

Breastfeeding Briefs

No 42-43, November 2007

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The new WHO growth standards¹

By the early 1990s, it became clear that the growth charts then recommended by the World Health Organization (WHO) and adopted in many countries were inadequate. The charts had been developed by the U.S. National Centre for Health Statistics (NCHS) based on a combination of different samples of North American children. There were concerns because the measurements had been taken at wide age intervals and because the curve-building techniques employed had become outdated.²³ The most important reason for a new growth curve was, however, the observation that most infants in the NCHS references had been artificially fed from birth. In the first years of life, the growth of such babies deviates substantially from that of healthy breastfed infants. In particular, the weight gain of artificially fed infants, starting at around 3-4 months of age, is much faster than that of breastfed babies. When breastfed infants are assessed using the NCHS charts, they often appear to falter from this age onwards. This poses a problem since strict interpretation of the charts by parents and health workers often results in a decision to introduce supplements to breastmilk to achieve faster weight gain. The consequences of introducing artificial feeding are well known: breastfeeding is reduced and often stops altogether, and infants and mothers no longer enjoy its many benefits. In low and middle-income countries, this decision can make the difference between death and survival.⁴ It was therefore clear that we were using a potentially dangerous growth curve.

I joined a group of experts convened by WHO to address this issue and we opted for a radically different approach. Existing curves were based on a descriptive approach, i.e. a representative sample of children was obtained, their growth was described, and other children were then assessed against this reference. We opted instead for a prescriptive approach that would describe "how children should grow". We first set out to define what characteristics are essential for a child to attain its full biological growth potential to build a curve based on children fulfilling these criteria. These characteristics included: the child should be breastfed according to international recommendations; the home environment should not present social or environmental constraints to growth; the child should be a singleton born at term; the mother should not smoke; and the child should be protected from important diseases and their consequences. Unlike the NCHS reference, based on a single country, we wanted ethnic diversity in our sample. The underlying assumption was that in favourable socio-economic conditions, with optimal nutrition and absence of important disease and maternal smoking, children's growth is very similar regardless of ethnic origin or geographic location. The WHO Multicentre Growth Reference Study (MGRS) included therefore children from six different countries: Brazil, Ghana, India, Norway, Oman and the United States. The study was carried out between 1997 and 2003 and it enrolled approximately 8,500 children. Rigorous procedures were used to ensure uniformity in sample selection, data collection and anthropometry in the six sites. The MGRS design combined a longitudinal study from birth to 24 months with a cross-sectional study of children aged 18-71 months. In the longitudinal study, mothers and newborns were screened and enrolled at birth and visited at home 21 times on weeks 1, 2, 4, and 6, monthly from 2 to 12 months, and bimonthly in their second year. Psychomotor

¹ Guest editor: Dr. Cesar G. Victora, Universidade Federal de Pelotas, Brazil.

² WHO. Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. Technical Report Series No. 854. Geneva: [World Health Organization](http://www.who.int), 1995.

³ WHO Working Group on Infant Growth. An evaluation of infant growth. Geneva: [World Health Organization](http://www.who.int), 1994.

⁴ WHO Collaborative Study Team on the Role of Breastfeeding on the Prevention of Infant Mortality. Effect of breastfeeding on infant and child mortality due to infectious diseases in less developed countries: a pooled analysis. [Lancet](http://www.lancet.com) 2000;355:451-5.

milestones were also assessed. A detailed description of these methods is available in publications⁵ and in the study website, where all publications related to the study as well as anthropometric software are freely available (www.who.int/childgrowth).

The first set of WHO Child Growth Standards became available in early 2006. It has already been adopted by several countries, including Brazil and India. Psychomotor development milestones are also available. Compared to the NCHS, the new standards show rapid weight gains in the first 3-4 months of life, but slower gains thereafter. Hopefully, early supplementation and untimely weaning due to perceived growth faltering among normal breastfed babies will no longer occur. The new standards include, in addition to weight for age and length/height for age, two sets of curves for weight relative to length/height. The first is the traditional plot in which a child's weight is charted against his/her length/height. The second is the innovative chart of body mass index (BMI) by age. Up to now, BMI has been used for adolescents and adults, but not for children. When compared to existing references, the new standards will result in more frequent diagnoses of overweight or obesity. This is because breastfed infants are lighter and more homogeneous, and thus the cut-offs for excess weight will be lower. In terms of linear growth, the mean length/height of children in the new standard is quite similar to the NCHS one, but because the standards are more homogeneous and their standard deviations narrower, more children will be classified as stunted.

Every study has its limitations. Our major shortcoming is that the curves stop at the age of five years. Further efforts are underway at WHO to develop curves for older children and adolescents. The next steps include the dissemination of standards for triceps and subscapular skinfolds, head and arm circumferences, and BMI. These will be useful for monitoring the increasing prevalence of childhood obesity affecting most of the world. Growth velocity standards are also under preparation, to allow the early detection of growth faltering and that of excess weight gain.

The new standards have major implications for the breastfeeding community. Given their prescriptive nature, breastfeeding is recognized as the norm for infant and child growth. The growth patterns of breastfed children who also fulfilled the other study entry criteria were remarkably similar in the six study sites.⁶ That is, children from India and Norway, or from Brazil and Oman, gained weight and length at virtually the same rates. It appears that, by defining prescriptive criteria for infant growth, we were able to outline the optimal growth pattern for the human species. Even if a child is not breastfed, its growth will be judged against that of breastfed infants.

This is likely to have important consequences for short-term child health and survival, since premature weaning is likely to be avoided. There is growing evidence that breastfeeding may contribute to the prevention of several chronic conditions in adults, possibly including overweight/obesity, diabetes, hypertension and elevated blood lipids.⁷ By promoting breastfeeding and healthy growth in infancy and childhood, the new WHO standards may also contribute to adult health in the long term.

Challenges in the implementation of the new WHO growth standards⁸

The new WHO growth standards represent significant progress over the old NCHS references, as clearly explained by Cesar Victora above. Their adoption and introduction in countries, however, may pose several challenges:

- Every innovation brings about resistance: in addition to the possible negative response of frontline health workers, the new WHO growth standards may meet with the refusal of national health authorities and

⁵ De Onis M, Garza C, Victora CG, Bhan MK, Norum K. The WHO Multicentre Growth Reference Study (MGRS): rationale, planning, and implementation. *Food Nutr Bull* 2004;25(Suppl):1-89.

⁶ WHO Multicentre Growth Reference Study Group, de Onis M. Assessment of differences in linear growth among populations in the WHO Multicentre Growth Reference Study. *Acta Paediatr* 2006;95(suppl. 450):56-65.

⁷ Horta BL, Bahl R, Martines JC, Victora CG. Evidence on the long-term effects of breastfeeding: systematic reviews and meta-analyses. Geneva: World Health Organization, 2007.

⁸ Comments by *Breastfeeding Briefs* editors, Dr. Adriano Cattaneo and Dr. Marina Rea.

professional associations, in particular those who have developed and adopted their own references based on local studies.

