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WASH, Nutrition and Early Childhood Development: New Evidence in ECD and Findings from the Field

June 25, 2014

washplus
Supportive Environments for Healthy Communities

care

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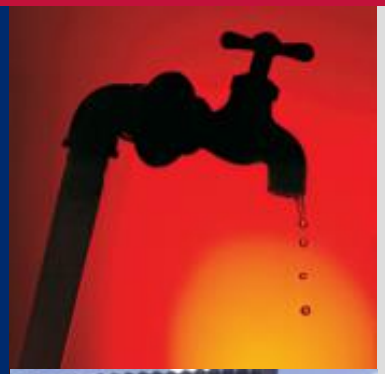

Community of Practice: Nexus of WASH, Nutrition, and Food Security

Helen Petach, Ph.D.
USAID

Community of Practice: The Nexus of WASH, Nutrition, and Food Security

Goals:

- To encourage discussion around integrated programming
- To provide articles, announcements, recent studies, and datasets
- To host webinars on recent research and program results

Contact: dacampbell@fhi360.org

http://usaidlearninglab.org/working-group/community-practice-nexus-between-wash-nutrition-and-food-security

Alignment with USAID Strategies

- USAID Water and Development Strategy emphasizes links among WASH, nutrition, and food security.

- USAID Multi-Sectoral Nutrition Strategy calls on USAID to increase access to high quality nutrition-sensitive services, including access to WASH.

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Speakers for today's webinar:

Jennifer Orgle	Director, CARE Nutrition at the Center Program
Maureen Black, Ph.D.	University of Maryland School of Medicine, Department of Pediatrics

Addressing Environmental Enteropathy in CARE's Nutrition at the Center Program

N@C Results Framework

Goal: Improve nutritional status for women (15-49) and children <2 years in identified resource poor geographical areas

	Nutrition Specific Activities		Nutrition Sensitive Activities	
First level Objectives	Improved nutrition-related behaviors	Improved use of maternal and child health and nutrition services	Household adoption of appropriate water and sanitation practices	Availability and equitable access to quality food
Second level Objectives	• Increased EBF and early initiation • Appropriate complementary feeding • Optimal dietary intake during pregnancy	• Increased community engagement and support of improved access to maternal and child health and nutrition services • Strong institutions, policies and linkages for nutrition • Improved quality of maternal and child services in communities	• Access to clean water • Children separated from feces • Optimal hand washing practices	• Increased homestead food production • Innovative food storage and processing techniques • Schemes to provide access to food where needed • Support to integrate nutrition into FS activities

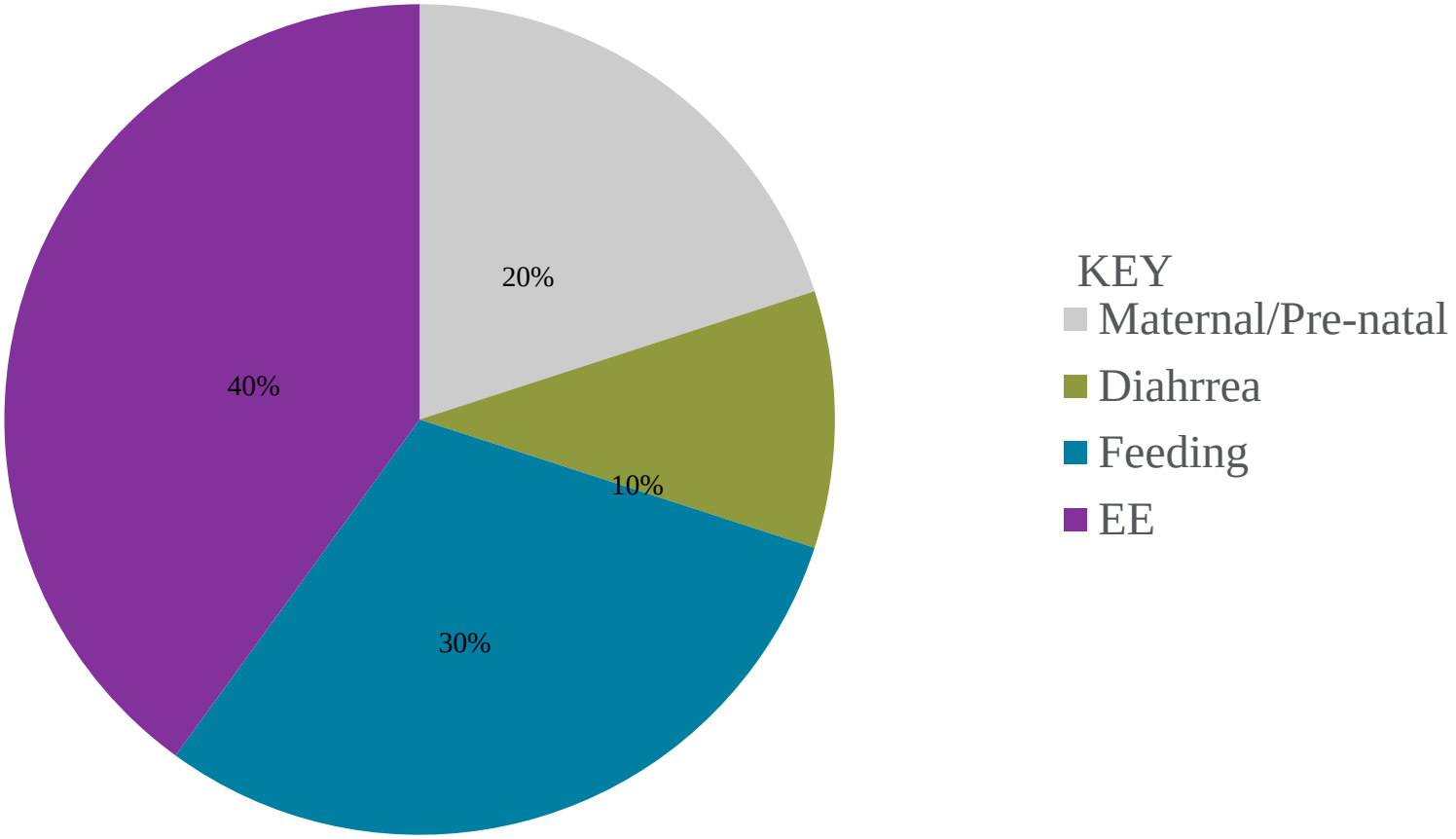
Cross Cutting Issues: Gender and Empowerment — Governance

