Breast-feeding from a public health perspective

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Presentation

- Breastfeeding definitions and recommendations
- Breastfeeding epidemiology
- Evidens-based research
- Conclusions based on scientific evidence
- Public Health perspective –
  - populational level
  - individual level
Breastfeeding definitions

Interagency Group for Action on Breastfeeding Definitions

Breastfeeding

- Full
  - Exclusive
    - No other liquid or solid is given to the infant
  - Almost exclusive
    - Vitamins, minerals, water, juice, or ritualistic feeds infrequently

- Partial
  - High - Medium - Low

- Token
  - Minimal, occasional, irregular breastfeeds

Breastfeeding recommendations

- **WHO** recommends mothers worldwide to *exclusively breastfeed infants for the child's first six months* to achieve optimal growth, development and health. Thereafter, they should be given nutritious complementary foods and continue breastfeeding up to the age of two years or beyond.

- **The American Academy of Pediatrics** recommends *breastfeeding at least 1 year*

- **ESPGAN**: *Exclusive breast-feeding for around 6 months* is a desirable goal, but partial breast-feeding as well as breast-feeding for shorter periods of time are also valuable

- *The role of health care workers, including paediatricians, is to protect, promote, and support breast-feeding.*
  ESPGAN, Agostoni JPN 2009; 49:112–125
PubMed search

- Breastfeeding 39144
- BF epidemiology 8664
- BF and and health economy 986
- BF and health benefit 573
- BF and cost saving 83
- BF systematic reviews 127
Proportion of children “ever breastfed”, around 2005
Proportion of children exclusively breastfed at 3, 4 and 6 months
Maternity Leave & Breastfeeding Rates

Primary Data Source: State of the World’s Mothers, Save the Children, May 2012.
Variables that may affect breastfeeding duration

<table>
<thead>
<tr>
<th>Demographic Variables</th>
<th>Biological Variables</th>
<th>Social Variables</th>
<th>Psychological Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race</td>
<td>Insufficient milk Supply</td>
<td>Maternal work</td>
<td>Prenatal maternal intention</td>
</tr>
<tr>
<td>Age</td>
<td>Infant health problems</td>
<td>Support from significant others</td>
<td>Maternal interest</td>
</tr>
<tr>
<td>Marital status</td>
<td>Maternal obesity</td>
<td>Inconsistent professional support</td>
<td>Maternal confidence</td>
</tr>
<tr>
<td>Level of education</td>
<td>Physical challenges</td>
<td>Appropriate professional support</td>
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<tr>
<td>Socioeconomic Status</td>
<td>Maternal smoking</td>
<td></td>
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<tr>
<td>WIC status</td>
<td>Parity</td>
<td></td>
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<td></td>
<td>Method of delivery</td>
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</tbody>
</table>

Note. WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.
Evidence criteria - WHO (1)

**Convincing evidence**
- Evidence based on epidemiological studies showing consistent associations between exposure and disease, with little or no evidence to the contrary.
- The available evidence is based on a substantial number of studies including prospective observational studies.
- The association should be biologically plausible.

**Probable evidence**
- Evidence based on epidemiological studies showing fairly consistent associations between exposure and disease, but where there are perceived shortcomings in the available evidence or some evidence to the contrary. Shortcomings in the evidence may be any of the following: insufficient duration of trials (or studies); insufficient trials (or studies) available; inadequate sample sizes; incomplete follow-up.
- The association should be biologically plausible.

Evidence criteria (2)

Possible evidence:
- Evidence based mainly on findings from case-control and cross-sectional studies. Insufficient randomised controlled trials, observational studies or non-randomised controlled trials are available. More trials are required to support the tentative associations, which should also be biologically plausible.

Insufficient evidence:
- Evidence based on findings of a few studies which are suggestive, but are insufficient to establish an association between exposure and disease. More well designed research is required to support the tentative associations.

Conflicting evidence:
- Several studies with sufficient power show opposite effects, so it is impossible to conclude whether breastfeeding has a positive, negative or no effect on the disease outcome.

No evidence:
- One or two studies with little power so no clear statement can be given about the strength of evidence.