- Every innovation implies a cost: who will pay for the printing and distribution of the new charts and associated materials to replace the widely used old ones? Will such an investment, including the cost of quality training, be considered a priority in countries with scarce health budgets and resources? Do the expected benefits justify the cost?
- Changing growth standards entails training: a WHO manual is already available (see website www.who.int/childgrowth), but training is much more than a manual in terms of planning, management, sites, materials, training of trainers, quality assurance, clinical practice, supervision, monitoring, evaluation, refreshing and updating courses, and cost.
- A shift from one type of charts to another may lead to confusion: health workers, and parents, may get confused during the transition to the new WHO growth standards, also because of their complexity. For many frontline health workers, the interpretation of growth, let alone growth velocity, is already a difficult exercise using the NCHS or national references. Having more curves, and in particular new and never-used-before measures such as the BMI, may turn growth monitoring into an unmanageable task for many health workers.
- Risk of overuse of supplements of infant formula: even in the hands of competent professionals and of knowledgeable parents, the new growth standards may attract too much attention. Health workers and parents may base their feeding decisions on current weight and length/height rather than on other variables. And since exclusively breastfed babies show faster growth gains up to about six months compared to reference populations, health workers and parents caring for babies in this age group who grow less than expected (i.e. like the reference rather than standard infants), may be tempted to overprescribe and overuse infant formula supplements. This may occur especially when growth is the sole focus of professional and parental attention, as opposed to health, nutrition and, in this age group, proper management of lactation and breastfeeding counselling. Needless to say, manufacturers and distributors of breastmilk substitutes would probably be ready to turn such an opportunity into profit. As people concerned with the protection of breastfeeding we should keep an eye on this risk and act as needed.

It is therefore critically important that a country considering the use of the new WHO Standards develops a comprehensive implementation strategy, including the budget, which is integrated into the national MCH or other relevant strategies, policies and plans.

Growth and growth monitoring

WHO Multicentre Growth Reference Study Group. Breastfeeding in the WHO Multicentre Growth Reference Study. *Acta Paediatr* 2006;95(Suppl 450):16-26

WHO Multicentre Growth Reference Study Group. Complementary feeding in the WHO Multicentre Growth Ref. Study. *Acta Paediatr* 2006;95(Suppl 450):27-37

Of the 1,743 enrolled newborns, 903 (52%) completed the follow-up. Three quarters (75%) of the infants were exclusively/predominantly breastfed (EBF/PBF) for at least 4 months, almost 100% were started on complementary foods (CF) by 6 months of age, and 68% were partially BF until at least the age of 12 months. Compliance varied across sites (lowest in Brazil, highest in Ghana) based on their initial baseline BF levels

and sociocultural characteristics. Median BF frequency among compliant infants was 10, 9, 7 and 5 feeds per day at 3, 6, 9 and 12 months, respectively. Compliant mothers were less likely to be employed, more likely to have had a vaginal delivery, and fewer of them were primiparous. CF began at a mean age of 5.4 months (range: 4.8 Oman - 5.8 Ghana). CF intake rose from 2 meals/day at 6 months to 4-5 meals in the second year, in a reverse trend to BF frequency. Total intake from the two sources was 11 meals/day at 6-12 months, dropping to 7 meals/day at 24 months. Differences among sites in total meal frequency were mainly due to variations in BF frequency. Grains were the most commonly selected food group compared with other food groups that varied more by site due to cultural factors, for example, infrequent consumption of flesh foods in India. The use of fortified foods and

nutrient supplements was also influenced by site-variable practices. Dietary diversity varied minimally between compliance groups and sites.

Onayade AA, Abiona TC, Abayomi IO, Makanjuola RO. The first six months growth and illness of exclusively and non-exclusively breastfed infants in Nigeria. East Afr Med J 2004;81:146-53

To compare the growth and illness pattern of infants who were EBF for 6 months with those of infants commenced on CF before 6 months and ascertain reasons for the early introduction of CF, 352 mothers and their normal birth-weight babies were studied through monthly weighing and recording of illnesses. At 6 months, 264 (77%) were EBF, 45 (13%) were started on CF between the ages of 4 and 6 months, while 36 (10%) commenced CF before the age of 4 months. Infants who were EBF for 6 months had median weights above the 50th percentile of the WHO/NCHS reference. The mean weight of these babies at age 6 months was above that of babies who started CF before 6 months. They also reported fewer symptoms and had fewer illness episodes. It is concluded that EBF supported adequate growth during the first 6 months of life for most of the infants studied. Early introduction of CF did not provide any advantages in terms of weight gain, and was frequently associated with illness episodes and growth faltering. Many mothers however require support, encouragement and access to health care providers to EBF for the first 6 months of life.

Kalanda BF, Verhoeff FH, Brabin BJ. Breast and complementary feeding practices in relation to morbidity and growth in Malawian infants. Eur J Clin Nutr 2006;60:401-7

This study compared growth, morbidity and risk factors for under-nutrition in a poor rural community between infants receiving CF early, before 3 months of age, with those receiving CF after 3 months. A cohort of babies was enrolled at birth for follow-up to 12 months of age. Weight, length, morbidity and feeding patterns were recorded at four weekly intervals from birth to 52 weeks. Mean age at introduction of water was 2.5 months (range 0-11.8), of CF was 3.4 months (range, 1.0-10.7) and of solids was 4.5 months (range 1.2-13.8). Over 40% of infants had received CF by 2 months and 65% by 3 months.

The proportion of EBF infants, which included those receiving supplemental water, was 13% at 4 months, 6% at 5 months and 2% at 6 months. Infants with early CF had lower weight for age at 3, 6 and 9 months. Early CF was significantly associated with increased risk for respiratory infection and marginally increased risk for eye infection and episodes of malaria. Maternal illiteracy was associated with early CF while later CF was associated with reduced infant morbidity and improved growth.

Wells JC, Hallal PC, Wright A, Singhal A, Victora CG. Fetal, infant and childhood growth: relationship with body composition in Brazilian boys aged 9 years. Int J Obes 2005;29:1192-8

This study tested the hypotheses that birth weight and weight gain in infancy or childhood were associated with later body composition in 172 Brazilian boys followed longitudinally since birth. Growth was assessed using measurements of weight and height at birth, 6 months, and 1 and 4 years. Measurements at 9 years comprised height, weight and body composition. The results showed that early rapid weight gain increased the risk of later obesity, but not through a direct effect on fatness. Childhood weight gain remained the dominant risk factor for later obesity. The reported link between early growth and later obesity may be due partly to hormonal programming, and partly to the contribution of lean mass to obesity indices based on weight and height.

Sachs M, Dykes F, Carter B. Feeding by numbers: an ethnographic study of how breastfeeding women understand their babies' weight charts. Int Breastfeed J 2006;1:29

Weighing BF babies has been the subject of some controversy as the previous international growth chart was largely based on data from formula-fed (FF) infants. The concern that professionals may be misled by the charts into suggesting to mothers that they supplement unnecessarily was a major impetus for the WHO investment in a new growth chart. Evidence of interpretation in practice has been scant. This ethnographic study was conducted in the Northwest of England to investigate this issue. In the first phase, women and health visitors were observed in the well-child clinic during clinic sessions and BF group meetings. In the second phase, longitudinal

interviews with 14 women were conducted. Each woman was interviewed up to three times in the first 6 months after the birth of her baby, with a total of 35 interviews. Mothers and health visitors focused on weight gain with frequent weighing and attention to even minor fluctuations of the plotted line being evident. Women felt it important to ensure their baby's weight followed a centile, and preferred for this to be the 50th percentile. Interventions included giving formula and solids as well as changing what the mother ate and drank. Women also described how they worried about their baby's weight. Little effective support by health professionals with BF techniques was observed. Babies were weighed more often than officially recommended, with weighing and plotting being at the core of each clinic visit. The plotted weight chart exerted a powerful influence on both women's and health visitors' understanding of the adequacy of BF. They appeared to rate the regular progression of weight gains along the chart centiles more highly than continued or EBF. Thus weighing and visual charting of weight constituted a form of surveillance under the medical gaze, with mothers actively participating in self monitoring of their babies. Interventions, by mothers and health visitors, were targeted towards increasing weight gain rather than improving BF effectiveness. Improvements in training are needed for health visitors in weighing techniques, assessing growth patterns – particularly of BF babies – and in giving information to women, if the practice of routine weight monitoring is to support rather than undermine BF.

