

BENEFITS OF BREASTFEEDING

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Human milk, or breastmilk, is uniquely engineered for human infants, and is the biologically 'natural' way to feed infants. Breastfeeding, in comparison to feeding breastmilk substitutes such as infant formula, has numerous health benefits. Despite this, infant formula has been actively promoted as a product equivalent to breastmilk. Consequently, evidence describing the health advantages of breastmilk and breastfeeding needs to 'argue the case' for breastfeeding.

Evidence of a causal relationship between breastfeeding and health outcomes has been difficult to obtain, in part because it would be unethical to conduct randomised controlled trials of infant feeding methods. Nevertheless, consistent evidence from well designed cohort and case-control studies, many of which demonstrate a positive dose-response relationship, have contributed to a sound evidence base. While the health benefits of breastfeeding infants in less developed countries, particularly in relation to infectious gastrointestinal disease, have long been recognised, the benefits in developed countries, like Australia, are less accepted.

This article provides an overview of the evidence regarding the health benefits of breastfeeding in developed countries. The range of benefits and the strength of the evidence is summarised, drawing where possible on systematic reviews and meta-analyses. Attempts to express these health benefits as economic benefits are also described. There are a few situations in which breastfeeding is contraindicated, for example for HIV/AIDS infected or drug addicted mothers,^{1,2} and these are not explored in this article.

SEARCH METHOD

The published literature was searched for:

- recent systematic reviews and meta-analyses that applied stringent criteria to the inclusion of studies
- critical reviews (non-systematic) that had been published in the past decade
- original papers, published primarily in the past five years, on the health advantages of breastfeeding.

The search included all OVID electronic databases, including CINAHL, EMBASE, Medline (Medline searched from 1996 to the second week in May 2005) and the Cochrane Library. The keywords used for the search were: *breastfeeding or breastmilk AND health or prevention or protection or reduced risk*; initially using the limits of systematic review,

review and meta-analysis, but subsequently extended to using particular health outcomes as key words. Findings in developed countries were prioritised.

Nine critical reviews covering a range of health outcomes, four narrative reviews of specific health outcomes, 11 meta-analyses of specific health outcomes and 24 papers were chosen to describe the current evidence base.

The strength of association between breastfeeding and a health benefit was classified as *convincing*, *probable* or *possible* (see Table 1). In general, evidence was regarded as *convincing* if the findings were based on one or more cohort studies, with at least a measure of duration of breastfeeding (preferably exclusive breastfeeding), and/or showed a clear dose-response in relation to health outcomes, and was biologically plausible. If the evidence was supported by reviews or meta-analyses then it was also considered to be convincing. *Probable* was generally used to refer to health outcomes for which most studies have found an association, but confirmation is required in more, or better designed studies. *Possible* was used to describe evidence of an association where there were few studies.

The quality of the evidence is limited by methodological issues other than study design, including problems in defining breastfeeding practices and health outcomes, and inadequate control for confounding factors.^{3,4}

THE HEALTH BENEFITS OF BREASTFEEDING

Early reviews considered that the evidence was strongest for a protective effect of breastfeeding against infectious disease⁵, even in developed countries.⁶ However, as illustrated below and summarised in Table 1, there is evidence that breastfeeding protects against a wide range of immediate and longer term adverse health outcomes in developed countries.

Infectious disease

Evidence shows that breastfeeding is protective against infectious diseases such as upper and lower respiratory tract infections, gastrointestinal illnesses, and otitis media, during the infant period and beyond.⁵⁻⁹ The magnitude of the effects are large. For example, a recent meta-analysis of studies conducted in developed countries indicated more than tripling of severe respiratory tract illnesses requiring hospitalisation for formula fed infants compared with those exclusively breastfed for at least four months.¹⁰ The biological plausibility of protection against infectious diseases relates to the immunological^{6,7} and antibacterial¹¹ properties of human milk and the elimination of exposure to pathogens that may be introduced through the preparation and delivery of formula feeding.¹² This evidence is strong for both developed countries and developing countries.⁶ Recent studies also indicate protection against urinary tract infection.^{13,14}

