Latest of Breastfeeding Benefits

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Breast milk composition

- Special fluid that keep changing !!!???
  - Colostrum-Transitional milk-mature milk
  - Foremilk-Hindmilk
  - Premature milk-Fullterm milk

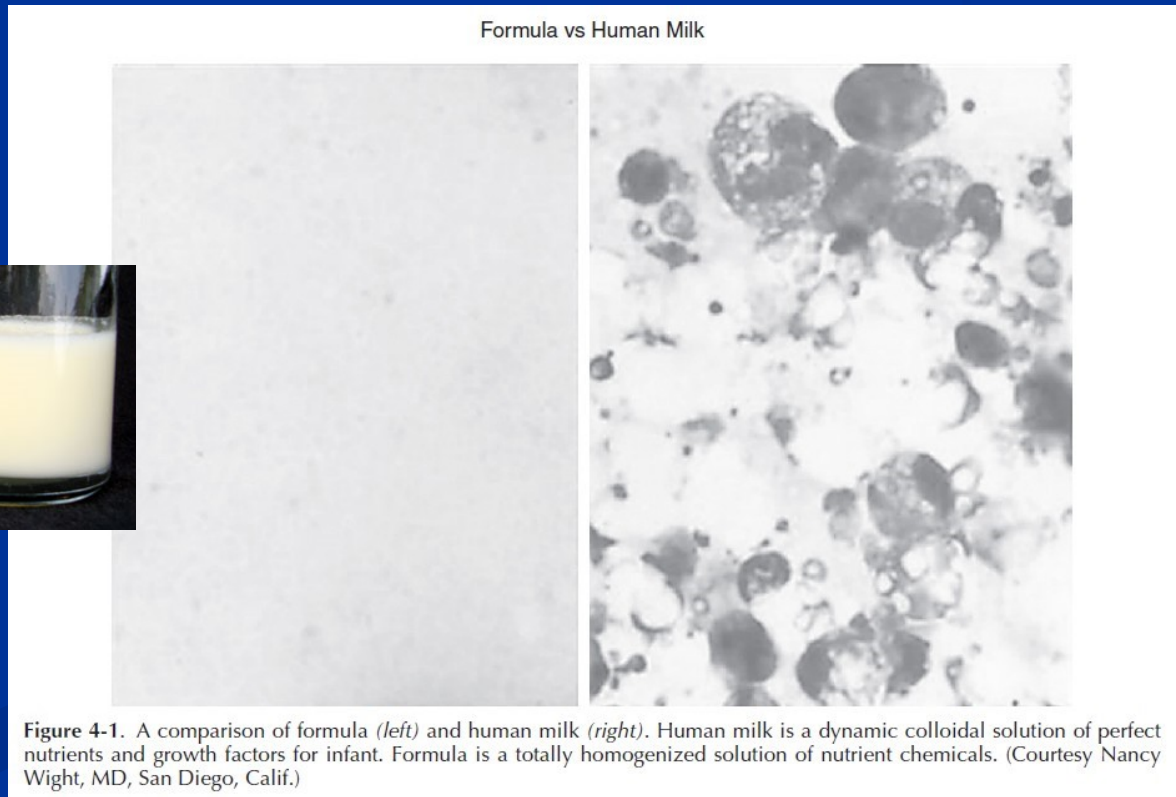


Figure 4-1. A comparison of formula *(left)* and human milk *(right)*. Human milk is a dynamic colloidal solution of perfect nutrients and growth factors for infant. Formula is a totally homogenized solution of nutrient chemicals. (Courtesy Nancy Wight, MD, San Diego, Calif.)

Nutrients in breast milk

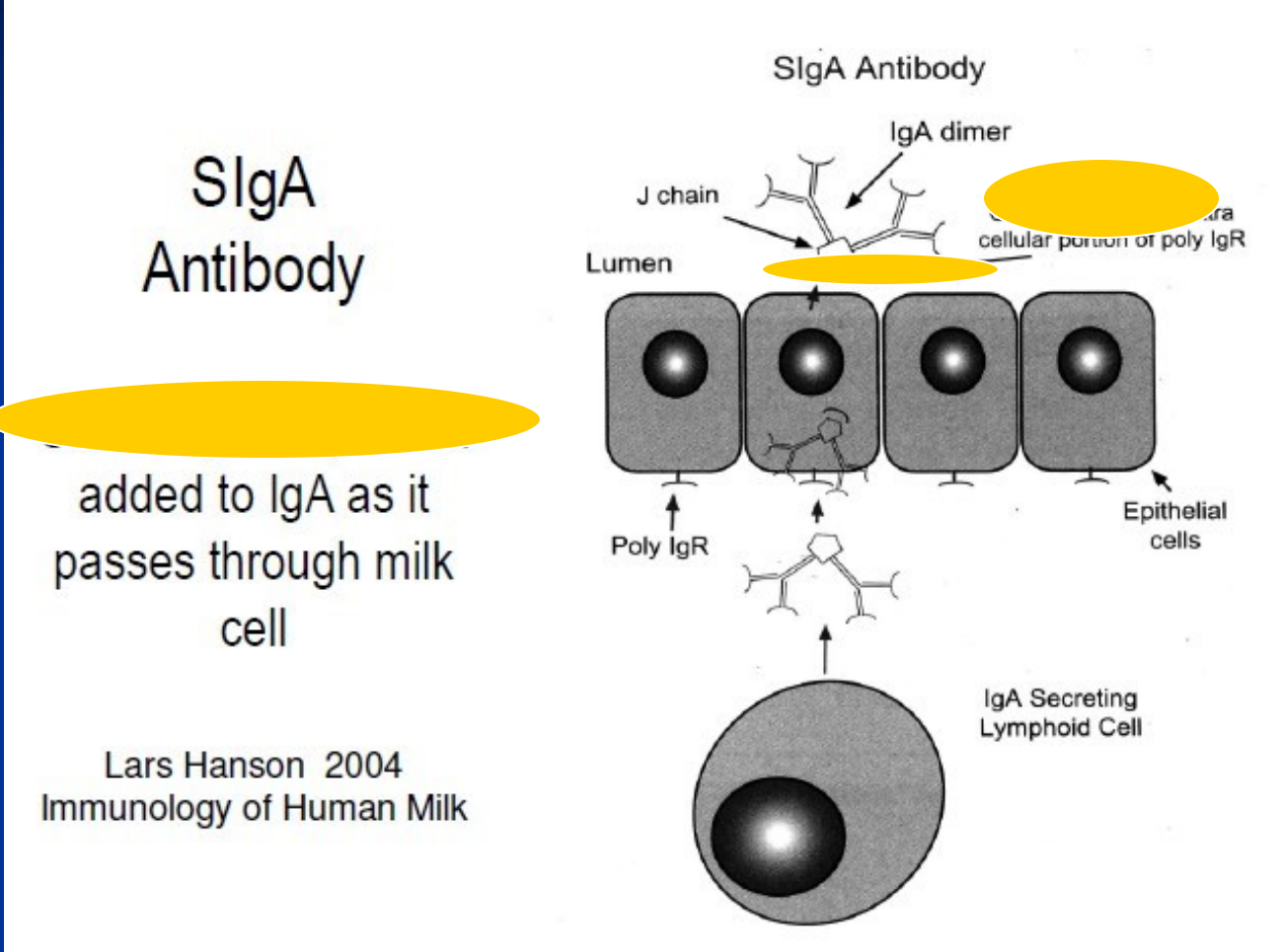
- Macronutrients
  - Lipids-most important E source (50%)
  - Protein
  - Carbohydrate
- Micronutrients
  - Vitamins
  - Minerals
- Non-nutritive factors in breast milk

