Delivering for Nutrition in South Asia

Towards Impact at Scale

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Effects of Egg Consumption and Psychosocial Stimulation on Cognitive Outcomes of Young Children in Resource-poor Settings in Bangladesh

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BACKGROUND: WHY EARLY CHILDHOOD MATTERS

Brain Growth | **Developmental Loss** | **Stunting**  | **Low Stimulation**

- Early childhood is a critical period—80% of brain growth occurs before age 3[1]
- 43% of children in LMICs fail to reach their developmental potential[2]
- 165M stunted children face impaired cognition and physical capability[3]
- Early developmental deficits reduce national productivity by ~8%[4]
- Nutrition + stimulation drive cognitive, language & socio-emotional outcomes[5]
- In Bangladesh, delays appear by 18 months, linked to stunting & low stimulation[6]
- Animal-source foods are often the first dropped from young children's diets[7]

[1]UNICEF [2]Black et al., 2017 [3]The Lancet [4]World Bank [5]The Lancet 2017 [6]Walker et al., 2007 [7]Headey et al., 2018

PSYCHOSOCIAL STIMULATION AND ANIMAL SOURCE FOODS FOR CHILD DEVELOPMENT

Animal Source Foods

- High-quality protein, iron, zinc, vitamin B12 & choline
- More bioavailable than plant foods
- Egg trials improved growth & micronutrient status[8]

Stimulation & Care

- Responsive caregiving boosts cognition
- Supports language & socio-emotional skills
- Predictor of early development

Bangladesh Evidence

- Effect of peer counseling on feeding practices and socially and emotionally[9]
- Egg + milk improved linear growth[10]
- Daily eggs and milk- based snacks improved cognitive & language scores[11]

[8]Iannotti et al., 2017, [9]Ara et al., 2018, [10]Mahfuz et al., 2021; [11]Ara et al., 2021

OBJECTIVES

To asses an integrated intervention designed to improve growth, development, complementary feeding, and WASH practices among children aged 6–23 months

- **Improve Nutritional Status** (LAZ & WAZ)
- **Improve Developmental Outcomes** (Cognitive, Motor, Language)
- **Improve Dietary Diversity**
- **Improve WASH Practices**

METHODS

Study Design

- Community-based cluster randomized controlled trial
- Three arms: 2 interventions & 1 control
- 6-12 months child-mother pair

