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Scaling Up Breastfeeding: Why it is a 'best buy'



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The case for investing in breastfeeding

Role: justify the need for a budget line – the case for prioritising investing in breastfeeding as part of Scaling Up Nutrition initiatives



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The problem ...

- Worldwide more than three quarters of children are not optimally breastfed
- This problem of 'mass mammary malfunction' is not because women cannot breastfeed ('lactation failure') or because we do not know what works to help them.
- It is because the economic value of mothers milk and the work mothers do is invisible
- And so funding agencies and governments and the public do not give breastfeeding the importance it deserves



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Breastfeeding is economically valuable and a 'best buy', but it is not free

- Breastfeeding of human infants reduces economic waste and builds better human capital for the nation
 - having lower death rates and health care costs for both children and mothers
 - babies who are not optimally breastfed as infants have IQ disadvantage, so affecting their education
- Breastmilk is an economically valuable commodity
- But it is not 'free'



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Economic framework for breastfeeding investment

- Breastfeeding does not 'compete' on equal terms in a market economy
- Mothers milk competes in markets (against breastmilk substitutes and for mothers time)
- Costs of breastfeeding are borne by the mother, but many of benefits accrue to others and to society as a whole
- 'Externality problem' = 'market failure'
- Result is that less is invested in breastfeeding than it warrants from an economic and social perspective

Smith, J.P. 2004. 'Mothers' milk and markets', *Australian Feminist Studies*, vol. 19, no. 45, November, pp. 369-79.

Every Drop Counts, Hobart, 16 April

2010



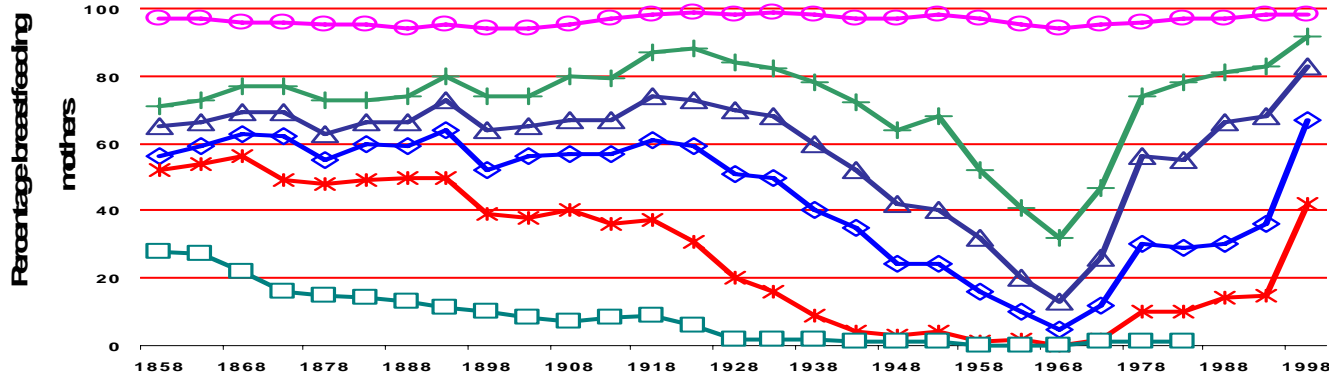
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Historical perspectives- mass mammary malfunction

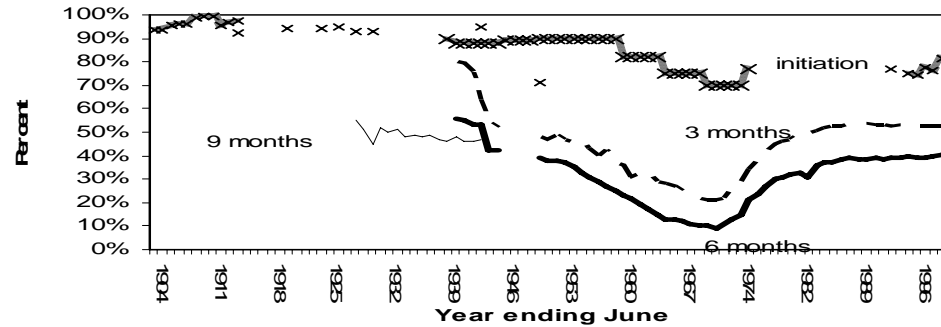
Norway 1858-1998

Helsing 2006



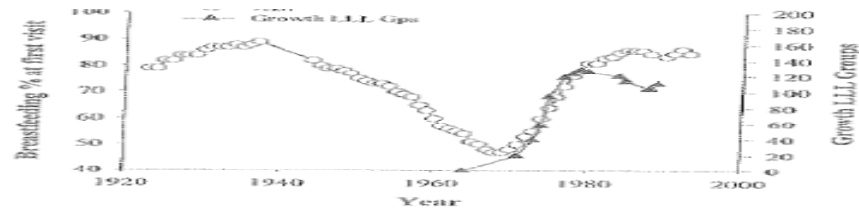
Australia 1904-2000

Smith 2007



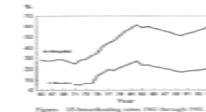
New Zealand 1920-2000

Ryan, K 1997



USA 1965-1995

Ryan, A 1997





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Risks of not investing in breastfeeding

- What will happen if we don't scale up investment in breastfeeding?
- **Breastfeeding will decline - it will not stay the same or go up**
- The food industry has billions of dollars at stake in sales of formula and manufactured foods for children, and is investing heavily in expanding the market for their products and thereby reducing the share of breastfeeding in infant and young child feeding
 - They are again expanding baby food sales through marketing to hospitals and health professionals, and to busy working mothers
- It is important for today's newly developing countries to avoid repeating this costly nutrition transition mistake



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Hospital practices as a strategy for increasing formula market share

Ten Steps to Unsuccessful Breastfeeding:

1. medicated birth
2. separation of mother and infant
3. routine supplementation with formula or other fluids
4. dummies
5. scheduled feeds
6. restricted number and duration of feeds
7. test weighing
8. early introduction of solids and juices
9. weight charts based on formula fed infants
10. lack of skilled, sensitive support in the family and community

WHO. *Evidence for the Ten Steps to Successful Breastfeeding* Geneva: 1998.

Enkin MW, Keirse MJ, et al. *A guide to effective care in pregnancy and childbirth*. Oxford: Oxford University Press, 1995.

