
H Breastfeeding — evidence of health benefits

Key points

- Despite the volume of research on the health benefits for infants, children and mothers, evidence of a causal relationship between breastfeeding and health benefits has been difficult to obtain as most studies are observational. Results from the Promotion of Breastfeeding Intervention Trial, a large cluster-randomised controlled trial in the Republic of Belarus, have more recently strengthened the evidence base.
- Breastfeeding is considered the optimal form of infant feeding and a key determinant of infant health.
- Based on the evidence available, international and Australian guidelines outlining optimal breastfeeding practices now recommend exclusive breastfeeding for six months.
- The evidence suggests that breastfeeding reduces the incidence and severity of a number of infectious diseases in infants (including gastrointestinal illnesses, respiratory tract infections and middle ear infections). More exclusive and longer periods of breastfeeding are also associated with lower rates of infant illnesses.
- *Possible* protective effects from breastfeeding have been found against sudden infant death syndrome in the first year of life, the incidence of insulin-dependent (type 1) diabetes, and some childhood cancers (but more research is required).
- And, there is increasing evidence that breastfeeding may have longer term effects including the reduced incidence of high cholesterol, blood pressure, obesity and diabetes in later life and better cognitive development. Results from the Belarus trial also provide evidence of better cognitive development from more prolonged and exclusive breastfeeding.
- For mothers, the evidence suggests that benefits include — promotion of maternal recovery, reduced risks of breast cancer and ovarian cancer and possible reduced risk of post-menopausal hip fractures.
- The evidence suggests that interventions to promote and support breastfeeding (including education, professional and peer support, professional training and hospital practices), can improve breastfeeding initiation and duration.

This appendix looks at some of the evidence on the health benefits to infants, children and mothers from breastfeeding and the evidence on the effectiveness of interventions to promote and support breastfeeding.

H.1 Assessing the evidence

The biomedical literature on breastfeeding is voluminous and the claimed health benefits for infants, children and mothers extensive.

But, despite the volume of research, evidence of a causal relationship between breastfeeding and health benefits has been difficult to obtain. This is largely because almost all the studies on potential health benefits of breastfeeding are observational.¹ Observational studies have well-recognised sources of potential bias (including selection bias, confounding variables and reverse causality), which puts questions around the credibility of inferences. As Kramer et al. said:

Current evidence that breastfeeding is beneficial for infant and child health is based exclusively on observational studies. Potential sources of bias in such studies have led to doubts about the magnitude of these health benefits in industrialised countries. (Kramer et al. 2001, p. 413)

Baker and Milligan also commented that:

... it is possible that unobservable characteristics drive both the health outcomes and the decision of when and how long to breastfeed.

This concern over causality is not pedantic. Two recent studies that more carefully address the question of causality find some results from the literature survive a more rigorous test while others do not. (Baker and Milligan 2008b, p.873)

The strongest evidence comes from randomised trials — studies that randomly assign one group (the treatment group) to receive an intervention and another (the control group) to not receive it and measure the effect of the intervention by comparing the change in outcome between the two groups (table H.1). But, it is difficult to undertake randomised trials to test breastfeeding benefits, largely because it is unethical to assign infants breast milk or formula.

And, a well-known confounder in breastfeeding research is differences between those mothers who breastfeed and those that don't (for example, mothers who breastfeed tend to be older and better educated). Also, infants that become very ill are often switched to alternative methods of feeding. While it is possible to control

¹ An observational study draws inferences about the effect of a treatment on subjects, where the assignment of subjects into a treated group versus a control group is outside the control of the researcher.

for some of these factors, as Ip et al. (2007, p. 12) said ‘it is not always possible to control for behavioural or attitudinal factors intrinsic in the desire to breastfeed’. Similarly, Leon-Cava et al. said:

Although there are many variants of [these] basic observational designs, all are flawed by the mother’s simple act of choosing an infant feeding method. As long as the feeding method is not randomly assigned, like placebos and real medicine in clinical trials, there is a good chance that other characteristics of the mother (such as her education or income) or of the infant (such as pre-existing illness) are associated with the chosen method of infant feeding or may have actually caused it. Then it becomes difficult to know what is responsible for the association between breastfeeding and the outcome of interest. (Leon-Cava et al. 2002, p. 2)

Table H.1 Levels of evidence

<i>Level of evidence</i>	<i>Study design</i>
I	Evidence obtained from a systematic review of all relevant randomised controlled trials
II	Evidence obtained from at least one properly-designed randomised controlled trial
III -1	Evidence obtained from well-designed pseudo-randomised controlled trials (alternate allocation or some other method)
III-2	Evidence obtained from comparative studies (including systematic reviews of such studies) with concurrent controls and allocation not randomised, cohort studies, case-control studies, or interrupted time series with a control group
III-3	Evidence obtained from comparative studies with historical control, two or more single arm studies, or interrupted time series without a parallel control group
IV	Evidence obtained from case series, either post-test or pre-test/post-test

Source: NHMRC 2000.