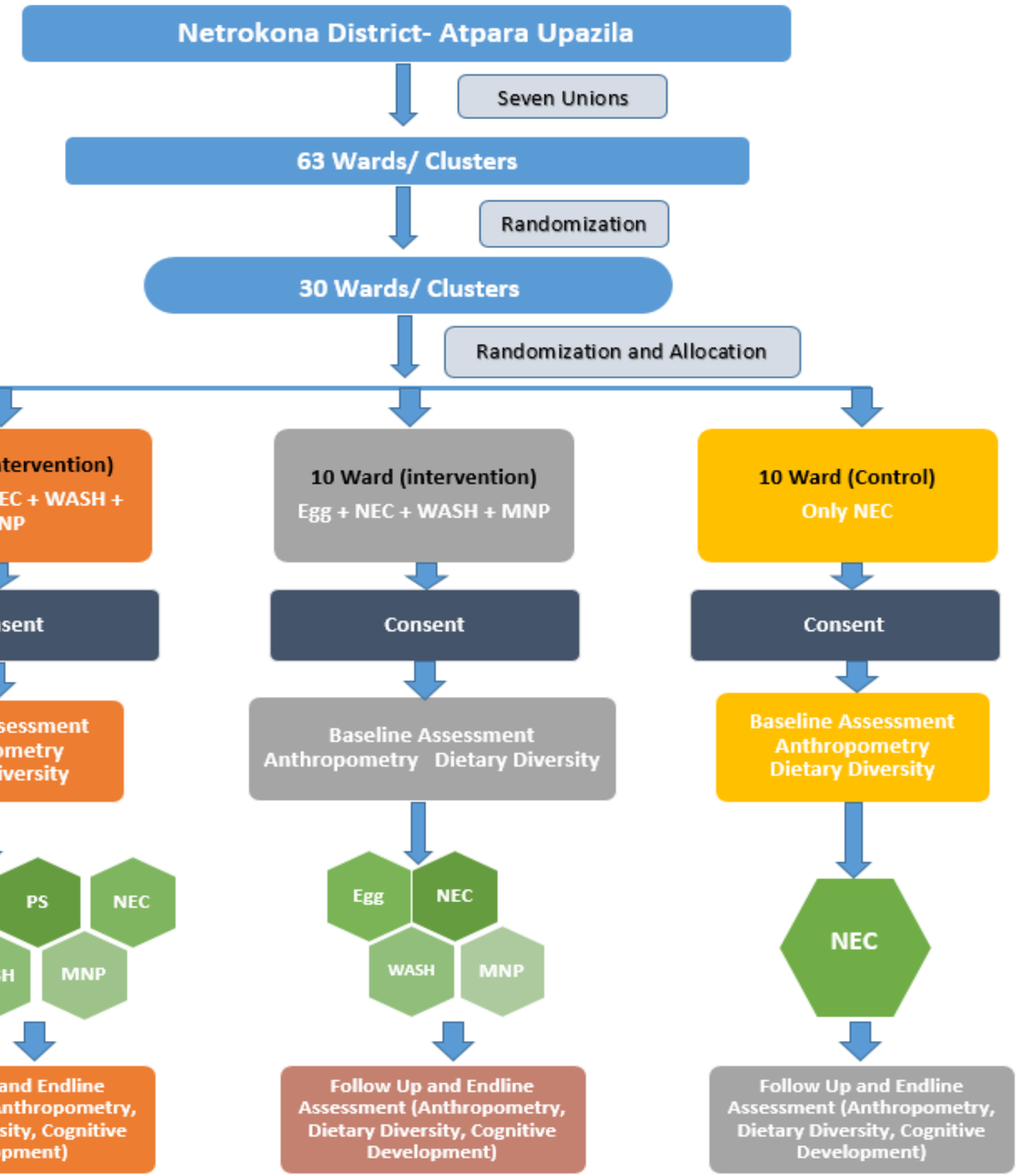
Participants

- 209 dyads per arm
- Food-insecure households
- 12-month participation

Outcomes

- Child growth & dietary diversity
- Developmental scores (Bayley-4)
- Comparison across study arms

Randomization and allocation



Developmental Assessment Domains

Cognitive

Language

Motor

Social–Emotional

Adaptive Behavior

Measures foundational domains of early development

- **Cognitive:** problem solving, memory, attention
- **Language:** receptive and expressive communication
- **Motor:** fine and gross movement skills
- **Social–Emotional:** interaction, engagement, regulation
- **Adaptive Behavior:** daily functioning, self-help, independence

Psychosocial Stimulation: Key Activities

Emotion & Bonding

- Praise & encourage
- Show love
- Respond to needs

Communication & Language

- Use new words
- Sing, talk & interact
- Name objects

Play & Exploration

- Skill learning
- Self-exploration
- Explore surroundings

Daily Routines

- Quality time
- Consistent discipline
- Structured interactions

Stimulation tools used during home visits

Baseline Characteristics of Households by Group

Variables	Intervention A	Intervention B	Control
	204 (%)	206 (%)	201 (%)
Religion			
Muslim	191 (93.6)	195 (94.7)	189 (94.0)
Hindu	13 (6.4)	11 (5.3)	12 (6.0)
Paternal education			
Primary	49 (38.0)	59 (44.7)	60 (47.2)
Secondary	62 (48.1) *	52 (39.4)	45 (35.4)
Secondary & above	18 (13.9)	21 (15.9)	22 (17.3)
Family size (Mean±SD)	5.4±1.9	5.3±1.9	5.4±1.8
Food Security			
Food Secure	16 (7.8)	15 (7.3)	15 (7.5)
Mild	36 (17.7)	35 (16.9)	39 (19.6)
Moderate	132 (64.7)	146 (70.9)	126 (63.3)
Severe	20 (9.8)	10 (4.9)	19 (9.6)
Improved water facility	202 (99.0)	199 (96.6)	195 (97.0)
Improved toilet facility	163 (79.9)	158 (76.7) *	173 (86.1)