Cross Cutting Strategies: Advocacy - SBC - Community Mobilization - Data for Decision Making - Capacity Building

Learning Agenda

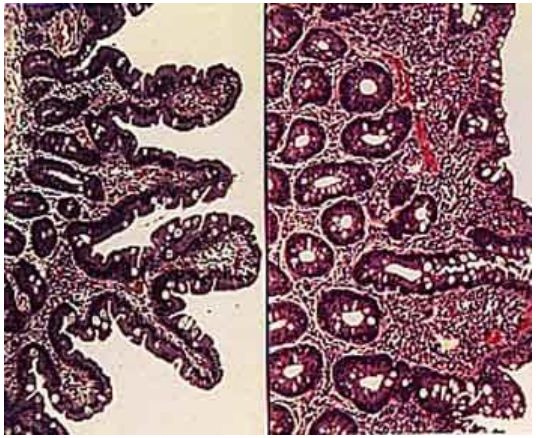
- Define the impact of integrated programming on maternal and child nutritional outcomes
- Develop and assess feasible interventions for Environmental Enteropathy (EE)
- Partnerships with academic institutions and peer organizations/communities of practice for research/learning

Potential Causes of Stunting



Environmental Enteropathy (EE)

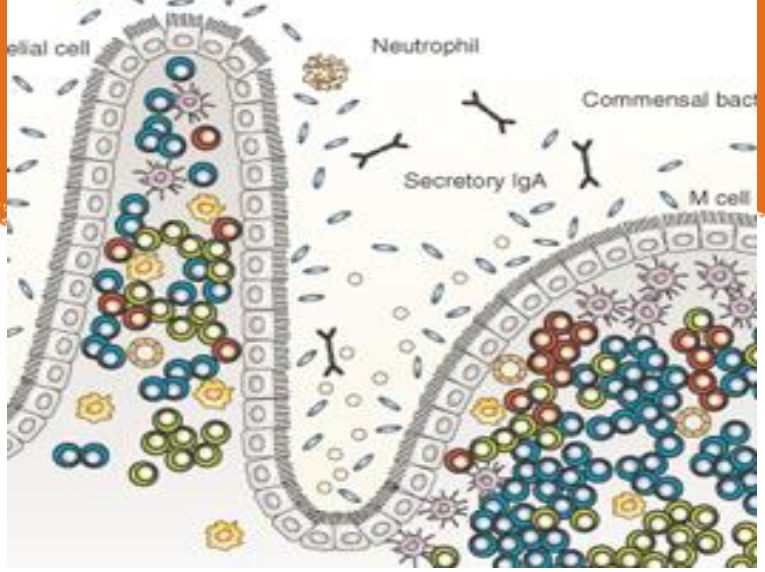
A subclinical invisible condition which causes the fattening of villi in the gut, reducing its surface area and resulting in decreased nutrient absorption and infiltration of microbes.