CTM van Rossum, FL Büchner, J Hoekstra 2005
Quality criteria

Recall bias

Breastfeeding data registered within 12 mo after birth
Validity studies shows parents have a good memory about initial breastfeeding duration but less for total duration and time for complementary food

Misclassification bias

Clear definition of exclusive breastfeeding and partial
Well-defined health outcomes

Statistic analysis

Adjusting for confounding factors in the statistic analysis
Reverse causality

- False conclusion that nutrition causes the outcome
  - Disease or disease risk precede the choice of nutrition
  - Stems from failure to establish temporal precedence of feeding choice or change
- A major problem in cross-sectional studies
- Possible in long-term studies of growth & behavior
  - Infant growth and temperament can influence feeding
  - Also predicts (influences?) long-term growth/behavior
RCTs vs Observational studies

- **Unethical to randomize** newborns to
  - Breastfeeding versus formula feeding
  - More vs less exclusive breastfeeding
  - Longer vs shorter breastfeeding duration

- **RCT design has been possible** to do
  - Lucas et al: Banked breastmilk vs formula to preterms
  - Dewey et al: complementary food at 4 vs 6 mo
  - Morrow et al, Kramer et al: breastfeeding promotion intervention

- **Thus, most evidence on child health benefits based on observational (nonexperimental) studies**
  - Many potential sources of bias, especially for long-term outcomes
  - F.ex. neurocognitive outcomes can be confounded by the mothers education, motivation, attachment, upbringing, nurturing behaviour, stimulation, contact/warmth etc.
Breastfeeding and growth

• Biological effect of breast-milk?
• Biological effect of formula or lack of BF?
• Due to “finish the bottle”? (risk for overnutrition)
  
  Li R, Fein SB et al. Pediatrics. 2008;122 Suppl 2:S77-84

• Selection bias due to growth pattern?
• Other confounders?
Systematic reviews on beneficial effects of breastfeeding


What are the associations between duration of exclusive breastfeeding/any breastfeeding and growth in infancy, or overweight and obesity in later life?

What are the associations between introduction of foods other than breast milk and growth in infancy, or overweight and obesity in later life?

What is the association between duration of exclusive breastfeeding/any breastfeeding and atopic disease, asthma, or allergy?

What is the association between introduction of foods other than breast milk and atopic disease, asthma, or allergy?

What are the associations between duration of exclusive breastfeeding/any breastfeeding and health and disease outcomes in infancy and later in life, such as: infectious diseases (otitis media, gastrointestinal infections, and respiratory tract infections), cognitive and neurological development, cardiovascular disease (CVD), cancer, diabetes, blood pressure, glucose tolerance, and insulin resistance?
<table>
<thead>
<tr>
<th></th>
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<tbody>
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<td>Otitis media</td>
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<td>—</td>
<td>Convincing evidence # = ▼</td>
<td>Convincing evidence</td>
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<td>—</td>
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<td>Limited inconsist evidence</td>
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<td>Severe lower RTI</td>
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<td>▼</td>
<td>—</td>
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<td>Atopy</td>
<td>—</td>
<td>—</td>
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<td>Atopic dermatitis</td>
<td>—</td>
<td>▼</td>
<td>Eczema Probable evidence #</td>
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<td>Asthma (young children)</td>
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<tr>
<td>Wheezing</td>
<td>—</td>
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<td>Probable evidence #</td>
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<tr>
<td>Obesity</td>
<td>OR 0.78 (0.72 to 0.84)</td>
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<td>Convincing evidence</td>
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<tr>
<td>Type 2 diabetes</td>
<td>OR 0.63 (0.45 to 0.89)</td>
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<td>Childhood leukaemia</td>
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<td>Crohn disease</td>
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<tr>
<td>Ulcerative colitis</td>
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<td>Insufficient evidence</td>
<td>Probable evidence</td>
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<tr>
<td>Cancer</td>
<td>—</td>
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<td>Probable evidence</td>
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<td>--------------------------------------------</td>
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<tr>
<td>High blood pressure</td>
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<td>Convincing evidence</td>
<td>Probable evidence</td>
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<tr>
<td>↓ systolic MD -1.2 mmHg</td>
<td></td>
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<tr>
<td>(-1.7 to -0.7)</td>
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<tr>
<td>↓ diastolic MD -0.49 mm Hg</td>
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<td>(-0.87 to -0.11)</td>
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<tr>
<td>↓ Serum cholesterol Adulthood MD -0.18 mmol/l</td>
<td>(-0.3 to -0.06)</td>
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<td>Intelligence and schooling</td>
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<tr>
<td>MD 4.9 (2.97 to 6.92)</td>
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<tr>
<td>Intellectual and motor development</td>
<td>Probable evidence</td>
<td></td>
<td>Probable evidence</td>
<td></td>
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</table>
**NNR- Systematic literature review for the 5th Nordic Nutrition Recommendations**

- **Growth**  
  Probable evidence (grade 2) that exclusive breastfeeding for longer than 4 months is associated with slower weight gain during the second half of the first year.

