Improving Mother's Nutrition to Impact Health of Future Generations – Latest Evidence on Benefits of Maternal Milk Supplementation on Birth Outcomes & Breastfeeding Success

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Outline

- **Importance of maternal nutrition for good headstart to life**
- **International evidence**
  - **Role of maternal nutritional supplementation**
- **Local evidence**
  - **First ever maternal milk supplementation study in Vietnam**

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Study from Harvard School of Public Health, USA

PLOS | MEDICINE

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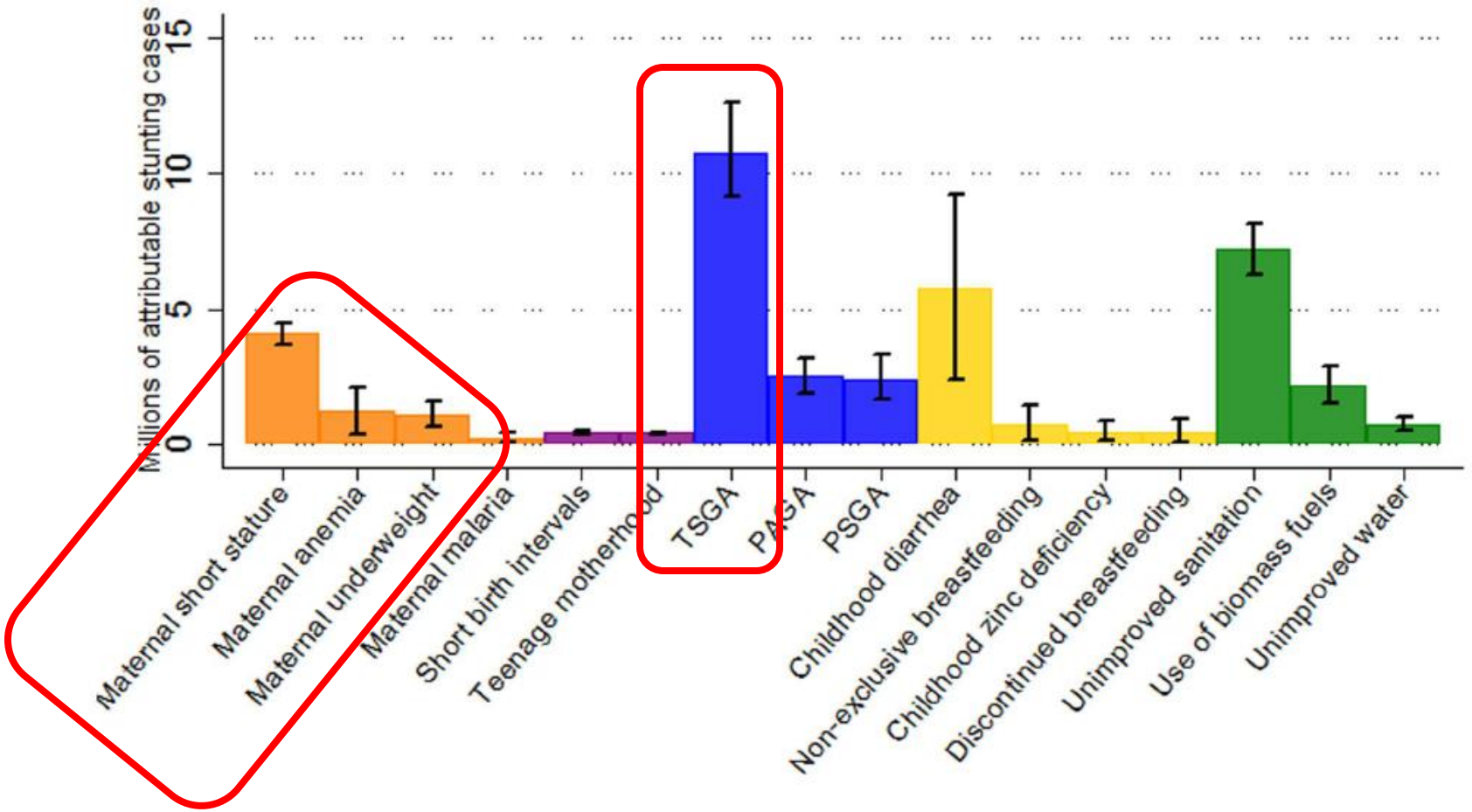
RESEARCH ARTICLE

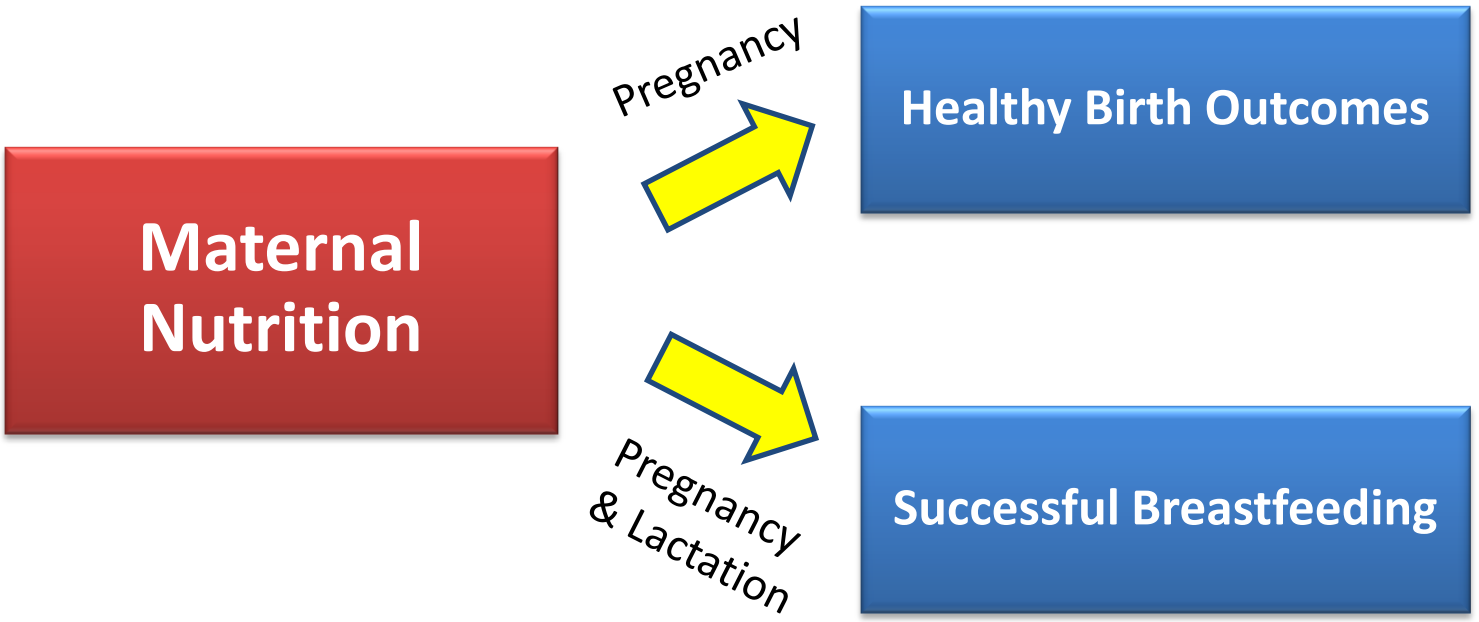
Risk Factors for Childhood Stunting in 137 Developing Countries: A Comparative Risk Assessment Analysis at Global, Regional, and Country Levels

Goodarz Danaei[1,2]*, Kathryn G. Andrews[1], Christopher R. Sudfeld[1], Günther Fink[1], Dana Charles McCoy[3], Evan Peet[1,4], Ayesha Sania[1], Mary C. Smith Fawzi[5], Majid Ezzati[6,7], Wafaie W. Fawzi[1,2,8]

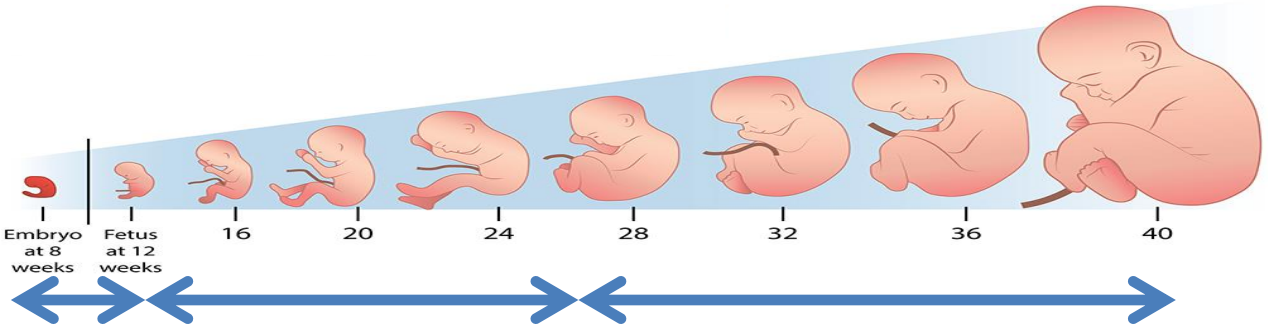
Term, small for gestational age (TSGA) is the leading risk factor for stunting worldwide