Composition/100ml	Colostrum	Mature milk	Cow milk	Codex standard
Energy (kcal)	58	65-70	64	60-70
Lipids (gm)	1.5-2.0	3.5-4.8	3.66	2.95-4.0
Carbohydrate (gm)	5-7	7.0-8.5	4.65	6.0-9.4
Lactose (gm)	2-5	6.7-7.0	4.5	
Oligosaccharides (gm)	2.2-2.4	1.2-1.4	Trace	
Glucose (gm)	0.02-0.1	0.02-0.03	NR	
Protein (gm)	1.5-2.0	0.8-1.1	3.2-3.5	1.2-2.0
Casein	0.38	0.3-0.5	2.7	
Whey	1.1-1.5	0.5-0.6	0.5	
α-lactalbumin	0.36	0.2-0.3	0.1	
β-lactoglobulin	-	-	0.36	
lactoferrin	0.35	0.1-0.3	Trace	
lysozyme	0.01-0.02	0.01	Trace	
serum albumin	0.4	0.3	0.04	
sIgA	0.2-1.2	0.05-0.1	0.003	
IgM	0.002	0.001	0.006	
IgG	0.001	0.005	0.003	
Non-protein nitrogen (gm)	0.05	0.045	0.02	

Non-nutritive factors in breast milk

- **Secretary IgA** (90% of total Ab)
  - very high in colostrum 0.2-1.2 gm/dL (twice adult sIgA produced per day), 0.1 gm/dL in mature milk
  - Protects mucosal surfaces eg gut, respiratory tract immediately after birth
  - Composed of specific antibodies against bacteria that mother has encountered in the environment (appear in milk around 1 day after mother infected)
  - Infant starts to make its own SIgA after some weeks/ takes much longer in less exposed infants

Secretary IgA in breast milk



- *the secretory component protects them from digestion*
- *2-4 grams sIgA per litre presents in infant's stool*

Non-nutritive factors in breast milk

- Living immunity
  - Macrophages and neutrophils
    - May protect mammary gland against infectious mastitis
    - May kill microbes in baby's gut
    - Macrophages make lysozyme secreted in milk
  - Lymphocytes – B and T cells
    - May enter infant's body and transfer immune functions
    - mother's cells tolerated by baby
    - enhanced response to vaccines
    - increased tolerance to kidney transplant from mother

Non-nutritive factors in breast milk

- **Lactoferrin : binds iron which inhibits bacterial growth, kills bacteria, viruses and Candida**
- **Lysozyme :** breaks down cell walls of many bacteria
- **Oligosaccharides :** stop bacteria attaching to epithelium, prebiotics effects
- **Nucleotides :** building blocks of nucleic acids; enhance maturation of immune system

Non-nutritive factors in breast milk

- < 100 cytokines+immunomodulatory factors: do not cause inflammation e.g TGF-β *(Transforming Growth Factor beta)*
- Epidermal growth factors
- Hormones: leptin, thyroid hormones, erythropoietin, prolactin
- Enzymes: bile salt-stimulated lipase
- Stem cells, etc……..

Health outcomes of breastfeeding

Advantages of breastfeeding
Risk increased with artificial feeding

- Infancy
  - Infections: diarrhea, pneumonia, otitis media, neonatal sepsis, NEC, *UTI, Invasive HIB*
  - *SIDS (Sudden Infant Death Syndrome)*
- Longer term
  - IQ, allergy, obesity, cardiovascular problems
  - *DM type I and II, IBD, Cancer, Malocclusion*
- Mothers
  - *Ovarian cancer, breast cancer*
  - *Rheumatoid arthritis*
  - *Obesity and cardiovascular problems*

- Breastfeeding and the Use of Human Milk. Pediatrics 2012, 129 (3); e827-41. Updated information from http://pediatrics.aappublications.org/content/early/2012/02/22/peds.2011-3552
- Horta BL, Victora CG. Long-term effects of breastfeeding: a systematic review. http://apps.who.int/iris/bitstream/10665/79198/1/9789241505307_eng.pdf.

TABLE 2 Dose-Response Benefits of Breastfeeding[a]