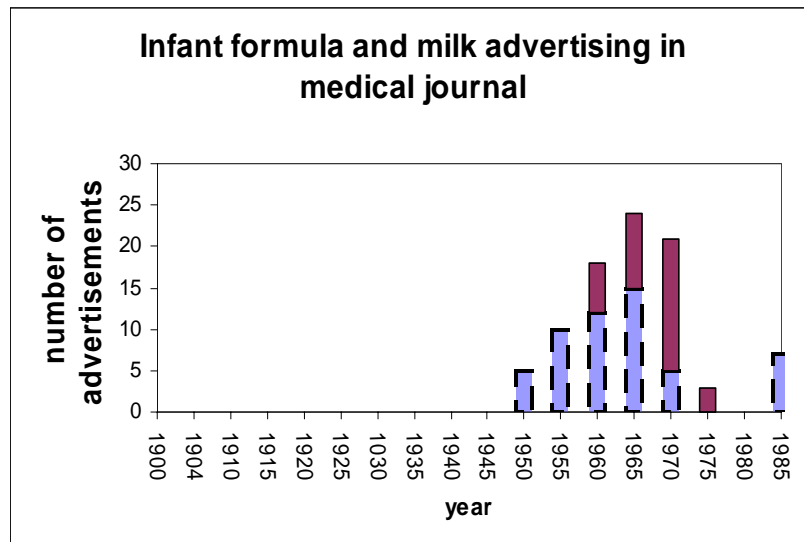


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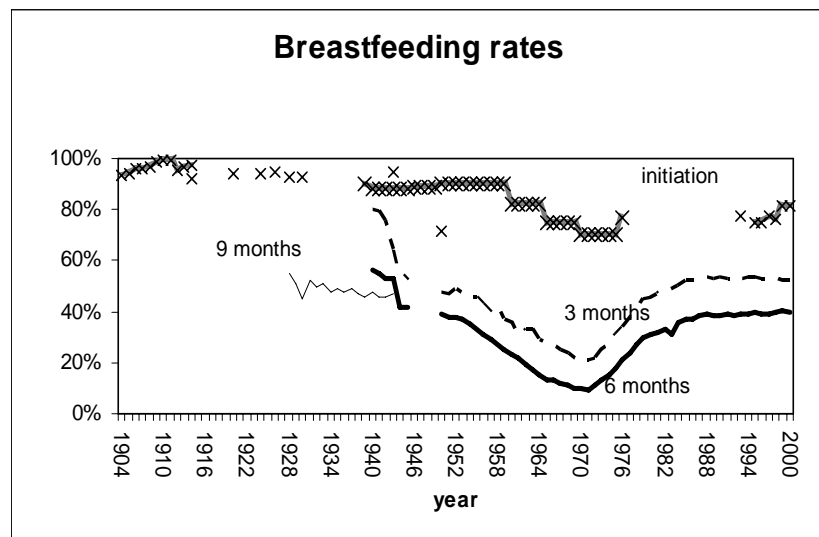
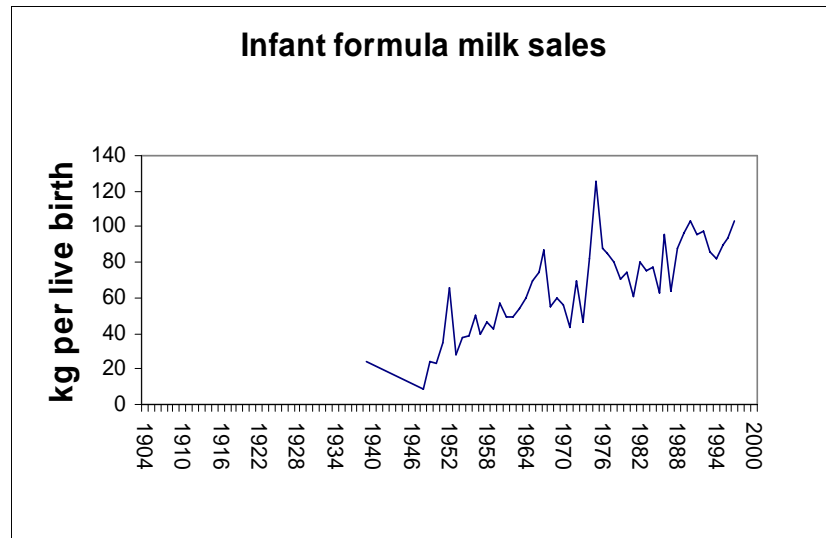
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Companies expand sales from marketing to health professionals and working mothers

Australia, 1904 to modern day



Smith, J.P. 2007. 'The contribution of infant food marketing to the obesogenic environment in Australia', *Breastfeed Rev*, vol. 15, March, no. 1, pp. 23-35.





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Established health risks of not breastfeeding in developed countries - infants

MORBIDITY	RELATIVE RISK/ODDS RATIO
gastro/infant botulism	5.5
respiratory illness	3.0
eczema	6
NEC	2
Hib/meningitis	3.9
urinary tract infection	5.4
acute otitis media	2.1

American Academy of Paediatrics (AAP) 2005



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Breastfeeding 'likely to be protective'

AAP 2005

- Crohn's disease
- ulcerative colitis
- lymphoma
- allergic diseases
- chronic digestive illness
- insulin dependent diabetes mellitus

And other studies

- pneumonia
- sepsis
- obesity
- blood pressure
- insulin resistance
- heart disease
- multiple sclerosis





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Other health and development impacts

- sudden infant death (SIDS) (RR ~ 2)
- brain development and IQ – (3-7 IQ points)
- vision/central nervous system development
- bonding and attachment
- speech, jaw and facial development
- dental decay
- later mental health





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Systematic reviews: infants

- Acute Otitis Media
- Atopic Dermatitis
- Gastrointestinal Infections
- Lower Respiratory Tract Diseases
- Sudden Infant Death Syndrome (SIDS).
- Necrotizing Enterocolitis (NEC)
- Obesity
- Type 1 Diabetes
- Type 2 Diabetes
- Childhood Leukemia

Ip S, Chung M, Raman G, Chew P, Magula N, DeVine D, Trikalinos T, Lau J. 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.



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Systematic reviews: infants

- Overweight/obesity
- Type 2 diabetes
- Lower performance in IQ test
- Higher blood pressure
- Higher total cholesterol

Horta BL, Bahl R, Martinez JC, Victora CG. Evidence on the long term effects of breastfeeding: systematic review and meta analyses. Geneva: World Health Organisation; 2007.



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Systematic reviews: infants

- Convincing evidence'
 - Gastrointestinal infections
 - Otitis media
 - Obesity
 - High blood pressure
- 'Probable'
 - Respiratory tract infections
 - Asthma
 - Wheezing
 - Eczema
 - Intellectual and motor development
- 'Possible'
 - Crohn's disease
 - Ulcerative colitis
 - Atopy
 - Type 1 diabetes
 - Childhood leukemia
 - SIDS
 - Hospitalisation

Büchner FL, Hoekstra J, van Rossum CTM. Health gain and economic evaluation of breastfeeding policies. 2007.



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AAP 2012

TABLE 2 Dose-Response Benefits of Breastfeeding^a

Condition	% Lower Risk ^b	Breastfeeding	Comments	OR ^c	95% CI
Otitis media ¹³	23	Any	—	0.77	0.64–0.91
Otitis media ¹³	50	≥3 or 6 mo	Exclusive BF	0.50	0.36–0.70
Recurrent otitis media ¹⁵	77	Exclusive BF ≥6 mo ^d	Compared with BF 4 to <6 mo ^d	1.95	1.06–3.59
Upper respiratory tract infection ¹⁷	63	>6 mo	Exclusive BF	0.30	0.18–0.74
Lower respiratory tract infection ¹³	72	≥4 mo	Exclusive BF	0.28	0.14–0.54
Lower respiratory tract infection ¹⁵	77	Exclusive BF ≥6 mo ^d	Compared with BF 4 to <6 mo ^d	4.27	1.27–14.35
Asthma ¹³	40	≥3 mo	Atopic family history	0.60	0.43–0.82
Asthma ¹³	26	≥3 mo	No atopic family history	0.74	0.6–0.92
RSV bronchiolitis ¹⁶	74	>4 mo	—	0.26	0.074–0.9
NEC ¹⁹	77	NICU stay	Preterm infants	0.23	0.51–0.94
Atopic dermatitis ²⁷	27	>3 mo	Exclusive HM Exclusive BFnegative family history	0.84	0.59–1.19
Atopic dermatitis ²⁷	42	>3 mo	Exclusive BFpositive family history	0.58	0.41–0.92
Gastroenteritis ¹⁵⁻¹⁴	64	Any	—	0.36	0.32–0.40
Inflammatory bowel disease ³²	31	Any	—	0.69	0.51–0.94
Obesity ¹³	24	Any	—	0.76	0.67–0.86
Celiac disease ³¹	52	>2 mo	Gluten exposure when BF	0.48	0.40–0.89
Type 1 diabetes ¹³⁻⁴²	30	>3 mo	Exclusive BF	0.71	0.54–0.93
Type 2 diabetes ¹³⁻⁴³	40	Any	—	0.61	0.44–0.85
Leukemia (ALL) ¹³⁻⁴⁶	20	>6 mo	—	0.80	0.71–0.91
Leukemia (AML) ¹³⁻⁴⁵	15	>6 mo	—	0.85	0.73–0.98
SIDS ¹³	36	Any >1 mo	—	0.64	0.57–0.81

ALL, acute lymphocytic leukemia; AML, acute myelogenous leukemia; BF, breastfeeding; HM, human milk; RSV, respiratory syncytial virus.