Weaver LT. Rapid growth in infancy: balancing the interests of the child. J Pediatr Gastroenterol Nutr 2006;43:428-32

Low birth weight is associated with a number of immediate adverse consequences, and it has been assumed that "catch-up" growth is a "good thing" because "better" nutritional status is associated with greater childhood health and survival. The same thinking applies to infants who suffer from malnutrition and growth faltering during weaning. Recent studies suggest that the rapid postnatal growth of babies is associated with an enhanced risk for obesity, diabetes, hypertension, cardiovascular disease and osteopenia in later life. If this is true, it has implications for our recommendations regarding infant feeding.

Insights from evolutionary biology, life cycle theory, animal husbandry, epidemiology and comparative zoology suggest that the energy-based feeding of underweight infants should be considered in the context of the whole life cycle, balancing the interests of the child with its potential risks in adulthood. Before we revise our current recommendations, we must consider the meaning of catch-up growth, what it involves in terms of tissues gained (fat, muscle and bone) and to what degree association represents causation. In the meantime, it will be prudent to balance the short- and long-term interests of the child by endeavouring to: 1) optimize maternal nutrition and health to avoid low birth weight; 2) breastfeed as recommended by WHO; 3) consider birth weight, gestation and future "nutritional environment" when making decisions about infant feeding; 4) use appropriate growth charts; 5) avoid excessive postnatal weight gain; 6) consider the whole life span; and 7) be cautious when extrapolating from animal studies.

Breastfeeding why

Human Immunodeficiency Virus (HIV)

Coovadia HM, Rollins NC, Bland RM *et al.* Mother-to-child transmission of HIV-1 infection during exclusive breastfeeding in the first 6 months of life: an intervention cohort study. Lancet 2007;369:1107–16

This study assessed the HIV transmission risk and survival associated with EBF and other types of infant feeding in 2,722 HIV-infected and uninfected pregnant women attending antenatal clinics in KwaZulu Natal, South Africa, enrolled into a non-randomised controlled study. Infant feeding data were obtained every week from mothers, and blood samples from infants were taken monthly at clinics to establish HIV infection status. The transmission risk at 6 and 22 weeks of age and the association with maternal and infant factors were estimated. 1,132 of 1,372 (83%) infants born to HIV-infected mothers initiated EBF from birth. Of 1,276 infants with complete feeding data, median duration of EBF was 159 days; 14% of EBF infants were infected with HIV by age 6 weeks and 20% by 6 months. Risk was significantly associated with maternal CD4-cell

counts below 200 cells per μL and birth weight less than 2,500 g. The estimated risk of infection at 6 months was 4%. BF infants who also received solids were 10 times (1.5 – 78) more likely to acquire infection than were EBF children; infants who at 12 weeks received both breastmilk (BM) and infant formula (IF) were almost twice more likely to acquire infection. Cumulative 3-month mortality in EBF infants was 6% versus 15% in infants given IF. The association between mixed BF and increased HIV transmission risk, together with evidence that EBF can be successfully supported in HIV-infected women, warrant revision of the present UNICEF, WHO, and UNAIDS infant feeding guidelines (see http://www.who.int/child-adolescent-health/publications/NUTRITION/consensus_statement.htm).

Thior I, Lockman S, Smeaton LM *et al* for the Mashi Study Team. Breastfeeding plus infant zidovudine prophylaxis for 6 months vs. formula feeding plus infant zidovudine for 1 month to reduce mother-to-child HIV transmission in Botswana: a randomized trial: the Mashi Study. *JAMA* 2006;296:794-805

To compare the efficacy and safety of two infant feeding strategies for the prevention of postnatal mother-to-child (MTC) HIV transmission, 1,200 HIV+ pregnant women were randomized to peripartum (single-dose nevirapine vs. placebo) and postpartum infant feeding (FF vs. 6 months BF, with one month zidovudine prophylaxis) interventions. Infants were evaluated at birth, monthly until age 7 months, at age 9 months, then every third month through to age 18 months. All mothers received zidovudine 300 mg orally twice daily from 34 weeks' gestation and during labour. The 7-month HIV infection rates were 5.6% (32 infants) in the FF group vs. 9.0% (51 infants) in the BF plus zidovudine group. Cumulative HIV infection rates at 18 months were 13.9% (80 infants) in FF vs. 15.1% (86 infants) in BF plus zidovudine infants. Cumulative infant mortality at 7 months was significantly higher for the FF group than for the BF plus zidovudine group (9.3% vs. 4.9%), but this difference diminished beyond month 7 and was not significantly different at 18 months. BF with zidovudine prophylaxis was not as effective as FF in preventing postnatal HIV transmission, but was associated with a lower mortality rate at 7 months. Both strategies had comparable HIV-free survival at 18 months. These

results demonstrate the risk of FF to infants in sub-Saharan Africa, and the need for studies on alternative strategies.

Becquet R, Bequet L, Ekouevi DK *et al* for the ANRS 1201/1202 Ditrane Plus Study Group. Two-year morbidity–mortality and alternatives to prolonged breastfeeding among children born to HIV-infected mothers in Côte d'Ivoire. *PLoS Med* 2007;4:e17

During the period 2001–2005 in Abidjan, HIV-infected pregnant women having received peripartum antiretroviral prophylaxis were presented antenatally with an infant feeding choice: either FF or EBF with early cessation from 4 months of age. Nutritional counselling and clinical management were provided for 2 years. IF was provided for free. The primary outcome was the occurrence of adverse health outcomes, defined as validated episodes of illness (diarrhoea, acute respiratory infections, malnutrition) or severe events (hospitalization or death). The 18-month mortality rates were also compared to those observed in a previous trial conducted at the same sites in 1995–1998 and in which long-term BF was practiced in the absence of any specific infant feeding intervention. Of the 557 live-born children, 262 (47%) were BF for a median of 4 months, whereas 295 were FF. Over the 2-year follow-up period, 37% of the FF and 34% of the short-term BF children remained free from any adverse health outcome. The 2-year probability of incurring a severe event was the same among FF (14%) and short-term BF children (15%). An overall 18-month probability of survival of 96% was observed among both HIV-uninfected short-term BF and FF children, which was similar to the 95% probability observed in the long-term BF ones of the previous trial. Given appropriate nutritional counselling and care, access to clean water, and a supply of IF, these alternatives to prolonged BF can be safe interventions to prevent MTC transmission of HIV in urban African settings.