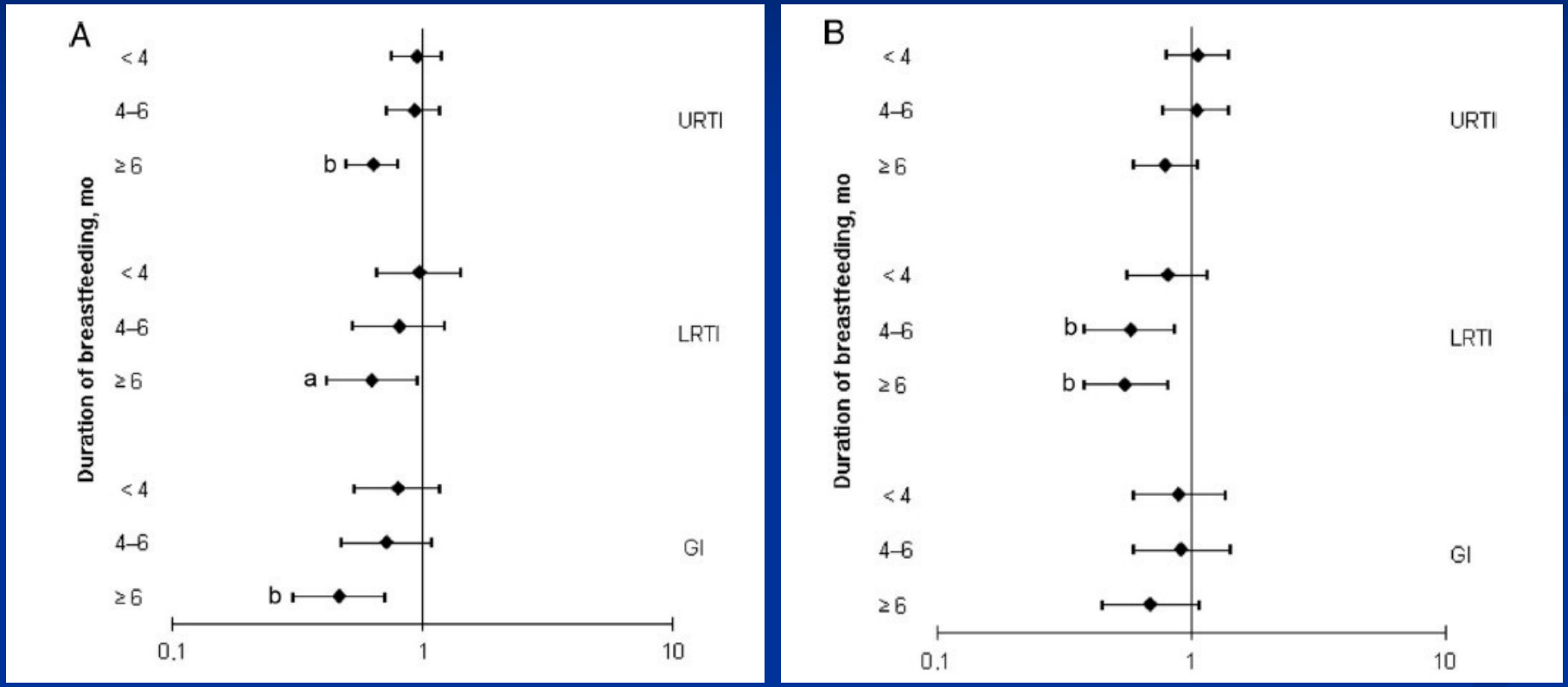
Condition	% Lower Risk[b]	Breastfeeding	Comments	OR[c]	95% CI
Asthma[13]	40	≥3 mo	Atopic family history	0.60	0.43–0.82
Asthma[13]	26	≥3 mo	No atopic family history	0.74	0.6–0.92
Atopic dermatitis[27]	27	>3 mo	Exclusive BFnegative family history	0.84	0.59–1.19
Atopic dermatitis[27]	42	>3 mo	Exclusive BFpositive family history	0.58	0.41–0.92
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	0.48	0.40–0.89
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

Breastfeeding and the Use of Human Milk. Pediatrics 2012, 129 (3); e827-41. Updated information from http://pediatrics.aappublications.org/content/early/2012/02/22/peds.2011-3552

Duration of breastfeeding and risk of infectious diseases in the first year of life.

0- 6 months
n ≈ 3,438-3,504

7-12 months
n ≈ 2,938-3,027



The reference group is never-breastfed infants. Values are ORs with 95% CIs (log scale), adjusted for maternal education, ethnicity, smoking, gestational age, birth weight, siblings, and day care attendance.

Duijts et al. Pediatrics. 2010;126(1): e18-25.

Recap: BF & Infection

- Breastfeeding more than 6 mo. reduce risk of common infection: URI (otitis media), LRI (RSV bronchiolitis, pneumonia), diarrhea up to one year (in developed country!!!)
- Breast milk feeding reduce NEC and mortality rate in preterm infants

ORIGINAL ARTICLE

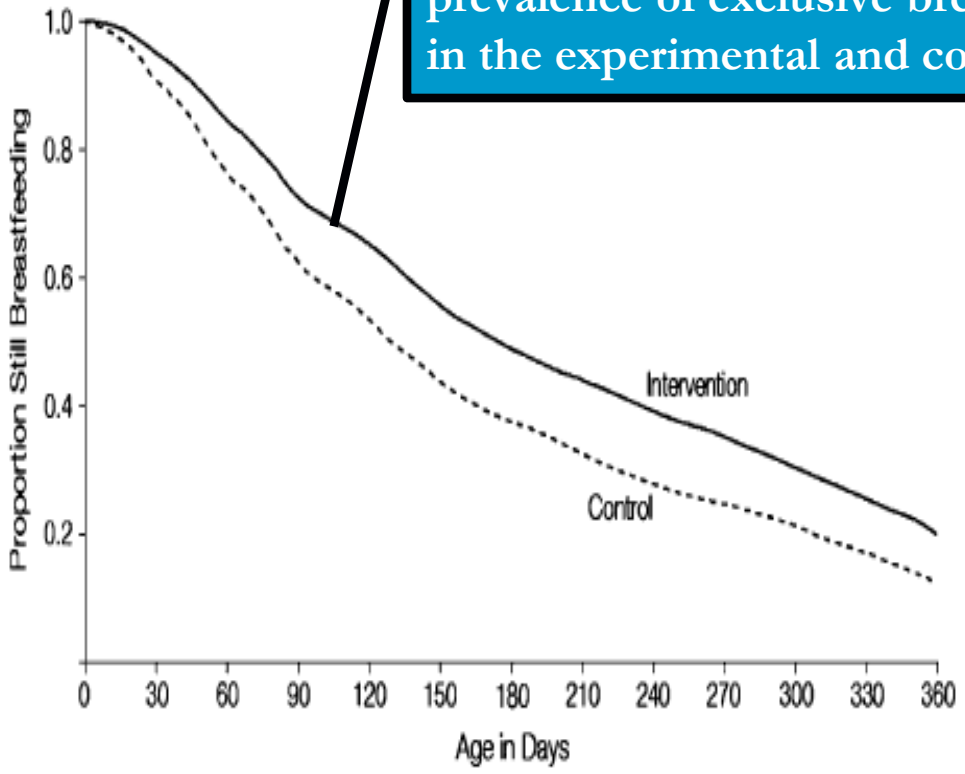
Breastfeeding and Child Cognitive Development

