood: a cohort study of European American subjects fed infant formula. *Circulation* 2005;111:1897-903

The aim of this study was to identify during which periods in infancy weight gain is associated with adult obesity. A cohort of European American formula-fed subjects, measured on seven occasions during infancy as part of several infant formula studies, were contacted at ages 20 to 32 years, and reported their usual adult weight and height. Approximately 32% of the 653 subjects were overweight adults. The period between birth and age 8 days was identified as potentially critical. After adjustment for important confounding factors, each 100g of weight gain during the first week of life was associated with a 1.28-fold increase in adulthood overweight status; the same weight gain during the first 112 days of life was associated with a 1.04-fold increase. These results contribute to the understanding of chronic disease programming and suggest new approaches to obesity prevention.

Ong KK, Emmett PM, Noble S et al. Dietary energy intake at the age of 4 months predicts postnatal weight gain and childhood body mass index. *Pediatrics* 2006;117:503-8

This birth cohort study conducted in the United Kingdom aimed at determining whether different feeding patterns and energy intakes in infancy affect body weight and body mass index (BMI) later in childhood. The energy intake at 4 months was estimated from 1-day unweighed dietary records in 881 infants and related to their childhood weight gain and BMI. Among 582 formula- or mixed-fed infants, energy intake at 4 months was higher in infants who were given solid foods earlier. Higher energy intake at 4 months predicted greater weight gain between birth to age 1, 2, or 3 years and larger body weight and BMI at ages 1 to 5 years.

Lawlor DA, Riddoch CJ, Page AS et al. Infant feeding and components of the metabolic syndrome: findings from the European Youth Heart Study. *Arch Dis Child* 2005;90:582-8

To assess the association between type and duration of infant feeding and the metabolic syndrome of obesity, 2,192 randomly selected schoolchildren aged 9 and 15 years from Estonia (n=1,174) and Denmark (n=1,018) were recruited in this study. Children who had been exclusively BF had lower systolic blood pressures than those who were not. After adjustment for age, sex, country, birth weight, pubertal stage, height, maternal and paternal education, income, smoking, and BMI, the mean systolic blood pressure of children who had been exclusively BF was 1.7 mm Hg lower than those who had never been exclusively BF. There was a dose-response in this association, with decreasing mean systolic blood pressure across categories from children never exclusively BF to children BF for more than 6 months. Exclusive BF was not associated with other components of the metabolic syndrome. The dose-response suggests that exclusive BF is causally associated with reduced systolic blood pressure. The magnitude of the effect is comparable to the published effects of salt restriction and physical activity on blood pressure in adult populations, suggesting that it is of great public health importance.

Owen CG, Martin RM, Whincup PH et al. Effect of infant feeding on the risk of obesity across the life course: a quantitative review of published evidence. *Pediatrics* 2005;115:1367-77

This systematic review examines the influence of initial infant feeding on obesity in later life. Sixty-one studies reported on the relationship of infant feeding to a measure of obesity in later life; of these, 28 (298,900 subjects) provided estimates of risk. In these studies, BF was associated with 11%-15% reduced risk of obesity, compared with formula feeding. In eleven small studies of less than 500 subjects, the risk reduction was particularly strong (45-67%), but was still apparent in larger studies of 500 or more subjects (10-15%). In six studies that adjusted for all three major potential confounding factors (parental obesity, maternal smoking, and social class), the risk reduction was lower (7-14%), but still present.

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## Blood pressure

Lawlor DA, Najman JM, Sterne J et al. Associations of parental, birth, and early life characteristics with systolic blood pressure at 5 years of age: findings from the Mater-University study of pregnancy and its outcomes. *Circulation* 2004;110:2417-23

This study shows that BF is one among the many early life factors that may be important for reducing the population distribution of blood pressure and thus cardiovascular disease risk. Information from 3,864 children who were followed up prospectively from their mother's first antenatal clinic showed that maternal age, BMI, and smoking during pregnancy were all positively associated with offspring systolic blood pressure at 5 years of age. Paternal BMI and child's weight, height, and BMI were also positively associated with blood pressure at age 5. Children who had been BF until at least 6 months had lower systolic blood pressure than those who were BF for a shorter duration.