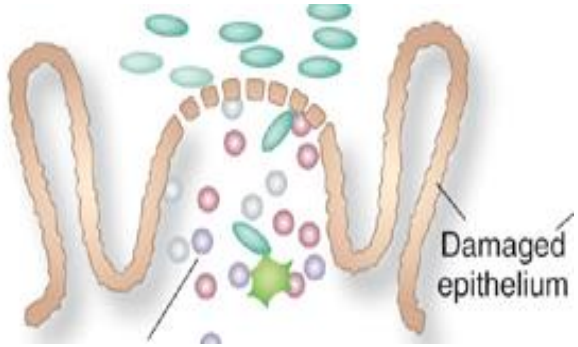
EE is caused by chronic exposure of children to bacterial pathogens in their environment from human and animal faeces.

Veitch AM, *Euro J Gastro Hepatology* 2001, 13:1175-1181

Microbial translocation



EE: Going beyond Nutrition to Understand Child Growth and Development
– *Laura Smith, Rebecca Stoltzfus et al*



Microbial products cross into blood stream

Chronic immune activation

Diverts nutrients from growth to infection-fighting

Further Observations

Study in Zimbabwe - (Stoltzfus)

- crawling and toddling babies, through their natural exploratory behaviours, ingest substantial quantities of soil that is contaminated with human and animal faeces.
- *E. coli* intake from ingestion of chicken faeces is 4,000 times greater than either untreated drinking water or soil

Study population 418 rural Malawi children 2-5 yr old

(Weisz, et al. J Ped Gastro & Nutr, Dec. 2012)

- Relatively good WASH: 87% improved water source; 67% children use pit latrine
- Relatively good food security: low food insecurity score; good dietary diversity and ingestion of animal protein
- 51% have animals that sleep in the house
- Height for age z score -2.8
- 87% with laboratory evidence of EE
- Low change over time in HAZ associated lab evidence of EE and animals sleeping in the house

Other Observations

Observations in Zimbabwe – Children most exposed to faeces and dirtiest environments (3 of 7 toddlers directly ate chicken feces during a 6-hour observation period).

Ngure F et al., submitted, 2012

Peruvian shantytown families -

Households who owned free-range poultry (Average ingestion of poultry feces by toddlers per 12-hour observation period was 3.9 times)

Marquis GM et al., Am J Public Health 1990

One year old Zimbabwe child on a typical day

	quantity	E. coli*
chicken feces	1 gm	13,800,000
laundry area soil	20 gm	2,340
contaminated water	400 ml	800

*mid points of 95% confidence intervals

Ngure et. al. *Am J Trop Med Hyg*. 2013 Oct;89(4):709-16.

Addressing EE

- Traditional water, sanitation, and hygiene interventions (such as latrines or hand-washing) do not address bacterial exposure of infants from soil.

- While animals pose a significant threat to the health and future of young children, in multiple ways they also are critical to resiliency of the rural poor.

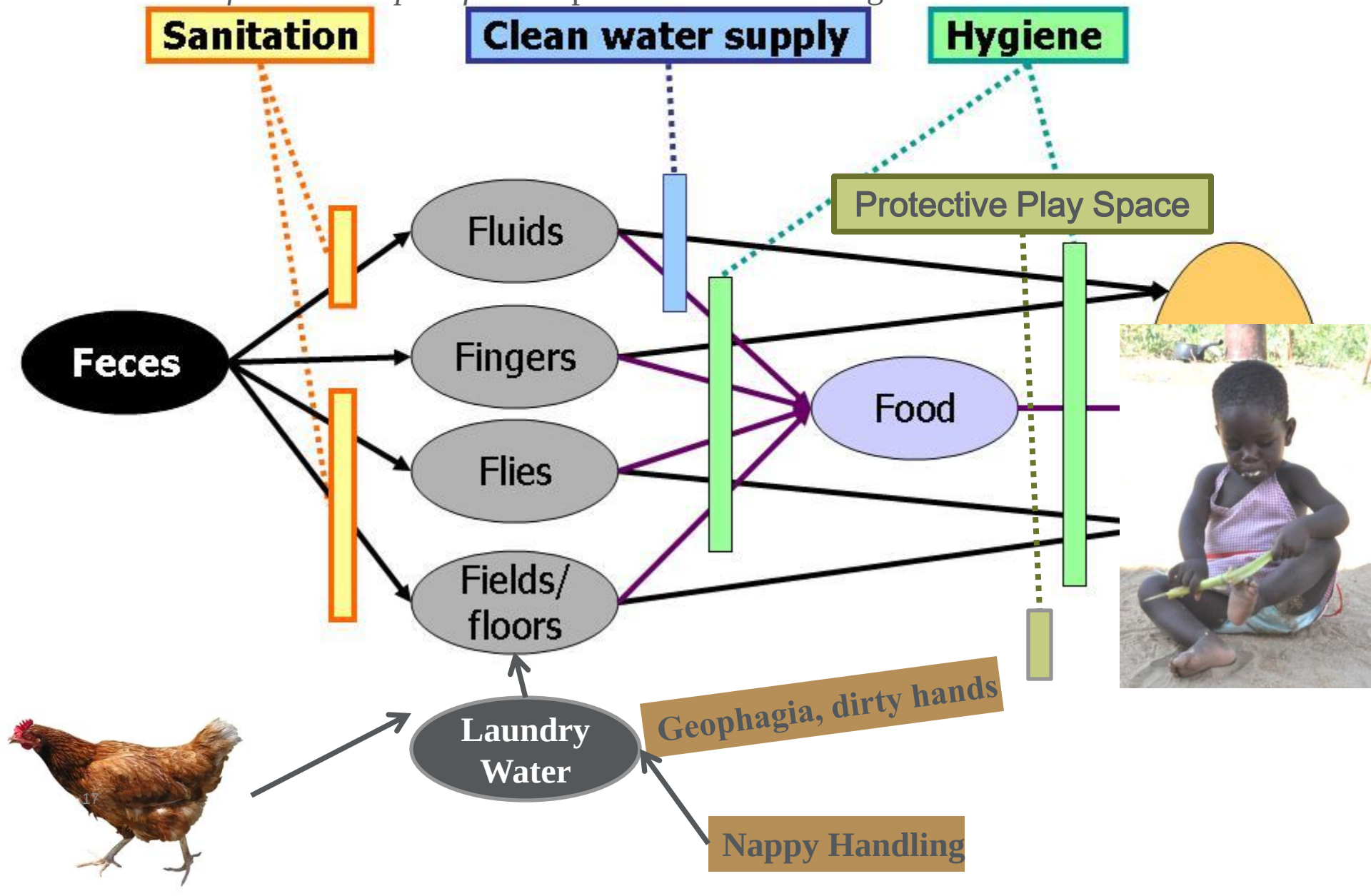
Environmental Enteropathy and Stunting Hypothesis:

EE is a major cause of post-natal stunting, anemia and immune competence.

EE can be reduced by reducing exposure of infants and young children from human and animal faeces through a package of interventions which include sanitation, hygiene and changing how families care for children and animals.

protective barriers *for infants!*

EE: Going beyond Nutrition to Understand Child Growth and Development – *Laura Smith, Rebecca Stoltzfus et al adapted from h*ttp://web.worldbank.org/WBSITE/EXTERNAL



Knowledge Gaps and Questions

- **How do we identify and implement socially acceptable mechanisms which reduce child exposures to human and animal feces?**
- **How do we effectively promote interventions which promote changes in the management of animals without undermining the benefits that small livestock provide to households?**
- **How do we influence changes in where children play and eat?**
- How much does exposure need to be reduced to prevent or reduce the severity of EE?
- How significant a contributor to malnutrition (stunting) is EE?

One Health for Babies and Livestock - Defining and Testing Solutions to Prevent Fecal Exposure & EE

Partnership with Cornell

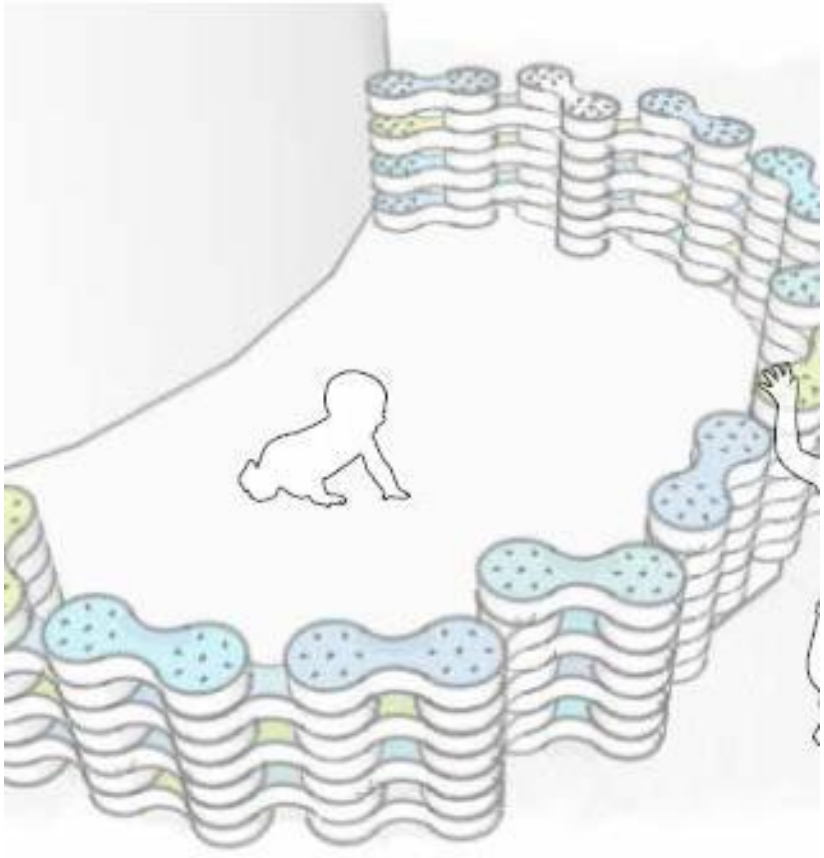
Vision - smallholder farming families in rural communities globally will reap the benefits that small animals provide and simultaneously provide their young children with safe environments for play, exploration and development.