New Evidence From a Large Randomized Trial

Michael S. Kramer, MD; Frances Aboud, PhD; Elena Mironova, MSc; Irina Vanilovich, MD, MSc; Robert W. Platt, PhD; Lidia Matush, MD, MSc; Sergei Igumnov, MD, PhD; Eric Fombonne, MD; Natalia Bogdanovich, MD, MSc; Thierry Ducruet, MSc; Jean-Paul Collet, MD, PhD; Beverley Chalmers, DSc, PhD; Ellen Hodnett, PhD; Sergei Davidovsky, MD, MSc; Oleg Skugarevsky, MD, PhD; Oleg Trofimovich, BSc; Ludmila Kozlova, BSc; Stanley Shapiro, PhD; for the Promotion of Breastfeeding Intervention Trial (PROBIT) Study Group

IQ

prevalence of exclusive breastfeeding
in the experimental and control group at 3 mo =43.3% vs 6.4%)



crease in exclusive breastfeeding at age 3 months (43.3% for the experimental group vs 6.4% for the control group; $P<.001$) and a significantly higher prevalence of any breastfeeding at all ages up to and including 12 months. The experimental group had higher means on all of the Wechsler Abbreviated Scales of Intelligence measures, with cluster-adjusted mean differences (95% confidence intervals) of +7.5 (+0.8 to +14.3) for verbal IQ, +2.9 (−3.3 to +9.1) for performance IQ, and +5.9 (−1.0 to +12.8) for full-scale IQ. Teachers' academic ratings were significantly higher in the experimental group for both reading and writing.

Conclusion: These results, based on the largest randomized trial ever conducted in the area of human lactation, provide strong evidence that prolonged and exclusive breastfeeding improves children's cognitive development.

Trial Registration: isrctn.org Identifier: ISRCTN37687716

Arch Gen Psychiatry. 2008;65(5):578-584

Main Outcome Measures: Subtest and IQ scores on the Wechsler Abbreviated Scales of Intelligence, and

Intelligence

Table 3. Wechsler Abbreviated Scales of Intelligence Results

Outcome	Score, Mean (SD)		ICC	Cluster-Adjusted Mean Difference (95% CI)
	Experimental Group	Control Group		
Vocabulary (n=13 838)	53.5 (11.6)	46.9 (11.4)	0.28	+4.9 (+0.4 to +9.3)
Similarities (n=13 836)	56.6 (9.9)	50.7 (11.7)	0.29	+4.6 (+0.2 to +9.0)
Block designs (n=13 840)	57.2 (9.4)	54.6 (10.3)	0.21	+1.9 (–1.7 to +5.5)
Matrices (n=13 841)	52.8 (10.1)	50.9 (9.9)	0.20	+1.8 (–1.9 to +5.5)
Verbal IQ (n=13 828)	108.7 (16.4)	98.7 (16.0)	0.31	+7.5 (+0.8 to +14.3)
Performance IQ (n=13 836)	108.6 (15.1)	104.8 (15.4)	0.24	+2.9 (–3.3 to +9.1)
Full-scale IQ (n=13 824)	109.7 (15.4)	101.9 (15.8)	0.31	+5.9 (–1.0 to +12.8)

Abbreviations: CI, confidence interval; ICC, intraclass correlation coefficient.

Association between breastfeeding and intelligence, educational attainment, and income at 30 years of age: a prospective birth cohort study from Brazil

Cesar G Victora, Bernardo Lessa Horta, Christian Loret de Mola, Luciana Quevedo, Ricardo Tavares Pinheiro, Denise P Gigante, Helen Gonçalves, Fernando C Barros

Summary

Background Breastfeeding has clear short-term benefits, but its long-term consequences on human capital are yet to be established. We aimed to assess whether breastfeeding duration was asso[illegible] of schooling, and income at the age of 30 years, in a setting where no stro[illegible]

Methods A prospective, population-based birth cohort study of neonate[illegible] Information about breastfeeding was recorded in early childhood. At 30 [illegible] Adult Intelligence Scale, 3rd version), educational attainment, and incon[illegible] used multiple linear regression with adjustment for ten confounding vari[illegible]

Findings From June 4, 2012, to Feb 28, 2013, of the 5914 neonates enrolle[illegible] duration was available for 3493 participants. In the crude and adjusted an[illegible] and predominant breastfeeding (breastfeeding as the main form of nutri[illegible] associated with IQ, educational attainment, and income. We identified dos[illegible] duration for IQ and educational attainment. In the confounder-adjusted a[illegible]

the effect on income.

Interpretation Breastfeeding is associated with improved performance in[illegible] have an important effect in real life, by increasing educational attainment[illegible]

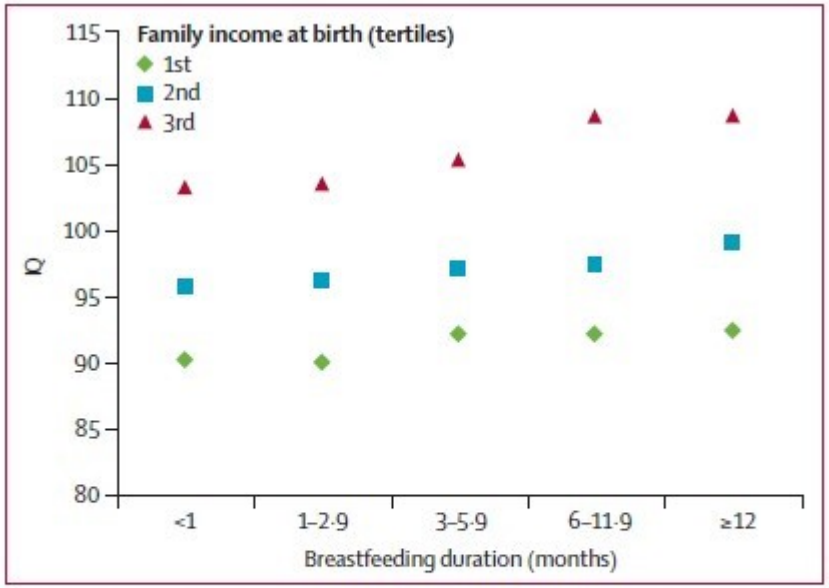


Figure 1: **Association of mean IQ with breastfeeding duration, stratified by family income at birth**

Estimates are adjusted for parental education, household score index, genomic ancestry, maternal smoking during pregnancy, maternal age, type of delivery, maternal body-mass index before pregnancy, gestational age, and birthweight.

Victora et al. Lancet Glob Health 2015; 3: e199–205

How breastfeeding 'protect' against allergic diseases?