Martin RM, Gunnell D, Smith GD. Breastfeeding in infancy and blood pressure in later life: systematic review and meta-analysis. *Am J Epidemiol* 2005;161:15-26

The authors conducted a systematic review of fifteen published studies, including 17,503 subjects, from which estimates of a mean difference in blood pressure between BF and bottle-fed subjects could be derived. Systolic blood pressure was lower in BF compared with bottle-fed infants by 1.4 mmHg. A lesser effect of BF on systolic blood pressure was observed in larger (1,000 subjects or more) studies. A small 0.5 mmHg reduction in diastolic blood pressure was also associated with BF, independent of study size. If causal, the small reduction in blood pressure associated with BF could confer important benefits on cardiovascular health at a population level.

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## Cancer

Martin RM, Gunnell D, Owen CG, Smith GD. Breastfeeding and childhood cancer: a systematic review with metaanalysis. *Int J Cancer* 2005;117:1020-31

This systematic review investigates the association between BF and childhood cancers. Forty-nine publications were potentially relevant; of these, 26

provided risk estimates for at least one childhood cancer outcome. The results suggest lower risks associated with having been BF of 9% for acute lymphoblastic leukemia, 24% for Hodgkin's disease and 41% for neuroblastoma. There was little evidence that BF was associated with acute nonlymphoblastic leukemia, non-Hodgkin's lymphoma, central nervous system cancers, malignant germ cell tumors, juvenile bone tumors, or other solid cancers. Even if causal, the public health importance of these associations may be small: increasing BF from 50% to 100% would prevent at most 5% of cases of childhood acute leukemia or lymphoma.

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### Rheumatoid arthritis (RA)

Karlson EW, Mandl LA, Hankinson SE, Grodstein F. Do breastfeeding and other reproductive factors influence future risk of rheumatoid arthritis? Results from the Nurses' Health Study. *Arthritis Rheum* 2004;50:3458-67

In a cohort of 121,700 nurses, 674 women were diagnosed with rheumatoid arthritis (RA) between 1976 and 2002. After adjustment for age, BMI, smoking, parity and other hormonal factors, a strong trend for decreasing risk of RA with increasing duration of BF was observed. The protective effect of BF was dose-dependent, with a significant trend toward lower risk with longer duration of BF, up to a 50% reduction in women who had been BF 24 months or more.

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### Schizophrenia

Sorensen HJ, Mortensen EL, Reinisch JM, Mednick SA. Breastfeeding and risk of schizophrenia in the Copenhagen Perinatal Cohort. *Acta Psychiatr Scand* 2005;112:26-9

The aim was to study whether early weaning from BF may be associated with increased risk of schizophrenia. The sample comprised 6,841 individuals, 1,671 (24%) BF for 2 weeks or less (early weaning) and 5,170 (76%) BF longer. The sample comprised 93 cases of schizophrenia (1.4%). Maternal schizophrenia was the strongest risk factor and a significant association between single mother status and elevated offspring risk of schizophrenia was also observed. Early weaning was significantly related to a 1.73-fold increased risk of later schizophrenia after adjustment for maternal schizophrenia, parental social status, single mother status and gender. No or less than 2 weeks of BF was also associated with elevated risk of schizophrenia.

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### Post-partum weight

Kac G, Benicio MH, Velasquez-Melendez G et al. Breastfeeding and postpartum weight retention in a cohort of Brazilian women. *Am J Clin Nutr* 2004;79:487-93

To study the relation between post-partum weight retention, compared to pre-pregnancy weight, and exclusive/predominant BF, 405 women aged 18-45 years were followed up and assessed at 0.5, 2, 6, and 9 months post-partum. Mean post-partum weight retention at the end of the study was 3.1 kg. When comparing women who had 22% body fat and had BF for 180 days with those who had 22% body fat and BF for only 30

days, each month of BF reduced post-partum weight by 0.44 kg. When only the percentage of body fat was varied, the total effect was 3.0, 1.7, 1.2, and 0.04 kg in women with 18%, 25%, 28%, and 35% body fat, respectively. These results support the hypothesis of an association between BF and post-partum weight retention and suggest that encouraging prolonged BF might contribute to decrease post-partum weight retention.

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## Breastfeeding how...