Maternal nutrition - Key to healthy birth outcomes and successful breastfeeding



Optimal nutrition during pregnancy to support normal and healthy fetal development



- Energy: +50 kcal +250 kcal +450 kcal
- Protein: +1 g +10 g +30 g
- Minerals (iron, zinc, calcium & iodine): + 20% to 50% compared with non-pregnant, non-breastfeeding women
- Vitamin (B vitamin, vitamin A, C & D): + 10% to 50% compared with non-pregnant, non-breastfeeding women

Build energy and nutrient store for later breastfeeding

Optimal nutrition during breastfeeding contributes the success of breastfeeding

Requirements during breastfeeding are higher than during pregnancy for most nutrients

	First 6 months	Second 6 months
• Energy:	+500 kcal (10% higher than in pregnancy)	
• Protein:	+19 g	+13 g
• Minerals (zinc, calcium, iodine): + 8 to 15% compared with pregnant women		
• Vitamin (B vitamin, vitamin A, C & E): + 5 to 50% compared with pregnant women		

Healthy Birth Outcomes

- Birth weight
- Birth length
- Birth head circumference

Birth outcomes (even within normal range) associated with later IQ in Singapore babies

TABLE 2 Relationship of BL, BW, HC, and GA With Childhood IQ

	All Children, β Coefficient (95% CI)		Excluding BW > 4 kg, BW < 2.5 kg, GA < 37 wk, HC > 36 cm, HC < 32 cm[a], β Coefficient (95% CI)	
	IQ Score, Model 1[b]	IQ Score, Model 2[c]	IQ Score, Model 1[b]	IQ Score, Model 2[c]
BL, per 1-cm increase	0.37 (0.14 to 0.61)	0.49 (0.19 to 0.78)	0.44 (0.08 to 0.79)	0.50 (0.12 to 0.87)
p	.002	.001	.016	.010
BW, per 1-kg increase	1.37 (0.24 to 2.49)	2.19 (0.60 to 3.77)	2.19 (0.04 to 4.34)	2.70 (0.43 to 4.98)
p	.017	.007	.046	.020
HC, per 1-cm increase	0.42 (0.08 to 0.75)	0.62 (0.21 to 1.04)	0.89 (0.23 to 1.55)	0.96 (0.26 to 1.66)
p	.015	.003	.009	.008
GA, per 1-wk increase[a]	0.05 (−0.32 to 0.41)	0.04 (−0.34 to 0.43)	−0.32 (−0.94 to 0.30)	−0.31 (−0.98 to 0.35)
p	.805	.821	.309	.351

[a] GA was not adjusted for in these models.

[b] Linear regression model of IQ scores, adjusted for age, gender, ethnicity, school, and mother's education.

[c] Linear regression model of IQ scores, adjusted for age, gender, ethnicity, school, mother's education, BMI, mother's age at birth, mother's and father's smoking, family size, birth order, and GA.

Broekman et al, 2009

Head circumference associated with different aspects of later IQ

TABLE 2 Differences in IQ at 4 Years of Age According to SDS Increases in Head Growth Variables Considered Simultaneously, With and Without Adjustment for Parental Factors

Head Growth Variable	Regression Coefficient (95% CI)	
	Not Adjusted for Parental Factors	Adjusted for Parental Factors
Full-scale IQ		
Head circumference at birth SDS	2.14 (1.02–3.26)[a]	2.41 (1.31–3.50)[a]
Conditional head growth		
Between birth and 1 y	2.60 (1.27–3.94)[a]	1.97 (0.68–3.26)[a]
Between 1 and 4 y	1.59 (−0.20 to 3.37)	0.46 (−1.25 to 2.17)
Verbal IQ		
Head circumference at birth SDS	1.33 (0.23–2.41)[a]	1.65 (0.59–2.71)[a]
Conditional head growth		
Between birth and 1 y	2.57 (1.27–3.86)[a]	2.00 (0.75–3.25)[a]
Between 1 and 4 y	1.06 (−0.69 to 2.80)	−0.21 (−1.88 to 1.45)
Performance IQ		
Head circumference at birth SDS	2.42 (1.26–3.57)[a]	2.52 (1.35–3.69)[a]
Conditional head growth		
Between birth and 1 y	1.79 (0.41–3.16)[a]	1.42 (0.07–2.76)[a]
Between 1 and 4 y	1.83 (−0.01 to 3.68)	0.90 (−0.90 to 2.70)

Parental factors were parental education, social class, parenting score, duration of breastfeeding, maternal age, history of postnatal depression, and number of older siblings.

[a] $P < .05$.

Gale et al, 2006

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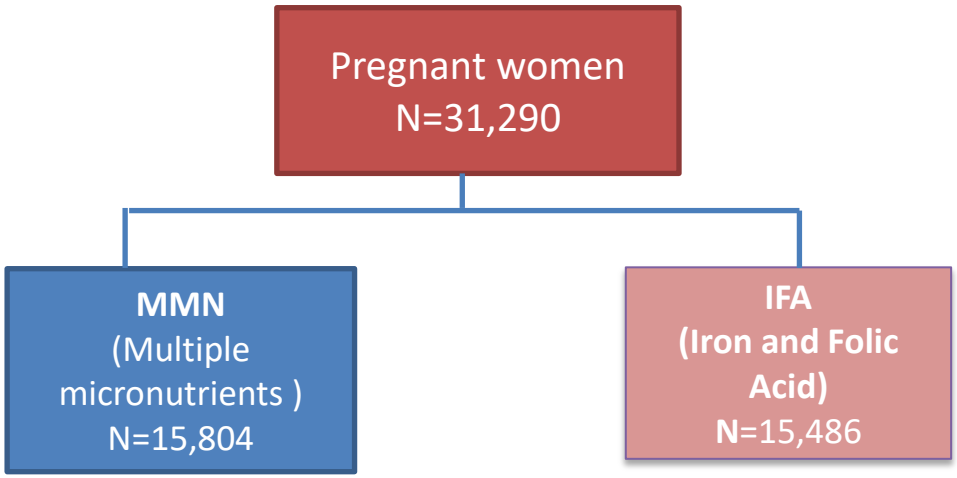
Supplementation with Multiple Micronutrients Intervention Trial (SUMMIT) in Indonesia



Supplementation duration from enrolment to 3 months postpartum

Neonatal outcomes

Follow up – Cognition 3-5 years

Follow up – Cognition 9-12 years

Neonatal outcomes
- 14% ↓ in Low Birth Weight
- 11% ↓ in fetal loss & neonatal deaths
- 18% ↓ in 3m infant mortality

Cognition outcomes : 3-5 years
- ↑ motor ability
- ↑ visual attention/ spatial ability

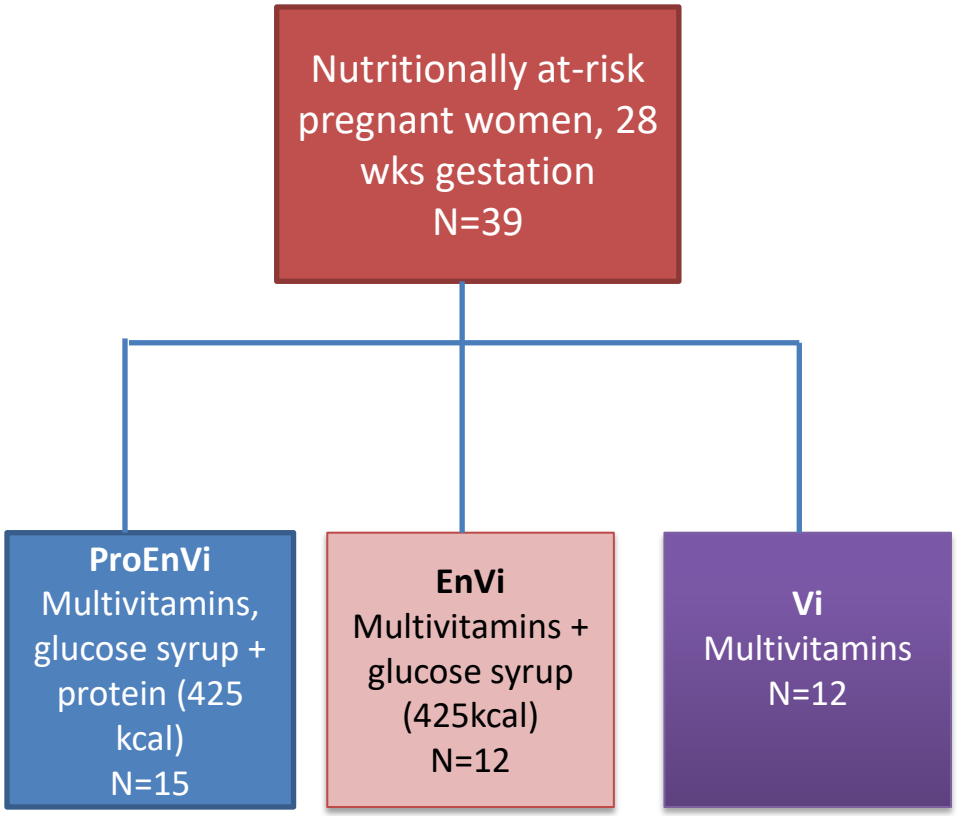
in children of undernourished mothers

Cognition outcomes : 9-12 years
- ↑ procedural memory (equivalent to half year schooling)
- ↑ in 18 out of 21 tests