- **IQ, neurological development, visual acuity**  
  Probable evidence (grade 2) that prolonged breastfeeding is beneficial for IQ and developmental scores of children.

- **Blood pressure**  
  Probable evidence (grade 2) that breastfeeding has a small but significant reductive effect on blood pressure.

- **Serum cholesterol**  
  Probable evidence (grade 2) for a small reduction on blood cholesterol in later life or adulthood from breastfeeding.
Costs and benefit

• Burden of disease (incidence, prevalence)
• Cost for diseases
  – Treatment cost (hospitalisation and medication)
  – Parent’s absence from work
• Cost of a prevention strategy + discounting
• Benefits of the prevention strategy
  – Less numbers of diseased, less costs
  – Life year gained, disability adjusted life years (DALYs), quality adjusted life years (QALYs)
• The value of human-milk
  – Shadow price to formula 2 Euro/L
  – Willingness to pay 50-100 Euro/L
  – GNP HM not included in GDP but formula is
  – Wet-nursing 100 Euro or more/day?
• The value of breast-feeding (outside nutrition) – emotional, social bonding, skin-to-skin etc
Potential economic impacts from improving breastfeeding rates in the UK

S Pokhrel,¹ M A Quigley,² J Fox-Rushby,¹ F McCormick,³ A Williams,⁴ P Trueman,¹ R Dodds,⁵ M J Renfrew⁶

Background
Low rates of breast feeding are associated with increased mortality and morbidity among infants and mothers.
In the UK and many other high-income countries, breastfeeding rates are low.
Previous studies reported from countries similar to the UK indicate that increasing breastfeeding rates reduces healthcare costs by improving mother and child health.

Aim: To calculate potential cost savings attributable to increases in breastfeeding rates from the National Health Service perspective.
Design and settings

- Cost savings in UK focused on where evidence of health benefit is strongest, mainly UK studies,
  - reductions in
    - gastrointestinal and
    - lower respiratory tract infections,
    - acute otitis media in infants,
    - necrotising enterocolitis in preterm babies and
    - breast cancer (BC) in women.
• Savings were estimated using an incidence-based disease model determined the number of cases that could have been avoided if breastfeeding rates were increased.

• Point estimates of cost savings were subject to a deterministic sensitivity analysis.

• Cost for treating four acute diseases in children in the UK - at least £89 million annually.

• The 2009–2010 value of lifetime costs of treating maternal breast cancer is estimated at £959 million.
<table>
<thead>
<tr>
<th>Condition</th>
<th>Exclusive breast feeding:</th>
<th>Any breast feeding:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrointestinal illnesses</td>
<td>Hospitalisation: 0.39 (0.18– 0.85)</td>
<td>GP visits: 0.28 (0.11–0.69)</td>
</tr>
<tr>
<td>Lower respiratory tract infection</td>
<td>Hospitalisation: 0.70 (0.49–0.98)</td>
<td>GP visits: 0.69 (0.47–1.0)</td>
</tr>
<tr>
<td>Acute otitis media</td>
<td>Hospitalisation: 0.67 (0.52–0.88)</td>
<td>GP visits: 0.65 (0.43–0.96)</td>
</tr>
<tr>
<td>NEC</td>
<td>Any breast milk: 0.19 (0.05–0.73)</td>
<td></td>
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</tbody>
</table>
Maternal breast cancer

- Ever breast feeding vs never breast feeding: 0.96 (0.92–0.99)
- Breast feeding for <6 months vs never: 0.98 (0.95–1.01)
- Breast feeding for 7–18 months vs never: 0.94 (0.91–0.97)
- Breast feeding for 18+ months vs never: 0.89 (0.84–0.94)
Cost savings with increased breastfeeding

- Supporting mothers who are exclusively breast feeding at 1 week to continue breast feeding until 4 months could save at least £11 million per year by reducing the incidence of three acute infections in children.

- Additionally, increasing the current rate of breast milk feeding in the neonatal units from 35% to 75% could save £6.12 million per year in treatment costs by reducing the incidence of NEC.

- If the proportion of mothers currently breast feeding for 7–18 months in their lifetime were to double, a net present value of £21 million savings could be realised by reducing the incidence of BC over the lifetime of each annual cohort of first-time mothers.
Realistic and feasible goals

• Achieving the savings does not depend upon persuading more women to breastfeed after the birth, but that those
• women who have chosen to breastfeed will receive better early support through investment in proactive, accessible, high-quality services.
• National statistics indicate that 80% of women who stop breastfeeding in the early weeks would have liked to have breastfed for longer.
• This study should reassure policymakers, service planners and commissioners that a rapid return on investment is realistic and feasible, supported by cost savings that can be realised in the first year of infants’ lives.
Summary from cost-analyses

• Increasing the current breastfeeding rates is likely to generate substantial cost savings
• The amounts saved will depend on the extent of the increase and the effectiveness of interventions
• The cost of the interventions must be considered, but the potential savings indicate that substantial further investment has a strong economic case.
• In countries with low breast-feeding rates the potential savings will probably be greatest
United States - human milk price of around US$3 per ounce (US$85 per L) or more, and this is the price used to value human milk production in this study.