### Baby Friendly Hospital Initiative (BFHI)

Merten S, Dratva J, Ackermann-Liebrich U. Do baby-friendly hospitals influence breastfeeding duration on a national level? *Pediatrics* 2005;116:702-8

This study reports results of a national study of the prevalence and duration of BF in 2003 throughout Switzerland and analyzes the influence of compliance with BFHI guidelines on BF duration. Data on a random sample of 2,861 infants 0 to 11 months born in 145 different hospitals show that the median duration of any and full BF was 31 and 17 weeks, respectively, compared with 22 and 15 weeks in 1994. The rate of exclusive BF in infants 0 to 5 months of age was 42% for infants born in baby friendly hospitals, compared with 34% for infants born elsewhere. BF duration was longer as well: 35 vs 29 weeks for any BF, 20 vs 17 weeks for full BF, and 12 vs 6 weeks for exclusive BF. After controlling for differences in the study population between the different hospitals, only the duration of exclusive and full BF remained significantly longer if delivery occurred in a baby-friendly hospital with high compliance with the BFHI guidelines. If a child had been exclusively BF in the hospital, the median duration of exclusive, full, and any BF was considerably longer than the mean for the entire population or for those who had received water-based liquids or supplements in the hospital. A positive effect on BF duration could be shown also for full rooming in, first suckling within one hour, BF on demand and pacifier use. These results support the hypothesis that the increase in BF in Switzerland since 1994 can be interpreted in part as a consequence of an increasing number of baby-friendly hospitals.

Szajewska H, Horvath A, Koletzko B, Kalisz M. Effects of brief exposure to water, breast-milk substitutes, or other liquids on the success and duration of breastfeeding: a systematic review. *Acta Paediatrica* 2006;95:145-52

To systematically evaluate the effect of supplemental fluids or feedings during the first days of life on the overall BF duration and rate of exclusive BF among healthy infants, 56 potentially relevant randomized controlled clinical trials were identified, but only one (170 infants) met the inclusion criteria for this systematic review. In this study, formula feeding was significantly more frequent at 4 weeks in the experimental group in which BF had been supplemented with 5% glucose ad libitum during the first 3 days of life (n=83) than in the exclusively BF control group (n=87). At 16 weeks, the percentage of mothers who continued BF, either exclusively or partially, was significantly lower in the experimental group than in the control group.

## On demand and prolonged

Kent JC, Mitoulas LR, Cregan MD et al. Volume and frequency of breastfeedings and fat content of breast milk throughout the day. Pediatrics 2006;117;387-95

71 mothers of infants who were 1-6 months of age and exclusively BF on demand test-weighed their infants before and after every BF from each breast for 24-26 hours and collected small milk samples from each breast each time the infant was weighed.

Infants BF  $11 \pm 3$  times in 24 hours (range 6–18) and a BF was  $76.0 \pm 12.6$  g (range 0–240 g), i.e.  $67.3 \pm 7.8\%$  (range 0–100%) of the volume of milk that was available in the breast at the beginning of the BF. Left and right breasts rarely produced the same volume of milk. The volume of milk consumed by the infant at each BF depended on whether the breast that was being suckled was the more or less productive breast, whether the BF was unpaired, or whether it was the first or second breast of paired BFs; the time of day; and whether the infant BF during the night or not. Night BFs were common and made an important contribution to the total milk intake. The fat content of the milk was  $41.1 \pm 7.8$  g/L (range 22.3–61.6 g/L) and was independent of BF frequency. There was no relationship between the number of BFs per day and the 24-hour milk production of the mothers.

It is concluded that BF infants should be encouraged to feed on demand, day and night, rather than conform to an average that may not be appropriate for the mother-infant dyad.

Mandel D, Lubetzky R, Dollberg S et al. Fat and energy contents of expressed human breast milk in prolonged lactation. Pediatrics 2005;116;432-5

To estimate fat and energy contents of human milk during prolonged lactation, 34 mothers of term, healthy, growing children, who had been lactating for more than 1 year (12–39 months) were compared with 27 mothers of term infants who had been lactating for 2-6 months. The mean fat levels were  $7.36 \pm 2.65\%$  in the short-duration group and  $10.65 \pm 5.07\%$  in the long-lactation group. The mean energy contents were  $3103.7 \pm 863.2$  kJ/L in the short-duration group and  $3683.2 \pm 1032.2$  kJ/L in the long-duration group.