Objectives

- Technologies and behavior change communications developed, using community-based design approaches to reduce risk of fecal exposure and EE among young children;
- Feasible, acceptable and effective strategies tested using outcome measures that include both animal husbandry and child care practices.
- CARE's N@C program and the SHINE Trial, for contextualization and implementation through those programs, and share learning globally.

Research Priorities

- Develop and test protective play spaces, to protect developing child from contaminated soil and animal feces.
- How to sensitize families on an issue they don't recognize.
- Create sufficient awareness among communities about EE that initiatives will originate from them.
- Identify and test feasible strategies to change animal and childcare behaviors.
- Address sanitation and hygiene behaviors to reduce child exposure in high risk areas.
- Community participation to find feasible and effective solutions.



Methodology

- Approach
  - Combining community-based participatory research and dialogues to create effective, context-relevant solutions for increased local ownership and sustainability in six villages (60-90 households)
- Community engagement
  - Education of families at community meetings, in mothers groups and in other appropriate forums.
  - Engaging entire communities to build commitment and support for subsequent interventions
- Designing by Dialogue/Pilot Study
  - Families with livestock and children 6 – 24 months invited to adopt the pilot intervention for a period of three months
  - Women recruited and trained to undertake observation

Methodology

- Evaluation
  - Selected households engaged in Trials of Improved Practices after 1 month.
  - All households with young children engaged in trials for 3 months
  - Qualitative assessment of changes in risk behaviors and behavioral outcomes for animals, babies and their caregivers.
  - Quantitative analysis of the effectiveness of each intervention strategy by comparing final evaluation with baseline results for each participating child/household.
  - Results of the study would inform N@C and Cornell programming
  - Raise additional funding to do similar trials.

Challenges

- Limitations of data and knowledge.
- Challenges/difficulties associated with testing EE in the field.
- Animal faeces are ubiquitous.
- Defining socially acceptable and effective mechanisms for restricting children's movements/ reducing exposure.
- Effectiveness of play spaces.

Finally!

- We don’t have all the answers or the perfect solution
- Need to continue to work with the development community


THANK
YOU

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New Evidence Linking Nutrition and Early Child Development

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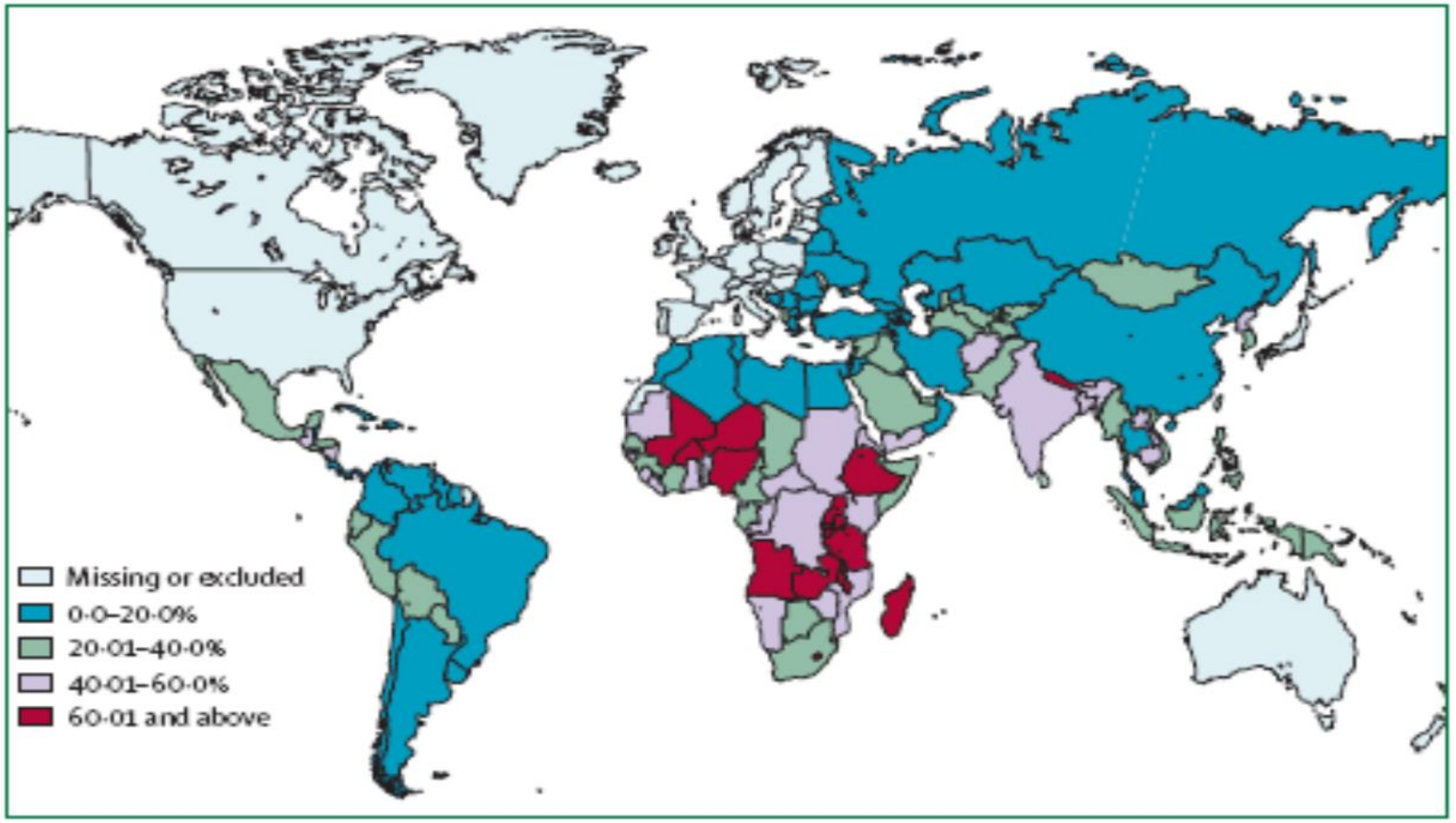
Objectives: Recent Evidence