- Elimination of nonhuman milk protein exposure
- Decrease absorption of Ag through intestinal tract
  - sIgA to major food protein (against β-lactoglobulin, casein, gliadin, ovalbumin→ influenced by mother's Ag exposure)
- Transforming growth factor-β (TGF- β)
- Reduced infection → RSV (wheezing)
- Changes in intestinal flora (good bacteria)
- Allergens in breast milk → Small amount induce tolerance

Friedman NJ and Zeiger RS. J Allergy Clin Immunol 2005;115:1238-48.

Vadas et al. JAMA 2001;285:1746-8.

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
tract infection[13]					
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
RSV bronchiolitis[16]	74	>4 mo	—	0.26	0.074–0.9
NEC[19]	77	NICU stay	Preterm infants Exclusive HM	0.23	0.51–0.94
Gastroenteritis[13,14]	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
SIDS[13]	36	Any >1 mo	—	0.64	0.57–0.81

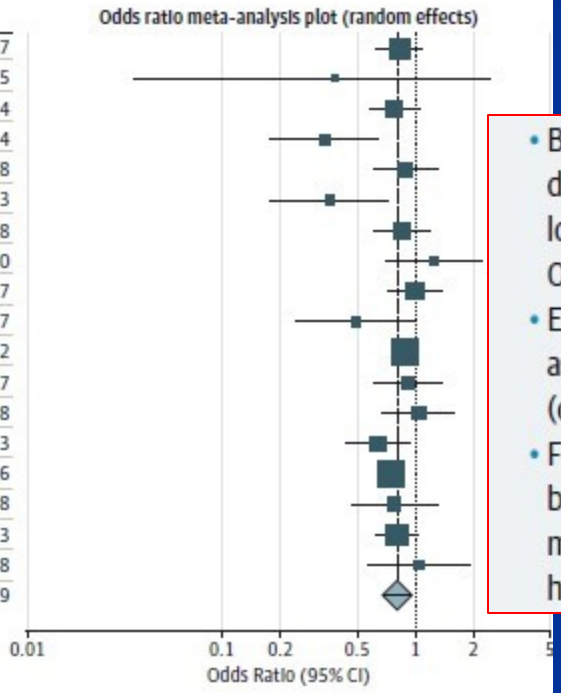
Breastfeeding and the Use of Human Milk. Pediatrics 2012, 129 (3); e827-41. Updated information from http://pediatrics.aappublications.org/content/early/2012/02/22/peds.2011-3552

Breastfeeding and Childhood Leukemia Incidence
A Meta-analysis and Systematic Review

Efrat L. Amitay, PhD, MPH; Lital Keinan-Boker, MD, PhD, MPH

Figure 3. Meta-analysis of All 18 Qualifying Studies: Any Breastfeeding for 6 Months and Beyond Compared With Shorter Duration

Source	Odds Ratio	95% CI
Crouch et al,[44] UK 2012	0.83	0.65-1.07
Waly et al,[43] Oman 2011	0.38	0.04-2.45
Rudant et al,[42] France 2010	0.78	0.58-1.04
Bener et al,[41] UAE 2008	0.34	0.18-0.64
MacArthur et al,[40] Canada 2008	0.89	0.62-1.28
Altinkaynak et al,[39] Turkey 2006	0.36	0.18-0.73
Kwan et al,[38] US 2005	0.85	0.61-1.18
Jourdan-Da Silva et al,[37] France 2004	1.25	0.72-2.20
Lancashire and Sorahan; OSCC,[25] UK 2003	1.00	0.73-1.37
Perrillat et al,[24] France 2002	0.49	0.24-0.97
UKCCS,[23] UK 2001	0.89	0.77-1.02
Hardell and Dreifaldt,[22] Sweden 2001	0.92	0.62-1.37
Infante-Rivard et al,[21] Canada 2000	1.04	0.69-1.58
Smulevich et al,[17] Russia 1999	0.64	0.44-0.93
Shu et al,[20] US 1999	0.75	0.65-0.86
Dockerty et al,[19] New Zealand 1999	0.78	0.48-1.28
Schüz et al,[18] Germany 1999	0.81	0.63-1.03
Shu et al,[16] China 1995	1.04	0.58-1.88
Combined (Random)	0.81	0.73-0.89