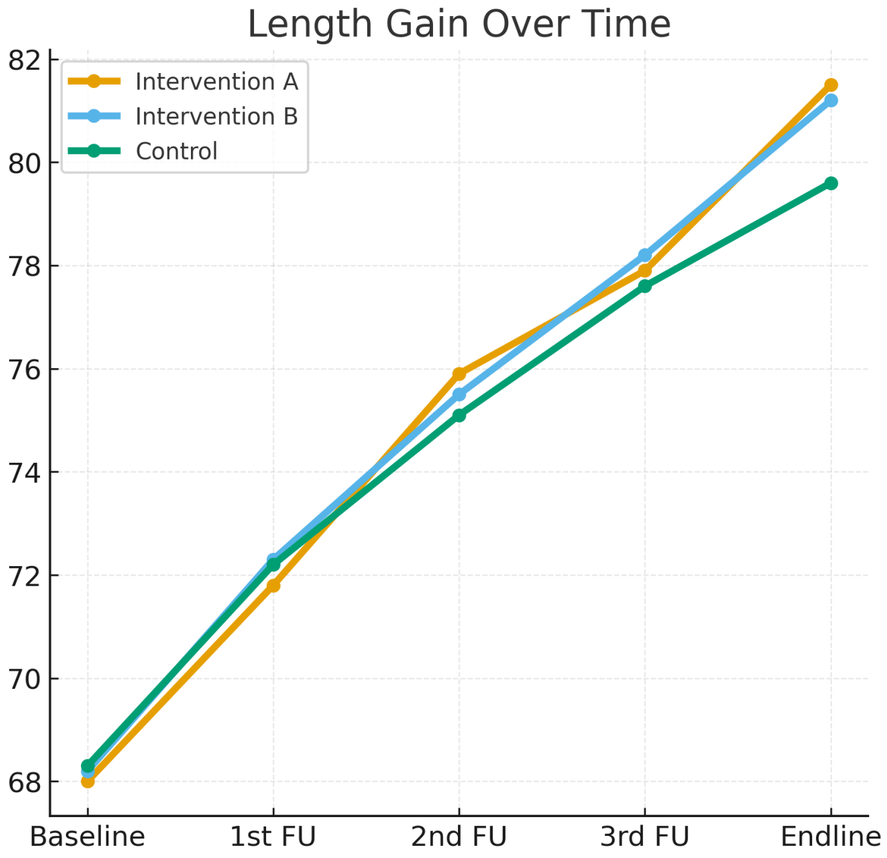
* P< 0.005

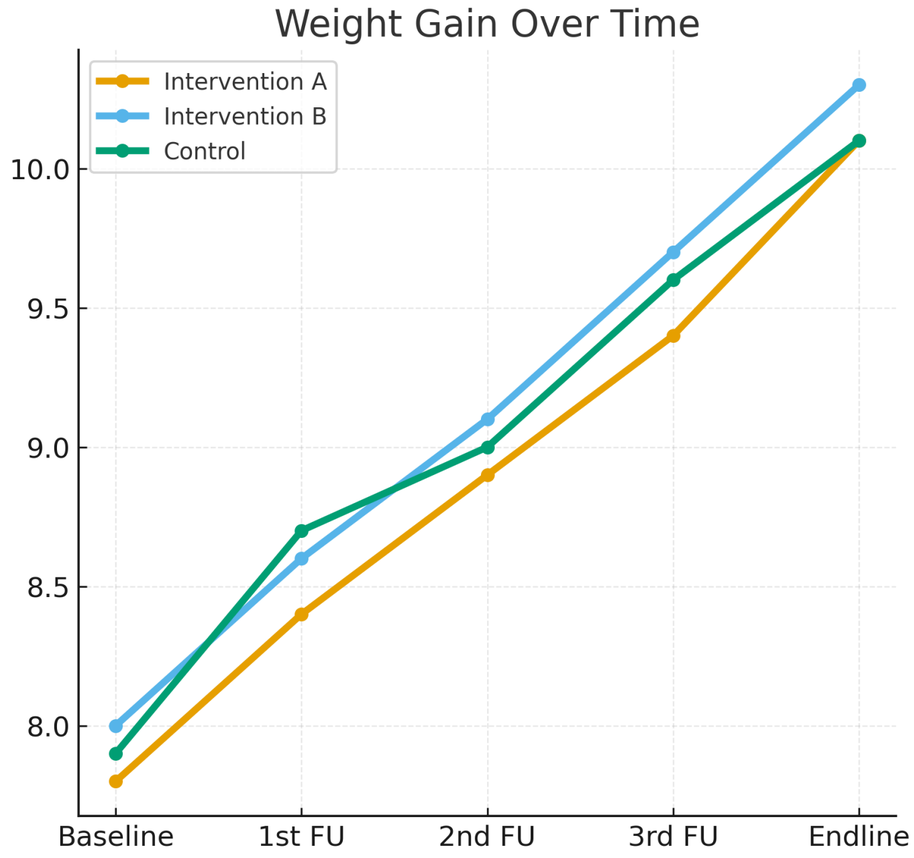
Baseline characteristics of Mother & Children by Group