Bland RM, Rollins NC, Coovadia HM, Coutsooudis A, Newell ML. Infant feeding counselling for HIV-infected and uninfected women: appropriateness of choice and practice. *Bull World Health Org* 2007;85:289-96

To examine infant feeding intentions of HIV-infected and uninfected women and the appropriateness of their choices according to their home resources; and to determine adherence to

their own intentions in the first postnatal week, 1,253 HIV-infected pregnant women were compared against four resources that facilitate replacement feeding: clean water, adequate fuel, access to a refrigerator and regular maternal income. First-week feeding practices were documented. The antenatal feeding intentions were: EBF 73%; FF 9%; undecided 18%. Three percent, of whom 23% chose FF, had access to all four resources. Of those choosing FF, 8% had access to all four resources. A clean water supply and regular maternal income were independently associated with intention to FF. Significantly more HIV-infected women intending to EBF, rather than FF, adhered to their intention in week one (EBF 78%; FF 42%). Of the 1,238 HIV-uninfected women, 82% intended to EBF; 2% to FF; and 16% were undecided. Seventy-five percent who intended to EBF adhered to this intention postnatally, and only 11 infants (< 1%) received no BM. The number of antenatal home visits significantly influenced adherence to feeding intention. These results show that most HIV-infected women did not have the resources for safe FF, instead choosing appropriately to EBF. Adherence to feeding intention among HIV-infected women was higher in those who chose to EBF than to FF. With appropriate counselling and support, spillover of suboptimal feeding practices to HIV-negative women is minimal.

Doherty T, Chopra M, Nkonki L, Jackson D, Greiner T. Effect of the HIV epidemic on infant feeding in South Africa: "When they see me coming with the tins they laugh at me". Bull World Health Org 2006;84:90-6

To explore how the HIV epidemic has affected the infant-feeding experiences of HIV+ mothers in South Africa, this qualitative study selected a subsample of 40 women from a larger cohort of 650 HIV+ mothers for in-depth interviews. The HIV epidemic has changed the context in which infant-feeding choices are made and implemented. HIV+ mothers in this study, predominantly young, single and unemployed, were struggling to protect their decision. Uncertainty about the safety of BF has increased the power and influence of health workers, who now act as gatekeepers not only to this new knowledge but also to essential resources such as IF. Fear of disclosure of HIV status and stigma has also weakened the ability of

mothers to resist family and community norms that encourage early introduction of fluids and foods and that question BF. Women who chose to exclusively FF had difficulties accessing IF because of inflexible policies and a lack of supplies at clinics. Limited postpartum support led to social isolation and mothers doubting their ability to care for their children. The infant-feeding experiences of HIV+ mothers have serious implications for the effectiveness of programmes that aim to prevent MTC HIV transmission. A better understanding of how HIV is changing infant-feeding practices can aid the development of interventions to improve infant-feeding counselling and postpartum support.

Doherty T, Chopra M, Nkonki L, Jackson D, Persson LA. A longitudinal qualitative study of infant-feeding decision making and practices among HIV-positive women in South Africa. J Nutr 2006;136:2421-6

This study examined the challenges that HIV+ women face at different stages of early infant feeding. It explored factors influencing infant-feeding decision-making and behaviour and identified characteristics of women and their environments that contributed to successfully maintaining exclusivity (EBF or EFF) of their infant feeding practices. The study was undertaken at three sites in South Africa. Participants consisted of a convenient sample of 27 women who tested HIV+ during antenatal care and were intending to either EBF or EFF their infants. The women were interviewed once ante-natally as well as at 1, 4, 6, and 12 weeks postpartum. Just under one-half of those who initiated BF maintained EBF and over two-thirds of those who initiated FF maintained EFF. Key characteristics of women who maintained exclusivity included the ability to resist pressure from the family to introduce other fluids and to recall key messages on MTC transmission risks and mixed feeding. Among women who maintained EBF, a strong belief in the benefits of BF and a supportive home environment was important. For women using IF, having resources such as electricity, a kettle, and flask made feeding at night easier. Support for infant feeding that extends beyond the antenatal period is important to enable mothers to cope with new challenges and pressures at critical times during the early postpartum period.

Rea MF, dos Santos RG, Sanchez-Moreno CC. Quality of infant feeding counselling for HIV+ mothers in Brazil: challenges and achievements. *Acta Paediatr* 2007;96:94–9

This project aimed to assess the information and counselling on infant feeding in HIV+ mothers through a cross-sectional study, based on 118 structured observations of mothers' visits to health professionals in 15 HIV/AIDS healthcare units in Sao Paulo. The general quality of communication and counselling skills was good: for example, professionals responded to all mothers' questions (98%); kept eye-to-eye contact (82%); encouraged the mother to talk (77%). However, the information provided to mothers that aimed to help them choose their mode of infant feeding was of very poor quality. No mother, for example, was informed about alternatives to FF and the danger of mixed feeding. None was offered the option of using banked BM. Only 20% of the mothers were told how to safely prepare IF (when counselled by a nutritionist, rather than by a paediatrician, more mothers were informed about the correct way to prepare bottle-feeds). No mention was made of cup feeding. Although health workers have good communication skills, the information provided to HIV+ mothers is insufficient. Recommending against BF and providing IF may not be enough to achieve safer infant-feeding practices.

Enterobacter sakazakii

Drudy D, Mullane NR, Quinn T, Wall PG, Fanning S. Enterobacter sakazakii: an emerging pathogen in powdered infant formula. *Clin Infect Dis* 2006;42:996-1002

Enterobacter sakazakii (Es) is an emerging opportunistic pathogen associated with rare but life-threatening cases of meningitis, necrotizing enterocolitis and sepsis in premature and full-term infants. Infants aged <28 days are considered to be most at risk. Feeding with powdered infant formula (PIF) has been implicated in several clinical cases. Infants should be EBF for the first 6 months of life, and those who are not should be provided with a suitable BM substitute. PIF is not a sterile product; to reduce the risk of infection, the reconstitution of PIF should be undertaken by caregivers using good hygienic measures and in

accordance with the latest WHO guidelines (see www.who.int/foodsafety/publications/micro/pif2007/en/).

Bowen AB, Braden CR. Invasive Enterobacter sakazakii disease in infants. *Emerg Infect Dis* 2006;12;1185-9

Es kills 40%-80% of infected infants and has been associated with PIF. This study analyzed 46 cases of invasive infant Es infection to define risk factors and guide prevention and treatment. Twelve infants had bacteraemia, 33 had meningitis, and 1 had a urinary tract infection. Infants with meningitis had greater birth weight (2,454 g vs. 850 g) and longer gestational age (37 weeks vs. 27.8 weeks), than infants with isolated bacteraemia, and infection developed earlier (6 days vs. 35 days). Among meningitis patients, 11 (33%) had seizures, 7 (21%) had brain abscess, and 14 (42%) died. Twenty-four (92%) of the 26 infants whose feeding patterns were specified were fed PIF. PIF samples associated with 15 (68%) of 22 cases yielded Es; in 13 cases, clinical and PIF strains were indistinguishable.