The mean fat levels and energy contents were correlated significantly with the duration of lactation after adjustment for maternal age, diet, BMI, or number of daily feedings. To conclude, during prolonged lactation, the fat energy contribution of breastmilk to the infant diet might be significant.

McKinley NM, Hyde JS. Personal attitudes or structural factors? A contextual analysis of breastfeeding duration. Psychology of Women Quarterly 2004;28:388-99

This longitudinal study of 548 mostly European American women shows that personal attitudes (i.e., enjoyment of BF, gender-role attitudes, work and family salience) account for half as much variance in BF duration for women who were employed outside the home compared to those who were not.

For women employed outside the home, both structural variables (length of maternity leave and workplace flexibility) and personal attitudes predicted duration.

## Neonatal weight loss

Wright CM, Parkinson KN. Postnatal weight loss in term infants: what is normal and do growth charts allow for it? Arch Dis Child Fetal Neonatal Ed 2004;89:F254-7

A cohort of 961 term infants, only 51% of which were BF at birth, were recruited at birth in Glasgow, UK, and were followed up using parental questionnaires and community nursing records to establish norms and limits for postnatal weight loss. Routine weights were collected for half the cohort at 5 days and for all at 12 days and 6 weeks. Less weight loss was seen than the 3-6% suggested by previous studies, but one in five infants had not regained their birth weight by 12 days. Those lightest at birth showed least weight loss. Twenty six (3%) children had more than 10% weight loss, but none showed evidence of major organic disease. Actual weights in the first 2 weeks were half to one centile lower than growth charts suggest. Neonatal weight loss is brief, with few children remaining more than 10% below birth weight after 5 days. Growth charts are misleading in the first 2 weeks, because they make no allowance for neonatal weight loss. Better knowledge about neonatal weight loss may prevent the unnecessary use of supplements and result in more exclusive BF.

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## Very low birth weight infants (VLBWI)

Minekawa R, Takeda T, Sakata M et al. Human breast milk suppresses the transcriptional regulation of IL-1beta-induced NF-kappaB signaling in human intestinal cells. Am J Physiol Cell Physiol 2004;287:C1404-11

This study shows that human breastmilk dramatically suppresses the activation of the Interleukin-8 gene promoter. Interleukin-8 plays an important role in the pathophysiology of necrotizing enterocolitis (NEC). Human breastmilk therefore could be protective and therapeutic in neonates with NEC, a disease with a very poor prognosis.

Sisk PM, Lovelady CA, Dillard RG, Gruber KJ. Lactation counseling for mothers of very low birth weight infants: effect on maternal anxiety and infant intake of human milk. Pediatrics 2006;117;67-75

Initiation of BF is low among mothers of VLBWI; mothers are anxious about the health of their children and medical staff may be reluctant to promote BF out of concern for increasing that anxiety.

In this study, 115 mothers that had initially planned to BF (BFG) were compared with 81 mothers that had initially planned to formula feed (FFG), but were counselled on the benefits of BF. After counselling, 100% of the BFG and 85% of the FFG mothers initiated breastmilk expression. Breastmilk intake was greater in the BFG for the entire hospital stay; BFG infants received breastmilk for 83% of hospital days, compared with 44% for FFG infants. However, FFG mothers were able to provide at least 50% of their infants' enteral intake for the first 3 weeks, 48.8% for the fourth week, and 32.8% of the enteral intake for the entire hospitalization. Anxiety and stress scores were initially similar in both groups and declined in a similar manner during hospitalization.

## Post-partum hospital stay

Waldenstrom U, Aarts C. Duration of breastfeeding and breastfeeding problems in relation to length of postpartum stay: a longitudinal cohort study of a national Swedish sample. *Acta Paediatr* 2004;93:669-76

Data from 2,709 women recruited from all antenatal clinics in Sweden were analysed to investigate the association between length of postpartum hospital stay and duration of BF. Women were divided into six groups according to length of postpartum hospital stay (from less than 24 hours to 120 hours or more). The median duration of any BF was 7 months in women discharged on day 1, and 8 months in women discharged on any of the following days, a non-significant difference. Maternal characteristics may be more important predictors of the duration of BF than length of stay in hospital after birth.