^a Pooled data.

^b % lower risk refers to lower risk while BF compared with feeding commercial infant formula or referent group specified.

^c OR expressed as increase risk for commercial formula feeding.

^d Referent group is exclusive BF ≥6 months.





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Breastfeeding is important to women's health

- pre-menopausal breast cancer
- postpartum hemorrhage
- rheumatoid arthritis
- type 2 diabetes
- ovarian cancer
- endometrial cancer
- osteoporosis
- postpartum depression and child abuse/neglect



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Systematic reviews: mothers

- Maternal Type 2 Diabetes.
- Breast Cancer
- Ovarian Cancer

Ip S, Chung M, Raman G, Chew P, Magula N, DeVine D, Trikalinos T, Lau J. 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.



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Systematic reviews: mothers

Convincing

Rheumatoid Arthritis

Possible

Type 2 diabetes

Premenopausal breast cancer

Ovarian cancer

Büchner FL, Hoekstra J, van Rossum CTM. Health gain and economic evaluation of breastfeeding policies. 2007.



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AAP 2012

- Postpartum blood loss and involution of the uterus
- Child spacing secondary to lactational amenorrhea
- Postpartum depression
- Child abuse/neglect
- Type 2 diabetes mellitus
- Rheumatoid arthritis
- Adult cardiovascular disease (hypertension, hyperlipidemia)
- Breast (primarily premenopausal) and ovarian cancer



Table 1 Results from meta-analyses of epidemiological studies on infant feeding and later disease risk*

Chronic disease	RR† for artificially fed infants	Confidence limits‡	Reference
Obesity	1.28	1.15, 1.43	Arenz <i>et al.</i> ⁽⁴⁾
	1.15	1.12, 1.18	Owen <i>et al.</i> ⁽⁵⁾
	1.23	1.14, 1.35	Harder <i>et al.</i> ⁽³⁷⁾
	1.11	—	Van Rossum <i>et al.</i> ⁽³⁹⁾
Diabetes (type 1)	1.28	1.19, 1.39	Horta <i>et al.</i> ⁽³⁸⁾
	1.43	1.15, 1.77	Gerstein ⁽⁴⁰⁾
	1.23	1.12, 1.35	Norris and Scott ⁽⁴¹⁾
Diabetes (type 2)	1.64	1.18, 2.27	Owen <i>et al.</i> ⁽⁶⁾
	1.59	1.12, 2.22	Horta <i>et al.</i> ⁽³⁸⁾
Heart, stroke and vascular disease			
Hypertension	~1.20	N/A	Martin <i>et al.</i> ⁽⁷⁾
CHD	~1.06		
Strokes/ischaemic attacks	~1.18		
Asthma	1.37	1.19, 1.61	Gdalevich <i>et al.</i> ⁽¹⁹⁾
Coeliac disease	1.37	1.09, 1.69	Ip <i>et al.</i> ⁽⁴³⁾
Inflammatory bowel disease	2.08	1.69, 2.5	Akobeng <i>et al.</i> ⁽¹⁰⁾
Crohn's disease	1.49	1.16, 1.92	Klement <i>et al.</i> ⁽⁴⁴⁾
Ulcerative colitis	1.30	1.04, 1.65	
Childhood cancer			
Acute lymphocytic leukaemia	1.32	1.19, 1.47	Kwan <i>et al.</i> ⁽⁴⁵⁾
Acute myelogenous leukaemia	1.18	1.02, 1.37	
All childhood cancers	1.28	1.01, 1.64	Martin <i>et al.</i> ⁽⁸⁾
Childhood leukaemia	1.12	1.06, 1.20	
Acute lymphocytic leukaemia	1.25	1.10, 1.41	Ip <i>et al.</i> ⁽⁴³⁾

RR, relative risk; N/A, not applicable.

*Shading represents our preferred estimates for use in later calculations.

†Assuming RR approximates the inverse of the OR, where OR represents the protective effect of breast-feeding and RR represents the risk of artificial feeding.

‡Confidence limits are based on 95% CI of OR.



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Approximate risk exposures Australia

Table 2 Approximate risk exposures to artificial baby milk

	Low exposure (adults born before 1940)	High exposure (adults born during 1965–1975)	Moderate exposure (infants/children/young adults born since 1980)
	Age in 2010: >70 years	Age in 2010: 35–45 years	Age in 2010: 0–30 years
Exposure in early weeks of life (%)	5	30	20
Exposure before 6 months (%)	40	90	60



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Chronic disease impacts of insufficient breastfeeding

Table 3 Attributable proportion of chronic disease risk assuming 30% exposure

Chronic disease	RR	Population-attributable proportion (%) [*]
Obesity	1.28	8
Diabetes (type 1)	1.43	11
Diabetes (type 2)	1.64	16
Heart, stroke and vascular disease	1.20	6
Asthma	1.37	10
Coeliac disease	2.08	24 [‡]
Inflammatory bowel disease	1.40 [†]	11
Childhood cancer	1.25	7

RR, relative risk.

^{*}Population-attributable proportion is calculated as $P_e(RR - 1) / [1 + P_e(RR - 1)]$, where P_e is the prevalence of exposure to artificial feeding and RR is the relative risk calculated as the ratio of the incidence of morbidity in artificially fed infants to the incidence in breast-fed infants.

[†]The RR ratio of 2.08 for coeliac disease is that associated with being weaned from breast-feeding before solids are introduced. We have calculated the population-attributable proportion here by assuming that 30% of infants are not being breast-fed at the time of introduction of solid food (P_e).

[‡]A RR ratio of 1.40 is calculated from an average of the OR for Crohn's disease and ulcerative colitis.

Smith, J. P., & Harvey, P. J. (2011). Chronic disease and infant nutrition: is it significant to public health? *Public Health Nutrition*, 14(02), 279-289. doi: doi:10.1017/S1368980010001953



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Population level effects of premature weaning

Table 4 Attributable proportion of chronic disease risk for different scenarios or cohorts of exposure to lack of breast-feeding

Rate of population exposure (% 'not breast-fed')	Proportion (%) of chronic disease in the population that is attributable to the exposure								
	Obesity	Type 1 diabetes	Type 2 diabetes	Heart, stroke and vascular disease	Asthma	Coeliac*	IBD	Childhood cancer	Range for all conditions
90	20	28	37	15	25	48	26	18	15-48
60	14	21	28	11	18	36	19	13	11-36
40	10	15	20	7	13	30	14	9	7-30
30	8	11	16	6	10	24	11	7	6-24
20	5	8	11	4	7	18	7	5	4-18
10	3	4	6	2	4	10	4	2	2-10

IBD, inflammatory bowel disease; RR, relative risk.