That said, consistent evidence from well designed observational case-control and cohort studies have contributed to the evidence base. The evidence is also built by pooling the results from several studies (applying stringent methodological criteria), where possible from different populations, either through systematic reviews or meta-analyses (see, for example, Kramer and Kakuma 2002, Leon-Cava et al. 2002, Heinig 2001, Oddy 2001, Bick 1999, Heinig and Dewey 1996, Horta et al. 2007, Ip et al. 2007). Recent sibling analysis (which provides a method of controlling for hereditary and household factors) has also added to the evidence base (Der et al. 2006).

Leon-Cava et al., while acknowledging the flaws of observational studies, argued that the evidence in sum is convincing:

... no single study is as conclusive as a randomized controlled trial could be. However, as the epidemiological evidence favouring breastfeeding is generally derived from

multiple studies in a variety of situations, the evidence is in sum, convincing. (Leon-Cava et al. 2002, p. 3)

In addition, a dose-response relationship between breastfeeding and health outcomes (that is, an indication that the benefits of breastfeeding are a function of the duration and exclusiveness of breastfeeding) is frequently identified in the studies providing further support to the evidence base.

While it is not ethical to randomly assign whether an infant is breastfed or formula fed, it is considered ethical to promote the duration and exclusivity of breastfeeding among mothers who have already decided to initiate breastfeeding. This is the strategy used in the Promotion of Breastfeeding Intervention Trial (or PROBIT), a large cluster-randomised controlled trial in the Republic of Belarus. Maternal hospitals and their corresponding clinics were randomly assigned to implement or not to implement the Baby-Friendly Hospital Initiative (in the intervention group, duration and exclusivity of breastfeeding were higher). Results from this trial of breastfeeding promotion and outcomes (covering more than 17 000 mother and baby pairs), have significantly improved the evidence base (Kramer et al. 2001, Kramer et al. 2007, Kramer et al. 2008). Follow-up of these children should also provide further opportunities to study the long-term effects of breastfeeding (Horta et al. 2007).

H.2 Health benefits for infants and children

Breastfeeding is considered the optimal form of infant feeding and a key determinant of infant health. The American Academy of Pediatrics (AAP) state that:

Human milk is species-specific, and all substitute feeding preparations differ markedly, making human milk uniquely superior for infant feeding. (AAP 2005, p. 496)

Australia's National Health and Medical Research Council also state that:

It is now clear that the composition of breastmilk is uniquely suited to the neonate, at a time when growth and development are occurring at very high rates yet when many of the infant's systems — such as digestive, hepatic, neural, renal, vascular and immune systems — are functionally immature. Many of the nutrients contained in breastmilk are in readily absorbed and bioavailable forms.

Breastmilk is not only a high-quality food; it also contains many components — ... that facilitate optimal function of the infant's immature systems. The living cells found in breastmilk are also important functionally.

Furthermore, the young of various mammals are born at very different stages of maturity, and it is not easy to modify the milk of one species so that it optimises the metabolism of the young of another species. (NHMRC 2003, pp. 317-8)

Evidence of early benefits for infants from breastfeeding

A range of studies find protective health effects for breastfed infants when compared with formula-fed infants (AAP 2005, Heinig and Dewey 1996, Bick 1999, Leon-Cava et al. 2002, Ip et al. 2007 — see box H.1). Summarising the evidence on the benefits of breastfeeding, Leon-Cava et al. said:

The greatest and most obvious benefits of breastfeeding are for the immediate health and survival of the infant. Rates of diarrhea, respiratory tract infections, otitis media, and other infections, as well as deaths due to these diseases, are all lower in breastfed than in non-breastfed infants. ...

These benefits, resulting from stronger immunity and reduced exposure to infectious agents, are greatest in younger infants and where hygiene and sanitation are poor. However, the research described here also suggests that these health and survival benefits extend beyond infancy and to well-off Western populations. (Leon-Cava et al. 2002, p. 3)

A review of the epidemiological evidence among developed countries undertaken by the American Academy of Pediatrics also reported that there was strong evidence that breastfeeding decreases the incidence and/or severity of — gastroenteritis, diarrhoea, respiratory tract infection and otitis media (ear infection), necrotizing enterocolitis, urinary tract infection, bacterial meningitis, bacteraemia, and last-onset sepsis in preterm infants (AAP 2005).

More recently, a summary of the literature conducted through the Evidence-Based Practice Centre program at the Agency for Health Research and Quality (screening over 9 000 abstracts) concluded that a history of breastfeeding was associated with a reduction in the risk of non-specific gastroenteritis, severe lower respiratory infections, acute otitis media and necrotizing enterocolitis, but that a relationship between breastfeeding and infant mortality in developed countries was unclear (Ip et al. 2007).