SUMMIT study group, Lancet 2008
Prado et al, Pediatrics 2012
Prado et al, Lancet Global Health 2017

Supplementation of multiple micronutrients is more effective than iron and folic acid alone and has long term benefits on child cognitive development

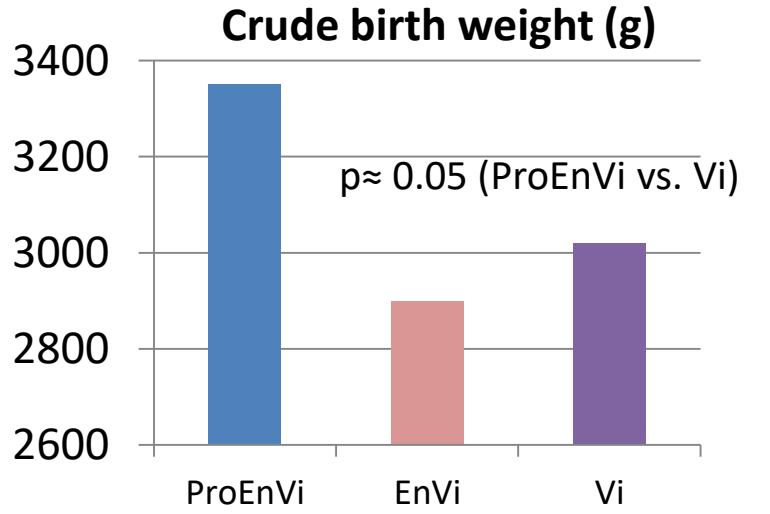
Protein energy multivitamins supplementation during the last trimester improves birth weight in Asian mothers at nutritional risk who lived in UK

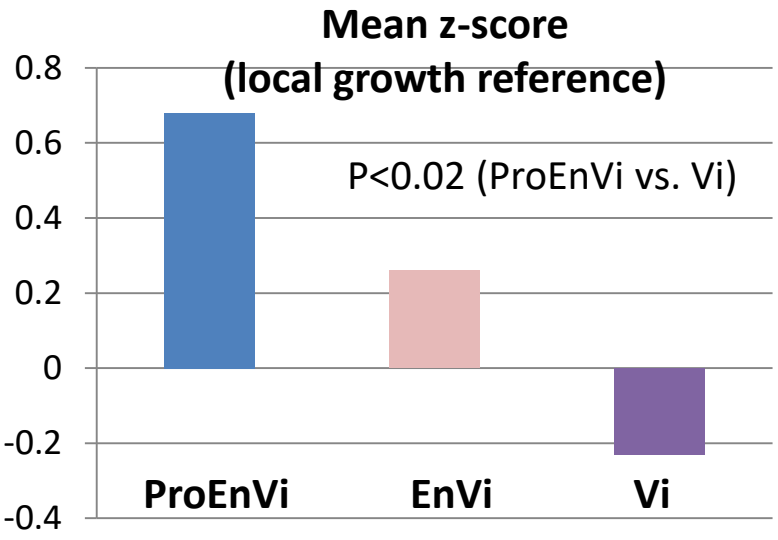


Supplementation duration from 28-38 weeks gestation

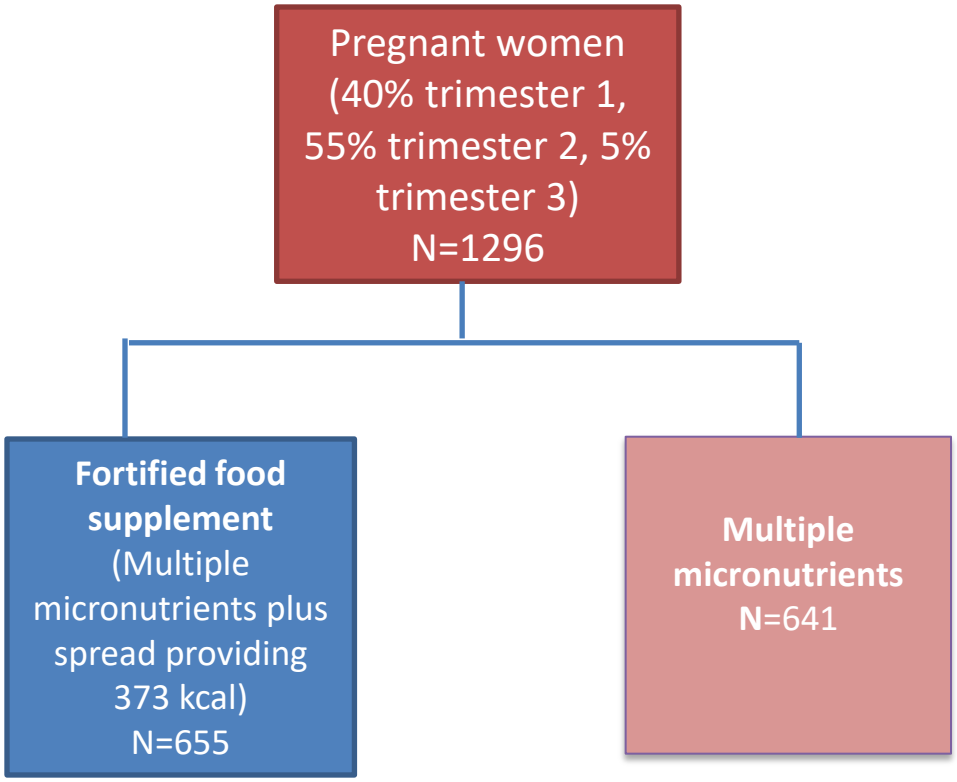
No differences in other growth parameters

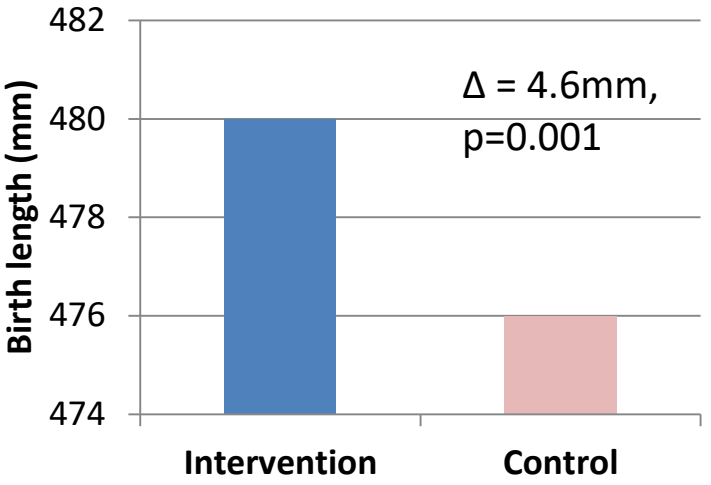
Viegas et al, Clin Res Edu 1982

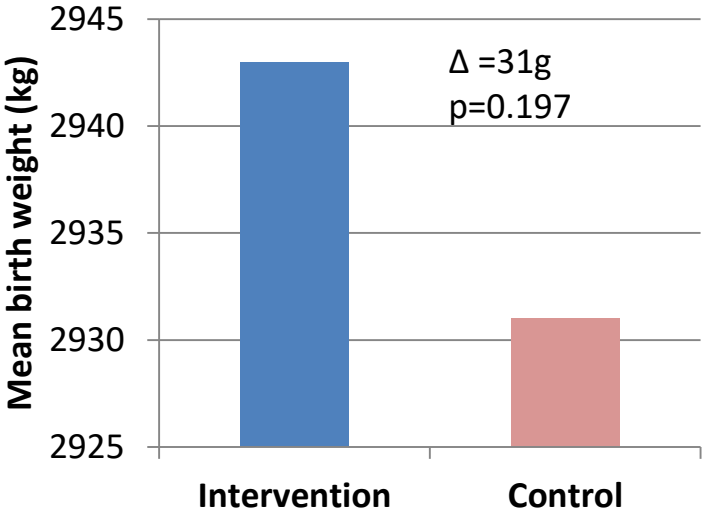




Impact of fortified food supplement vs. multiple micronutrient supplementation on birth outcomes in African women