- Integrated interventions
- Long-term effects of early child development intervention (2)
- Recent trials – nutrition & child development (2)
- Future research recommendations

219 million children < age 5 (39%) do not reach developmental potential



McGregor, *Lancet*, 2007

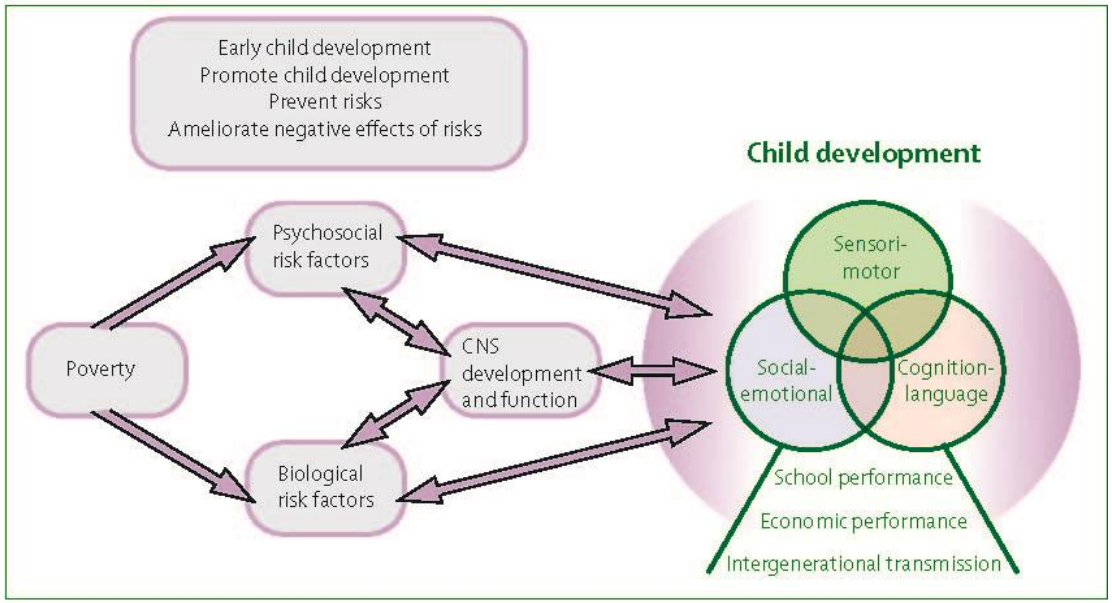
Background & Rationale

- Sustainable development requires healthy, productive citizens
  - Building blocks of health & well-being begin prenatally (first 1,000 days) through nutrition, nurturance , and protection from illness
  - Continue through childhood & adolescence

- Child development is a dynamic process:
  - **Time-sensitive** genetic-environmental interactions
  - **Dose** and **duration** of threats and interventions