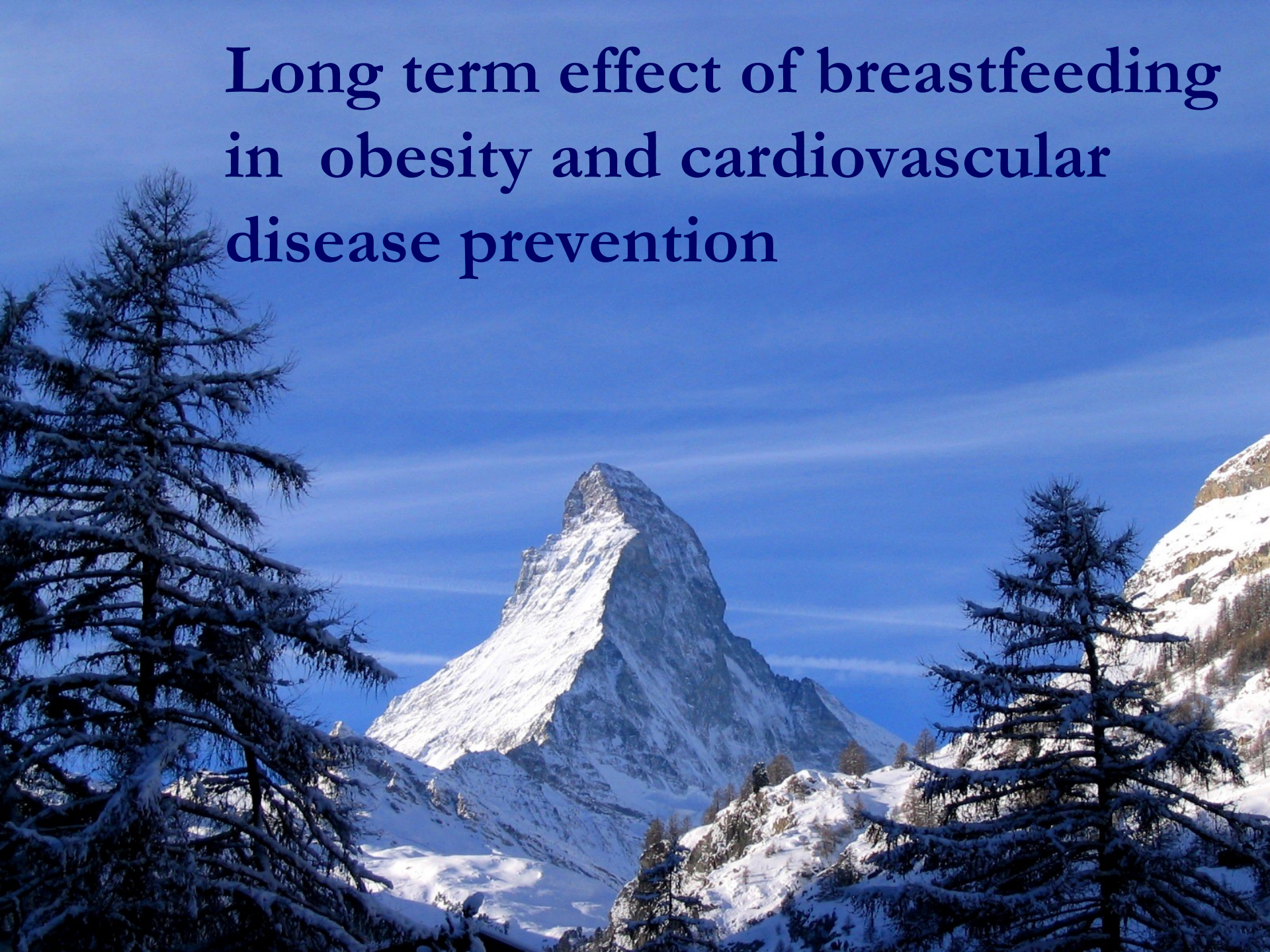


OSCC indicates Oxford Survey of Childhood Cancers; UAE, United Arab Emirates; UK, United Kingdom; UKCCS, UK Childhood Cancer Study; US, United States.

- Breastfeeding for 6 months or longer compared with a shorter duration or not breastfeeding at all is associated with a 19% lower risk for childhood leukemia (odds ratio, 0.81; 95% CI, 0.73-0.89).
- Ever breastfeeding compared with never breastfeeding is associated with an 11% lower risk for childhood leukemia (odds ratio, 0.89; 95% CI, 0.84-0.94).
- Few biological mechanisms may explain the inverse relationship between breastfeeding and leukemia including more favorable microbiome in an infant's gut and natural-killer and stem cells in human milk.

Amitay EL and Keinan-Boker L. JAMA Pediatr. 2015;169(6):e151025.

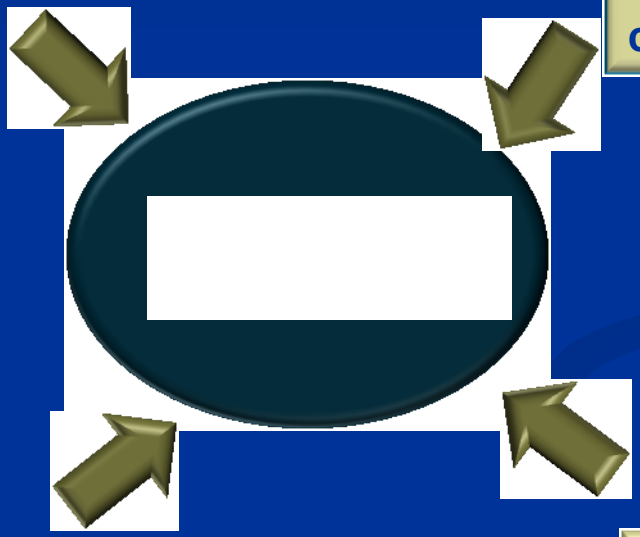
Long term effect of breastfeeding in obesity and cardiovascular disease prevention



Early life risk factors for obesity in childhood

Intrauterine & perinatal
- Birthweight (low and high)
- Maternal smoking

Infant feeding and weaning practice
-Breast feeding (lack of)
-Time of introduce complementary food (too soon)



Family characteristics and demographics
- Parental obese

Lifestyle in early childhood
-Sleep pattern
-Sedentary behavior
-Dietary pattern

John J Reilly, Andrea Sherriff ,et al. Early life risk factors for obesity in childhood: cohort study. BMJ 2005;10:1-7.

Potential causes for the protective effects of breastfeeding on later obesity

Modulating child behavior

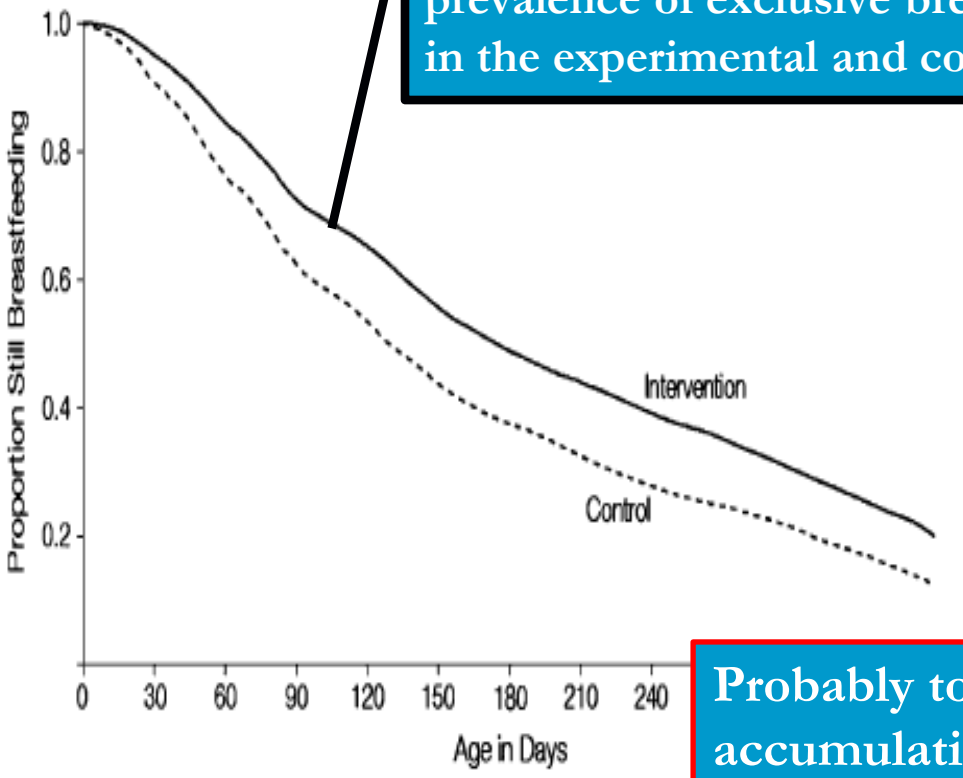
- BF infant
  - Different suckling pattern
  - Higher suckling frequency
  - Greater degree of control on meal size & interval
- BM
  - Varies taste & smell << programmed to different food selection & dietary habit in later life

