

# Breastfeeding and Infant Health: Why you may not want to randomize even if you could

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Mechanisms in Medicine

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# Why breastfeeding?

- Wide consensus over its benefits backed almost universally:
  - Pediatricians and health authorities
  - WHO
  - *'lactivism'*
- Increasing adoption of breastfeeding and of exclusive breastfeeding as the default feeding option in the first months/years

-A closer look on current evidence over benefits suggests that public and private campaign efforts may not be justified. Evidence is:

Contradictory

Observational.

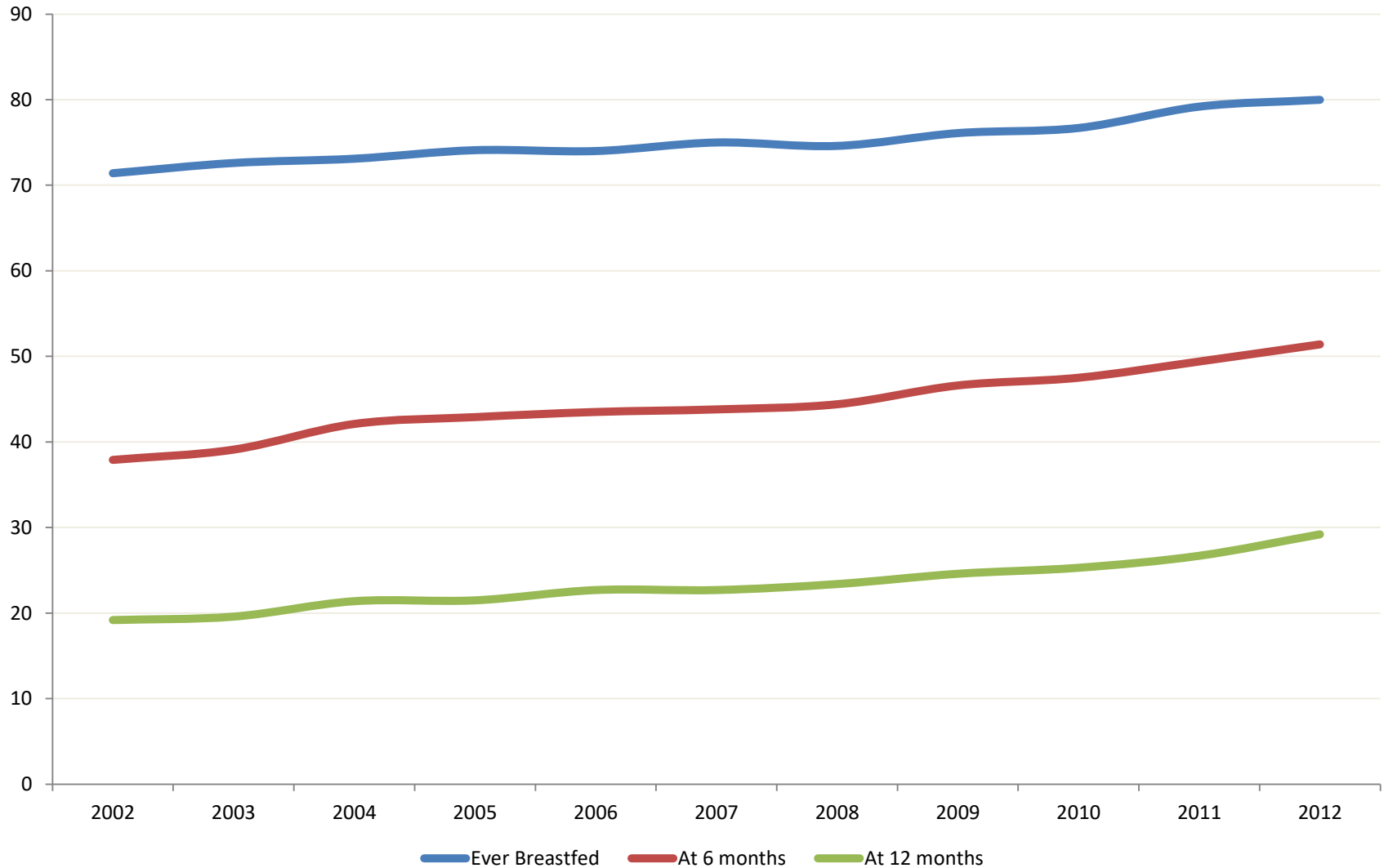
-But would randomization solve most problems?