The biological plausibility of protection against infectious diseases relates to the immunological and antibacterial properties of human milk. Commenting on the specific immune factors of human milk, the National Health and Medical Research Council's Infant Feeding Guidelines for Health Workers said:

Immunoglobulin A (IgA) is the most abundant antibody in breastmilk. It is manufactured in and excreted by the breast in response to specific bacteria and viruses to which the mother is exposed. This provides protection against pathogens the infant is most likely to encounter in his or her local environment. IgG and IgM antibodies offer further protection against specific pathogens. (NHMRC 2003, pp. 319–320)

Breastfeeding also eliminates exposure to pathogens that could be introduced through the preparation and delivery of formula feeding (Allen and Hector 2005).

Box H.1 **Some evidence on breastfeeding and infant illnesses**

Gastroenteritis and diarrhoea — Many studies find an association between breastfeeding and protection against diarrhoeal illnesses (Heinig and Dewey 1996, Heinig 2001, Leon-Cava et al. 2002, Ip et al. 2007). For example:

- Dewey et al. (1995) found the incidence of diarrhoeal illness among formula fed infants to be almost twice that of breastfed infants during the first year of life.
- US longitudinal analysis of 2615 mother-infant pairs (infants aged 2–7 months) found that infants fed only formula (compared with exclusively breastfed infants) had an 80 per cent increase in the risk of developing diarrhoea (Scariati et al. 1997).
- Experimental interventions conducted as part of PROBIT (largest randomised trial), found a 40 per cent reduction in the risk of gastrointestinal tract infection in infants exclusively breastfed to six months compared to those exclusively breastfed for three months and partially breastfed to six months (Kramer et al. 2001).

Respiratory illness — Heinig's (2001) review found half (four out of eight) of the studies showed a protective effect against respiratory illness from breastfeeding. Also:

- Chantry et al. (2002) found infants breastfed for six months to have a significantly lower risk of respiratory infections (first two years) compared with babies fully breastfed for four months. Chantry et al. (2006), also found that infants exclusively breastfed for four months but less than six months were four times more likely to suffer from pneumonia than those breastfed for six months or longer. Similarly, Bachrach's (2003) meta-analysis of seven studies reported a 72 per cent reduction in the risk of hospitalisation due to lower respiratory tract diseases in infants less than one year of age who were exclusively breastfed for four months or more.
- However, results from PROBIT found no significant reduction in respiratory tract infection from longer and more exclusive breastfeeding (Kramer et al. 2001).

Otitis media (OM) — 'ear infection' — Dewey et al. (1995) found that during the first year of life, the incidence of acute OM was significantly higher among formula-fed infants than breastfed infants (0.53 versus 0.45), as was the number of episodes per year (1.78 versus 1.53). Scariati et al. (1997) found breastfeeding to be protective against OM in a dose-response manner. And both Duncan et al. (1993) and Duffy et al. (1997) found a two fold increase in the incidence of OM in formula-fed infants compared to exclusively breastfed infants (four and six months respectively).

Urinary tract infection — Both Pisacane (1992) and Marild (2004) found breastfeeding to provide substantial protection against urinary tract infection.

Necrotising enterocolitis (NEC) — A Cochrane review of eight randomised controlled trials found that in preterm and low birth weight infants, feeding with formula (compared with donor breast milk) increased short-term growth rates but was also associated with a higher risk of developing necrotising enterocolitis (Quigley et al. 2007).

Sources: Heinig & Dewey (1996), Heinig (2001), Leon-Cava et al. (2002), Ip et al. 2007, Dewey et al. (1995), Scariati et al. (1997), Kramer et al. (2001), Chantry et al. (2002), Chantry et al. (2006), Duncan et al. (1993), Duffy et al. (1997), Pisacane (1992), Marild (2004) Hector et. al.2004b, Quigley et al. (2007).

Evidence of a dose-response relationship

The evidence also points to a dose and duration response relationship between breastfeeding and some infant illness. Raisler et al. (1999) looking at the association between breast-feeding dose and illnesses in the first six months of life (covering 7092 infants from the US National Maternal and Infant Health Survey) found that full breastfeeding was associated with the lowest illness rates, while minimal breastfeeding was not protective. Compared with no breastfeeding, full breast-fed infants had lower odds ratios of diarrhoea, cough or wheeze and vomiting and lower mean ratios of illness months and sick baby medical visits. Breastfeeding was found to confer health benefits on infants from all socio-economic groups.