TABLE 1

EVIDENCE FOR HEALTH ADVANTAGES OF BREASTFEEDING TO INFANTS, CHILDREN, MOTHERS, AND ADULTS, IN DEVELOPED COUNTRIES

Level of evidence ¹	Health outcomes for which breastfeeding is protective		
	Infants and children	Chronic disease in childhood and/or later life	Mothers
convincing ²	gastrointestinal illnesses otitis media respiratory tract infections neonatal necrotising enterocolitis		slow maternal recovery from childbirth reduced period of postpartum infertility premenopausal breast cancer
probable ³	asthma and allergy cognitive ability/intelligence some childhood leukaemias urinary tract infection inflammatory bowel disease coeliac disease sudden infant death syndrome	obesity	postmenopausal breast cancer ovarian cancer rheumatoid arthritis
possible ⁴	insulin dependent diabetes mellitus bacteraemia meningitis dental occlusion	ischaemic heart disease atherosclerosis risk factors for: • atherosclerosis and heart disease • Type 2 diabetes and metabolic syndrome	maternal depression reduced maternal-infant bonding endometrial cancer osteoporosis and bone fracture no or slow return to pre-pregnancy weight

Notes:

1. The classification of evidence of the relationship between breastfeeding and health benefits is based on a comprehensive overview of the evidence base (systematic reviews, meta-analyses, reviews, recent single studies)
2. Convincing: evidence of relationship was critically identified in a review and/or shown in meta-analyses to be significant
3. Probable: most studies have found an association, but confirmation is required in more, or better designed, studies
4. Possible: too few methodologically-sound studies

The immunological properties of breastmilk have been indicated in pre-term infants and very-low-birth-weight infants¹⁵, with evidence of breastmilk offering protection against respiratory symptoms¹⁶ and necrotising enterocolitis.¹⁵

Neurodevelopment and SIDS

The benefits of breastfeeding in children born pre-term or small-for-gestational-age has been shown in relation to neurodevelopment.¹⁷ This association is seen in term infants also. A number of studies have shown a relationship between breastfeeding and cognitive development in children, although meta-analyses^{18,19} have indicated difficulty in distinguishing the effect of breastfeeding from the confounding factor of the mothers' intelligence. A recent study indicated a positive effect throughout childhood, regardless of maternal intelligence.²⁰ The problem of confounding factors was also highlighted in the interpretation of a meta-analysis of breastfeeding and sudden infant death syndrome (SIDS); the combined analysis showed that formula-fed infants were twice as likely to die from SIDS.²¹

Asthma and atopy

One area of scientific controversy is the effect of breastfeeding on the development of asthma and atopy. Some recent studies have reported no difference or an increased risk of asthma and atopic disease in childhood amongst breastfed infants²², particularly in those children with a family history of asthma and allergy.²³ However other methodologically

sound studies have found breastfeeding to be protective against asthma and allergy.^{24,25} On balance, breastfeeding is still recommended for reducing asthma and atopic disease in childhood, even for high risk children.^{26,27} Possible mechanisms linking breastfeeding to asthma and atopy as either a risk or protective factor have been suggested.^{28,29}

Chronic disease risk in childhood and later life

A number of recent meta-analyses and quantitative reviews indicate a protective effect of breastfeeding, even for a short duration, against childhood obesity.^{30,31} As obesity in childhood can lead to obesity as an adult, this suggests a possible role for breastfeeding in the long-term prevention of obesity.³² Further, one review³³ and a recent single study³⁴ have shown that the protective effect against obesity may extend into adulthood.

Several recent studies have shown that breastfeeding may be protective against chronic diseases such as ischaemic heart disease³⁵ and atherosclerosis³⁶ and also for risk markers for diabetes and heart disease, including reduced insulin response³⁷, lipoprotein profile³⁸, and diastolic blood pressure.³⁹ However, longitudinal research, using sound measures of breastfeeding practices, is required to confirm these associations. Most recently a meta-analysis demonstrated that exclusive breastfeeding to six months and longer term breastfeeding reduces systolic blood pressure in older children. The magnitude of the effect was comparable to the published effects of salt restriction and physical activity on

blood pressure in adult populations.⁴⁰ Breastfeeding is also likely to be protective against Type 1 diabetes.^{41,42}

Other diseases and conditions—infants and children

A recent meta-analysis concluded that both short-term and long-term breastfeeding is protective against childhood acute lymphoblastic leukaemia and acute myeloblastic leukaemia.⁴³ However, earlier studies exploring a protective relationship against childhood leukaemia were inconclusive.