NO

<b>Country</b>	<b>Ever breastfed</b>	<b>Exclusive</b>	<b>Months</b>	<b>Any at 6 months</b>
Norway	99	70	3	80
Slovenia	97			
Sweden	98	60	4	72
Luxembourg	90	26	4	41
Austria	93	60	3	55
Lithuania	98	41	3	31
Latvia	92	63	3	46
Czech Rep	96			53
Netherlands	81	30	3	37
Germany	96	33	4	48
Estonia	82			40
Poland	71	31	3	
Portugal	90	52	3	29
France	65			
Belgium	72	25	3	25
Ireland	46			
Italy	91	47	3	47
Switzerland	92			41
N. Zealand	88	56	3	
Cyprus	79	52	3	
Denmark	98	48	3	
Greece	86			
Slovak Rep.	92	57	4	
Spain	76	44	3	40
UK	81	13	3	25
Finland	93	51	3	60
Japan	97	38	3	
Hungary	96	62	4	
Canada	90	52	3	54
Iceland	98	48	4	65
Australia	96	39	3	60
Malta	62			
US	75	35	3	44

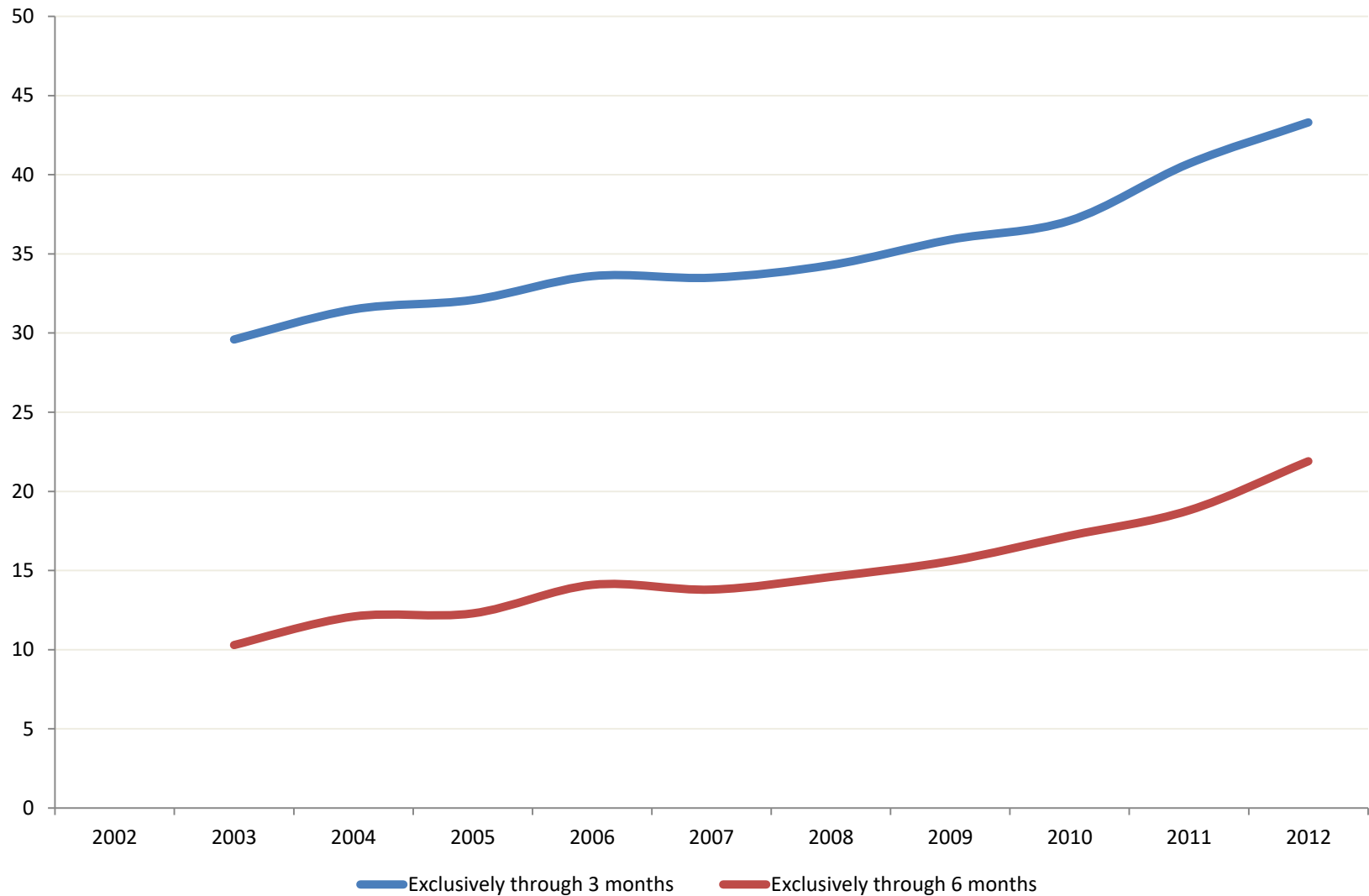
Source: 2012 "Nutrition in the First 1,000 Days". Save the Children