Experimental interventions conducted as part of the PROBIT study (a promotion program based on the WHO-UNICEF Baby Friendly Hospital initiative where the infants from the intervention group were much more likely to be breastfed at twelve months and exclusively breastfeed at three and six months) found a significant reduction in the risk of gastrointestinal tract infection (40 per cent) and atopic eczema (46 per cent) in the intervention group. No significant reductions, however, were found in respiratory tract infections (Kramer et al. 2001).

In 2000, a World Health Organization (WHO) commissioned Cochrane Systematic Review of the scientific literature on the optimal duration of exclusive breastfeeding concluded that:

Infants who are exclusively breastfed for six months experience less morbidity from gastrointestinal infection than those who are mixed breastfed as of three or four months, and no deficits have been demonstrated in growth among infants from either developing or developed countries who are exclusively breastfed for six months or longer. ... the available evidence demonstrates no apparent risk in recommending as a general policy, exclusive breastfeeding for the first six months of life in both developing and developed-country settings. (Kramer and Kakuma 2002, p. 2)

The review led to the WHO revising its recommendation of exclusive breastfeeding from four to six months.

More recently, Chantry et al. found that infants exclusively breastfed for more than four months but less than six months were four times more likely to suffer from pneumonia and twice as likely to suffer recurrent ear infections than those breastfed for six months or longer (protection was found independent of factors known to be associated with respiratory illness, including age, smoke exposure, day care, race/ethnicity, family size, education, and socioeconomic status). The authors concluded that:

Our findings add to growing evidence that breastfeeding benefits are dose-and-duration responsive and support current recommendations that infants receive only breast milk during the first 6 months of life. (Chantry et al. 2006, p. 431)

Based on the evidence available, international and Australian guidelines outlining optimal breastfeeding practices now recommend exclusive breastfeeding for six months.

Possible protection from other child illnesses

Possible protective effects from breastfeeding have also been found against sudden infant death syndrome (SIDS) in the first year of life, the incidence of insulin-dependent (type 1) diabetes, and some childhood cancers (leukaemia, lymphomas, Hodgkin's disease) (AAP 2005).

- The larger and better studies looking at the protection against sudden infant death syndrome indicate that formula feeding is a risk factor for SIDS (Alm et al. 2002, Ford et al. 1993). A meta-analysis of seven case-control studies found that a history of breastfeeding was associated with a 36 per cent reduction in the risk of sudden infant death syndrome compared to those without a history of breastfeeding (Ip et al. 2007).
- Two meta-analyses (Gerstein 1994, Norris and Scott 1996) of case-control studies suggest that breastfeeding for at least 3 months reduces the risk of childhood type 1 diabetes compared with breastfeeding for less than 3 months. A number of studies published since the meta-analyses report similar results (Visalli et al. 2003, McKinney, et al. 1999). Ip et al. (2007, p. 5) suggest that the results be interpreted with caution because of 'the possibility of recall biases and suboptimal adjustments for potential confounders in the studies'.
- A number of studies show a protective effect of breastfeeding against different childhood cancers (Davis 1998, Kwan et al. 2004, Guise et al. 2005, Ip et al. 2007). A meta-analysis by Kwan et al. 2004 indicated that both short and long term breastfeeding reduced the risk of childhood acute lymphoblastic leukaemia (ALL) and acute myeloblastic leukaemia. A meta-analysis by Ip et al. (2007) found breastfeeding of at least 6 months to be associated with a 19 per cent reduction in the risk of ALL.

There is conflicting evidence for the protective effect of breastfeeding against asthma and other allergies. A number of studies show protective effects of breastfeeding against asthma and atopy (Oddy et al. 1999, Chandra 1997, Mimouni Bloch et al. 2002), and some report increased protection with more exclusive and prolonged breast feeding (Dell and To 2001). Other studies, however, report no reduction in risk or even an increase in risk associated with breastfeeding,

particularly in children with a family history of asthma and allergy (Purvis et al. 2005, Stabell Benn et al. 2004). As Kramer said:

Whether breast feeding protects against the development of allergy and asthma has been frequently studied and hotly debated for more than 70 years. Research findings indicating a beneficial effect have been more consistent for atopic eczema during infancy, but the evidence on asthma and other atopic outcomes (including hay fever, food allergies and positive skin tests) has been far more mixed. (Kramer et al. 2007)

The PROBIT study failed to find evidence of reduced risk of asthma, hay fever or eczema at age 6.5 years, or reduced prevalence of positive skin prick tests, with large increases in the duration and exclusivity of breastfeeding (Kramer et al. 2007).

A recent Canadian study using the National Longitudinal Study of Children and Youth, looked at the impacts of the increase in maternity leave entitlements in Canada and corresponding increases in breastfeeding duration (breastfeeding duration increased by over a month and the proportion of women exclusively breastfeeding for six months increased by 40 per cent) and found no effect on most self-reported indicators of infant health outcomes. While finding some evidence of beneficial impacts on asthma, allergies, chronic conditions and ear infections at ages seven to twelve months, sensitivity testing raised ‘doubts about their robustness, persistence, and relation to breastfeeding/increased maternal care’ (Baker and Milligan 2008b, p. 884).