Conceptual Framework

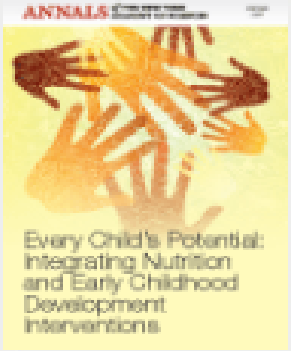
Child development has multiple determinants, including nutrition[1,2]



www.globalchilddevelopment.org

[1] Grantham-McGregor *Lancet,* 2007 [2] Engle, Black, Behrman et al. *Lancet*, 2007

Annals of the New York Academy of Sciences, January 2014



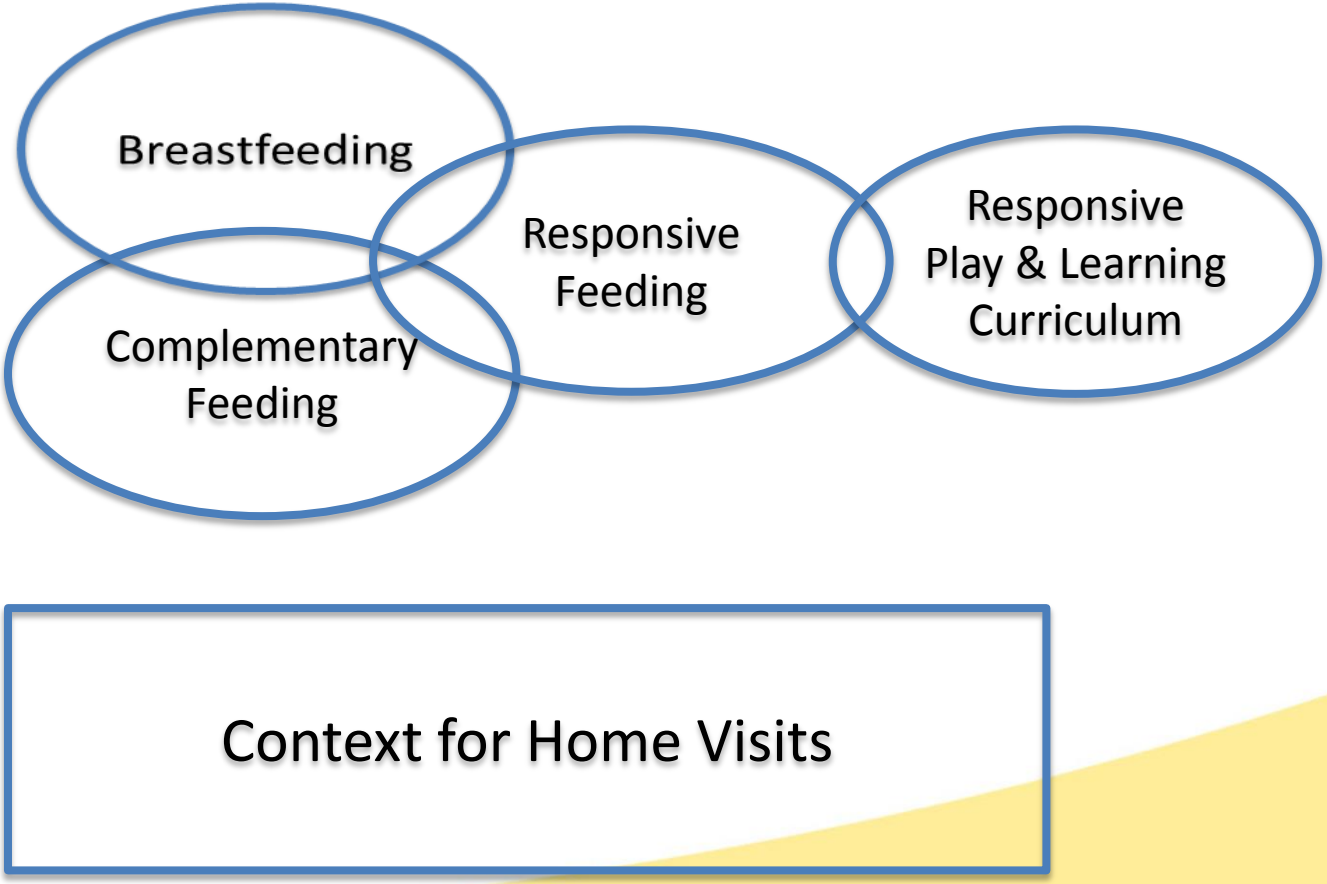
Every Child's Potential: Integrating Nutrition and Early Childhood Development Interventions

Edited by **Maureen M. Black** (University of Maryland School of Medicine, Baltimore, Maryland) and **Kathryn G. Dewey** (University of California, Davis, California)
Volume 1308, January 2014
264 Pages, 20 Papers