Maternal information	Intervention A n=204 (%)	Intervention B n=206 (%)	Control n=201 (%)
Age (Mean±SD)	26.1±5.6	26.3±6.0	26.7±6.4
Education			
Primary	65 (39.4)	80 (46.0)	72 (43.9)
Secondary	82 (49.7) **	66 (37.9)	58 (35.4)
Secondary & above	18 (10.9) *	28 (16.1)	34 (20.7)
ANC			
< 4 visits	107 (52.5)	130 (63.1)	118 (58.7)
≥ 4 visits	97 (47.6)	76 (36.9)	83 (41.3)
Type of delivery			
Normal	131 (64.2)	126 (66.0)	128 (63.7)
Caesarean	73 (35.8)	70 (34.0)	73 (36.3)
BMI			
Underweight	44 (21.8)	48 (23.4)	42 (21.2)
Overweight/obesity	35 (17.3) *	22 (10.8)	24 (12)
Child information			
Age in months (mean ± SD)	9.4±2.3	9.4±2.2	9.4±2.2
Sex			
Male	93 (45.6)	101 (49.0)	103 (51.2)
Female	111 (54.4)	105 (50.9)	98 (48.8)
Birth weight in kg (mean ± SD)	2.8±0.6 **	3.0±0.5	3.1±0.7

**P< 0.001, * P< 0.005

MEAN LENGTH AND WEIGHT GAIN OVER TIME





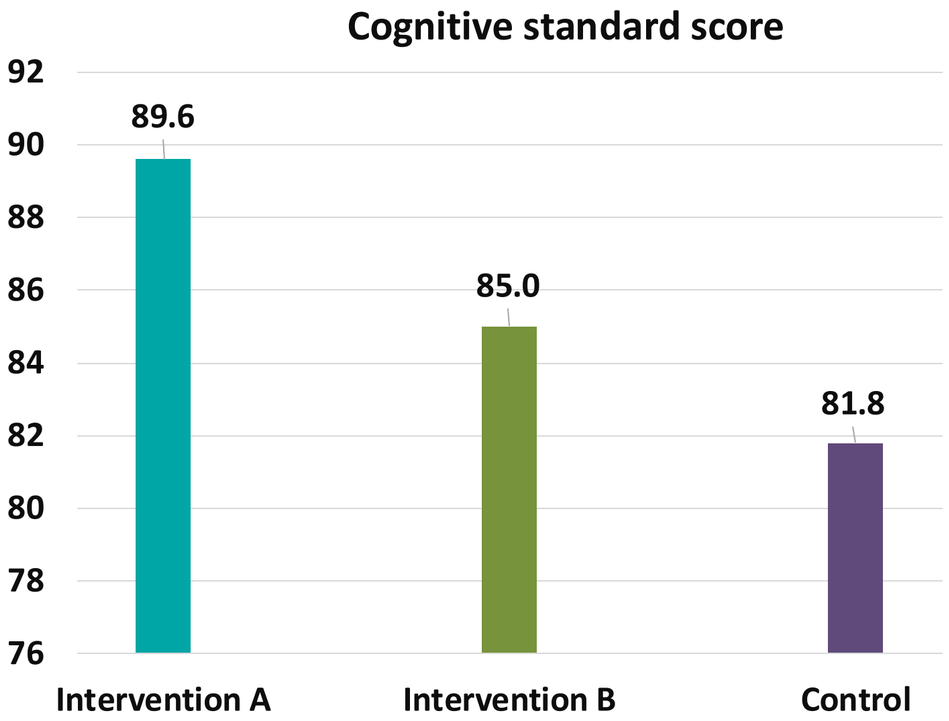
- Children in both intervention arms showed consistently higher length and weight gain than control across all follow-ups
- **Intervention A** led the greatest improvement in linear growth [A gained {81.5}; 1.9** cm, B gained {81.2}; 1.6** cm, Control {79.6}
- **Intervention B** group had the highest overall weight gain by endline