*The RR ratio of 2.08 for coeliac disease is that associated with being weaned from breast-feeding before solids are introduced. We have calculated this figure for coeliac disease by assuming that the exposure (P_e) is not being breast-fed at the time of introduction of solid food (P_s).



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The hidden costs of formula feeding

- The economic value of mother's milk is excluded from national food production (GDP) statistics
- If **more** mothers breastfeed, national statistics **wrongly** count this as falling national food output and GDP, because less breastfeeding increases commercial infant food production and the related increases health care expenses - **which are measured in GDP!**

Smith, J.P., and Ingham, L.H. 2005, 'Mothers milk and measures of economic output', *Feminist Economics*, vol. 11, no. 1, March, pp. 43-64.





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Measuring the economic value of mothers milk

- The economic value of breastfeeding is indicated by:
 - The costs it avoids, if artificial feeding (for example, cost of formula, attributable health costs, extra maternal time costs caring for sick infant)
 - The market value of human milk production

Smith, J. P. (1999), 'Human Milk Supply in Australia', *Food Policy*, 24, 71-91.

Every Drop Counts, Hobart, 16 April

2010



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Hospitalisation costs

- In Australia , hospital system costs of premature weaning were \$60-120m pa for just 4 conditions (gastrointestinal illness, respiratory illness, eczema & NEC) (Smith, J.P., Thompson, J.F., and Ellwood, D.A. *Australian and New Zealand Journal of Public Health* 2002)
- Comparable US estimates for avoidable cost of common illnesses around \$3.6 billion pa (mainly NEC deaths) (Weimer USDA 2001)
- US study showing avoidable health treatment costs including chronic illness of \$10.5 billion from poor US breastfeeding rates (Bartick 2010 et al *Pediatrics*)



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Chronic disease costs

- UK study estimates health care system saving from increasing breastfeeding of £40 million per year including reductions in the costs of maternal breast cancer (Renfrew *et al* UNICEF UK 2012)
- US study calculates the maternal health and morbidity costs of not breastfeeding of more than \$17 billion in economic cost (premature death of mothers, and lost productivity) (Bartick 2013)

Renfrew, M. J., Pokhrel, S., Quigley, M., McCormick, F., Fox-Rushby, J., Dodds, R., . . . Williams, A. (2012). Preventing disease and saving resources; the potential contribution of increasing breastfeeding rates in the UK: UNICEF UK.

Bartick, M. C., Stuebe, A. M., Schwarz, E. B., Luongo, C., Reinhold, A. G., & Foster, E. M. (2013). Cost analysis of maternal disease associated with suboptimal breastfeeding. *Obstet Gynecol*, 122(1), 111-119. doi: 10.1097/AOG.0b013e318297a047



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What mothers milk adds to economic production

- The economic value of breastfeeding and breastmilk food production has not been included in GDP as it has been seen as unpaid work
- Breastmilk is a commodity which has high market value and its economic contribution to GDP **can and should** be measured
- If it were better measured, women would be better appreciated and supported to breastfeed

Waring, M (1988) *Counting for Nothing*. Allen & Unwin, New Zealand, Wellington.

Elson, D (2008) *The Three R's of Unpaid Work: Recognition, Reduction and Redistribution*, United Nations Development Program (UNDP), New York.

Smith, J² (in press 2013) 'Making Mothers' Milk Count'. *Counting on Marilyn Waring*, M Bjørnholt & A McKay. Bradford, Ontario, Demeter Press.



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Human milk value is wrongly excluded from GDP

- Two Nobel Prize winners in economics, Joseph Stiglitz and Amartya Sen recently reported to the French President that human milk is a valuable resource that should be counted in GDP
- *“There is a serious omission in the valuation of home-produced goods – the value of breast milk. This is clearly within the System of National Accounts production boundary, is quantitatively non-trivial and also has important implications for public policy and child and maternal health.”*

Stiglitz, JE, A Sen & J-P Fitoussi (2009) The Measurement of Economic Performance and Social Progress Revisited; Reflections and Overview, Centre de recherche en économie de Sciences Po (OFCE).

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Production of human milk (2006-2010)

Country	Actual human milk production volume (million liters)	Biologically feasible potential volume of production (million liters)
<i>Norway</i>	11	18
<i>Australia</i>	41	89
<i>United Kingdom</i>	47	223
<i>Philippines</i>	467	691
<i>United States</i>	525	1,269
<i>China 2010</i>	3,574	4,862
<i>The World 2010</i>	23,315	39,744



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The market value for breastmilk is much higher than for formula

- Formula is not an analogous product to breastmilk
 - It has adverse health and development consequences for infant and mother
 - It is a meal at “McDonalds” vs a ‘broad spectrum medicine/food’
- The economic value of breastmilk can be valued using the price that hospitals and mothers are willing to pay to obtain it – **around \$US85-120 per L**



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Comparison of alternative prices for valuing human milk

<i>Market price approach - analogous product</i>	<i>Gross Price (US\$ per Litre)</i>
Human milk bank transaction prices (2009-2012)	
USA	85
Norway	100
UK	123
Internet trading buy-sell offer prices	28-85
Commercial human milk products transaction prices	
Standardised human milk formulation	1183
Human milk fortifier	6250
<i>Input cost approach – replacement cost</i>	
Wet nurse wages sell offer prices	
USA	63*



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Value of human milk production

Country	Actual value of milk production, US\$ million	Biologically feasible potential value of production, US\$ million
<i>Norway</i>	907	1,505
<i>Australia</i>	3,466	7,601
<i>United Kingdom</i>	3,980	18,989
<i>Philippines</i>	39,701	58,797
<i>United States</i>	44,649	107,887
<i>China 2010</i>	303,961	413,538
<i>The World 2010</i>	1,982,942	3,380,192





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Economic value of human milk production (0-24 months, p.a.), 2010

<i>Country</i>	<i>Potential milk value</i> <i>US\$ million^{c)}</i>	<i>'Lost milk' value</i> <i>(US\$ million)^{d)}</i>	<i>'Lost milk' (% of potential^{e)}</i>
<i>Norway</i>	1,505	598	40
<i>Australia</i>	7,601	4,016	53
<i>United States</i>	107,887	63,113	58
<i>Philippines</i>	58,797	39,701	32
<i>United Kingdom</i>	18,989	3,980	79
<i>World</i>	1,982,942	3,380,192	59

For China the economic value of optimal breastfeeding (IYCF) is potentially >\$400 billion (@ \$100 per litre). For India it is \$350 billion, optimal IYCF is potentially worth \$800 billion pa of food production value

Smith, J. P. (2012). Including household production in the System of National Accounts (SNA) ACERH Working Paper, No. 10, http://www.acerh.edu.au/publications/ACERH_WP12.pdf.

Smith, J. P. (2013). "Lost Milk?": Counting the Economic Value of Breast Milk in Gross Domestic Product Journal of Human Lactation, 29 (4), 537 - 546



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The value of 6 months of breastfeeding...

Breastfeeding for at least six months helps ensure better health throughout your baby's first year of life, and reduces your own risk of breast cancer. Breastfeeding for six months or more may greatly reduce your little one's risk of ear infections and childhood cancers. And exclusive, frequent breastfeeding during the first six months, if your periods have not returned, provides 98% effective contraception.



\$20,511, or \$29,757 if you paid a wet nurse



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To 2 years and beyond ...