H.3 Evidence of longer term effects

There is increasing evidence that breastfeeding may have longer term effects on the development and risk of chronic diseases including the reduced incidence of cholesterol, blood pressure, obesity and diabetes in later life (Arenz et al. 2004, Fewtrell 2004, Owen et al. 2002, Martin et al. 2005, Schnack-Nielsen and Michaelsen 2006, Ip et al. 2007, Horta et al. 2007).

And, many (but not all) studies find that children who are breastfed do better on intellectual and motor development tests than those who are not breastfed (Evenhouse and Reilly 2005 compared with Der et al. 2006, also Anderson et al. 1999, Leon-Cava et al. 2002, Kramer et al. 2008). Studies that adjust for maternal intelligence (including sibling analysis) tend to find little or no evidence of an association between breastfeeding in infancy and cognitive performance (Ip et al. 2007).

A recent systematic review conducted by the World Health Organization (Horta et al. 2007), concluded that subjects who were breastfed experienced lower blood pressure and total cholesterol, as well as higher performance in intelligence

tests. The prevalence of overweight/obesity and type 2 diabetes was also found to be lower among breastfed subjects (table H.2).

Ip et al. (2007), while finding an association between being overweight or obese in adolescence and adult life were unable to confidently characterise a relationship between breastfeeding in infancy and the risk of cardiovascular diseases (because of possible biases and limitations in the studies reviewed).

A study by Lawlor et al. (2005) suggested that *exclusive* breastfeeding to six months and longer term reduces systolic blood pressure in older children (based on 2192 randomly selected school children aged 9 to 15 from Estonia and Denmark). The magnitude of the effect was found to be comparable to the published effects of salt restriction and physical activity on blood pressure in adult populations.

New evidence from the PROBIT study also shows that prolonged and exclusive breastfeeding improves children's cognitive development as measured by IQ and teachers' academic ratings at age 6.5 years. Compared with the control group, the intervention group had higher means on all the Wechsler Abbreviated Scales of Intelligence measures. Cluster-adjusted mean differences were +7.5 for verbal IQ, +2.9 for performance IQ and +5.9 for full-scale IQ. Teacher's academic ratings were significantly higher in the experimental group for both reading and writing. The authors concluded that:

Because protection against infections in developed country settings does not have the life-and-death implications for infant and child health that it does in less-developed settings, cognitive benefits may be among the most important advantages for breastfed infants in industrialised societies. (Kramer et al. 2008, p. 583)

What remains unclear, however, is if the cognitive benefits of breastfeeding are due to the makeup of breast milk itself or the social and physical interactions between mother and infant inherent in breastfeeding. The authors suggest that the higher frequency and duration of breastfeeding compared to bottle feeding results in increased verbal interaction between mother and child which might also have a stimulatory effect on cognitive development.

Table H.2 Estimated long-terms effects of breastfeeding, based on five meta-analyses^a

<i>Outcome</i>	<i>Pooled effect size (95% CI)</i>	<i>Conclusion</i>
Blood pressure (mean difference in mm Hg. 95% CI)		The effect of breastfeeding was found to be significant, but smaller than the effects of other interventions such as diet, exercise and modest salt reduction.
- Systolic	-1.21 (-1.71 to -0.70)	Publication bias was found to be unlikely but residual confounding could not be excluded.
- Diastolic	-0.49 (-0.87 to -0.11)	
Total serum cholesterol among adults (mean difference in mmol/L 95% CI)	-0.18 (-0.30 to -0.06)	The effect of breastfeeding was found to be significant and larger than the effects of other interventions such as diet (-0.13) and multiple risk factor (-0.14). No significant effect was observed in children or adolescents.
Overweight or obesity	Odds ratio 0.78 (0.72 to 0.84)	The effect of breastfeeding was found to be significant (22% reduction) while other interventions showed no effect. In spite of evidence of publication bias, a protective effect continued to be observed among larger studies (>1500 participants).
Type 2 diabetes	Odds ratio 0.63 (0.45 to 0.89)	Studies assessing the risk of Type 2 diabetes reported a protective effect and of similar magnitude to the effect of other interventions such as diet and physical activity. Two studies failed to report an association between a measure of insulin resistance and breastfeeding duration and a study on fasting blood glucose levels was also negative. The study concluded that it was not possible to draw firm conclusions about breastfeeding on the risk of Type 2 diabetes and related outcomes.
Intelligence test scores	Mean difference 4.9 points (2.97 to 6.92)	The effect of breastfeeding was found to be significant with a substantial effect size. But the study noted that the practical implications of a relatively small increase in the performance in development tests in childhood may be open to debate. Evidence from three studies on school performance in late adolescence or young adulthood indicated that breastfeeding is positively associated with educational attainment.

