Breastfeeding and Early Childhood Development

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www.thelancet.com/series/ECD2016
Learning Objectives

1. Describe the major methodological challenges in studying breastfeeding and childhood development.

2. Describe the strength of the evidence linking breastfeeding and childhood development.

3. Describe strategies to promote both breastfeeding and childhood development.
The Amazing Journey of Human Development

- Genetic blueprint in the embryo/fetus establishes basis of development
- Environment modifies blueprint during critical periods of development
Developmental Perspective

Human Brain Development

1000 days

Fetus  Late Infancy/Toddler  Pubertal

Thompson & Nelson, 2000
Environments Across the Life-course

Quality of early environments (including nutrition) shape a child’s future potential.
Interactions Across The Life-course

Foundations for healthy & productive life set in early childhood
Hypothesized Mechanisms Linking Breastfeeding and Cognition

- **Content** of breast milk (DHA)
- **Process** of feeding at the breast
  - Skin-to-skin
  - Internal regulation
- Process of feeding breast milk from a bottle
- Exclusivity vs. mixed feeding
- Duration

\[\text{confounded}\]
\[\text{not independent}\]
Methodological Challenges in Breastfeeding Research

• Most studies observational: associations between breastfeeding and cognition → correlational
• Randomized trials
  • Randomize mothers to breast/formula (preemies)
  • Randomize baby friendly hospitals
• Propensity score matching - simulated random assignment by matching on background scores
  • (e.g., demographics, depressive symptoms, smoking hx, medical insurance, social class, number siblings)
Methodological Challenges in Breastfeeding Research

- What to study: initiation, exclusivity, or duration
- Initiation, exclusivity, and duration vary with social conditions
- Birth intervals (no. of siblings) vary by breastfeeding
- Infant cognition influenced by heritability (maternal IQ)
- Many investigators do not adequately adjust for social conditions
Methodological Challenges in Breastfeeding Research

• Quality of formula
  • Vary over time and across countries
• Delivery method
  • Breast
  • Bottle (mother, other)
• What about the infant’s role??
  • Initiation of sucking
  • Harder at breast than bottle
RCT: Promotion of Breastfeeding Intervention Trial (PROBIT) Belarus

- Cluster-randomized trial of breastfeeding promotion intervention: Baby-Friendly Hosp
- At 3 mos. Exclusive breastfeeding rates: 43.3% vs. 6.4%
- At age 6.5 years, examined cognition:
  - Wechsler Abbreviated Scales of Intelligence (WASI)
  - Teacher report
  - Intervention vs. Control group
  - N = 13,383 children

Kramer, JAMA Psychiatry, 2008
PROBIT WASI Findings

All differences significant (adjusted for clustering & 10 confounders)

Kramer, JAMA Psychiatry, 2008
PROBIT Teacher Ratings

Reading differences significant (adjusted for clustering & 10 confounders)

Kramer, JAMA Psychiatry, 2008
Trial: Breast milk vs Formula to Preemies

• Trial – all tube/bottle fed
  • Breast milk vs Formula
• At age 7½ - 8 years, WASI administered
• N=300
• 8.3 point advantage among children given breast milk

Lucas, The Lancet, 1992
Meta-analysis Breastfeeding and IQ

• 17 studies
• 3.44 point IQ difference across studies
  • Studies that controlled for maternal IQ found 2.62 point difference
• Possible causal effect
  • Milk
  • Skin-to-skin contact

Horta, Acta Paediatrica, 2015
Propensity Score: Ireland
Breastfeeding and Cognition (age 3-5)

Compare:
• Fully breast fed (exclusive)
• Not breastfed

British Abilities Score (cognition & vocabulary)
Strengths & Difficulties (behavior) (parent & teacher)

N~8000
Breastfeeding and Cognition (age 3-5)

![Graph showing the proportion of full and partial breastfeeding rates over duration of breastfeeding.](image)

**FIGURE 1**
The category “1” on the x-axis represents breastfeeding up to 31 days; “2” represents between 32 and 180 days; and “3” represents ≥181 days.