- Breastfeeding exclusively for 6 months and ... into early childhood



The World
Health
Organisation
Gold Standard
\$50,812

If your child weans when she is ready, you can feel confident that you have met your baby's physical and emotional needs in a very normal, healthy way. In cultures where there is no pressure to wean, children tend to breastfeed for at least two years. The World Health Organisation and UNICEF strongly encourage breastfeeding through toddlerhood: 'Breastmilk is an important source of energy and protein, and helps to protect against disease during the child's second year of life.' Our biology

Every Drop Counts, Hobart, 16 April

2010



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Breasts a treasure chest worth \$2.2bn

Jacqueline Maley

Mothers of Australia stand proud, your breasts are worth \$2.2 billion a year.

months and then partially until 12 months.

“Looking at the economics helps support the argument of why we need to encourage and



Australian National University, calculated for the study that the 34 million litres of breast milk produced by Australian mothers a year was worth \$2.2 billion. This



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Breastfeeding and economics

The lactating mother is an exceptional national resource, for not only does she process coarse cheap foods to produce a unique and valuable infant food, but also the production process (lactation) provides measurable benefits to health and contributes to nationally declared goals of fertility reduction. In contrast to virtually all processing industries, the lactating woman requires no capital outlays and the direct benefits are enjoyed uniquely and fully by the producer and her child. Mother milk production is the ultimate in economic equity, with “right-to-work” enjoyed by all, direct and immediate value to the producer, and far reaching benefits affecting all of society.

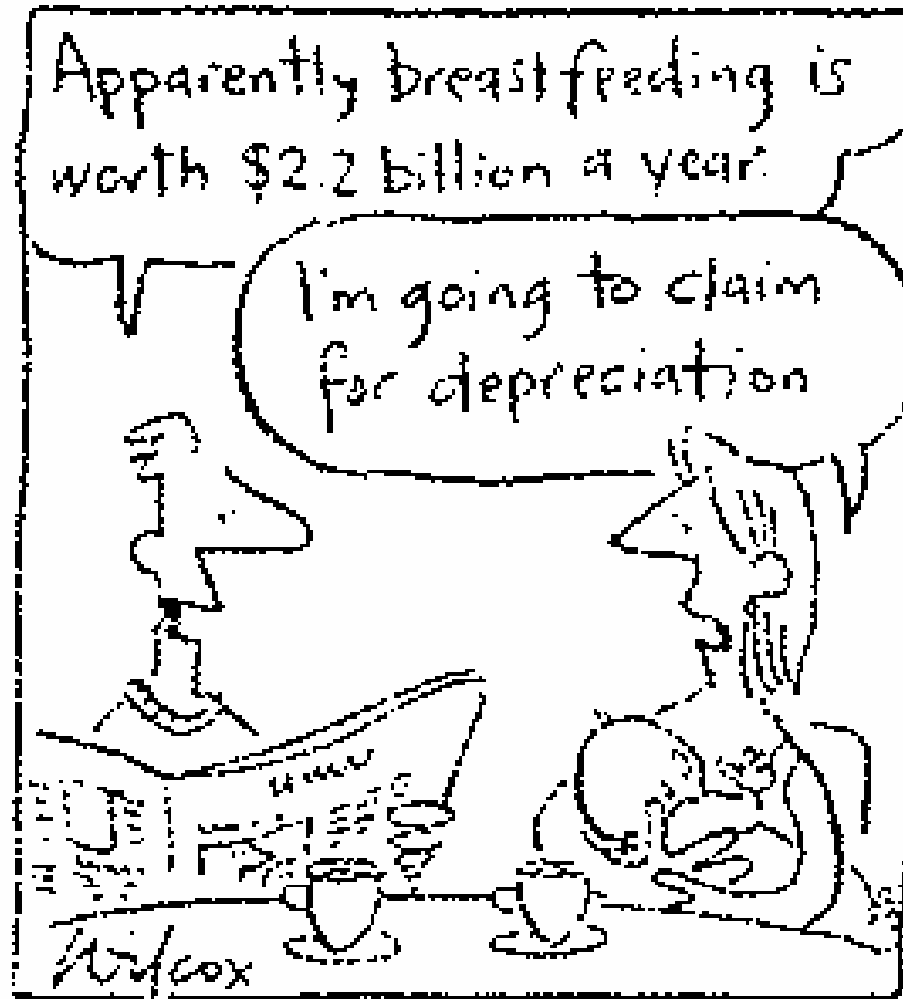
Rohde JE. Mother milk and the Indonesian economy: A major national resource. *Journal of Tropical Pediatrics*, 1982, 28(4):166-74.



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Mothers pay ...



*Wilcox, The Age,
17 March 2006*



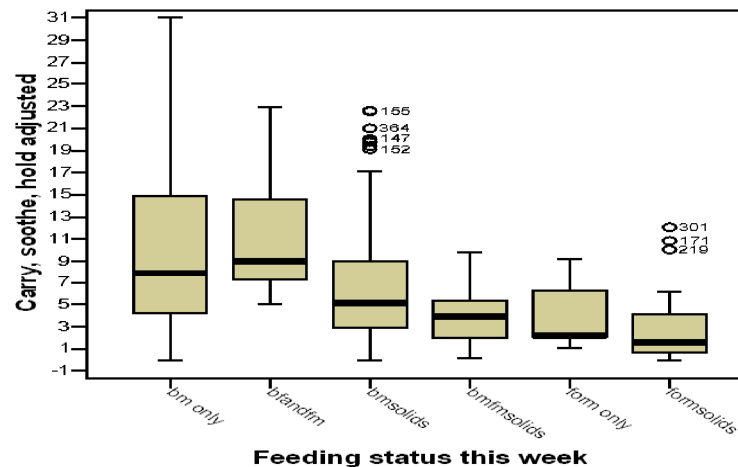
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Maternal time investment is a cost of breastfeeding

- Economic opportunities for women benefit them and their families.
- Time is an important economic cost.
- Care of infants and breastfeeding is time intensive – women bear this economic cost through lost earnings or leisure.

Feeding status this week	Age of youngest child	Mean	N
bm only	3	17	77
	6	20	15
bmsolids	6	11	98
	9	9	78



Smith JP, Ellwood M. Feeding patterns and emotional care in breastfed infants. *Social Indicators Research* 2010 (online 13 July 2010). DOI: 10.1007/s11205-010-9657-9).

Smith JP, Ellwood M. Where does a mothers' day go? Preliminary estimates from the Australian Time Use Survey of New Mothers. ACERH Research Paper no 1. Canberra 2008. www.acerh.edu.au



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Maternal economic cost of breastfeeding

- Exclusively breastfeeding at around 6 months (2.6 hours daily) takes substantial time; less time feeding if mother has commenced weaning from EBF.
- EBF mothers also had less help with feeding
- Premature weaning may be a maternal response to
 - excessive time stresses of infant care
 - a strategy to share the time costs of infant feeding with others
 - OR mothers who EBF may be trading off other things...

Smith, J. P., & Forrester, R. (2013). Who pays for the health benefits of exclusive breastfeeding? An analysis of maternal time costs *Journal of Human Lactation*, 29(4), 547 - 555.