^a The authors stress that the table is intended for illustrative purposes only and should be interpreted with caution as it includes a comparison of the effect of actual interventions (without perfect compliance levels) with the gross difference of the effect between breastfed and non-breastfed subjects, which corresponds to an intervention with 100 per cent compliance.

Source: Horta et al. 2007.

Other evidence

Other research suggests an increased risk of developing ulcerative colitis, Crohn's disease and celiac disease in individuals who were formula fed as infants (Davis 2001, sub. 249). And, research based on the Western Australian Pregnancy Cohort Study found breastfeeding to be associated with reduced risk of depression and anxiety in teenagers (Oddy et al. 2007).

There is also some evidence of associations between not breastfeeding and dental occlusion and decreased lung capacity in children (sub. 249, sub. DR391).

H.4 Benefits of breastfeeding for mothers

The literature points to a range of health benefits from breastfeeding for mothers, including:

- the promotion of a mother's recovery from childbirth. Breastfeeding increases levels of oxytocin resulting in accelerated uterine involution and less postpartum bleeding (reduces maternal mortality and preserves maternal haemoglobin stores) through reduced blood loss, leading to improved iron status.
- earlier return to pre-pregnancy body weight and a prolonged period of postpartum infertility (AAP 2005, Chua et al. 1994, Dewey et al. 1993, Kennedy and Visness 1992, Labbock and Colie 1992). A dose-response relationship has also been identified. The pooling of results from two Hondurian trials showed that women from the six-month exclusively breastfeeding group (versus breastfeeding for 3 to 4 months followed by mixed breastfeeding) showed a longer period of postpartum infertility and lost on average 0.42 kg more than the group of women who breastfed exclusively for four months (Kramer and Kakuma 2002). Ip et al. 2007, however, found that results from seven studies consistently showed that many factors other than breastfeeding had larger effects on weight retention or postpartum weight loss.
- reduced risks of pre-menopausal breast cancer with longer periods and more exclusive breastfeeding being more protective. A meta-analysis covering 47 studies (including 50 302 women with breast cancer and 96 973 women without the disease), found that the relative risks of breast cancer decreased by 4.3 per cent for every 12 months of breastfeeding in addition to a decrease of 7 per cent for every birth. The study concluded that:

... the longer women breastfeed the more they are protected against breast cancer. The lack of a short lifetime duration of breastfeeding typical of women in developed countries makes a major contribution to the high incidence of breast cancer in these countries (Beral 2002, p. 187).

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- possible reduced risk of ovarian cancer. While some studies find a dose-response (for example, Rosenblatt and Thomas 1993), Labbok (2001) in a review of literature concluded that while there was evidence of protective effects of breastfeeding against the occurrence of ovarian cancer, a dose-response relationship was not supported.
 - possible reduced risk of post-menopausal hip fractures and osteoporosis. Some studies show that, although bone mineral density decreases during lactation after weaning, women who have breastfed have a higher bone mineral density (decreasing the risk of post-menopausal hip fracture) than those who have not breastfeed (Cumming et al. 1993). Other studies, however, indicate no relationship (Rea 2004, Labbok 2001). Ip et al. 2007 found little or no evidence from six moderate quality case-control studies for an association between lifetime breastfeeding duration and the risk of fractures due to osteoporosis. Two large cohort studies (Rea 2004, Jacobsson et al. 2003) indicated protective effects for rheumatoid arthritis with some suggestion that there is a dose response effect.
 - decreased maternal depression (Mezzacappa 2004, Ip et al. 2007). Ip et al. 2007 on reviewing six prospective cohort studies found that the studies of moderate quality reported an association between not breastfeeding or short duration of breastfeeding and postpartum depression but note that more research was needed to determine the nature of the association.

Many participants indicated that breastfeeding creates a special bond between mother and baby and offers unique interactions which create a greater sense of security for the child. The National Health and Medical Research Council's Infant Feeding Guidelines for Health Workers states that:

Breastfeeding can be an important factor in the bonding between mother and infant. The interdependence between the breastfeeding mother and infant, the regular close interaction, and the skin-to-skin contact during breastfeeds encourage mutual responsiveness and attachment. (NHMRC 2003, p. 322)

Hart et al. (2003), assessed infants on the Brazelton Neonatal Behavioural Assessment Scale (BNBAS) when they were 8.95 days of age and found that breastfed infants surpassed formula-fed infants on items of orientation, motor, range of state, and state regulation dimensions of the BNBAS. Breast-fed infants were also found to exhibit fewer abnormal reflexes, signs of depression, and withdrawal. Hart et al. suggested that:

In addition to promoting breastfeeding and on the basis of its known benefits to infant health, it can be advanced on the basis of findings that breast-fed infants are more alert and responsive, and thus more likely to facilitate favourable parental attention and the formulation of attachment. (Hart et al. 2003, p. 533)

Fergusson and Woodward (1999) also found that children breastfed for longer tended to perceive their mothers as more caring and less over-protective, while Ainsworth's (1973) research showed that a secure attachment to the mother through breastfeeding enabled children to form attachments to others and to become more independent (compared to a group of bottle-fed infants).