In Norway in 2009 - €130 (US$100) per liter, after covering a payment of US$20 for donor expenses.
The potential loss of economic value from not protecting women’s lactation and milk production from competing market pressures is large. Failure to account for mothers’ milk production in GDP and other economic data has important consequences for public policy. The invisibility of human milk reduces the perceived importance of programs and regulations that protect and support women to breastfeed. The value of human milk can be measured using accepted international guidelines for calculating national income and production. It is quantitatively nontrivial and should be counted in GDP.
Value of human milk

- the price of formula as a proxy for the food value of breastfeeding does not value the benefice of HM/BF

- human milk as part of the national food system or GDP and use the price of milk in milk banks to measure the value of human milk in its own right as a food/medicine

- “obtaining comprehensive estimates of the societal and individual health costs of formula feeding is impractical” - can be discussed.

- Using the market price of expressed breast milk implicitly incorporates its value for health and so avoids the need to separately identify and estimate the health costs of formula feeding
This paper examines opinion towards financial incentives for breastfeeding using reader responses to UK online media coverage of a study undertaken in this area. Many commenters identified that financial incentives do not address the many structural and cultural barriers to breastfeeding. Further research is needed on how financial incentive interventions can be designed and communicated to the public to maximize acceptability and so achieve their potential for behavior change.

• Counseling by peers or health personnel, baby friendly hospital support and community mobilization approaches are the key interventions to improve breastfeeding rates delivered concurrently in a combination of settings.

• For promotion of EBF, counseling or education in the health system and community is likely to be the most powerful (increase by 152%) among the examined interventions.

• Family or social support had no significant effect on promoting exclusive breastfeeding (RR 0.95, 95% CI 0.87-1.02
Some recent publications

- Breastfed subjects achieved a higher IQ of 3.44 points (2.30;4.58) and after controlling for mothers IQ 2.62 (1.25-3.98)

- Children exposed to more versus less breastfeeding up to 12 months had reduced risk of dental caries
- Increased risk of dental caries in children breastfed > 12 months, especially if frequent or nocturnal, may be due to unmeasured confounders including dietary sugars and oral hygiene practices
<table>
<thead>
<tr>
<th>BF practice</th>
<th>Relative Risk (95% CI)</th>
<th>Number of studies*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predominant, partial or no BF vs. exclusive BF in 0-5 months of age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exclusive BF</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Predominant BF</td>
<td>1.48 (1.13 to 1.92)</td>
<td>3</td>
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<tr>
<td>Partial BF</td>
<td>2.84 (1.63 to 4.97)</td>
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<tr>
<td>No BF</td>
<td>14.4 (6.13 to 33.9)</td>
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<tr>
<td>Partial, no BF vs. predominant BF in 0-5 months of age</td>
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<tr>
<td>Predominant BF</td>
<td>1.0</td>
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<tr>
<td>Partial BF</td>
<td>1.6 (1.09 to 2.33)</td>
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<td>No BF</td>
<td>6.09 (3.57 to 10.4)</td>
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<tr>
<td>Partial, no BF vs. exclusive/predominant BF in 0-5 months of age</td>
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<tr>
<td>Exclusive or predominant BF</td>
<td>1.0</td>
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<tr>
<td>Partial BF</td>
<td>2.27 (1.66 to 3.1)</td>
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<td>No BF</td>
<td>2.47 (1.86 to 3.3)</td>
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<tr>
<td>Partial vs. no BF in 0-5 months of age</td>
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<tr>
<td>Partial BF</td>
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<tr>
<td>No BF</td>
<td>3.89 (2.28 to 6.65)</td>
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<tr>
<td>Any vs. no BF in infants aged 6-23 mo</td>
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<tr>
<td>Any BF</td>
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<tr>
<td>No BF 6-11 m</td>
<td>1.76 (1.28 to 2.41)</td>
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<tr>
<td>No BF 12-23 m</td>
<td>1.97 (1.45 to 2.67)</td>
<td>6</td>
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</tbody>
</table>
Breastfeeding and childhood acute otitis media: a systematic review and meta-analysis