Huybregts et al, AJCN 2009

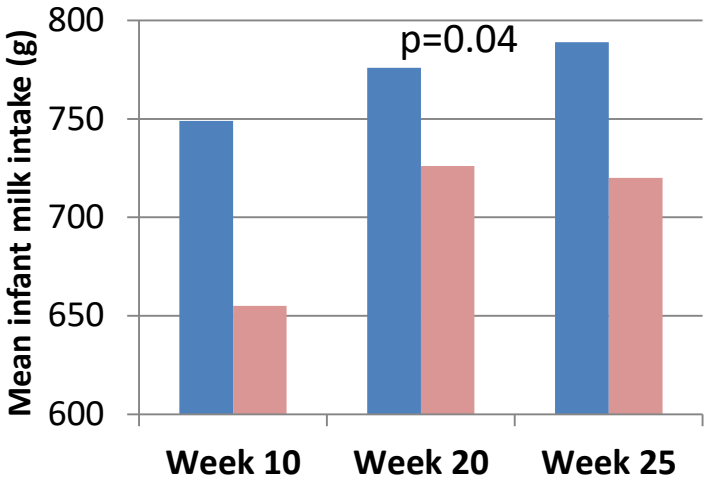
Supplementation of protein, energy and multiple micronutrients is more effective in improving birth outcomes compared with multiple micronutrient supplementation alone

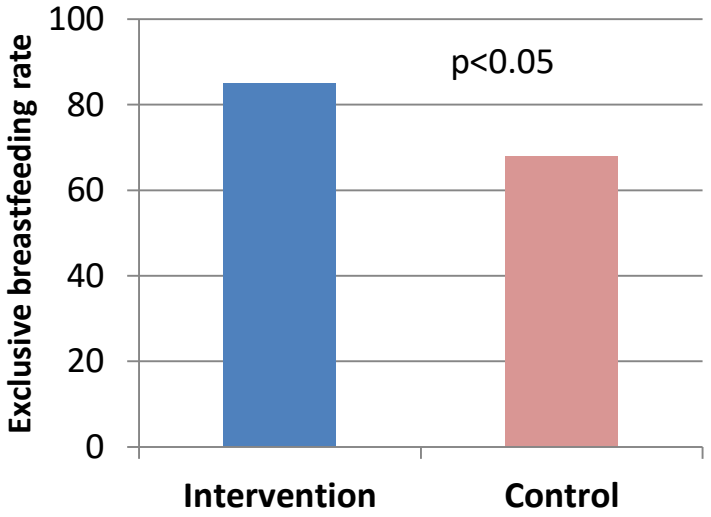
Higher energy food supplementation increases breast milk production in nutritionally at-risk breastfeeding mothers

Nutritionally at-risk breastfeeding women 5wks postpartum
N=53

Higher energy fortified food supplement
(510 kcal, 10% protein, 45% carbohydrate, 45% fat)
N=27

Low energy fortified supplement with lower micronutrients
(119 kcal, 12% protein, 72% carbohydrate, 16% fat)
N=26





Gonzalez-Cossio et al, J Nutr 1998

Maternal nutritional supplementation during breastfeeding helps improve breastfeeding performance

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- Importance of maternal nutrition for good headstart to life
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How can a daily continued maternal milk supplementation from pregnancy to breastfeeding in conjunction with lactation support help mothers and babies – New evidence in Vietnamese mothers

The key findings of this study are also mentioned in the Maternal Nutrition Guideline

Study Objective

Collaboration with Vietnam National Institute of Nutrition

To evaluate the effects of a lactation support program consisting of:

- Maternal milk supplementation twice daily
- Pre- and postnatal breastfeeding education and consultation

on birth outcomes and breastfeeding performance in Vietnamese mothers

Study Design

26-29 weeks gestation

Delivery

Week 4

Week 8

Week 12

Postpartum

Vietnamese pregnant women (N=228)
- 26-29 weeks gestation
- 20-35 y
- pre-pregnant BMI <25

Intervention N=114

2 servings of maternal milk/ day + Lactation support*

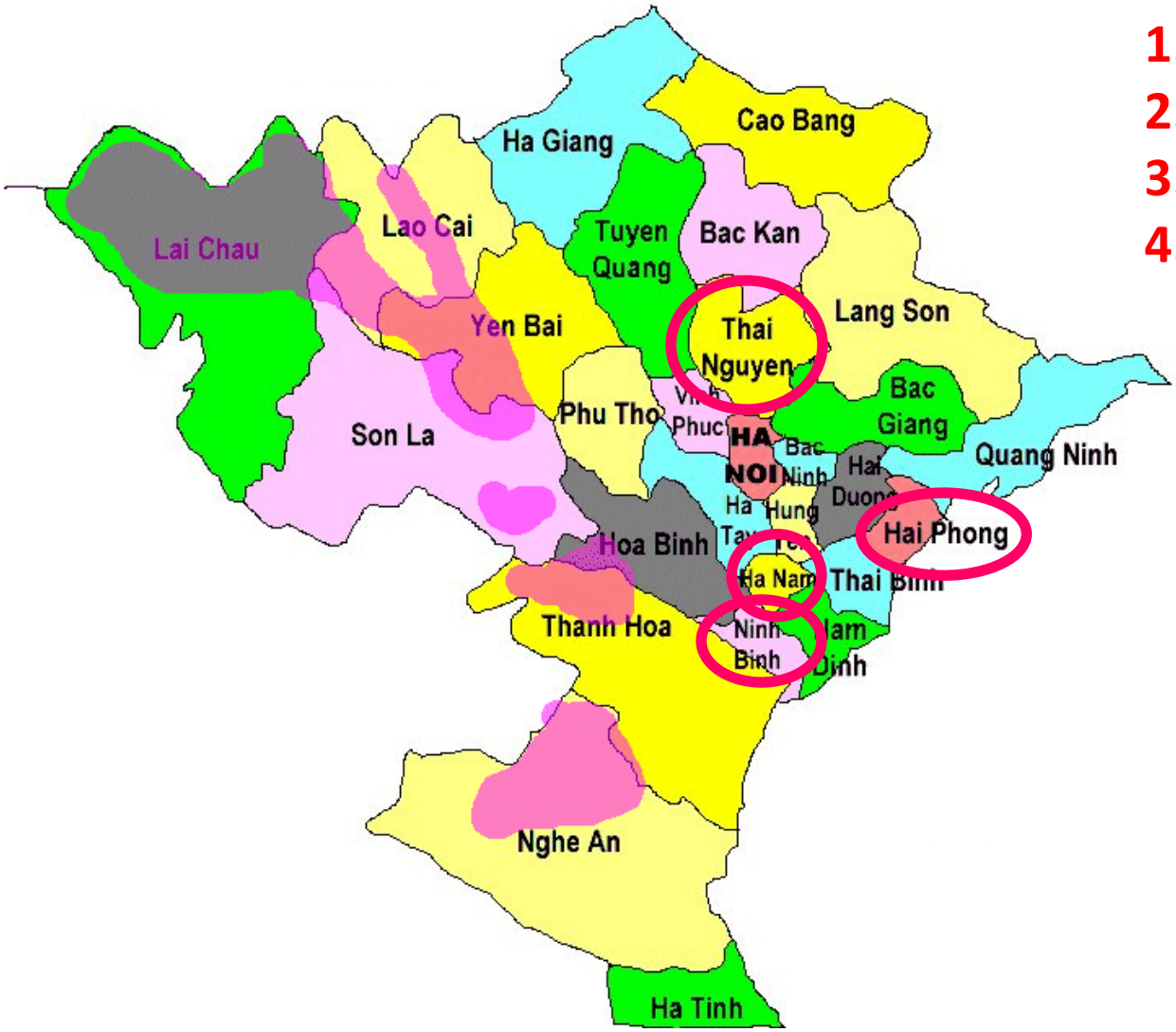
Control N=114

Folic acid & iron supplement + breastfeeding advice if available

- ❑ Primary outcome: Exclusive breastfeeding rate
- ❑ Other outcomes:
  - Infant's breast milk intake
  - Infant's anthropometry
  - Mother's dietary intake and anthropometry

** Lactation support consists of one prenatal BF class, 1 consultant visit within 48 h of delivery, one telephone follow-up at 1 week postpartum and one follow-up at 1 month postpartum*