# % of children breastfed (US)



Source: Centers for Disease Control and Prevention.

# % of children exclusively breastfed (US)



Source: Centers for Disease Control and Prevention.

## Alleged benefits of breastfeeding

- Breastfeeding benefits for infants
  - Higher I.Q.
  - Lower risk of Sudden Infant Death Syndrome
  - Lower incidence of food allergies
  - Lower incidence of asthma
  - Lower incidence of eczema
  - Lower incidence of obesity
  - Lower incidence of type II diabetes
  - Lower incidence of ear infections (*acute otitis media*)
  - Lower incidence of respiratory infections
  - Lower incidence of gastrointestinal infections
  - Lower incidence of necrotizing enterocolitis in premature babies



# 10 good things you need to know about exclusive\* breastfeeding



**1 saves life**  
and protects baby against disease with antibacterial agents.



**2 provides**  
all nutrients baby needs for the first 6 months.



**3 ensures**  
clean and safe source of food, especially in emergencies.



**4 makes**  
child grow strong and intelligent.



**5 breaks**  
the cycle of diarrhea and malnutrition.



**6 bonds**  
mother and child.



**7 reduces**  
the mother's risk of ovarian and breast cancer.



**8 helps**  
space pregnancies, a natural method of birth control.



**9 saves money**  
by not having to buy infant formula and feeding equipment.



**10 protects**  
the environment with no need for packaging and disposal.

\*exclusive means 100% breastmilk, no water, no solid food, nothing else.

## Stash your Breastmilk for a sick day.

Freeze small portions of your Breastmilk  
You can use to help cure sore ears, crusty eyes  
and runny noses.



The possibilities are endless...

## BENEFITS OF BREASTFEEDING



**TO THE CHILD**  
Starting breastfeeding in the first hour after birth improves chances of a child to survive

**22%**

reduction in the risk of death related to sepsis, pneumonia, diarrhoea and hypothermia

**14 times**  
more likely to survive the first six months of life than non-breastfed children



**TO THE MOTHER**  
Starting breastfeeding in the first hour reduces mother's risk of death

Mothers who breastfeed are less likely to become pregnant in the first six months following delivery and return to their pre-pregnancy weight sooner

Experience less post-partum depression and also have a lower risk of ovarian and breast cancers



### Hair

Breastfed toddlers have glossier, healthier hair. Protein is a major functional and structural component of hair cells and is essential for growth and repair. After 12 months 448 ml (15 ounces) of breastmilk provides 45% of a toddler's protein requirements in its most natural form.