Diarrhoea and acute respiratory infections

Quigley MA, Cumberland P, Cowden JM, Rodrigues LC. How protective is breast feeding against diarrhoeal disease in infants in 1990s England? A case-control study. *Arch Dis Child* 2006;91;245-50

To assess the effect of several measures of infant feeding on diarrhoeal disease (DD), and whether these effects varied according to markers of social deprivation, 167 infants with DD visiting 34 general practices in England, were classified by age group, area deprivation index, and whether or not the practice was in London; they were then compared to 137 control infants. After adjustment for confounders, BF was associated with significantly less DD. Associations were striking even in infants aged > 6 months. Variations did not relate to social class, but increased among infants living in rented council accommodation and in more crowded households. The negative effects of receiving no BM and of not being EBF were stronger in more deprived areas than in less deprived areas. In FF infants, there was significantly more DD in those whose bottles/teats had not been sterilized. The protective effect of BF only persisted two months after BF had stopped.

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 (exclusive + predominant) BF of 6 months compared with 4 to 6 months provided greater protection against respiratory tract infection (RTI). Data from the National Health and Nutrition Examination Survey III, a nationally representative cross-sectional home survey conducted from 1988 to 1994, were analysed. Data from 2,277 children aged 6 to 24 months, who were divided into five groups according to BF status, were compared. In unadjusted analyses, infants who were fully BF for 4 to 6 months (n=223) were at greater risk for pneumonia than those who were fully BF for 6 months (n=136) (6.5% vs. 1.6%). There were no statistically significant differences in episodes of cold/influenza (45% vs. 41%), wheezing (23% vs. 24%), episodes of otitis media (27% vs. 20%), or first otitis media at 12 months of age (49% vs. 47%). Adjusting for demographic variables, childcare, and smoke exposure revealed statistically significant increased risk for both pneumonia and three or more episodes of otitis media in those who were fully BF for 4 to 6 months compared with 6 months. These findings support current recommendations that infants should receive only BM for the first 6 months of life.

Quigley MA, Kelly YJ, Sacker A. Breastfeeding and hospitalization for diarrheal and respiratory infection in the United Kingdom Millennium Cohort Study. *Pediatrics* 2007;119:e837-e842

The objective of this study was to measure the effect of BF on hospitalization for DD and lower respiratory tract infections in the first 8 months after birth. Data on infant feeding, infant health, and a range of confounding factors were available for 15,890 healthy singleton term infants who were born in 2000–2002. The main outcome measures were parental report of hospitalization for DD and lower RTI. Seventy percent of infants were ever BF, 34% received BM for at least 4 months, and 1.2% were EBF for at least 6 months. By 8 months of age, 12% of infants had been hospitalized (1.1% for DD and 3.2% for lower RTI). Data analyzed by month of age, with adjustment for confounders, showed that EBF, compared with

not-BF, protected against hospitalization for DD and lower RTI. The effect of partial BF was weaker. An estimated 53% of DD hospitalizations could have been prevented each month by EBF and 31% by partial BF. Similarly, 27% of lower RTI hospitalizations could have been prevented each month by EBF and 25% by partial BF. The protective effect of BF for these outcomes wore off soon after BF cessation. A population-level increase in prolonged EBF would be of considerable potential benefit for public health.

Child development

Gibson-Davis CM, Brooks-Gunn J. Breastfeeding and verbal ability of 3-year-olds in a multicity sample. *Pediatrics* 2006;118:1444-51

This study analyzed the effect of maternal verbal ability and education on the association between BF and children's cognitive functioning with data from 1,645 American-born mothers participating in a longitudinal birth cohort study. Mothers were categorized into one of three educational-status groups: no high school diploma, high school diploma, and some post-secondary education. In unadjusted comparisons, BF children had verbal ability scores 6.6 points higher than children who were not BF. After adjusting for demographic characteristics and maternal verbal ability, the coefficient dropped to 1.72. Among mothers with education beyond high school, the children's verbal ability scores in adjusted models were 2.2 points higher for BF children. Among mothers with a high school diploma or less, there were no significant differences in the children's verbal ability scores by BF status. These results were consistent in white, black, and Hispanic children. The beneficial effects of BF on children's cognition may emerge only when BF is undertaken in conjunction with other positive parenting behaviour. The advantageous effects of BF do not seem to be solely attributable to the superior nutrient content of BM.

Sacker A, Quigley MA, Kelly YJ. Breastfeeding and developmental delay: findings from the Millennium Cohort Study. *Pediatrics* 2006;118:682-9

This study investigated whether the duration and exclusivity of BF affects the likelihood of gross and

fine motor delay in infants and examined the effect of factors that might explain any observed differences. The study sample included all term singleton infants who weighed more than 2,500 g at birth and were not placed in a special infant care unit. Incomplete data reduced the sample to 14,660 (94%). Almost half (47%) of the infants were initially EBF, but only 3.5% of these were still EBF after 4 months of age; 34% of the infants were not BF at all. At 9 months, 9% were identified as suffering from gross motor coordination delay and 6% from fine motor coordination delay. The proportion of infants who mastered the developmental milestones increased with BF duration and exclusivity. Infants who had never been BF were 50% more likely to present gross motor coordination delays than infants who had been EBF for at least 4 months (10.7% vs. 7.3%). Any BM was also positively related to development: infants who had never been BF were 30% more likely to present gross motor delays than infants who were given some BM for up to 2 months (10.7% vs. 8.4%). These differences did not diminish after adjustment for biological, socioeconomic, or psychosocial factors. Infants who were never BF had at least a 40% greater likelihood of presenting fine motor delays than infants who were given BM for a prolonged period. These results suggest that the protective effect of BF on attaining gross motor milestones is attributable to some component(s) of BM or some features of BF: it does not simply result from a superior social position, education, or parenting style, because control for these factors did not explain any of the associations observed. On the other hand, biological, socioeconomic, and psychosocial factors did explain the association between BF and fine motor delay.

Der G, David Batty G, Deary IJ. Effect of breastfeeding on intelligence in children: prospective study, sibling pairs analysis, and meta-analysis. *BMJ* 2006;333:945-50

To assess the importance of maternal intelligence and the effect of controlling for it and other important confounders in the link between BF and children's intelligence, data on 5,475 children, the offspring of 3,161 mothers in the 1,979 US national longitudinal survey of youth, were analysed. Additional analyses compared pairs of siblings from the sample who were and were not

BF. The mother's IQ was more highly predictive of BF than were her race, education, age, poverty status, smoking status, home environment, or her child's birth weight or birth order. One standard deviation advantage in maternal IQ more than doubled the odds of BF. Before adjustment, BF was associated with an increase of around four points in mental ability. Adjustment for maternal intelligence accounted for most of this effect. When fully adjusted for a range of relevant confounders, the effect was small and non-significant. The results of the sibling comparisons and meta-analysis corroborated these findings. While BF has many advantages for the child and mother, enhancement of the child's intelligence is unlikely to be among them.

Diabetes

Owen CG, Martin RM, Whincup CH, Smith GD, Cook DG. Does breastfeeding influence risk of type 2 diabetes in later life? A quantitative analysis of published evidence. *Am J Clin Nutr* 2006;84:1043-54

The objective of this systematic review was to examine the influence of initial BF on type 2 diabetes and blood glucose and insulin concentrations. Of 1,010 published reports, 23 examined the relation between infant feeding and type 2 diabetes in later life or risk factors for diabetes. Risk factors in infants were examined separately from those in children and adults. Subjects who were BF had a 39% lower risk of type 2 diabetes in later life than did those who were FF (7 studies; 76,744 subjects). Children and adults without diabetes who had been BF had marginally lower fasting insulin concentrations than did those who were FF (6 studies; 4,800 subjects). No significant difference in fasting glucose concentrations was observed. BF infants had lower mean preprandial blood glucose (12 studies; 560 subjects) and insulin (7 studies; 291 subjects) concentrations than did those who were FF.