H.5 Support for breastfeeding

Despite the evidence that breastfeeding decreases the risks for a range of diseases, and international and Australian guidelines recommend exclusive breastfeeding for six months and continued breastfeeding for at least 12 months (box 4.5), most Australian mothers exclusively breastfeed for much shorter periods. While the majority of Australian women commence breastfeeding (92 per cent of babies are breastfed at birth), just 14 per cent are exclusively breastfed at six months. The rate of exclusive breastfeeding falls to 71 per cent at one month, declines steadily over the next three months and then falls rapidly after the fourth month — from 46 per cent to 28 per cent at five months.

While Australia's breastfeeding initiation rate meets the National Health and Medical Research Council's target (in excess of 90 per cent), the rate of breastfeeding at six months is well below the Council's target 80 per cent (a goal considered by the Council to be achievable in Australia).

The main reasons given by Australian women for discontinuing breastfeeding include:

- problems in producing adequate milk (30 per cent)
- felt it was time to stop (23 per cent)
- other problems with breastfeeding (10 per cent)
- resuming work (8 per cent) (ABS 2003).

What this suggests is that paid parental leave by itself is likely to be only partly effective in increasing breastfeeding duration with complementary measures also playing an important role in improving the prospects that paid parental leave will encourage mothers to breastfeed for longer.

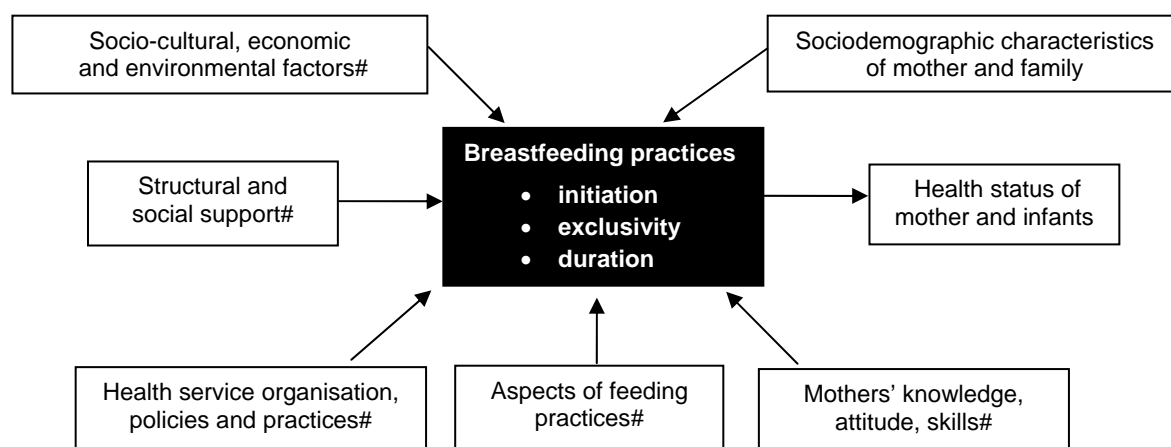
Researchers have identified a range of factors that influence breastfeeding rates. The seven main categories of factors thought to contribute to breastfeeding practice include:

- the socio-demographic characteristics of the mother and family

- structural and social support
- health and risk status of mothers and infants (including birth and neonatal experiences of mothers and infants and health behaviours of mothers)
- mothers' knowledge, attitudes and skills
- aspects of the feeding regime/practices
- health service organisation, policies and practices (including hospital and health facilities)
- socio-cultural, economic and environmental factors (figure H.1).

The importance of linking interventions to contributing factors is highlighted within health planning guidelines, such as the National Public Health Partnership's Planning Framework for Public Health Practice (National Public Health Partnership Secretariat 2000). However, not all factors contributing to breastfeeding practices are amenable to intervention (figure H.1).

Figure H.1 **Determinants of breastfeeding**



Amenable to intervention.

Source: Hector, King and Webb 2004, p. 5.

Interventions to support breastfeeding include — educational and social support strategies (peer or professional), reorientation of health services (health professional training, organising health services, such as hospital practices, to provide support for breastfeeding), the promotion of supportive environment strategies (such as interventions to support breastfeeding in public places and workplaces), public health policy (such as limiting the promotion and marketing of infant formula) and community action and advocacy strategies (Hector, King and Webb 2004).