### Taste Buds

Breastfed toddlers are less likely to be fussy eaters. However, even if they go through a fussy period, breastfed toddlers still get their taste buds stimulated by the range of flavors in their Mummy's milk.

## The Breastfed Toddler

### Brain

Higher intellectual and cognitive aptitude compared to formula fed peers and peers breastfed for a shorter amount of time.

### Ears

Breastfed toddlers have better hearing due to lower incidence of ear infections.

### Eyes

As the eye is similar to the brain in regards to nervous tissue, breastfed toddlers have stronger vision. Also at 12 months 448 ml (15 ounces) of breastmilk provides 75% of a toddler's vitamin A requirements. Vitamin A is needed by the retina of the eye and is necessary for both low-light (scotopic vision) and color vision.

### Teeth

Thumb sucking is less likely to occur in breastfed toddlers so their teeth are less likely to become misaligned. Also increased duration of nursing actually improves the dental arch.

### Independence

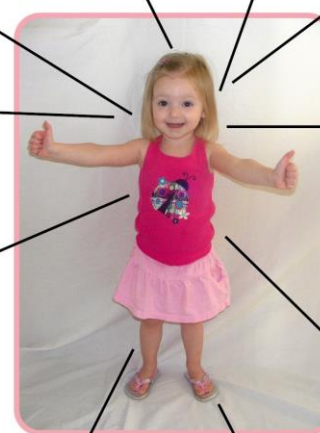
Breastfeeding is part of meeting a child's dependency needs, and this is the key to helping the child achieve independence. Children who achieve independence at their own pace are more secure in that independence than children forced into independence prematurely.

### Weight

Toddlers who are breastfed for extended periods of time tend to have leaner bodies with less risk of obesity.

### Portability

Breastfed toddlers are easier to travel with. Nursing is far more convenient than carrying around feeding cups and paraphernalia, and can be a wonderful way of providing reassurance in unfamiliar surroundings.



### Limbs

Breastmilk is an excellent painkiller the bumps and bruises that come along with toddlers and climbing.

### Skin

Smoother and more supple.

### Hydration

Although breastfed toddlers are less likely to become ill, if they do get sick breastmilk can keep them hydrated when they can not tolerate other liquids.

# Other effects of breastfeeding and formula feeding

- B'feeding impact on mother's health:
  - **postpartum depression**
  - premenopausal breast cancer
  - ovarian cancer
  - retained gestational weight gain
  - type 2 diabetes
  - myocardial infarction
  - metabolic syndrome
- B'feeding risks for infants:
  - Increased risk of dehydration
  - Increased risk of hypoglycemia
  - Increased risk of neonatal Jaundice
  - Increased risks of anemia
  - Increased risk of failure to thrive (length, weight and head circumference)



# Selection bias and overestimation of effects

## “Selection to treatment” bias:

mother's (family/household) characteristics affect both the feeding choice and the infant's health

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 **Social Science & Medicine**  
Volume 109, May 2014, Pages 55–65

**Is breast truly best? Estimating the effects of breastfeeding on long-term child health and wellbeing in the United States using sibling comparisons**

Cynthia G. Colen , David M. Ramey  
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<https://doi.org/10.1016/j.socscimed.2014.01.027> [Get rights and content](#)


### Highlights


- In the U.S., breastfeeding is strikingly socially patterned, especially by race and SES.
- We use sibling comparisons to estimate the effect of breastfeeding on long-term child wellbeing.
- Outcomes include BMI/obesity, asthma, hyperactivity, attachment, compliance, academic achievement and competence.
- The effect of breastfeeding on 10 of the 11 outcomes is substantially attenuated when comparing siblings.
- Our results suggest that typical estimates of the impact of breastfeeding on child wellbeing may be overstated.