Study Sites



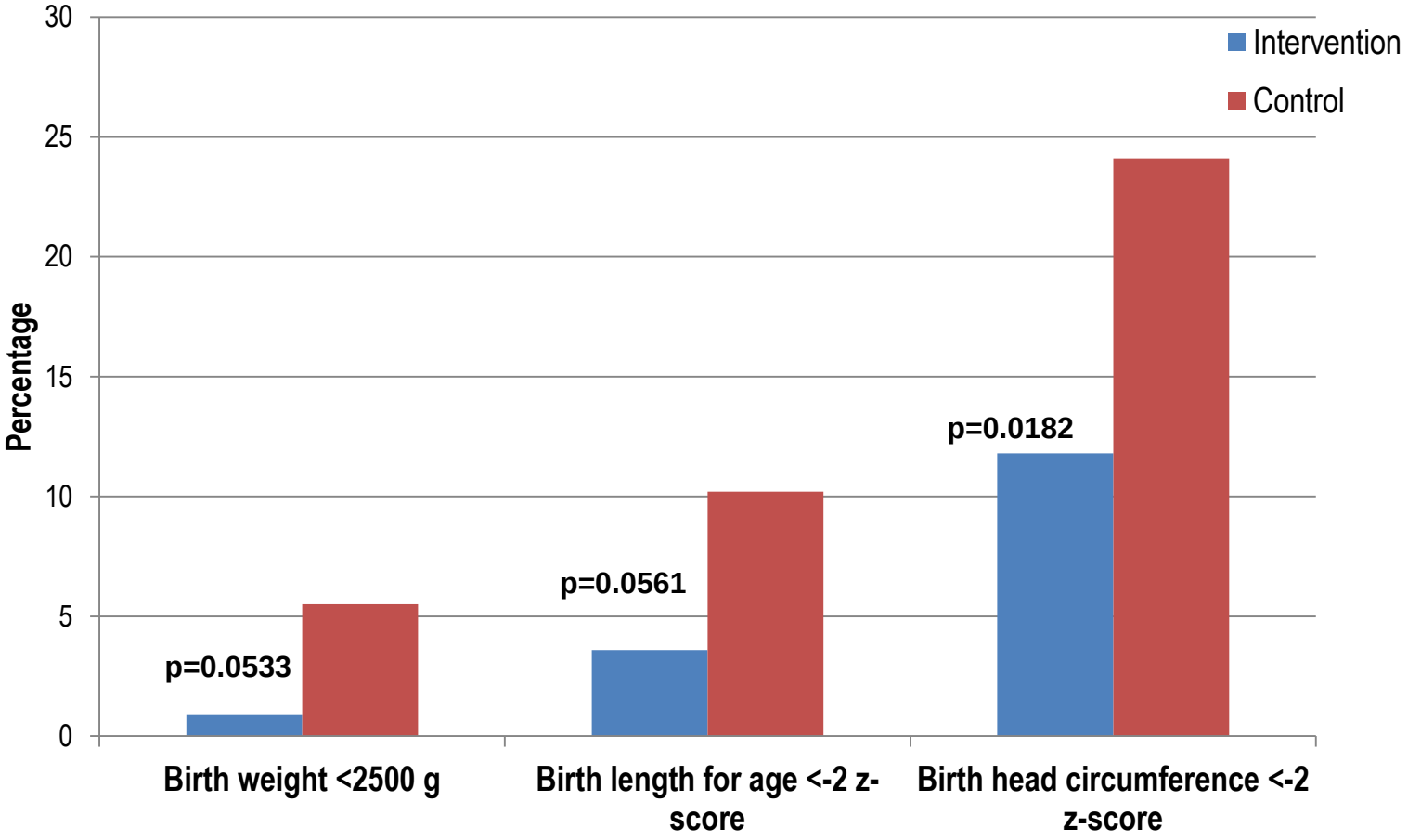
1. Hà Nam
2. Ninh Bình
3. Hải Phòng
4. Thái Nguyên

Baseline characteristics

Characteristics	Intervention N=113	Control N=113	p-value
Age (years), mean (SD)	23.9 (2.7)	24.1 (3.0)	0.8142*
Education level, n (%)			0.7081**
Primary	1(0.9)	2(1.8)	
Secondary	27(23.9)	32(28.3)	
High school	43(38.1)	36(31.9)	
Colleague/University	42(37.2)	43(38.1)	
Pre-pregnant BMI (kg/m^2), mean (SD)	19.2 (0.2)	19.2 (0.2)	0.8203***
Mid upper arm circumference, mean (SD)	24.1 (1.9)	24.2 (2.4)	0.7471***
Delivery mode, n (%)			0.4872**
Normal delivery	76 (68.5)	80 (72.7)	
C-section	35 (31.5)	30 (27.3)	

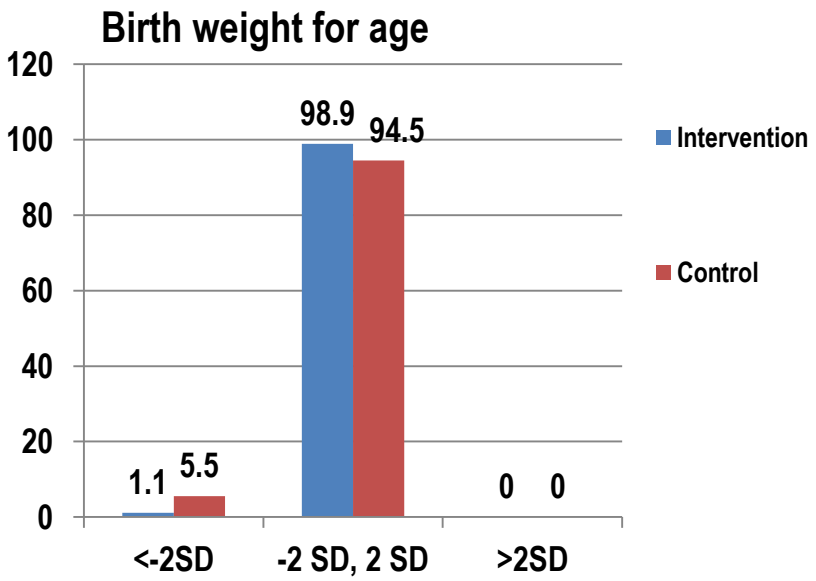
p-values is calculated from * Wilcoxon test, ** Chi-square test and ***t-test

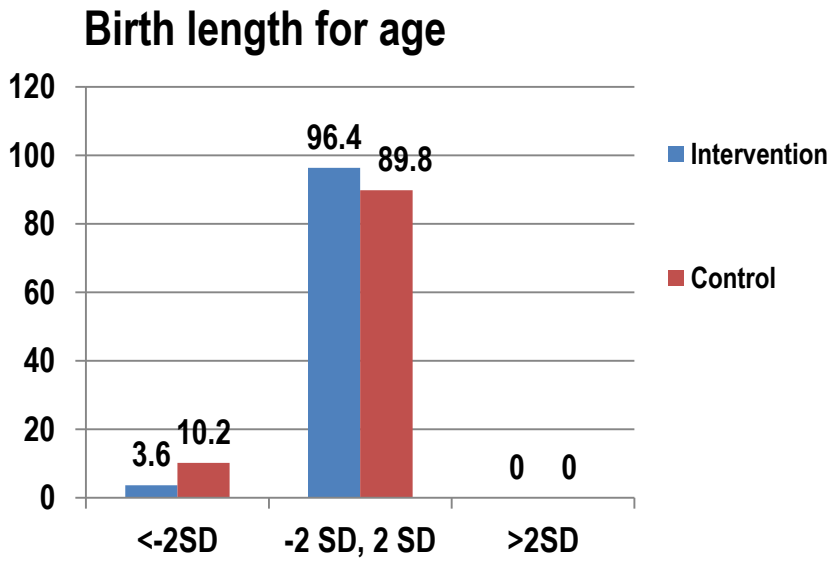
Intervention reduces risk of small for gestational age birth outcomes