Early growth and substrate supply

- BM
  - Lower average caloric density
  - Lower protein intake per kg bodyweight
- Slower growth rate in the 1st year

Effects of Promoting Longer-term and Exclusive Breastfeeding on Adiposity and Insulin-like Growth Factor-I at Age 11.5 Years

A Randomized Trial



prevalence of exclusive breastfeeding
in the experimental and control group at 3 mo =43.3% vs 6.4%)

Conclusion :
Among healthy term infants in Belarus, improving the duration and exclusivity of breastfeeding did not prevent overweight or obesity, nor did it affect IGF-I levels at age 11.5 years.

Probably too young to see the effects on body fat accumulation /Different environmental factors?

Martin et al. JAMA. 2013;309(10):1005-1013

Long-term effects of breastfeeding

A SYSTEMATIC REVIEW

Bernardo L. Horta, MD, PhD
Universidade Federal de Pelotas, Pelotas, Brazil

Cesar G. Victora, MD, PhD
Universidade Federal de Pelotas, Pelotas, Brazil

In the pooled analyses of all studies, breastfeeding was associated with a 24% reduction in overweight and/or obesity, but the reduction was only 12% in the high-quality studies.

World Health Organization

Odds ratio and its 95% CI of overweight/obese, comparing breastfed vs. not-breastfed subjects

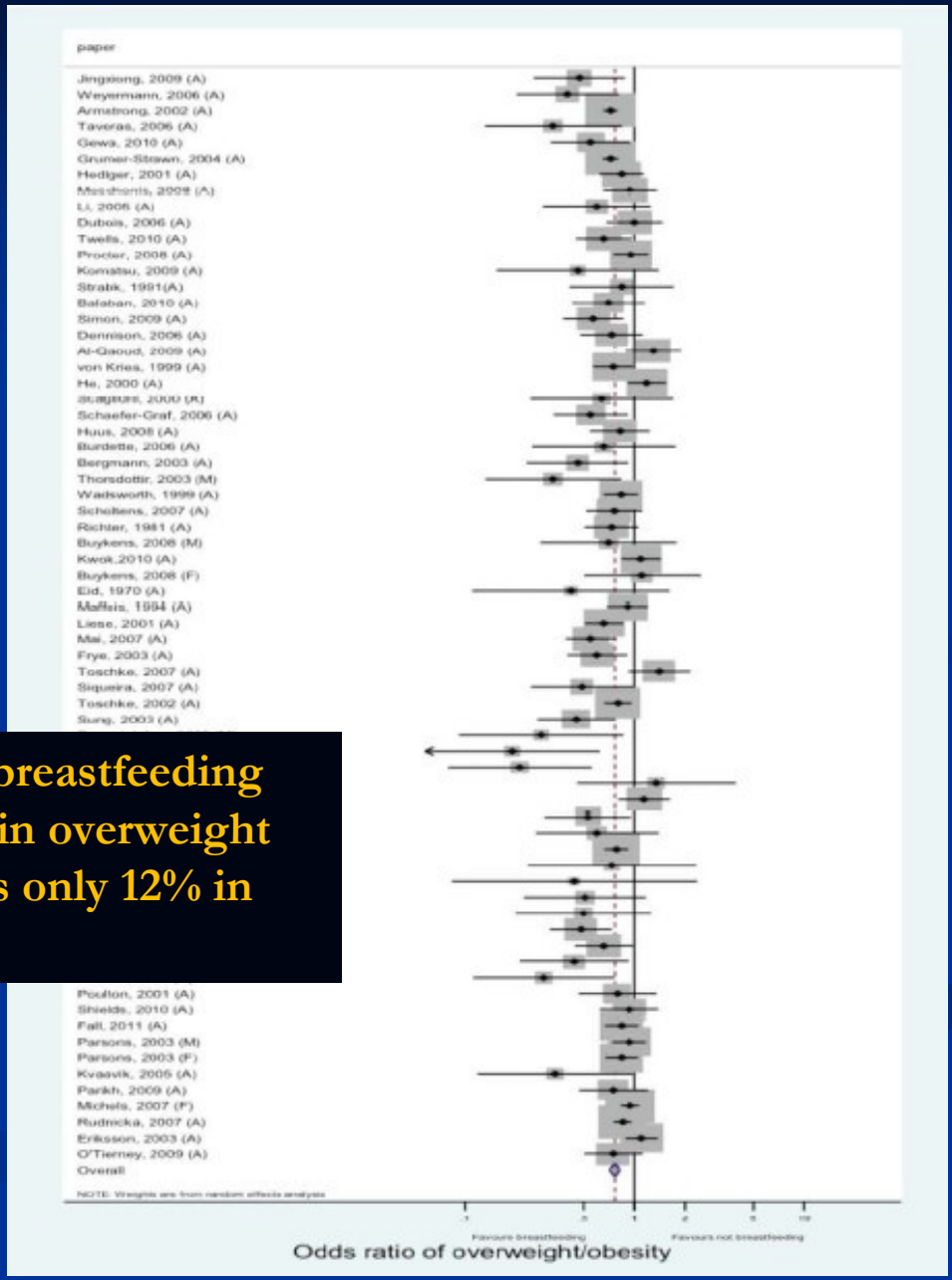


TABLE 10.1

Pooled effects for each outcome, from all studies and from those deemed to be of higher scientific quality

Outcome	Pooled effect (95% confidence interval)	
	All studies	High-quality studies[a]
Mean total blood cholesterol (mmol/L)		0.00 (-0.02; 0.02)
Mean systolic blood pressure (mmHg)		-0.71 (-1.24; -0.19)
Mean diastolic blood pressure (mmHg)		-0.27 (-0.64; 0.09)
Odds ratio of type-2 diabetes	0.66 (0.49-0.89)	Not estimated
Odds ratio of overweight/obesity	0.76 (0.71; 0.81)	0.88 (0.83; 0.93)
Mean performance in intelligence test (points)	3.45 (1.92-4.98)	2.19 (0.89-3.50)

[a] High-quality studies include those with larger sample sizes and adjustment for confounding variables relevant to each outcome (see individual chapters for further details).