Systematic reviews report that studies show 'probable' protection against inflammatory bowel disease (Crohn's disease and ulcerative colitis)⁴⁴ and a recent critical review indicates probable protection against coeliac disease.⁴⁵ There is limited evidence for associations between not breastfeeding and other adverse health outcomes such as dental occlusion⁴⁶ and pyloric stenosis.⁴⁷

Health benefits for the mother

There is compelling evidence that breastfeeding is protective against developing premenopausal and probably postmenopausal breast cancer. There is convincing evidence of a dose-response effect, with longer duration and more exclusive breastfeeding being more protective. A review of 47 studies carried out in 30 countries indicated that the relative risk of breast cancer decreased by 4.3 per cent for every 12 months of breastfeeding.⁴⁸

Studies have consistently shown that hormonal changes associated with breastfeeding help recovery after childbirth and suppress maternal fertility.^{49,50} The extent of these changes is again dependent on the frequency, intensity and duration of breastfeeding.

Evidence from two recent case control studies indicates that breastfeeding may protect against ovarian cancer^{51,52}, and two large cohort studies showed protective effects for rheumatoid arthritis, the latter with a dose response effect.^{49,53} Increased postpartum weight loss, shown in a number of studies, is likely given that lactation requires an additional 500–640 calories per day.⁴⁹ Robust evidence is accumulating that breastfeeding decreases maternal depression⁵⁴ and improves mother-infant bonding.⁵⁵ The evidence for protection against endometrial cancers and osteoporosis (and hip fracture) is mixed, although biological plausibility lends strength to the argument.^{49,50}

ECONOMIC BENEFITS OF IMPROVED BREASTFEEDING PRACTICES

The illnesses for which there is convincing evidence of a protective effect of breastfeeding are among the major health problems in Australia and contribute significantly to the health burden. However, research into the costs and benefits of breastfeeding is poorly developed. Most economic analyses of breastfeeding have focused on a small number of infant illnesses and thus considerably underestimate the total costs^{56,57} resulting from low rates of breastfeeding.

These analyses also focus on the infant period alone, and exclude many infant and maternal illnesses, as well as the costs of increased rates of longer term chronic diseases. Many of the potential costs are currently unquantified and difficult to measure; consequently analyses commonly measure direct health costs. Indirect costs (for example, cost of infant formula, equipment, storage and preparation; cost of medicine and staff time for treating sick infants), and out-of-hospital costs to the health system (for example, physician visits) are seldom measured.

An alternative way of approaching breastfeeding in economic analysis has been to consider breastmilk as a food commodity that contributes to the total food supply (and therefore the Gross Domestic Product). In a novel analysis, breastmilk was considered to yield a net economic benefit (after adjustment for a small increase in maternal food consumption) of a minimum of \$2.2 billion each year in Australia.^{58,59}

Rigorous economic analysis of breastfeeding is a research priority as these results inform advocacy for maintaining the investment in breastfeeding support and promotion.

CONCLUSION

Evidence suggests that there are many health benefits and advantages of breastfeeding at all stages of life. Breastfeeding has been consistently shown to be protective against a large range of immediate and longer term health outcomes that are a significant burden on individuals, the health system and society. While some of the positive effects of breastfeeding on particular health outcomes may be small, these differences are extremely important at the population level. Taken together with the numerous health outcomes where the effect is pronounced, the overall benefits of breastfeeding are likely to be considerable. Better quality research on breastfeeding with regard to the range of health outcomes is required to enhance our understanding of its health benefits, and the mechanisms by which it confers protection.

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A copy of the WHO report *Nutrient adequacy of exclusive breastfeeding for the term infant during the first six months of life* is included on the CD that accompanies this special issue of the *NSW Public Health Bulletin*. The report is also available at www.who.int/nut/documents/nut_adequacy_of_exc_bfeeding_eng.pdf.

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