Time spent on infant feeding activities at infant age 6 months, by feeding group^{a)}

<i>mean weekly hours</i>	EBF	Not EBF (PBF or FF)	p-value^{b)}
Milk feeding*	18.2	11.6	0.002
Solids feeding**	0.1	2.5	<0.001
Preparing feeds*	0.4	1.4	0.04
Total	18.7	15.4	0.18

- a) Two-sided t-tests on log transformed data (variances in parentheses)
- b) Mean difference in log transformed data



ACERH

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Time contributed to care of infant by others at infant age 6 months by feeding group^{a)}

<i>mean weekly minutes</i>	EBF	Not EBF (PBF or FF)	p- value ^{b)}
Help with infant feeding*	9	35	0.003
Help with infant care	324	235	0.839
Time mother not responsible for infant	88	341	0.142

•a) Two-sided t-tests on log transformed data (variances in parentheses)

•b) Mean difference in log transformed data



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Comparison of EBF with PBF and FF

- ❖ ANOVA showed statistically significant differences in milk feeding times, solid feeding times and feed preparation times between the EBF, PBF, and FF groups
- ❖ EBF mothers spent significantly more time in milk feeding, and significantly less time in solid feeding and preparing feeds



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Comparison of feeding activities by feeding group

a)

		N	Mean weekly hours	F(2,131) statistic (p value) ^{b)}
Milk feeding	FF	18	9.2	7.06 (p=0.001)
	PBF	101	12.0	
	EBF	15	18.2	
Solid feeding	FF	18	2.7	19.46 (p<0.001)
	PBF	101	2.5	
	EBF	15	0.1	
Preparing feeds	FF	18	2.3	7.20 (p=0.001)
	PBF	101	1.3	
	EBF	15	0.4	
Total	FF	18	13.9	1.65 (p=0.196)
	PBF	101	15.7	
	EBF	15	18.7	



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Infant feeding and nurture

Figure 1: Emotional care by feeding status

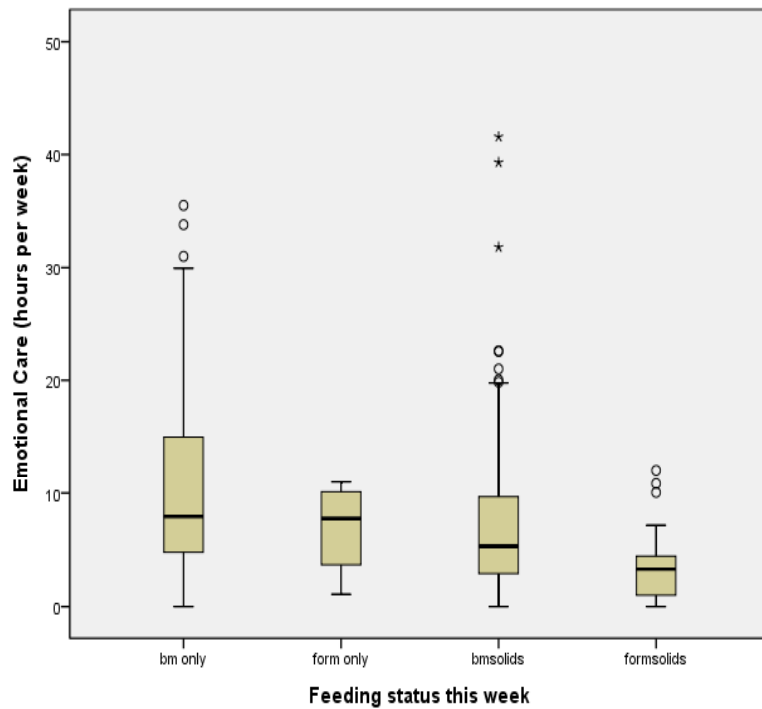
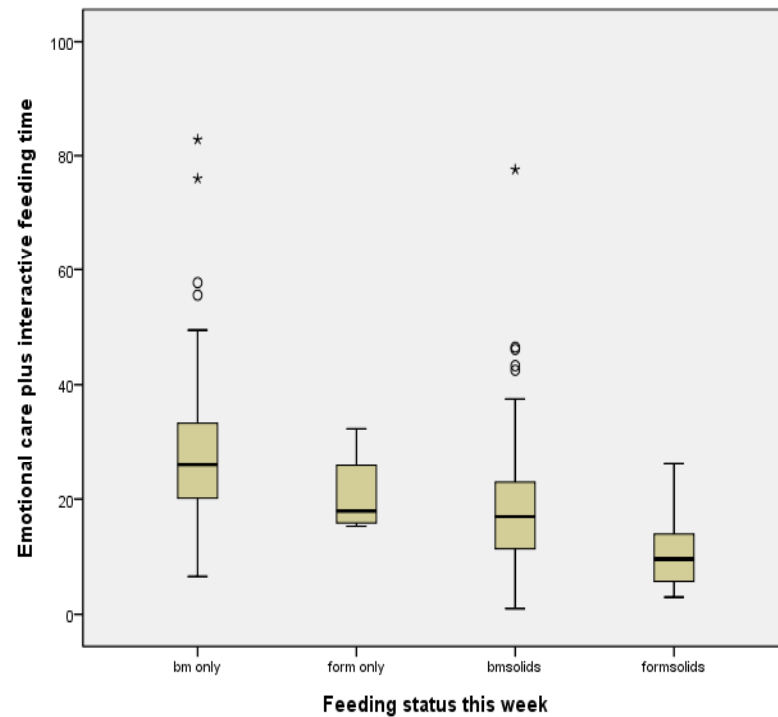


Figure 2: Emotional care + interactive feeding by feeding status



Smith JP. 'Maternal investment of time in care of infants', unpublished manuscript, 2012



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Emotional care and feeding time by infant feeding status

Exclusively breastfeeding mothers in the Australian Time Use Survey of New Mothers spent 29 hours a week in interactive feeding and emotional care of their infants

Table 2 Weekly hours spent in emotional care + interactive feeding time, and total childcare, breastfeeding and non breastfeeding mothers

	Exclusively breastfeeding at		Breastfeeding & feeding solids at	
	3 months (n = 79)	6 months (n = 15)	6 months (n = 99)	9 months (n = 83)
Emotional care + interactive feeding time	28.2	29.4	19.2	16.8
Total childcare	48.8	53.9	42.6	40.3
	Exclusive formula feeding at		Formula feeding & feeding solids at	
	3 months (n = 4)	6 months (n = 1)	6 months (n = 12)	9 months (n = 11)
Emotional care + interactive feeding	20.9	13.4	11.9	9.5
Total childcare	42.7	29.9	37.8	32.1



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Mothers investment of time

- Other Australian time use research also shows additional time spent by breastfeeding mothers in feeding, holding and cuddling baby*
- Breastfed infants on average, spend more time:
 - being held, cuddled or soothed (32 minutes more per day)
 - being read, talked or sung to (27 minutes more per day)
 - crying / upset (5 minutes more per day)
- Breastfed infants spend less time:
 - other eating, drinking or being fed (54 minutes less per day)
 - sleeping or napping (40 minutes less per day)
 - watching TV (9 minutes less per day)



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Risk factors for cognitive development

	Recent evidence	Implications
Risk factors		
Lead exposure	Evidence for adverse effects of low concentrations of prenatal exposure for child development (ES 0.19-0.27)	Continued attention to prevention of exposure to lead (eg, through removal of lead in paint, gasoline)
Protective factors		
Breastfeeding†	Stronger evidence for beneficial effects of exclusively breastfed and longer duration of breastfeeding (ES for IQ 0.38; grades attained 0.22-0.35)	Benefits to development add to existing reasons for promotion of breastfeeding
<p>IUGR=intrauterine growth restriction. ES=effect sizes. HAART=highly active antiretroviral therapy. IQ=intelligence quotient. *ES are for studies reviewed in this paper that reported them or with sufficient information to compute; where specific ES are given, these are Cohen's d unless otherwise specified (previously reported effect sizes from earlier studies are reported in Walker and colleagues¹). †Not reported as a high priority risk or protective factor in the previous Series in <i>The Lancet</i>.</p>		
Table 4: High priority developmental risk and protective factors		Lancet 2011; 378: 1325-38