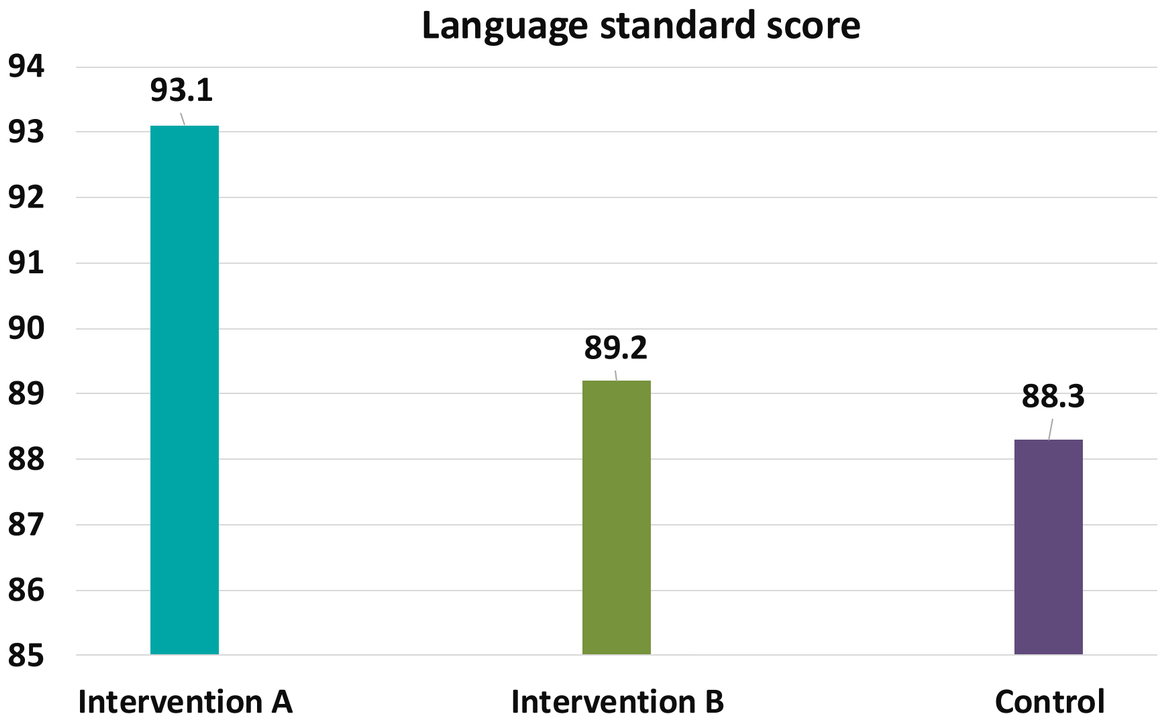
** P< 0.001, *p<0.005

Baseline Bayley and Wolk's Behaviour Rating Scores

Baseline Information	Intervention A (n=164) Mean ± SD	Intervention B (n=158) Mean ± SD	Control (n=155) Mean ± SD
Cognitive standard scores	97.8±9.3	97.2±12.8	97.3±15.8
Language standard scores	84.3±12.5	84.8±8.9	84.4±10.3
Motor standard scores	97.0±11.1	96.7±12.5	95.2±13.9
Vocalization Score	4.2±1.4	4.0±1.4	3.7±1.4
Approach Score	5.5±1.2	5.3±1.3	5.2±1.3
General Emotional Tone Score	5.3±1.0	5.3±1.0	5.2±1.1