Bowatte G et al. Acta Paed 2015 online

- Breastfeeding was associated with a reduced risk of AOM during the first 2 years of life.
- Infants exclusively breastfed for the first 6 months derived the most benefit with around 43% reduction in ever AOM during the first 2 years.
- There was no clear evidence of continued benefits of breastfeeding on AOM incidence after the age of 2 years.
Human breast milk: A review on its composition and bioactivity

Nicholas J. Andreas a,*, Beate Kampmann a,c, Kirsty Mehring Le-Doare a,b,c

a Centre for International Child Health, Department of Paediatrics, Imperial College London, St. Mary's Hospital, Praed Street, London, W2 1NY UK
b Wellcome Trust Centre for Global Health Research, Norfolk Place, London, UK
c MRC Unit-The Gambia, Vaccines & Immunity Theme, Atlantic Road, Fajara, The Gambia
Breast-feeding from different perspectives

- Nutritional
- Health
- Ethical
- Epidemiological
- Economical
- Public health
- Political
- Philosophical
- Traditional
- Natural
- Practical
- Hygienic
- Research
- Etc
Exclusive breastfeeding is recommended the first 6 months and then partial BF up to 2 years of age or longer

- Optimal nutrition
  - optimal growth and neurodevelopment
- Protection against infections
  - Reduced risk for infectious diseases
- Immunomodulation
  - Reduction of risk for autoimmune diseases
- Composition of intestinal flora
- Metabolic programming
  - Reduction of risk for obesity and cardiovascular disease
- Biologic communication
  - Extended umbilical cord
World bank: “Why do statistics matter?”

“In simple terms, they are the evidence on which policies are built.”

But breastfeeding is more than economics, it is ethical, political etc.

Support but do not force individuals

Fight and act on the public health level against structures that hinder breast-feeding

There is no better investment for a community than putting milk into babies...

Sir Winston Churchill
Thanks for your attention

There is no better investment for a community than putting milk into babies...

Sir Winston Churchill
Radio Broadcast 1943
<table>
<thead>
<tr>
<th>Health effect</th>
<th>References</th>
<th>Strength evidence</th>
<th>See also:</th>
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</thead>
<tbody>
<tr>
<td>Gastrointestinal infections including diarrhoea</td>
<td>10,28,39,43,52,54,58,74,77,126,135,136,141,172</td>
<td>Convincing +</td>
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<td>Urinary tract infections</td>
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<td>Insufficient</td>
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<td>69,71,129</td>
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<td>Haemophilus influenza</td>
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<td>Fever</td>
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<td>Jaundice</td>
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<tr>
<td>Eczema</td>
<td>12,37,48,58,65,68,74,77,82,87,142,147,150,153,161,165</td>
<td>Probable +</td>
<td>3.1.3</td>
</tr>
<tr>
<td>Atopy</td>
<td>19,42,77,82,111,114,138,144,147,153,165,177,178</td>
<td>Possible +</td>
<td>3.1.3</td>
</tr>
<tr>
<td>Obesity</td>
<td>8,9,11,40,47,56,70,90,91,121,127,128,156,163</td>
<td>Convincing +</td>
<td>3.1.4</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>97,99</td>
<td>X</td>
<td>3.1.4</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>88,89,98,99,117,127,152</td>
<td>Convincing +</td>
<td>3.1.4</td>
</tr>
<tr>
<td>Diabetes I</td>
<td>60,63,101,110,139,140</td>
<td>Possible +</td>
<td>3.1.4</td>
</tr>
<tr>
<td>Leukaemia</td>
<td>54,61,83,85,143,145,158</td>
<td>Possible +</td>
<td>3.1.5</td>
</tr>
<tr>
<td>Lymphomas</td>
<td>54,158</td>
<td>Insufficient</td>
<td>3.1.5</td>
</tr>
<tr>
<td>All childhood cancers</td>
<td>24,26,34,85,158</td>
<td>X</td>
<td>3.1.5</td>
</tr>
<tr>
<td>Growth</td>
<td>75,77</td>
<td>Insufficient</td>
<td>3.1.6</td>
</tr>
<tr>
<td>Intellectual and motor development</td>
<td>6,32,44,49,57,62,73,95,104,112,122,125,132,155,162,164</td>
<td>Probable +</td>
<td>3.1.7</td>
</tr>
<tr>
<td>Sudden infant death syndrome</td>
<td>33,77,100</td>
<td>Insufficient</td>
<td>3.1.8</td>
</tr>
<tr>
<td>Hospitalization</td>
<td>119</td>
<td>X</td>
<td>3.1.8</td>
</tr>
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