The cost of not breastfeeding

Cattaneo A, Ronfani L, Burmaz T, Quintero-Romero S, Macaluso M, Di Mario S. Infant feeding and cost of health care: a cohort study. *Acta Paediatr* 2006;95:540-6

To compare the use and cost of health care in infants with different feeding patterns, a cohort of 842 infants born in ten hospitals in northern Italy was followed up to age 12 months. Data on 24-hour recall feeding were gathered through telephone interviews. Data on use of health services were reported by mothers and checked against records. Data on hospital cost were derived from Disease Related Groups codes. Data on cost of other services were obtained from maternal reports and available price lists. At 3 months, 56% of infants were fully BF, 17% CF and 27% not BF. Fully BF infants had less episodes of illness requiring ambulatory care, less hospital admissions and lower health care costs than infants not BF or not fully BF. Seven hundred and ten ambulatory visits (€ 85,215), and 50 hospital admissions (€ 29,955) per 1,000 infants/year could have been saved if all infants had been fully BF to 3 months. The higher cost of health care was significantly associated with hospital admission and being a twin. Moreover, the cost of health care decreased with each additional gram at birth, each extra month of leave from work after the third month, and each extra month of BF.

Maternal depression

Dennis CL, McQueen K. Does maternal postpartum depressive symptomatology influence infant feeding outcomes? *Acta Paediatr* 2007;96:590–4

To examine the relationship between diverse infant feeding outcomes (e.g. mode of infant feeding, maternal satisfaction, infant feeding plans, BF progress and BF self-efficacy) and postpartum depressive symptoms, 594 mothers completed questionnaires at 1, 4 and 8 weeks postpartum. No relationship was found between diverse infant feeding outcomes at 1 week postpartum and the development of depressive symptomatology at 4 or 8 weeks. Conversely, mothers with an Edinburgh Postnatal Depression Score >12 at 1 week postpartum were significantly more likely to discontinue BF at 4 and/or 8 weeks, to be unsatisfied with their mode of infant feeding, to experience significant BF problems and to report lower levels of BF self-efficacy. These findings suggest that early identification of depressive symptoms amongst BF mothers is needed not only to reduce the morbidity

associated with postpartum depression but also in an attempt to promote increased BF duration.

Breastfeeding how

Antenatal preparation

Mattar CN, Chong YS, Chan YS *et al.* Simple antenatal preparation to improve breastfeeding practice: a randomized controlled trial. *Obstet Gynecol* 2007;109:73-80

A randomized controlled trial was carried out in a tertiary referral centre in Singapore on a sample of low-risk antenatal patients. Group A received BF educational material and individual coaching from a lactation counsellor. Group B received BF educational material but without any counselling. Group C received routine antenatal care only. A total of 401 women were recruited. Mothers receiving individual counselling and educational material practiced EBF and predominant BF 2.6 times more at 3 months postpartum and 2.4 times more at 6 months postpartum than mothers receiving routine care alone. Among women receiving individual counselling, 2.5 times more practiced EBF and predominant BF at 6 months than those exposed to educational material alone. Where BF practices are suboptimal, simple one-encounter antenatal education and counselling significantly improve BF practice up to 3 months after delivery. Provision of printed or audiovisual educational material is not enough.

Baby Friendly Hospital Initiative (BFHI)

Bartington S, Griffiths LJ, Tate AR, Dezateux C and the Millennium Cohort Study Child Health Group. Are breastfeeding rates higher among mothers delivering in Baby Friendly accredited maternity units in the UK? *Int J Epidemiol* 2006;35:1178–86

This study examined whether mothers from a cohort with a high representation of disadvantaged and lower socioeconomic groups with traditionally low rates of BF were more likely to start and to continue BF if they delivered in a Baby-friendly hospital. Maternal reports on BF initiation and prevalence of any BF at 1 month were analysed for 17,359 singleton infants according to the BFHI status (accredited, certificated, or neither of these

distinctions) of the maternity unit at birth. Mothers delivering in accredited units were more likely to start BF than those delivering in units with neither distinction, but after adjustment for social, demographic, and obstetric factors they were not more likely to BF at 1 month. Antenatal class attendance, vaginal delivery, a companion at delivery and maternal post-partum hospital stay longer than 24 hours were also independently associated with BF initiation. Policies aiming to increase the proportion of maternity units participating in the BFHI are likely to increase BF initiation but not BF duration. Other strategies are required to support UK mothers to BF for the recommended duration.

Pain relief during labour and delivery

Torvaldsen S, Roberts CL, Simpson JM, Thompson JF, Ellwood DA. Intrapartum epidural analgesia and breastfeeding: a prospective cohort study. Int Breastfeed J 2006;1:24

A prospective cohort study of 1,280 women aged ≥ 16 years, who gave birth to a single live infant in Australia in 1997, was conducted to determine any association between epidural analgesia and: 1) BF in the first week postpartum, and 2) BF cessation during the first 24 weeks postpartum. Women completed questionnaires at weeks 1, 8, 16 and 24 postpartum. BF information was collected in each of the four surveys and women were categorised as either fully, partially or not BF at all. Women who had stopped BF since the previous survey were asked when they had stopped. In the first week postpartum, 93% of women were either fully or partially BF and 60% were continuing to BF at 24 weeks. Intrapartum analgesia and type of birth were associated with partial BF and BF difficulties in the first week. Analgesia, higher maternal age and lower (?) education were associated with BF cessation in the first 24 weeks, with women who had epidurals being twice as likely to stop BF than women who used non-pharmacological methods of pain relief. Although this relationship may not be causal, it is important that women at higher risk of BF cessation are provided with adequate BF assistance and support.

Skin-to-skin contact

Moore ER, Anderson GC. Randomized controlled trial of very early mother-infant skin-to-skin contact and breastfeeding status. J Midwifery Women's Health 2007;52:116-25

Healthy primiparous mother-infant dyads were randomly assigned to skin-to-skin contact during the first 2 hours after birth (n = 10) or to standard care (holding the infant swaddled in blankets; n = 10). The Infant BF Assessment Tool was used to measure success of the first BF and the time to effectively BF. Intervention dyads experienced a mean of 1.66 hours of skin-to-skin contact. These infants, compared to swaddled infants, had higher mean sucking competency during the first BF and achieved effective BF sooner (935-721 minutes vs. 1737-1001 minutes). No significant differences were found at one month.

Low birth weight infants

Raimbault C, Saliba E, Porter RH. The effect of the odour of mother's milk on breastfeeding behaviour of premature neonates. Acta Paediatr 2007;96:368-71

To assess the effects of exposure to the odour of mother's milk on BF behaviour of premature neonates, thirteen infants born at 30-33 weeks gestational age were tested; seven were randomly assigned to the milk-odour condition, and six to the water-control condition. During week 35 post-conceptual age, each baby was exposed to the appropriate odour stimulus for 120 seconds on 5 consecutive days immediately prior to a BF attempt. The BF bout following the final odour exposure session, and a second BF session shortly before the baby left the hospital, were analysed. Babies were weighed before and after each session. During each session, babies in the milk-odour condition displayed longer sucking bouts and more bursts composed of >7 sucking movements, and also consumed more milk than the control infants. Hospital stay was significantly shorter for the milk-odour condition (median = 43 days vs. 55.5 days for controls). Brief exposure to the odour of mother's milk prior to early BF trials had a positive effect on sucking behaviour and milk ingestion of preterm babies, which in turn resulted in a shortened stay in the hospital.