Mean comparison of Cognitive and Language standard score at Endline





Mean difference:
A vs B: 4.6***
A vs C: 7.8***
B vs C: 3.2*

Mean difference:
A vs B: 3.9**
A vs C: 4.8**
B vs C: 0.9

** P< 0.001, *p<0.005

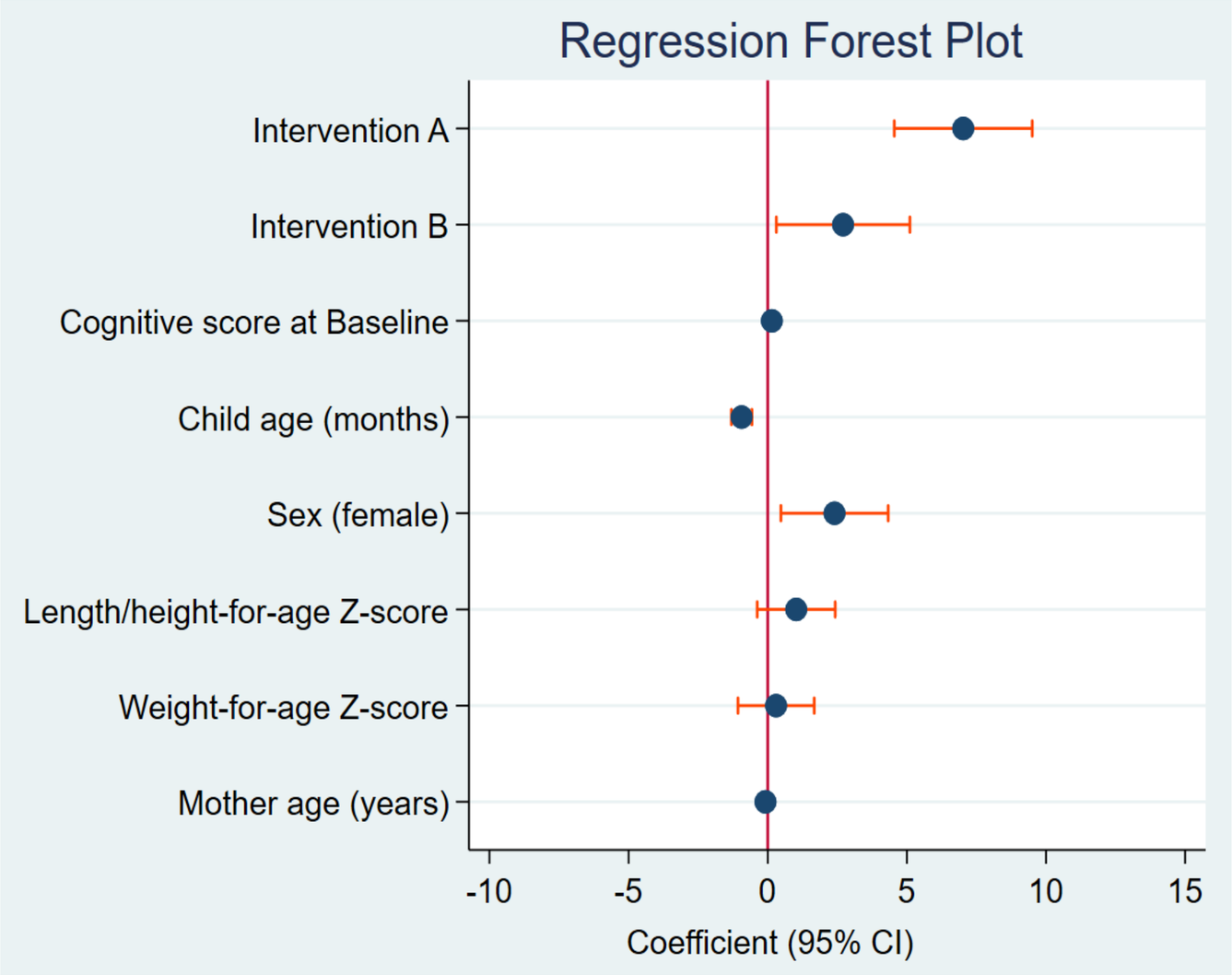
At Endline Mean Motor and Behaviour Rating Scores of Group A, B and C

Baseline Information	Intervention A (n=164) Mean ± SD	Intervention B (n=158) Mean ± SD	Control (n=155) Mean ± SD
Motor standard scores	94.1±9.7	92.7±8.0	92.7±11.1
Vocalization Score	4.5±1.5	4.3±1.5	4.3±1.5
Approach Score	5.7± 1.1	5.5± 1.1	6.0±5.1
General Emotional Tone Score	5.3±1.0	5.2±0.8	5.2±0.8

Effects of Intervention on Cognitive Development at Endline

Groups	Coef. (95% CI)	P value
Control	Ref.	
Intervention A	7.03 (4.55, 9.51)	<0.001
Intervention B	2.71 (0.31, 5.11)	0.027