What's the evidence about the effectiveness of interventions?

There are a number of published reviews of interventions to promote breastfeeding initiation and duration, including several Cochrane Reviews, reviews by the US Preventative Services Task Force, the World Health Organization and NSW Health (Dyson et al. 2005, Britton et al. 2007, Chung et al. 2007, Fairbank et al. 2000, Oliveira et al. 2001, WHO 1998, Hector, King and Webb 2004).

The systematic reviews and meta-analyses of interventions to promote and support breastfeeding indicate that:

- breastfeeding interventions are more effective than routine care in increasing short and long term breastfeeding rates
- a variety of educational formats are effective in improving rates of initiation and short-term duration of breastfeeding (although not all studies find education to be effective), with one-to-one education and/or small group programs appearing most effective. The isolated use of written materials is consistently shown to be ineffective and may be detrimental
- both peer and professional support strategies appear effective in increasing duration and exclusivity of breastfeeding. These forms of support appear to be particularly effective in areas where initiation and continuation of breastfeeding is not high
- strategies that depend mainly on face-to-face support are more effective than those that rely primarily on telephone contact and the effectiveness of support is enhanced by home visits
- postnatal support by a health professional and/or trained peer counsellors (including one or more of the following — early intervention services, parenting groups, face-to-face contacts and home visits) appear effective in promoting the duration of breastfeeding between four and six months
- health service policy and professional training can be important in enabling the consistent and integrated adoption and implementation of recommended practices (including the Baby Friendly Hospital Initiative and the WHO's Ten steps to successful breastfeeding). A Cochrane review indicated that exclusive breastfeeding was prolonged when care was provided by health professionals who had undertaken WHO/UNICEF training courses
- combining prenatal and postnatal interventions and inclusion of lay support in a multicomponent intervention may be beneficial

There is also some evidence that early skin-to-skin contact between baby and mother, rooming-in babies and avoiding inclusion of infant formula or material marketing infant formula in commercial hospital discharge packs, can be effective

in improving breastfeeding initiation and short-term duration (Moore, Anderson and Bergman 2007, Rosenberg, et al. 2008, WHO 1998).

While the systematic reviews provide some insights into the effectiveness of interventions to promote breastfeeding, there are also limitations to the conclusions that can be drawn from the reviews because:

- they rely on statistically measurable outcome variables while interventions to promote and support breastfeeding are relational and not easily captured in quantitative outcomes alone
- there is large heterogeneity of interventions, settings, outcome measures and comparison groups
- studies tend to look at the effectiveness of individual interventions or specific combinations of interventions which makes it difficult to identify an optimal overall strategy or combination of interventions
- while some studies examine how strategies differentially affect initiation and duration, there are a number of interventions that increase initiation that also have a positive effect on duration (Hector, King and Webb 2004).

Considerable gaps in the evidence also remain. This is particularly the case for strategies related to public policy, supportive environments (such as interventions in the workplace to support breastfeeding and physical facilities in public places) and community action. For example, a recent Cochrane review on interventions in the workplace to support breastfeeding for women in employment was unable to identify any randomised controlled trials or quasi-randomised controlled trials (Abulwadud and Snow 2007). There are also gaps in the evidence in terms of the effectiveness of strategies that specifically support breastfeeding continuation between three and four months, and strategies for promoting exclusive breastfeeding up to six months and breastfeeding beyond the six month period (Hector, King and Webb 2004).

H.6 Summing up

Breastfeeding is considered the optimal form of infant feeding and a key determinant of infant health.

The evidence indicates breastfeeding reduces the incidence and severity of a number of infectious diseases in infants including — gastrointestinal illnesses, respiratory tract and middle ear infections. More exclusive and longer periods of breastfeeding are also associated with lower rates of infant illnesses (particularly gastrointestinal illnesses). Possible protective effects from breastfeeding against

SIDS in the first year of life, the incidence of insulin-dependent (type 1) diabetes and some childhood cancers have also been found, although more research is required.

There is also increasing evidence that breastfeeding may have longer term effects, including the reduced incidence of obesity, diabetes, blood pressure and high cholesterol in later life. And some (but not all) studies find an impact on later intelligence.

For mothers, the evidence suggests that benefits include — promotion of maternal recovery, reduced risks of breast cancer and ovarian cancer and possible reduced risk of post-menopausal hip fractures.

The evidence on the effectiveness of interventions to promote and support breastfeeding suggests that — educational, professional and peer support interventions, as well as professional training and hospital practices that support breastfeeding — can improve breastfeeding practices. Combined prenatal and postnatal support interventions also appear to be beneficial.