Merewood A, Chamberlain LB, Cook JT, Philipp BL, Malone K, Bauchner H. The effect of peer counselors on breastfeeding rates in the neonatal intensive care unit: results of a randomized controlled trial. Arch Pediatr Adolesc Med 2006;160:681-5

To determine whether peer counsellors impacted BF duration among premature infants, 108 mothers of infants 26 to 37 weeks' gestational age and otherwise healthy were enrolled between 2001 and 2004 in the NICU of the Boston Medical Centre, an inner city teaching hospital with approximately 2,000 births per year. Subjects were randomized either to a peer counsellor who saw the mother weekly for 6 weeks or to standard care. Intervention and control groups were similar on all measured socio-demographic factors. The average gestational age of infants was 32 weeks (range, 26.3-37 weeks) with a mean birth weight of 1,875 g (range, 682-3,005 g). At 12 weeks postpartum, women with a peer counsellor had an 81% higher probability of providing any amount of BM than women with no counsellor.

Care of the breast and nipple

Kvist LJ, Hall-Lord ML, Larsson BW. A descriptive study of Swedish women with symptoms of breast inflammation during lactation and their perceptions of the quality of care given at a breastfeeding clinic. Int Breastfeed J 2007;2:2

This descriptive study, set at a midwife-led BF clinic, considered a cohort of women recruited between 2002 and 2004, who accounted for 210 episodes of breast inflammation. Of the total cohort, 176 (84%) responded to a postal questionnaire 6 weeks after recovery. Fever was recorded at the first visit for 154 women; it ranged from 38.1°C to 40.7°C in 80 (52%) cases. Thirty-six percent of women had damaged nipples. Most women recovered well from the episode of breast inflammation and 96% considered their physical health – and 97% their psychological well-being – to be good 6 weeks after the episode. Those whose illness lasted 6 days or more showed less confidence in the midwives and in the care given to them. Twenty-one (12%) women contacted health care services because of recurring symptoms and 8 of the 176 responders (4.5%) were prescribed antibiotics for these recurring symptoms. A further 46 women (26% of the

responders) reported recurring symptoms that they managed without recourse to health care services. Initial fever may not be indicative of outcomes for women with inflammatory breast symptoms and treatment by antibiotic therapy may be necessary less often than has been supposed. Women who are also suffering from damaged nipples may need special attention. Those with protracted symptoms were less satisfied with care and showed less confidence in caregivers.

Expressed breastmilk

Win NN, Binns CW, Zhao Y, Scott JA, Oddy WH. Breastfeeding duration in mothers who express breast milk: a cohort study. Int Breastfeed J 2006;1:28

Breast milk expression allows a mother to leave her infant intermittently while continuing to BF. The aim of this study was to investigate the association between BM expression and BF duration. A total of 587 mothers were recruited from two public maternity hospitals in Australia for a cohort study covering a period of 12 months. While in hospital, mothers completed a questionnaire that included questions on how they were feeding their newborn. Telephone interviews conducted at regular periods monitored changes in infant feeding practices, including BM expression. Almost 94% of these mothers were BF at discharge from hospital. Mothers who expressed BM (at one or more time periods) were 30% less likely to discontinue any BF before 6 months than those who had never expressed BM.

Integrating BM expression into the daily life of mothers may be a means for them to achieve 6 months of full BF while at the same time opening more lifestyle options.

Support to exclusive breastfeeding

Chandrashekhara TS, Joshi HS, Binu V *et al.* Breastfeeding initiation and determinants of exclusive breastfeeding: a questionnaire survey in an urban population of western Nepal. Public Health Nutr 2007;10:192-7

To assess the rates of initiation of BF and of EBF 2 months after delivery and to determine the factors influencing EBF, a health worker-administered questionnaire survey was carried out

for 385 mothers who had delivered a child during the previous 2 months. The rates of initiation within one hour and within 24 hours of delivery were respectively 73% and 84%. Two months after delivery, EBF was practised by 82% of mothers. BM/colostrum was given as the first feed to 332 (86%) babies and 17% of these were given expressed BM or put to the breast of another lactating mother. Fourteen percent of the babies received pre-lacteal feeds – IF (6%), sugar water (6%) and cow's milk (3%). 13% of the mothers introduced CF. The factors influencing EBF included feeding practice of friends, the type of delivery and the baby's first feed. Despite the fact that higher rates of initiation and EBF are noted, practices such as pre-lacteal feeds and premature introduction of complementary feeds still remain great concerns in this population.

Scott JA, Binns CW, Oddy WH, Graham KI. Predictors of breastfeeding duration: evidence from a cohort study. Pediatrics 2006;117:646-55

This study examines the duration of BF among a population of Australian women and identifies the factors associated with the duration of full BF to 6 months and any BF to 12 months. It included 587 women recruited from two maternity hospitals in Perth who completed a baseline questionnaire at or shortly after discharge from the hospital. Women were then followed by telephone interview at 4, 10, 16, 22, 32, 40, and 52 weeks postpartum. Data collected included socio demographic, biomedical, hospital-related, and psychosocial factors associated with the initiation and duration of BF. At 6 months of age, fewer than one half of the infants were receiving any BM (46%), and only 12% were being fully BF. By 12 months, only 19% of the infants were still receiving any BM. BF duration was positively associated with maternal infant feeding attitudes and negatively associated with BF difficulties in the first 4 weeks, maternal smoking, introduction of a pacifier, and early return to work. Women should receive anticipatory guidance while still in the hospital on how to prevent and manage common BF difficulties and should be discouraged from introducing a pacifier before 10 weeks, if at all. Improved maternity leave provisions and more flexible working conditions may help women to remain at home with their infants longer and/or to combine successful BF with employment outside the home.

Complementary feeding

Dratva J, Merten S, Ackermann-Liebrich U. The timing of complementary feeding of infants in Switzerland: compliance with the Swiss and the WHO guidelines. Acta Paediatr 2006;95:818-25

A sample of mothers randomly chosen by local community mother-and-child health services in Switzerland was examined to: 1) report the prevalence of adequate timing of CF by comparing compliance to Swiss and WHO guidelines, and 2) to investigate factors influencing CF. The mothers completed a 24-h dietary recall questionnaire, reporting the infant's age at the first introduction of various foods. Introduction of solids occurred mainly between the 5th and 6th months. Five per cent of the mothers introduced CF before the age of 4 months. The main influencing factors for infant feeding were maternal age, language regions, mother's BMI and smoking status, the presence of siblings, and an allergic predisposition of the infant. The timing of CF introduction met Swiss guidelines (4 to 6 months), but WHO recommendations for 6 months of EBF were not met.