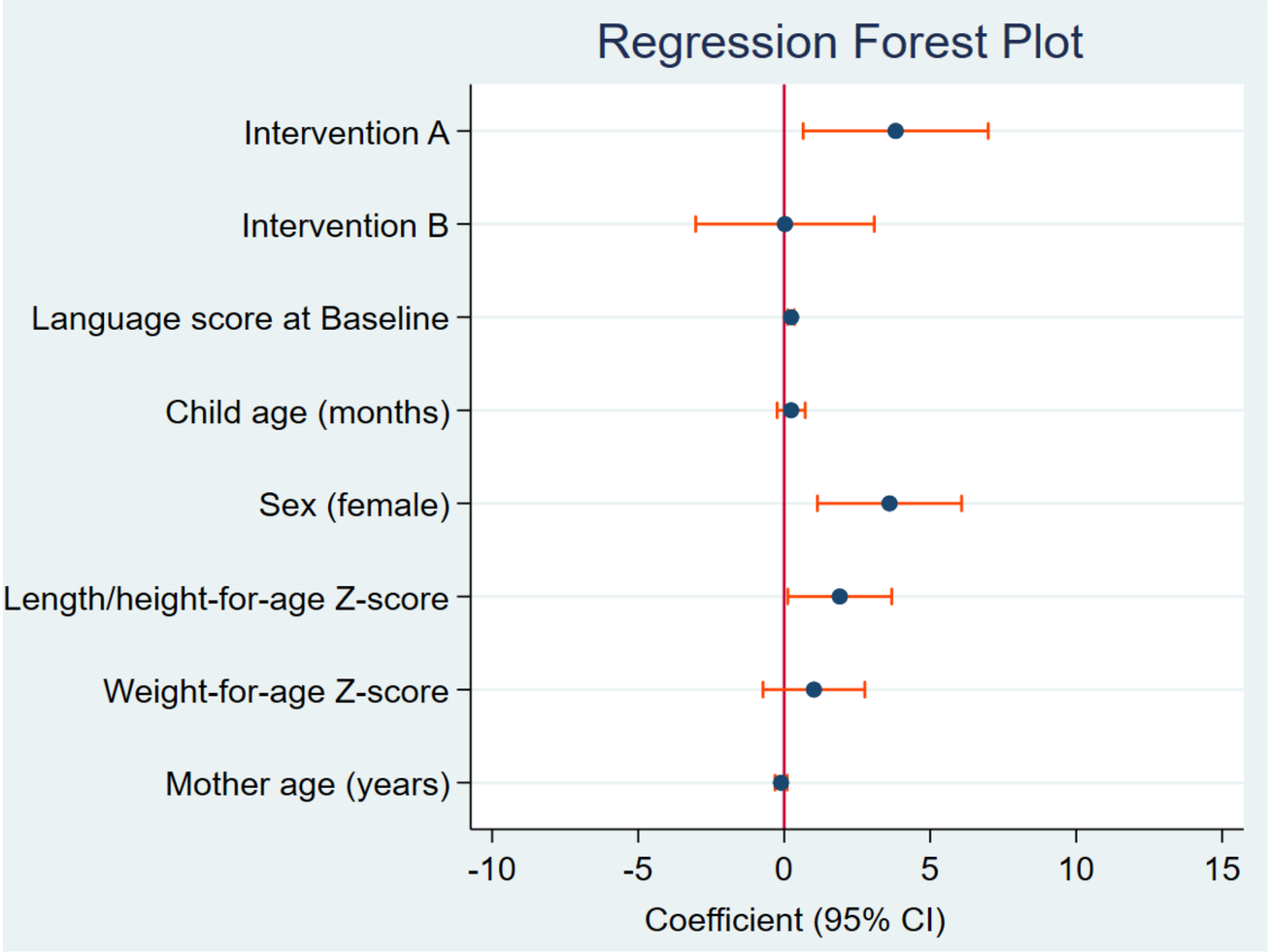
- Intervention A: +7.03 points, significant (P < 0.001)
- Intervention B: +2.71 points, significant (P = 0.027)



Effects of Intervention on Language standard score at Endline

Groups	Coef. (95% CI)	P value
Control	Ref.	
Intervention A	3.82 (0.65, 6.99)	0.018
Intervention B	0.03 (-3.03, 3.08)	0.986

- Intervention A +3.82 points, significant (P= 0.018)
- Indicating meaningful effect compared with control



Conclusion

Main Findings

- Both interventions improved growth and cognitive and language development
- Intervention A had the strongest overall impact
- Control group showed the lowest scores

Key Effect Sizes

- Linear Growth: +1.9 cm (highest)
- Cognitive Score: +7.03 points
- Language: +3.82 points (positive trend)
- Intervention B: modest cognitive gain (+2.73)

Implications

- Combining animal-source foods with psychosocial stimulation is more effective than standard care
- Integrated nutrition + stimulation interventions are crucial in resource-poor settings

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