Result from an interventional study in preterm cohorts showed some protective effects

Horta BL, Victora CG. Long-term effects of breastfeeding: a systematic review. http://apps.who.int/iris/bitstream/10665/79198/1/9789241505307_eng.pdf.

Recap: long-term health effects

- Higher intelligence→strong evidence from observational and experimental studies, in childhood up to adulthood
- Plausible allergy prevention →strong evidence for atopic dermatitis but weaker for asthma
- Small effect on obesity, diabetes, and cardivascular disease prevention
- New meta-analysis (n ≈ 10,000)→ decrease incidence of childhood leukemia

Maternal health benefits

European Code against Cancer 4th Edition: Breastfeeding and cancer☆

Breast cancer is the most frequent cancer in women, and incidence rates have been rising in European Union (EU) countries over recent decades due in part to a sharp decline in breastfeeding practices. Evidence for [redacted] and modest protective relationships between breastfeeding and the risk of endometrial and ovarian cancers have been suggested. The reduction in breast cancer risk is estimated at 2% for an increase of 5 months of lifetime breastfeeding. The longer women breastfeed, the more they are protected against breast cancer. In addition, breastfeeding is associated with several health benefits for both the mother and the breastfed child. Taking all this evidence into account, the 4th edition of the European Code against Cancer recommends: "Breastfeeding reduces the mother's cancer risk. If you can, breastfeed your baby".

Scoccianti C, et al. European Code against Cancer 4th Edition: Breastfeeding and cancer. Cancer Epidemiology (2015), http://dx.doi.org/10.1016/j.canep.2014.12.007

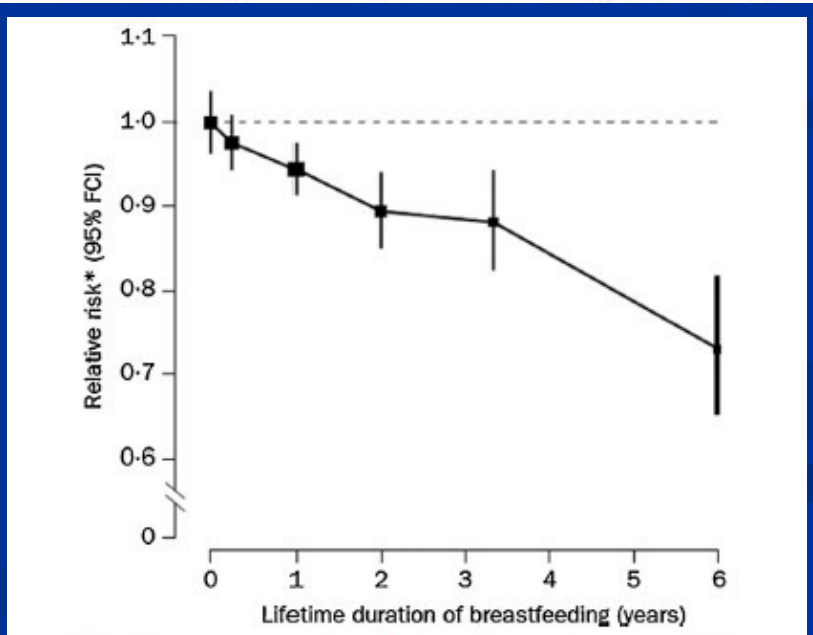


Fig. 3. Risk of breast cancer in relation to lifetime duration of breastfeeding. Relative risk (calculated as floating absolute risk) of breast cancer in parous women adjusted for parity, age, age at first birth, and menopausal status.

Recommendation from AAFP

Table 1. Health Risks for Mothers Who Do Not Breastfeed

Breast cancer	Myocardial infarction
Diabetes mellitus	Obesity
Hyperlipidemia	Ovarian cancer
Hypertension	

American Academy of Family Physicians. Breastfeeding (policy statement). http://www.aafp.org/about/policies/all/breastfeeding.html. Accessed August 12, 2014.

Advantages of breastfeeding
Risk increased with artificial feeding

- Infancy
  - Infections: diarrhea, pneumonia, otitis media, neonatal sepsis, NEC, *UTI, Invasive HIB*
  - *SIDS (Sudden Infant Death Syndrome)*
- Longer term (evidence exist but difficult to prove)
  - IQ, allergy, obesity, cardiovascular problems
  - *DM type I and II, IBD, Cancer, Malocclusion*
- Mothers
  - *Ovarian cancer, breast cancer*
  - *Rheumatoid arthritis*
  - *Obesity and cardiovascular problems*

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- Horta BL, Victora CG. Long-term effects of breastfeeding: a systematic review. http://apps.who.int/iris/bitstream/10665/79198/1/9789241505307_eng.pdf.

Take home message !

- การศึกษาเกี่ยวกับประโยชน์ของนมแม่ต่อสุขภาพลูกมีหลักฐานที่ชัดเจนว่าช่วยลดเรื่องการติดเชื้อในช่วงทารกและวัยเด็ก ทั้งในประเทศพัฒนาแล้วและกำลังพัฒนา
- หลักฐานชัดเจนทั้งจากการศึกษาแบบที่มี **intervention** และไม่มี **intervention** ว่าทารกที่กินนมแม่ระยะยาวมี **IQ** สูงกว่าเทียบกับกลุ่มที่ได้นมแม่น้อยกว่า
- การศึกษาเรื่องผลต่อสุขภาพลูกในระยะยาว เช่น ภูมิแพ้ อ้วน เบาหวาน โรคหลอดเลือดหัวใจ ยังต้องติดตามต่อไปเนื่องจากโรคเหล่านี้มีหลายปัจจัยร่วม ประโยชน์ที่ได้จากการกินนมแม่อาจถูกทำให้เบาบางลงจากปัจจัยอื่นๆ เช่น พันธุกรรม สิ่งแวดล้อม วิถีการดำรงชีวิตในวัยผู้ใหญ่
- มีผลการศึกษาใหม่ๆ เกี่ยวกับประโยชน์ของการได้รับ/ให้นมแม่ต่อการลดโอกาสในการเกิดมะเร็งทั้งในลูก (มะเร็งเม็ดเลือดขาว) และแม่ (มะเร็งเต้านม) ซึ่งน่าเชื่อถือ


Thank you for your kind attention!