Training

Ekström A, Nissen E. A mother's feelings for her infant are strengthened by excellent breastfeeding counseling and continuity of care. Pediatrics 2006;118:309-14

The study investigated whether Swedish mothers attended by midwives and nurses (who had had a process-oriented training programme in BF counselling), perceived stronger maternal feelings for their infant than mothers who had received only routine care. Ten municipalities, classified in pairs similar in size and BF duration, were randomly distributed into a process-oriented training programme or a control group. A sample of 540 women who were cared for at one of either the intervention or the control clinics responded to three questionnaires (3 days, 3 months and 9 months postpartum). At 3 days, mothers in the intervention group thought that their understanding of the infant was better, they perceived more strongly the infant as their own, and they enjoyed more BF and resting with the infant. At 9 months, mothers in the intervention group talked more to

their infant, perceived their infant to be more beautiful than other infants, and perceived more strongly that the infant was their own than did mothers in the control group. In addition, the mothers in the intervention group felt significantly more confident with their infant and felt it to be closer than did mothers in the control group. In conclusion, a process-oriented BF training programme for antenatal midwives and postnatal nurses that included an intervention guaranteeing continuity of care, strengthened the maternal relationship with and the feelings for the infant.

Shinwell ES, Churgin Y, Shlomo M, Shani M, Flidel-Rimon O. The effect of training nursery staff in breastfeeding guidance on the duration of breastfeeding in healthy term infants. Breastfeed Med 2006;1:247-52

To study the effect on BF duration of training in BF guidance, data were collected before and after an intensive course provided to all the neonatal nurses, midwives and medical staff in a local General Hospital in Israel. Data collected on two cohorts of mothers and infants (before 1999, n=471; after 2003, n=364) examined the duration of BF and the factors influencing its discontinuation. Over the period, the rate of BF initiation rose from 84% to 93% and the mean duration of BF rose from 3.7±3.7 to 5.6±4.3 months. The rate of BF in the delivery room rose from 3% to 37%. Satisfaction with BF guidance in the hospital rose from 43% to 79%. However, there was no change in the proportion of mothers who planned to BF their infant (88% in both cohorts) and no significant differences in the reasons given by the mothers for stopping BF.

International Code

Foss KA, Southwell BG. Infant feeding and the media: the relationship between *Parents' Magazine* content and breastfeeding, 1972–2000. Int Breastfeed J 2006;1:10

Mass media content likely influences the decision of women to BF their newborn children. However, relatively few studies have empirically assessed such a hypothesis to date. Most work has tended to focus either on specific interventions or on broad general commentary about the role of the media. This study examined infant feeding advertisements in 87 issues of *Parents' Magazine*,

a popular parenting magazine – from the years 1971 through to 1999. Content analysis results were used to predict subsequent changes in levels of BF among US women. When the frequency of FF advertisements increased, the percentage change in BF rates reported the next year generally tended to decrease. These results underscore the need to acknowledge the potential role of popular media content in understanding BF patterns and public health trends.

Mizuno K, Miura F, Itabashi K, Macnab I, Mizuno N. Differences in perception of the WHO International Code of Marketing of Breastmilk Substitute between paediatricians and obstetricians in Japan. Int Breastfeed J 2006;1:12

Japan adopted the WHO Code in 1994, but most hospitals in Japan continue to receive free supplies of IF and to distribute discharge packs provided by IF companies to new mothers. The aim of this study was to explore the knowledge and attitudes of paediatricians and obstetricians to the WHO Code. A self-completion questionnaire was sent in 2004 to 132 paediatricians in 131 NICUs and to 96 chief obstetricians in general hospitals. Responses were received from 68% of paediatricians and 64% of obstetricians. Sixty-six percent of the paediatricians agreed that “BM is the best”, compared to only 13% of the obstetricians. Likewise, paediatricians were more familiar with the WHO Code (51%) than obstetricians (18%). To increase BF rates in Japan, both paediatricians and obstetricians need increased knowledge about current infant feeding practices and increased awareness of international policies to promote BF.

Systematic reviews

Horta BL, Bahl R, Martines JC, Victora CG. Evidence on the long-term effects of breastfeeding: systematic reviews and meta-analyses. Geneva: World Health Organization, 2007

This series of systematic reviews assessed the effects of BF on several long-term consequences. Observational and randomized studies, published in English, French, Portuguese and Spanish were selected and data were extracted after quality assessment. The available evidence suggests that BF may have long-term benefits. Subjects who

were BF experienced lower mean blood pressure and total cholesterol, as well as higher performance in intelligence tests. Furthermore, the prevalence of overweight/obesity and type-2 diabetes was lower among BF subjects. All effects were statistically significant, but for some outcomes their magnitude was relatively modest. Because nearly all studies included in the analyses are observational, it is not possible to completely rule out the possibility that these results may be partly explained by self-selection of BF mothers or by residual confounding. Publication bias was assessed by examining the effect of study size on the estimates and was found to be unimportant for most outcomes. Very few studies were available from low/middle-income countries, where the effect of BF may be modified by social and cultural conditions.

Ip S, Chung M, Raman G *et al.* Breastfeeding and maternal and infant health outcomes in developed countries. Evidence Report/Technology Assessment No. 153. AHRQ Publication No. 07-E007. Rockville, MD: Agency for Healthcare Research and Quality. April 2007

This review included 43 studies on infant health outcomes, 43 studies on maternal health outcomes, and 29 systematic reviews or meta-analyses, covering approximately 400 individual studies on the effects of BF and relevant outcomes, conducted in developed countries and having a comparative arm of FF or different durations of BF. The results show that BF is associated with a reduction in the risk of acute otitis media, non-specific DD, severe lower RTI, atopic dermatitis, asthma (in young children), obesity, types 1 and 2 diabetes, childhood leukaemia, sudden infant death syndrome, and necrotizing enterocolitis. On the other hand, in

term infants, there is no relationship between BF and cognitive performance and the relationships with cardiovascular diseases and infant mortality are unclear. For maternal outcomes, BF is associated with a reduced risk of type 2 diabetes, as well as breast and ovarian cancer. Early cessation of BF or not BF is associated with an increased risk of maternal postpartum depression. There is no relationship between BF and the risk of osteoporosis. The effect on return-to-pre-pregnancy weight is negligible and the effect on postpartum weight loss is unclear. Because almost all the data in this review were gathered from observational studies, one should not infer causality based on these findings.

Britton C, McCormick FM, Renfrew MJ, Wade A, King SE. Support for breastfeeding mothers. Cochrane Database Syst Rev 2007, Issue 1.

This review included 34 trials (29,385 mother-infant pairs) from 14 countries. It shows that additional professional support was effective in prolonging any BF, but that the effects on EBF were less clear. WHO/UNICEF training courses appeared to be effective for professional training. Additional lay support was effective in prolonging EBF, while its effects on duration of any BF were uncertain. Effective support offered by professionals and lay people together was specific to BF and was offered to women who had decided to BF. Further trials are required to assess the effectiveness (including cost-effectiveness) of both lay and professional support in different settings, particularly those with low rates of BF initiation, and for women who wish to BF for longer than 3 months. Research into appropriate training for supporters (whether lay or professional) of BF mothers is also needed

Prepared by the **Geneva Infant Feeding Association (GIFA)**, a member of the **International Baby Food Action Network (IBFAN)**. Editors: Adriano Cattaneo, Marina Ferreira Rea. Guest editor: Cesar G. Victora. Special thanks to Lida Lhotska who took part in drafting the editorial comments. Elaine Petitot-Côté revised and edited the text. Copies of former numbers of *Breastfeeding Briefs* sent upon request to GIFA, Box 157, 1211 Geneva 19, Switzerland, Fax: +41-22-798 44 43, e-mail info@gifa.org. Available also in French, Spanish, Portuguese and Arabic.

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