Brown S, Bruinsma F, Darcy MA et al. Early discharge: no evidence of adverse outcomes in three consecutive population-based Australian surveys of recent mothers, conducted in 1989, 1994 and 2000. *Paediatr Perinat Epidemiol* 2004;18:202-13

These three population-based surveys of recent mothers conducted in the State of Victoria, Australia, confirm that shorter lengths of stay (1-2 days vs. 5 days or more, 3-4 days vs. 5 days or more) do not appear to have an adverse impact on BF at 6 weeks, after adjustment for relevant social and obstetric factors.

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## Support after hospital discharge

Di Napoli A, Di Lallo D, Fortes C et al. Home breastfeeding support by health professionals: findings of a randomized controlled trial in a population of Italian women. *Acta Paediatr* 2004;93:1108-14

This randomized controlled trial assessed the effectiveness of a support intervention delivered by health professionals to increase the rate and duration of BF. A total of 605 mothers who had given birth in a public maternity ward located in the city of Rome, Italy, were randomized. The intervention consisted of a home visit by a midwife from the maternity ward of the hospital. According to intention-to-treat analysis, there was no significant difference between the intervention and the control group, after controlling for confounding factors. The duration of BF was 1.61 times shorter for women in the intervention group who refused the visit of the midwife.

Coutinho SB, Cabral de Lira PI, Lima MC, Ashworth A. Comparison of the effect of two systems for the promotion of exclusive breastfeeding. *Lancet* 2005; 366: 1094-100

This study aimed to compare the effects of two systems for the promotion of BF in Brazil: a hospital-based system and the same system combined with a programme of home visits. Maternity staff from two hospitals in Pernambuco were trained according to the BFHI. Between March and August 2001, 350 mothers giving birth at these hospitals were randomly assigned ten postnatal home visits to promote and support BF (n=175) or no home visits

(n=175). BF practices were studied on days 1, 10, 30, 60, 90, 120, 150, and 180 by researchers unaware of group allocation. The hospital-training intervention achieved a high rate (70%) of exclusive BF in the hospitals, but this rate was not sustained at home and at 10 days of age only 30% of infants were exclusively BF. The patterns of exclusive BF in the two groups for days 10-180 differed significantly, with a mean aggregated prevalence of 45% among the group assigned home visits compared with 13% for the group assigned none. It is concluded that BFHI achieves high rates of exclusive BF in hospital; however, in Brazil at least, the rates fall rapidly thereafter unless a follow-up programme of home visits is instituted.

A combination of promotional systems (hospital-based and in the community - the BFHI 10<sup>th</sup> step) may be needed to sustain exclusive BF to 6 months.

Venancio SI, Monteiro CA. Individual and contextual determinants of exclusive breastfeeding in São Paulo, Brazil: a multilevel analysis. *Public Health Nutrition* 2006;9:40-6

To identify individual and contextual factors associated with the practice of exclusive BF, the authors analysed data in Brazil from 34,435 children under 6 months of age living in 111 municipalities, and who had participated in a 1999 survey investigating feeding practices during the first year of life.

The results showed a greater chance of exclusive BF in women with tertiary education, women aged between 25 and 29 years, multiparae, female babies, birth weight 3000 g or more, child follow-up in the private healthcare network, and municipalities with four or five pro-BF measures. These included: the presence of a written municipal policy, activities for monitoring compliance with the International Code, participation in World BF Week activities, the presence of a baby-friendly hospital, the presence of a human milk bank, attendance of healthcare professionals at courses on BF management or counselling, the presence of a multi-professional group dedicated to the promotion of BF or to research, and conducting surveys to measure the prevalence of BF. An analysis of the interactions between individual and contextual variables showed that the presence of at least four pro-BF measures in the municipality attenuated the risk of early termination of exclusive BF associated with low maternal schooling and low birth weight, and transformed child follow-up in the public network into a protective factor against the early termination of BF.