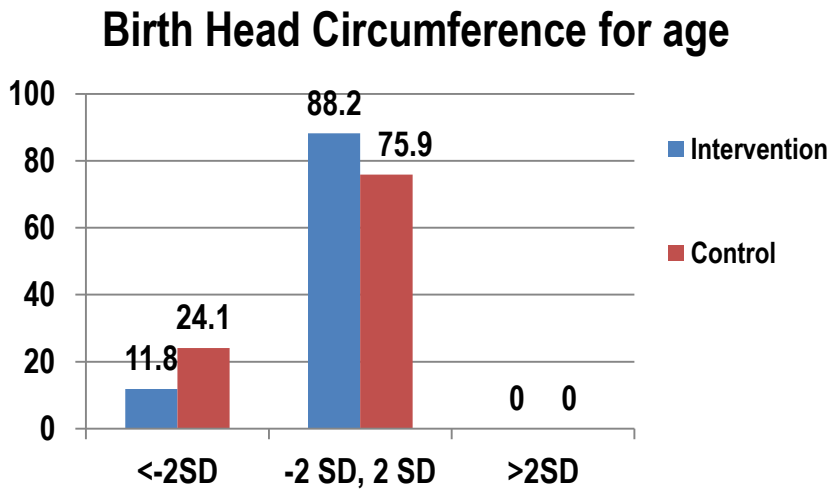


P-value is from Chi-square test

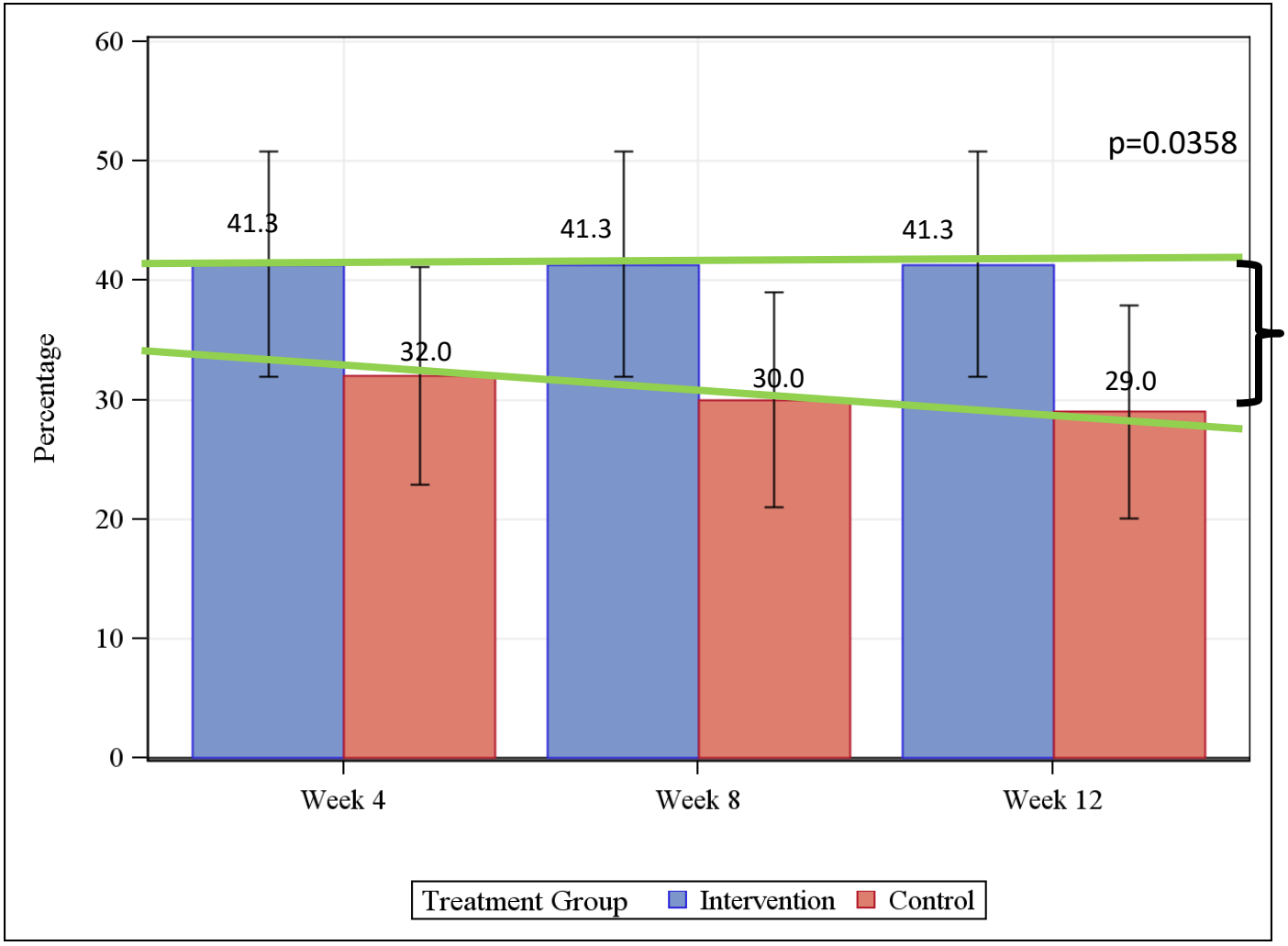
Not too small, not too big - Improved percentage of infants in healthy z-score range







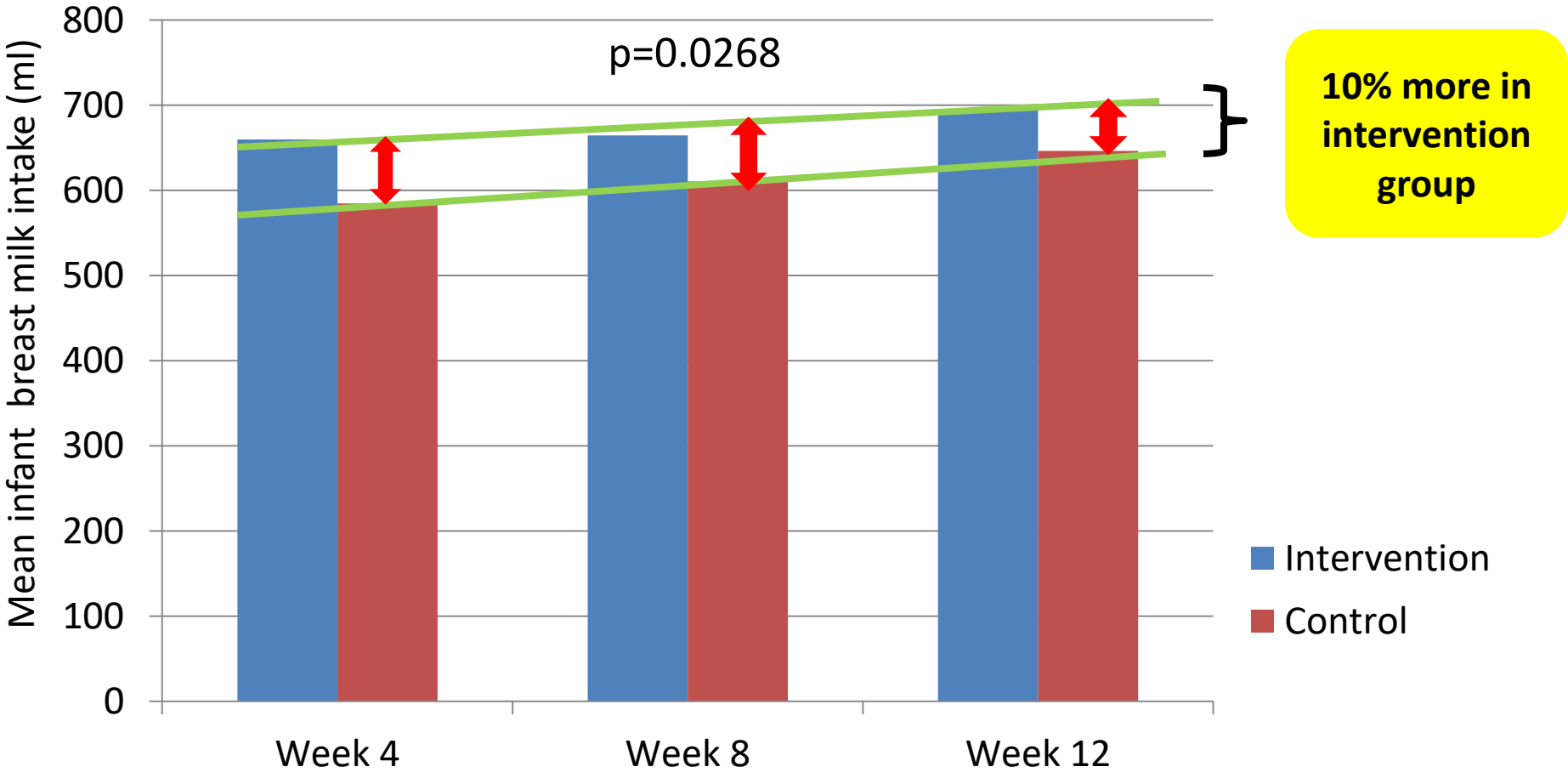
Intervention had significantly higher exclusive breastfeeding rate over 12 weeks postpartum