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### FAMILY

## Is Breast-Feeding Really Better?

By **NICHOLAS BAKALAR** MARCH 4, 2014 12:49 PM 282

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Many women who are unable to breast-feed feel guilty about it and worry they may be depriving their children of a range of benefits. Groups like the American Academy of Pediatrics and the World Health Organization recommend six months of exclusive breast-feeding for all infants, citing studies that show breast milk is easily digestible and has nutrients that are superior to or absent from infant formulas, including immunological substances that reduce rates of infection and fatty acids important in brain development.

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# Strategies to minimize Selection Bias

## 1) Siblings studies: exploit intra-family variation

Limitation:

- Few databases
- Limited subsamples for discrepancies of breastfeeding across siblings
  - selection bias within each discrepant cases

## 2) Other, “quasi-experimental” statistical methods:

e.g., Propensity Score Matching

e.g., Augmented probability weighting

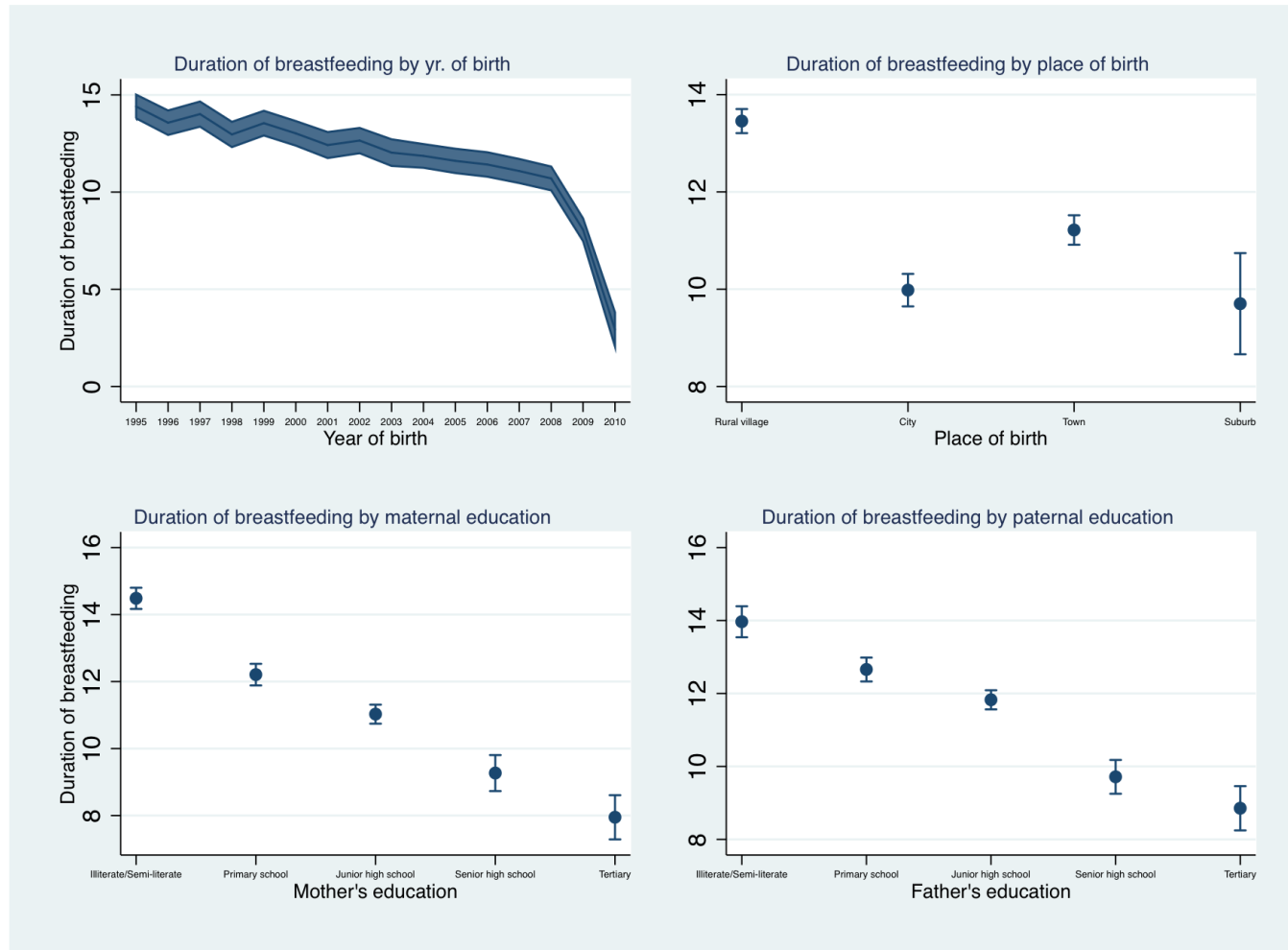
## 3) Strategic selection of cases:

Countries where BFers show an alternative route to selection to the treatment

- A distinct pattern of normativization. E.g., China

# Breastfeeding in China

## Duration of breastfeeding (in months) by various characteristics



Legend: Results from the estimation of separate HLM models (with province fixed effects) predicting the average duration of breastfeeding by family characteristics. Uncontrolled effects. Results available upon request.

# Randomization

## Kramer's PROBIT study: Random allocation of BFHI training

- 17,795 mothers at 32 sites. infants were followed up at 1, 2, 3, 6, 9, and 12 months of age.

Infants from the intervention sites were:

- more likely to be breastfed at 12 months
- more likely to be exclusively breastfed at 3 months and at 6 months
- Statistically significant reduction in the risk of gastrointestinal tract infections and of atopic eczema.
- No statistically significant reduction in respiratory tract infection.

- B'feeding benefits for infants
  - Higher I. Q.
  - Lower risk of SIDs
  - Lower incidence of food allergies
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# Recalcitrant selection bias

## **“Selection of the treated” bias:**

- child's characteristics affect the duration of treatment
  - neonatal health is likely to predict b-feeding success
- DOSE RESPONSE: DURATION OF BREASTFEEDING DEPENDS ON ITS SUCCESS.

## **Other, adjunct biases involved:**

### **“Administration” bias:**

administration of breastmilk is inseparable from mother's attention to baby, so effects of the two treatments can be confounded

### **“Self-fulfilling” bias:**

induced adoption of treatment may not benefit infants for which breastfeeding is difficult, thus further biasing results

# Breastfeeding

- Supply-demand system
  - Imperfect: unobservable characteristics of both mother (supply) and demand (infant) affect the b'feeding process
- Duration of b'feeding depends on mother's socioeconomic constraints and preferences **but also, crucially, on the characteristics of the S-D dyad**
  - S: Approximately 5-20% mothers have delayed lactogenesis II and insufficient supply (lack of reliable data!)
  - D: No reliable data on the determinants of b'feeding ability in babies. Tied tongue, low muscle tone, etc.

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# Possible solutions:

- Clinical studies in which milk and interaction can be separated (i.e. pre-term children fed with mother's breast milk (in bottle), mother's breast milk from breast, donor's breast milk in bottle, compared with children fed with formula): very complex data-collecting process

and

- **Close examination of the mother-child dyad:** further understanding is needed of the mechanics of breastfeeding:
  - a complex supply-demand system
- **Randomization is not only impractical and/or unethical.**
  - It could exacerbate selection problems

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  - Approximately 5-20% mothers have delayed lactogenesis II and insufficient supply (lack of reliable data!)
  - No reliable data on the determinants of b'feeding ability in babies. Tied tongue, low muscle tone, etc.
- **Notwithstanding these factors, pro-breastfeeding campaigns are targeted UNIVERSALLY**

## **Discussion:**

### **Heterogeneous effects and current promotion strategies**

- Benefits are targeted (i.e. preterm babies, developing countries, etc), and modest but recommendations are universal.
- No evidence that benefits are due to exclusive breastfeeding; yet, policy focuses on exclusiveness.
- The aim of universality can endanger vulnerable babies and mothers.

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**THANK YOU**

## Discussion

In light of this evidence and its flaws, can this be considered strong evidence? No

Formulation of policy recommendations based on weak medical evidence, uncritical reception from policy makers.

This applies to other topics in public health, but also outside the health domain.