Inequality in early childhood: risk and protective factors for early child development

Susan P Walker, Theodore D Wachs, Sally Grantham-McGregor, Maureen M Black, Charles A Nelson, Sandra L Huffman, Helen Baker-Henningham, Susan M Chang, Jena D Hamadani, Betsy Lozoff, Julie M Meeks Gardner, Christine A Powell, Atif Rahman, Linda Richter



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Breastfeeding - implications for child cognitive development

- Breastfeeding to 4 months adds 3-7 points to IQ compared to exclusive breastfeeding for 3 months or less (Kramer et al 2008)
- This is an impact of considerable economic significance;
 - It is akin to the impact of low level lead exposure on child development



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Labour productivity implications of infant feeding choices

- long term effects on labour market productivity and wages
 - excessive chronic disease and reduced cognition and educational achievement
 - Maternal ill health reducing labour participation and productivity
- Maternity leave and breastfeeding friendly workplace provisions needed to combine breastfeeding with work especially in formal labour market
- Childcare services – needs to be nearby and ‘breastfeeding friendly’

Smith JP, Craig L. The Time Use of New Mothers – What Do We Know and Does It Matter? ACERH Research Paper, www.acerh.edu.au Canberra, 2009 forthcoming

Baxter J, Smith JP. Breastfeeding and time use. Australian Institute of Family Studies Research Paper. Melbourne, 2009.



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Costs and benefits to government & society

- Mothers time investment in quality of human capital through infant care and breastfeeding is large and has many benefits to society
- If society doesn't share some of this economic cost, eg via maternity leave and other accommodations, breastfeeding reduces to socially suboptimal levels (excess health care costs, human milk production)
- Breastfeeding is no longer the norm, so there are costs of disinvestment in existing institutions, industries and practices to restore it to higher levels



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Breastfeeding: benefits and costs

Perspective	<i>Benefits</i>	<i>Costs</i>
Society and economy	Value of infant food production Environmental externalities/costs Health care costs for mother and baby Costs of mortality (lost lifetime production) Health, development and productive capacity of 'human capital'	Opportunity cost of women's time Costs of protecting breastfeeding from damaging institutional arrangements/practices and culture
Government, community, and health care services	Lower incidence and treatment costs of ill health and chronic disease of mothers and babies Reduced welfare/WIC expenditures on infant food for low income mothers Reduced abandonment/child abuse	Costs of maintaining institutions and training which enable breastfeeding Costs of 'marketing' breastfeeding in competition with artificial infant food producers
Industry sectors and employers	Healthier so more productive current and future workforce More jobs and profits in lactation support services More jobs and profits in breastfeeding related products	Employer costs of accommodating breastfeeding employees Fewer jobs and profits in health care services, agriculture and food processing and retailing
Family/household	Reduced health care costs for mother Reduced health care costs for baby Reduced food costs for baby Food security (quality/safety and availability) Child spacing	Reduced employment income of new mother Reduced mother time for unpaid work and care of other children Proximity of mother and infant Increased food needs of mother Sexual availability of mother/fewer babies
Mother	Reduced reproductive and other health risk Appropriate weight gain and loss during reproductive years Calming hormones and satisfaction of breastfeeding Child spacing Time savings for feeding of older infant	Proximity/"Tied down" by baby Reduced employment income of new mother Reduced leisure time of mother Reduced fertility Embarrassment at public breastfeeding
Baby	Time/development opportunities with mother Bonding hormones etc with mother Nutrition Health/survival Long term health and development and labour force productivity/earnings	Dependent on availability/proximity of mother



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Need action on 5 broad fronts in the global infant food economy:

1. Policy and planning to address the imbalance of private and public interest
2. Health services eg BFHI and maternity care, including grass roots community based support empowering women themselves
3. Address marketing (medical detailing) via WHO International Code
4. Protect time to breastfeed ie in labour markets (ILO maternity protection = breastfeeding friendly workplaces and childcare, paid maternity leave)
5. Match and neutralise media impact and the cultural competition with information and education of society – eg antidiscrimination , health education



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What works best?

- Is regulation or legislation cheaper or more effective than 'programs' or 'projects'?
- 'Interventions' are costly. Are they worth it?
- Which interventions are most effective?
 - Milk banking implementation?
 - BFHI implementation?
 - Health professional training and education?
 - Breastfeeding friendly workplaces or childcare?
 - Public awareness and education campaigns on breastfeeding in public?
 - Funding women's own breastfeeding support organisations such as La Leche, Australian Breastfeeding Association, Ammehjelpen?



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Effective measures exist to increase breastfeeding

Table 8. Summary of the magnitude of effect (derived from meta-analyses) of different types of intervention on breastfeeding practices

Reviewer	Intervention	Breastfeeding outcome (95% confidence intervals)	Measure of effect
Anderson et al. (2003)	Early skin-to-skin contact	Still breastfeeding (any) at 1-3 months post-birth	OR ¹ 2.15 (1.10, 4.22)
		Duration	WMD ² 41.99 days (13.97, 70.00)
USPSTF (2003)	Breastfeeding education	Initiation Short-term duration (< 3 months)	difference ³ 0.23 (0.12, 0.34) difference 0.39 (0.27, 0.50)
	Support alone	Short-term duration (1-3 months) Long-term duration (4-6 months)	difference 0.11 (0.03, 0.19) difference 0.08 (0.02, 0.16)
	Education plus Support	Initiation Short-term duration	difference 0.21 (0.07, 0.35) difference 0.37 (0.17, 0.58)
Sikorski et al. (2001)	Support (all types)	Duration	RR (for stopping breastfeeding before last stu assessment up to six months) 0.88 ⁴ (0.81, 0.95)
		Exclusive breastfeeding	RR (for stopping exclusive breastfeeding before last study assessment) 0.78 (0.60, 0.89)
	Professional support	Duration	RR (for stopping breastfeeding before last study assessment up to 6 months) 0.89 (0.81, 0.97)
		Exclusive breastfeeding	RR (for stopping exclusive breastfeeding before 4-6 wks) 0.50 (0.27, 0.90) RR (for stopping exclusive breastfeeding before 2 months) 0.76 (0.61, 0.94)
	Lay support	Duration	RR (for stopping breastfeeding before last study assessment) 0.84 (0.69, 1.02) non significant trend
		Exclusive breastfeeding	RR (for stopping exclusive breastfeeding before last study assessment) 0.66 (0.49, 0.89)
	Face-to-face interventions	Duration	RR for giving up breastfeeding 0.86 (0.78, 0.94)
	Only Postnatal support	Duration	RR for giving up breastfeeding 0.88 (0.80, 0.96)
	WHO/UNICEF Training	Prolonged exclusive breastfeeding	RR for giving up exclusive breastfeeding 0.70 (0.53, 0.93)
	Donnelly et al (2000)	Commercial hospital discharge packs: With promotional material but no formula sample <i>versus</i> no intervention	Exclusive breastfeeding 0-2 weeks
3-6 weeks			1.23 (1.05, 1.43)
8-10 weeks			1.73 (1.13, 2.64)
With formula + leaflets <i>versus</i> no intervention or non-commercial packs		0-2 weeks	1.99 (1.04, 3.79)
		3-6 weeks	1.25 (1.06, 1.47)
Packs with formula promotional material, no formula sample <i>versus</i> no intervention		3-6 weeks	1.27 (1.01, 1.62)

¹ OR = Odds ratio. Mothers that experienced early skin-to-skin contact with their babies were over two times (2.15 times) more likely to be still breastfeeding at 1-3 months than mothers who did not experience early skin-to-skin contact with their babies.