Improve full breastfeeding rate by **42%**

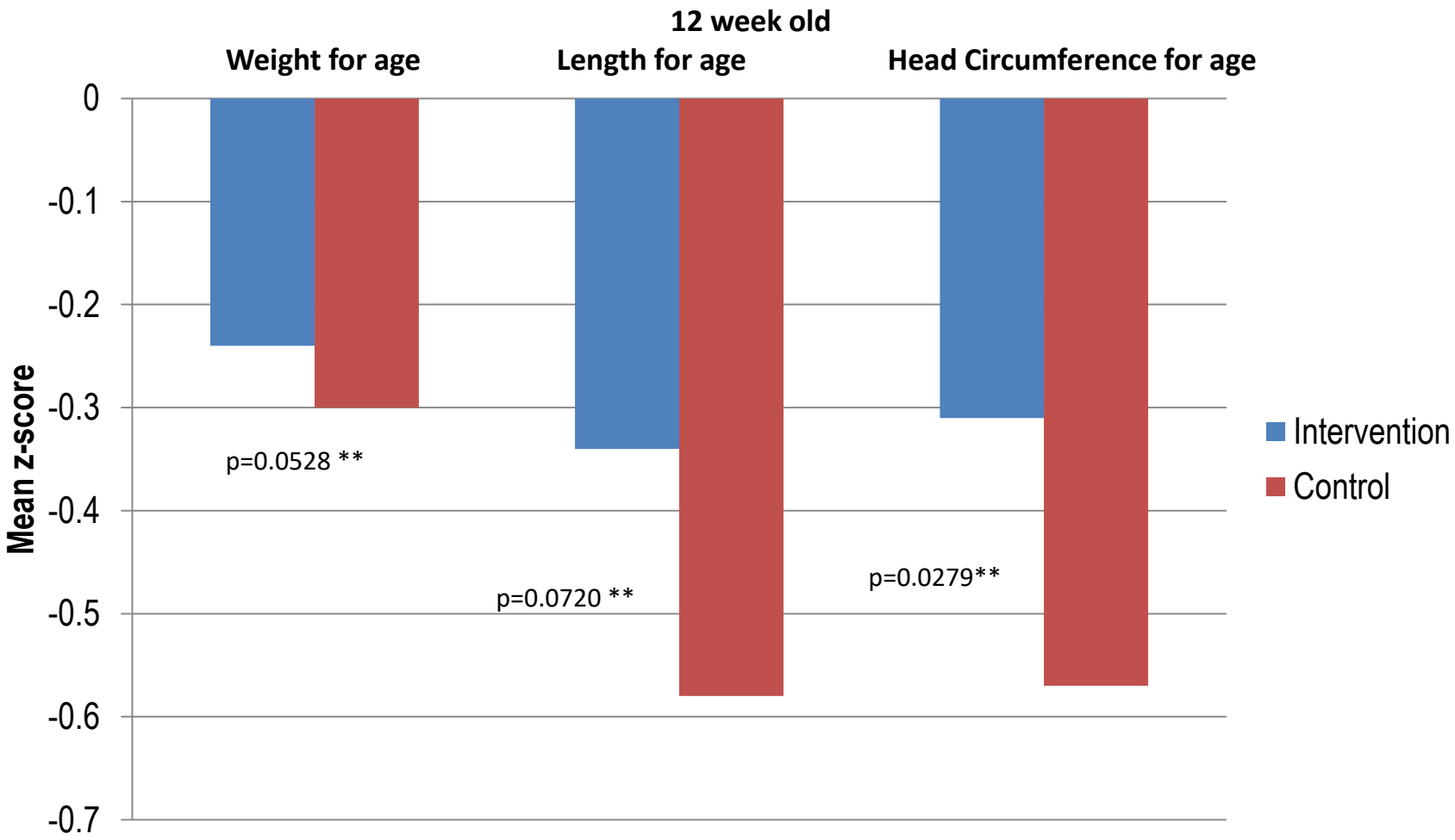
P-value from GEE analysis, controlling for mother's MUAC, delivery mode, infant gender, study site and visit

10% more breast milk production in half of mothers with lower nutritional status



P-value is from GEE analysis, controlling for MUAC, wealth index score, study site and visit

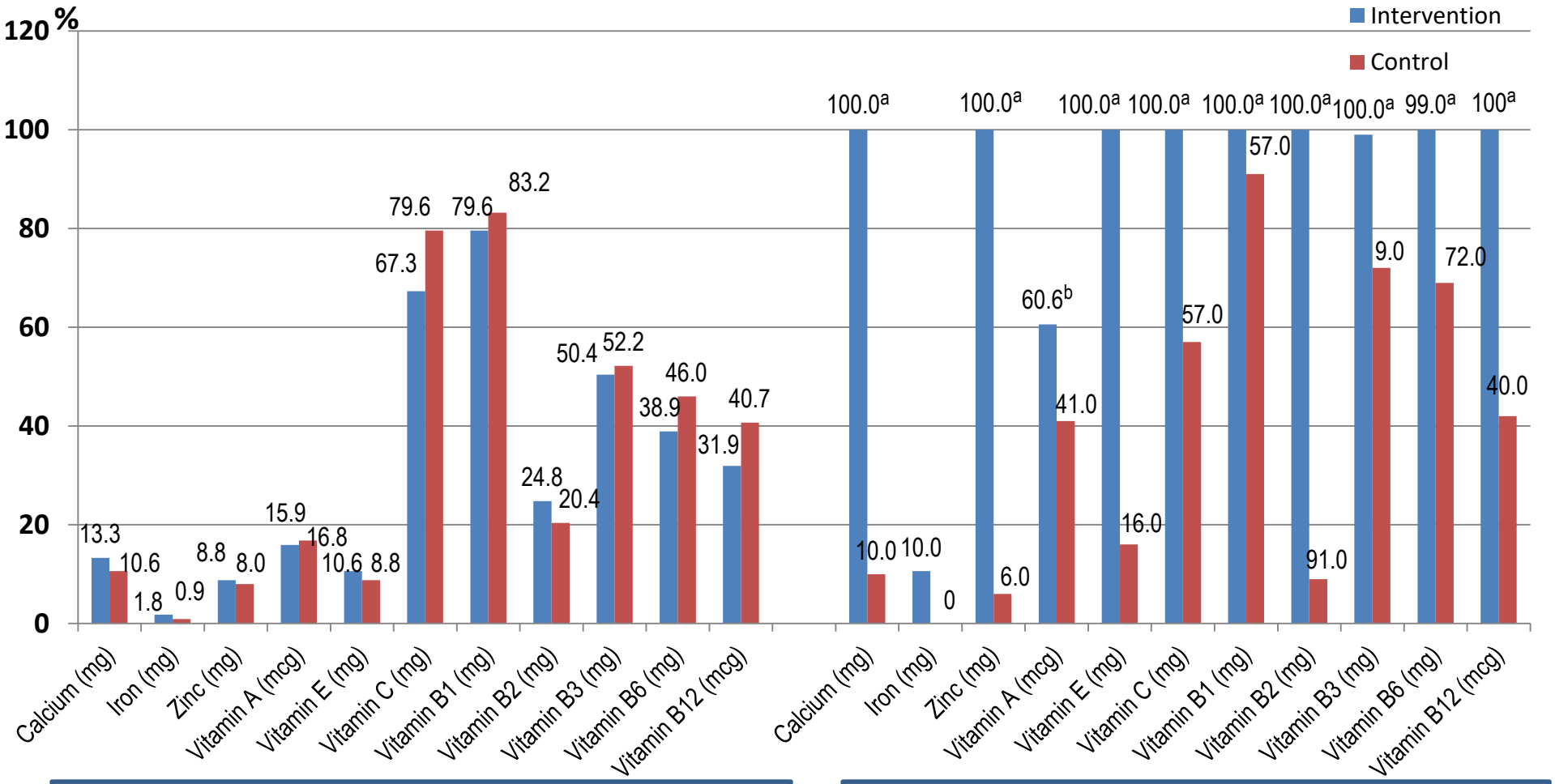
Intervention babies also had better postnatal growth



* P-value is from ANCOVA analysis controlling for mother's age, mother's mid arm circumference and infant gender

** P-value is from GEE analysis considering repeated measures of growth indicators at birth, weeks 4, 8 and 12 controlling for mother's mid arm circumference and/or infant gender and/or wealth index score, and/or site and visit

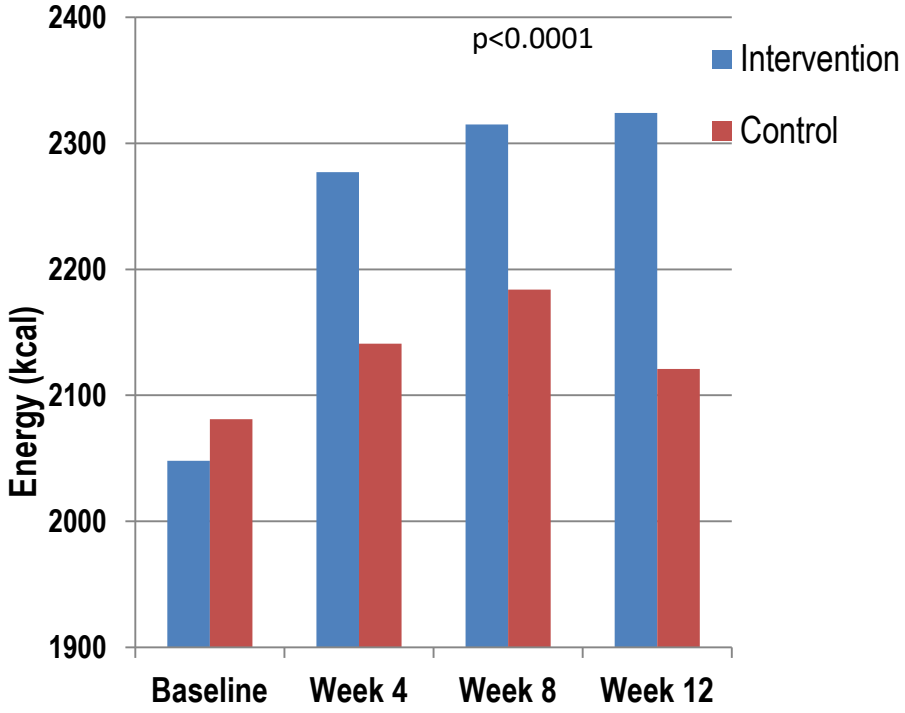
Intervention had significantly higher percentage of mothers with nutritional adequacy of wide range of nutrients