Girard, Pediatrics, 2017
Results

• < 1 month
  • No differences in any outcome ages 3-5

• 1-6 months
  • No differences in any outcome ages 3-5

• > 6 months
  • Problem-solving. 2.95 points higher*
  • Hyperactivity. 0.84 points lower

Similar findings using partial breast feeding vs. no breast-feeding

* Did not hold after adjustment for multiple comparisons
30 year follow-up from Brazil

• Cohort enrolled 1982

• High rates of breast feeding initiation (few socioeconomic differences)

• At age 30, Wechsler Intelligence Scales administered, data on educational attainment and annual income

IQ at Age 30 by Breast feeding Duration, reference no bf

Adjusted for family income, parent ed, household index, skin color, mat smoking preg, birth wt, breastfeeding duration

Years Schooling at Age 30 by Breastfeeding Duration, reference no bf

Adjusted for family income, parent ed, household index, skin color, mat smoking preg, birth wt, breastfeeding duration

Income at Age 30 by Breastfeeding Duration, reference no bf

Adjusted for family income, parent ed, household index, skin color, mat smoking preg, birth wt, breastfeeding duration

72% of effect of breastfeeding on income at age 30 mediated by IQ

Direct acyclic graph of the effect of breastfeeding on monthly income at 30 years

NIE shows that 72% of the total effect of breastfeeding on income at 30 years (99 [95% CI 6.0–192.0]) is mediated by an individual’s IQ and only 28% through NDE. We adjusted estimates for base confounders—family income at birth, parental education, household score index, genomic ancestry, maternal smoking during pregnancy, and birthweight—and educational attainment as a postconfounder. NIE=natural indirect effect. NDE=natural direct effect.
Are small gains in IQ meaningful?

• At an individual level, perhaps not
• At a population level, yes
  • a distribution shift means fewer individuals in the Intellectually deficient range

Economists: each IQ point increases lifetime earnings by 1.8-2.4%

Life Course Perspective to Child Development

Healthy nutrition and learning opportunities throughout life

Conception

Birth

Early Childhood

Childhood

Adolescence

Adulthood

Black et al., Lancet, 2017
Life Course Perspective to Child Development

- Conception
- Birth
- Early Childhood
- Childhood
- Adolescence
- Adulthood

Healthy nutrition and learning opportunities throughout life

Chronic health problems
Limited economic potential
Nurturing Care

- Nurturing care promotes early child development

Each component of Nurturing Care is necessary!

No single component is sufficient.

Black et al., Lancet, 2017
Nurturing care is fostered by a supportive environment
Nurturing care is fostered by a supportive environment – the ecological model
Nurturing care is fostered by a supportive environment – the ecological model

Nutrition & Early Child Development Programs

Capacity for nurturing care

Nurturing care: parents & caregivers
Nurturing care is fostered by a supportive environment – the ecological model

- National Policies
- Early Child Development Programs
- Capacity for nurturing care
- Nurturing care: parents & caregivers
Breastfeeding Promotion

• Focus on mothers
  • Preparation
  • Peer counselors

• Focus on environment
  • Families
  • Workplace
  • Policies
Countries that guarantee breastfeeding breaks at work
Breastfeeding at 12 months

Figure 1: Global distribution of breastfeeding at 12 months
Data are from 153 countries between 1995 and 2013.
Summary: Lancet series on Breastfeeding

- Most countries do not support or provide enabling environment for women who want to breastfeed.
- Countries can improve breastfeeding practices by scaling up known interventions, policies, and programs.
- Breastfeeding promotion is a collective societal responsibility.
- Breastmilk substitute industry is large and growing, and its marketing undermines efforts to improve breastfeeding.
- Health and economic costs of suboptimal breastfeeding are unrecognized.
- Measure investments to promote breastfeeding against the cost of not investing.
- Political support and financial investment as essential.

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Global Child Development Group
www.globalchilddevelopment.org
www.thelancet.com/series/ECD2016