² WMD = Weighted mean difference. A statistical measure of difference used in meta-analysis. In this instance it means that mothers experiencing early skin-to-skin contact breastfed on average 42 days longer than mothers who didn't experience early skin-to-skin contact.

³ 'difference' refers to the difference in proportion of mothers breastfeeding in the intervention group compared to the control group, ie 0.23 indicates that 23% more mothers were breastfeeding as indicated as a result of the intervention.

⁴ Sikorski et al present the measure of effect (relative risk) in terms of the risk to the breastfeeding practice, hence it is less than 1. A smaller number indicates a larger, positive effect of the intervention in terms of improved breastfeeding practice.

⁵ The peto odds ratio is used in Cochrane meta-analyses as an approximation to the odds ratio (see footnote 1 above)



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Impact of changes in maternity care practices

- WHO study in Belarus (Kramer 2001)
 - Cluster randomised design , 'Breastfeeding Friendly Hospital' (BFHI) was the intervention
 - Exclusive breastfeeding and breastfeeding duration increased substantially in intervention group for up to 12 months
 - Exclusive breastfeeding prevalence at 3 months was 43% in the intervention group vs 6% in the control group
 - At 6 months exclusive breastfeeding was increased 7 fold (7.9% in intervention group vs 0.6%)
 - Any breastfeeding at 12 months nearly doubled (19.7% in the intervention group vs 11.4%)



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How does breastfeeding rank for cost effectiveness at the 'big picture' level?

- Life saving interventions in the United States - US\$13, 800-\$4.2 million per YLS (Tengs 1995)
 - For example, primary health care \$5,000 per YLS, secondary health care \$23,000, tertiary health care \$22,000
 - Neonatal intensive care \$279,000 for LBW infants; \$5,700 YLS (1000-1499 gm)
- Pharmaceuticals – cost effective standard for Australian PBS funding A\$35,000-69 000 per DALY (Pezzullo 2007)
- Public health interventions in developed countries
 - Smoking cessation – costs between \$US498 and \$US15,282 per YLS (Ronckers et al)
- Vaccination
 - Rotavirus vaccination of infants A\$100-200 per death averted - (Caulfield et al 2006 - developing country)
- Breastfeeding
 - US\$100-200 per death averted
 - US\$180 per ED admission averted
 - US\$2-30 per DALY gained



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How does breastfeeding rank as a nutrition 'intervention'

- Breastfeeding is cited internationally as one of the most cost effective 'interventions' in mother and child health
 - Promoting ebf has potential to prevent 13% of all under 5 deaths in developing countries and 'are the single most important preventative intervention against child mortality", Bhandari et al, *Maternal and Child Nutrition*, 2008
 - "Of available interventions, counseling about breastfeeding [and fortification] have the greatest potential to reduce the burden of child mortality and morbidity', Bhutta et al, *The Lancet*, 2008.
 - Costs of breastfeeding programs range from US\$100 to US\$200 per death averted, making them comparable in cost-effectiveness to measles and rotavirus vaccination. Caulfield, et al 2006, 551-68.
 - "Despite the lack of RCTs evaluating the impact of breastfeeding neonatal outcomes, overwhelming evidence for perinatal and neonatal health benefits from breastfeeding'.



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Table of results against criteria

Author	Date	Setting	Perspective	Costs	Effectiveness measure	Time preferences and discounting	Uncertainty and sensitivity analysis	Summary cost-effectiveness measure - incremental	Result	Transparency and presentation of data
Adam et al	2005	WHO subregions: sub-Saharan and South East Asia	Health system/funding agencies	Capital, personnel, equipment & materials	Breastfeeding rates	☹	☹	\$/DALY averted; ACER & ICER	\$/DALY averted = 6-10 ACER = 1 - 6 ICER = 1 - 6	☹
Chee	2002	Rural Ghana	Funding agency	Capital, personnel, training, materials, equipment. Volunteer costs excluded.	Exclusive breastfeeding rate (ExBR) in babies aged 0 - 6 months and timely initiation of breastfeeding (TIB)	☹	☹	Cost / behaviour change	Cost per behaviour change: Exclusive BF = \$34 Timely initiation of BF = \$45	☹
Chee	2004	Rural & urban Madagascar	Funding agency	Capital, personnel, training, materials, equipment. Volunteer costs excluded.	ExBR 0 - 6 months and TIB	☹	☹	Cost / behaviour change	Cost per behaviour change: Exclusive BF = \$10 Timely initiation of BF = \$2.33	☹
Chee	2006	Zambia	Funding agency	Capital, personnel, training, materials, equipment. Volunteer costs excluded.	ExBR 0 - 6 months and TIB	☹	☹	Cost / behaviour change	Cost per behaviour change: Exclusive BF = \$104 Timely initiation of BF = \$50	☹
Horton et al 1996	1996	Brazil, Mexico & Honduras	Health service provider	Capital, personnel, materials, equipment. Donated goods valued at market rates. Program maintenance only; no set up. Formula savings included	Exclusive and partial breastfeeding	☹	☹	\$/DALY gained (diarrhoea only)	1992 US\$2-\$19/DALY gained	☹
Paul et al	2004	USA	Health service funder	Service provision (no further detail provided)	Readmission or emergency visit 10 days postpartum	☹	☹	ICER for home nursing strategy	\$181.82 per admission/ED visit averted	☹
Pugh et al	2002	USA (low income urban women)	Health service funder and family	Personnel, time for feeding valued at mother's wage, formula costs included. Capital and admin costs excluded.	Exclusive and partial breastfeeding	☹	☹	Average cost per mother for intervention	Not calculated	☹
Stevens et al	2007	Canada	Family and health system	Caring time (excluding by mothers) and expenses (incl medications, supplies, equipment); hospital system costs as reported by mothers	Exclusive breastfeeding or breastmilk feeding at 7 days; jaundice or re-admission.	☹	☹	Cost per mother for experimental cf standard care	Not calculated	☹



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Breastfeeding Friendly Hospitals

WHO/UNICEF Ten Steps to Successful Breastfeeding

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

Breastfeeding and the Use of Human Milk

SECTION ON BREASTFEEDING

Pediatrics; originally published online February 27, 2012;

DOI: 10.1542/peds.2011-3552



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Best value investment 2013

- Lancet review team concludes that **evidence based strategies to promote exclusive breastfeeding exist** and are **cost effective**
- **Evidence for effectiveness of complementary feeding strategies is insufficient**
- Global progress on IYCF is uneven and suboptimal
- Potential for scaling up,
 - including community based programs for mass implementation and conditional cash transfer programs
 - Need to address breastfeeding among underprivileged working women
- Such strategies have wider implications in addressing economic justice for women



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Costs and benefits to government & society

- Mothers investment of time and energy in human capital through breastfeeding is large
- Through investing in 'Scaling Up Breastfeeding' societies share some of this economic cost of breastfeeding and make it easier for women to resist company marketing
- **If this investment is not made, history suggests that breastfeeding will decline, health costs will be much higher, and economic progress will be held back due to excess costs of insufficient breastfeeding.**



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The End