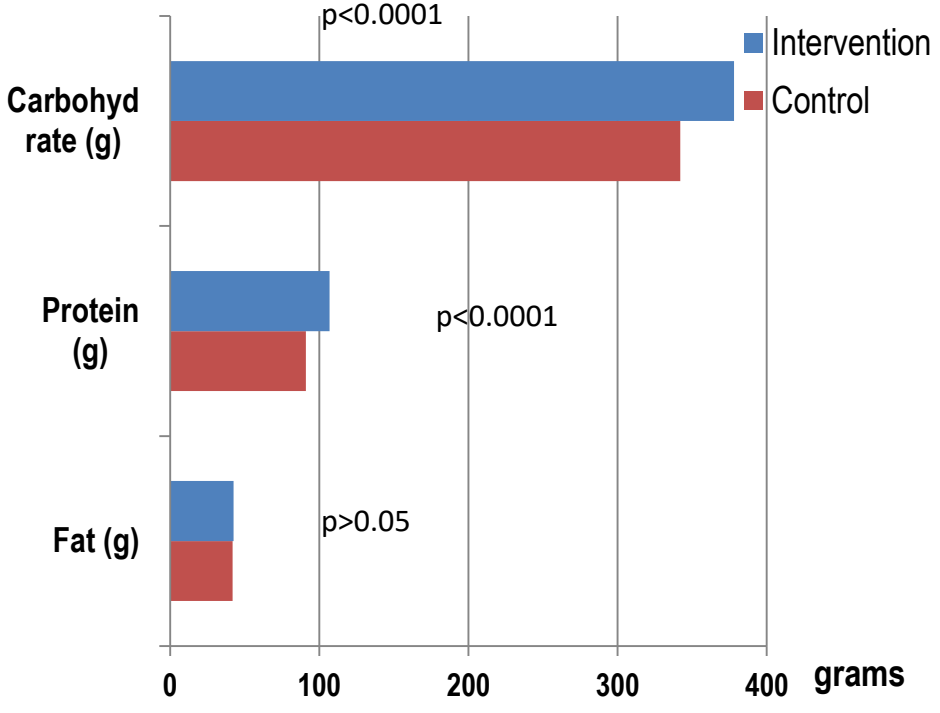


Vietnam RNIs, NIN 2016

P-value is from Chi-square test, [a] p<0.0001, [b] p<0.001

Intervention mothers had significantly higher energy and macronutrient intake



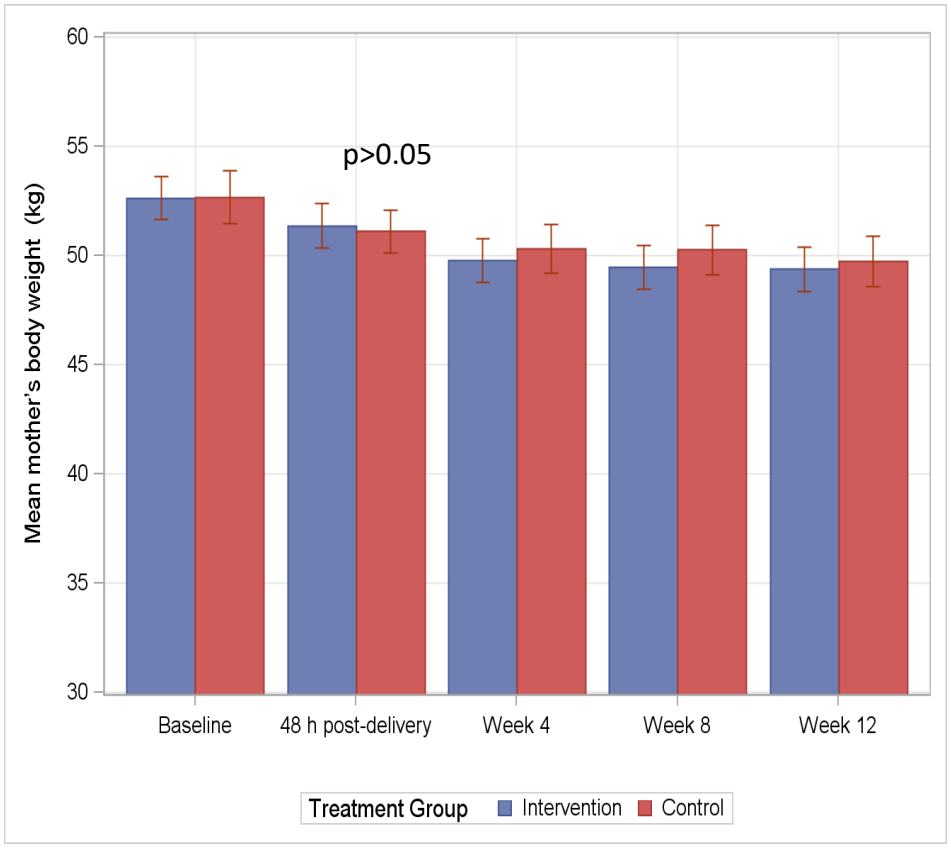


P-value is from repeated measure ANOVA for log transformed energy and protein intake

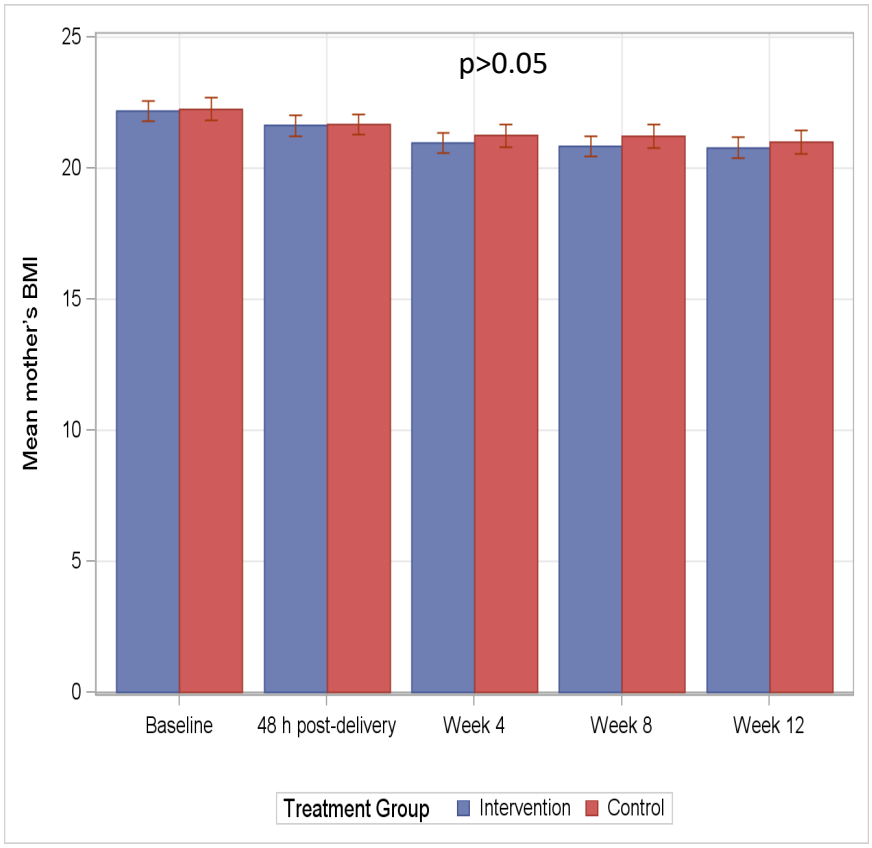
How does the supplement affect weight gain during pregnancy and weight loss after delivery?

Both groups had similar weight measurements at all time points during pregnancy and post-delivery

Weight



Body Mass Index



P-value is from repeated measure ANCOVA , controlling for baseline energy intake and study site's effect

Summary of key study findings

Maternal milk supplementation as part of a lactation support program is clinically proven to help:

- ✓ Improve birth outcomes and postnatal growth
- ✓ Improve and sustain exclusive breastfeeding
- ✓ Support weight management of mothers during pregnancy and post-delivery

Key considerations when recommending maternal nutrition supplementation

High in key vitamins and minerals

- Provide key micronutrients to build up mother's
  milk production
  l growth &

Balanced prot carbohydrate energy

ional demands
ilk production
nt

Very low fat

- Low fat to prevent excessive weight gain of mother
- Contains long chain polyunsaturated fatty acids such as DHA to support fetal development

Conclusions

- Maternal nutrition plays an extremely important role to improve health and development of future generations
- First ever maternal milk supplementation study in Vietnam demonstrated that such supplement is clinically proven to improve birth outcomes and breastfeeding success in Vietnamese moms and babies.


IT'S EASIER TO BUILD STRONG CHILDREN THAN REPAIR BROKEN MEN.
FREDERICK DOUGLASS