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## Peer counseling

Anderson AK, Damio G, Young S et al. A randomized trial assessing the efficacy of peer counseling on exclusive breastfeeding in a predominantly latina low-income community. *Arch Pediatr Adolesc Med* 2005;159:836-41

To assess the effect of peer counselling on exclusive BF among low-income inner-city women, 162 pregnant women were recruited at less than 32 weeks of gestation in Hartford, US, and randomly assigned to receive support from a peer counsellor plus conventional support (PC) or only conventional support (C). PC women were offered three prenatal home visits, daily peri-natal visits, nine postpartum home visits, and telephone counselling

as needed. At hospital discharge, 24% in the C group compared with 9% in the PC group had not initiated BF, with 56% and 41%, respectively, non-exclusive BF. At 3 months, 97% in the C and 73% in the PC group had not exclusively BF during the previous 24 hours. The likelihood of non-exclusive BF throughout the first 3 months was 1.24-fold higher for the C group than the PC group (99% vs 79%). The likelihood of having one or more diarrhoeal episode in infants was cut in half in the PC group (18% vs 38%).

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## Support by fathers

Pisacane A, Continisio GI, Aldinucci M et al. A controlled trial of the father's role in breastfeeding promotion. Pediatrics 2005;116:494-8

In this controlled trial of 280 mothers and their partners recruited in Naples, Italy, support and advice on BF was provided to all the mothers, but a training session on the management of the most common BF problems was offered only to fathers in the intervention group. The prevalence of full BF at 6 months was 25% in the intervention group and 15% in the control group and that of any BF at 12 months was 19% and 11%, respectively. Perceived milk insufficiency was significantly more frequent among the mothers of the control group (27% vs 9%), as well as BF interruption because of problems with lactation (18% vs 4%). Moreover, significantly more women in the intervention group reported receiving support and relevant help with infant feeding management from their partners (91% vs 34%). Among the women who had reported difficulties with lactation in the intervention (69%) and control groups (64%), the prevalence of full BF at 6 months was 24% and 4.5%, respectively.

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## Tongue tie

Griffiths DM. Do tongue ties affect breastfeeding? J Hum Lact 2004;20:409-14

This study carried out in the UK assessed indications for and safety and outcome of simple division of tongue tie without an anesthetic. 215 infants younger than 3 months (mean 0-19 days) had major problems BF, despite professional support. Feeding was assessed by the mothers immediately, at 24 hours, and 3 months after division. Prior to division, 88% had difficulty latching, 77% of mothers experienced nipple trauma,

and 72% had a continuous feeding cycle. During division, 18% slept throughout; 60% cried more after division (mean 0-15 seconds). There were no significant complications. Within 24 hours, 80% were feeding better. Overall, 64% BF for at least 3 months (UK national average is 30%).

Hogan M, Westcott C, Griffiths M. Randomized controlled trial of division of tongue-tie in infants with feeding problems. J Paediatr Child Health 2005;41: 246-50

This randomized controlled trial shows that dividing tongue-ties is safe and results in greater improvements than the intensive skilled support of a lactation consultant. A total of 57 babies with tongue-tie and associated feeding problems were randomized to have either immediate division of the tongue tie or 48 hours of intensive lactation consultant support. Of the 29 babies in the latter group, one improved (3%) and BF for 8 months, but 28 did not. At 48 hours, these 28 mothers were offered division, which all accepted, and 27 of their babies improved (96%) and fed normally. Of the 28 babies in the immediate division group, 27 improved and fed normally but one remained on a nipple shield. Twenty-four mothers (60%) BF for 4 months. Overall, division of the tongue-tie babies resulted in improved feeding in 54/57 (95%) babies.

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## Methods

Li R, Scanlon KS, Serdula MK. The validity and reliability of maternal recall of breastfeeding practice. Nutrition Reviews 2005;63:103-10

In large epidemiologic studies, information on BF practice is often collected from maternal recall through interviews, but there is concern about the accuracy of the data, especially when mothers are asked to recall their practices from many years earlier. This review examines the validity and reliability of maternal recall of BF history using eleven studies published between 1966 and 2003 in English with a sample of ten or more. Validity is the degree to which recall compares with a validation standard or reference, and reliability refers to the degree to which the BF practices obtained by recall are repeatable over time. The existing studies suggest that maternal recall is a valid and reliable estimate of BF initiation and duration, especially when the duration of BF is recalled after a short period ( $\leq$  3 years). Validity and reliability of maternal recall for the age at introduction of food and fluids other than breastmilk are less satisfactory. Further and more extensive studies on maternal recall of BF history and ways to improve such recall are warranted.

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