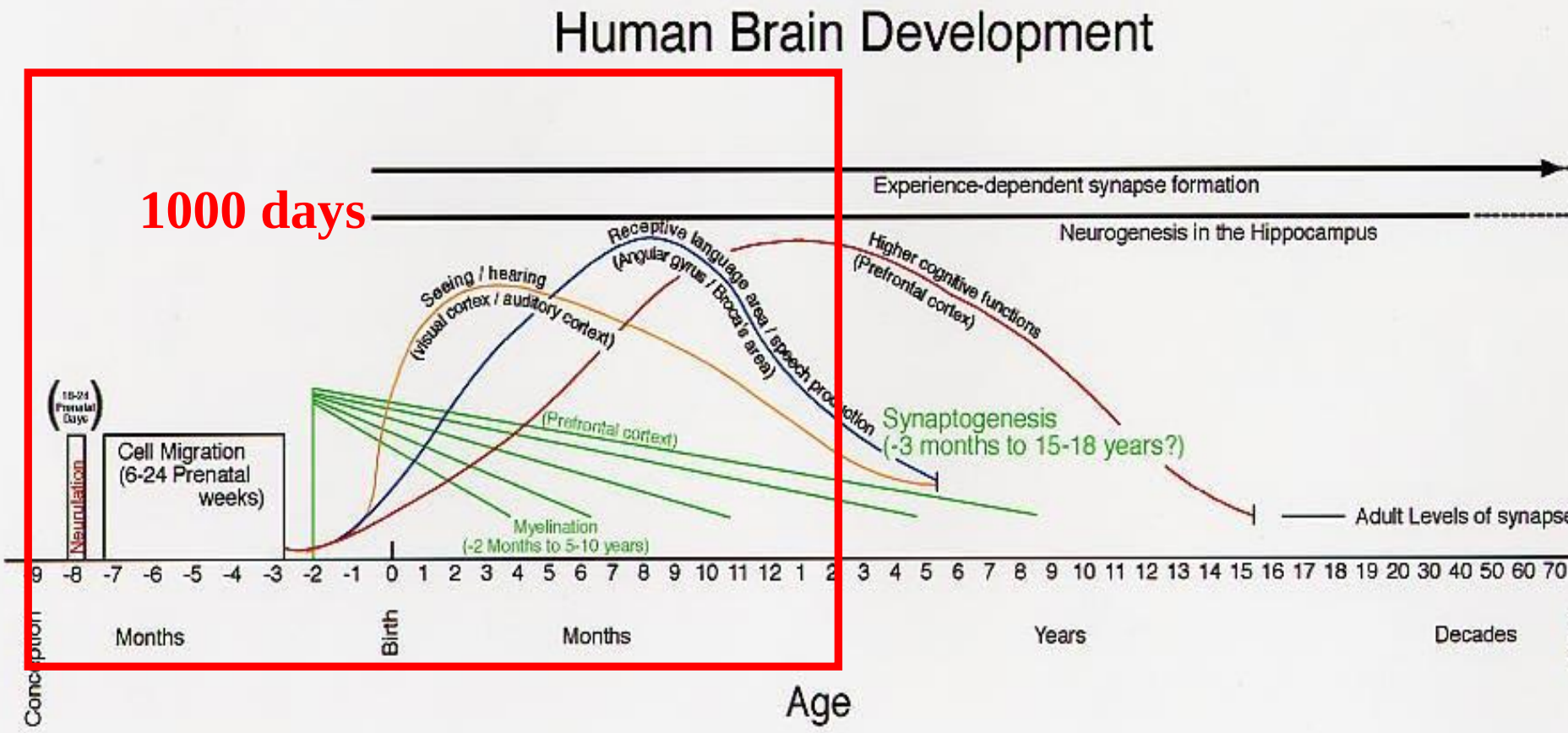
Open Access:

http://onlinelibrary.wiley.com/doi/10.1111/nyas.2014.1308.issue-1/issuetoc

Example of Nutrition & Early Child Development Integration



Developmental Perspective



Fetus **Late Infancy/Toddler** **Pubertal**

Thompson & Nelson, 2000

Advantages & Disadvantages to Integrated Services

Advantages

- Same geographic location
- Health & nutrition often only sectors reaching young children
- Children with poor heath & nutrition at risk for poor development
- Lower cost than stand-alone service

Disadvantages

- Limited contact by health & nutrition sectors beyond 12 mos
- Overstretched services and workers
- May overload mother
- Nutrition focus early in life, child development focus extends through childhood
- Sector collaboration

Evidence of Integrated Interventions

- Efficacy trials
  - Most evidence from home-visiting trials – beneficial
  - Benefits appear to improve with duration
- Limited evidence from programs at scale that added stimulation into health services (e.g., bed nets)
- Nutrition programs with stimulation
  - Most center-based
  - Most integrated programs benefited children's development , not nutritional status

Grantham-McGregor, Fernald, Kagawa, &Walker, 2014

Evidence Gaps

- Evaluations of integrated programs at scale
- Long term follow-ups
- Attention to quality
- Strategies to improve quality at scale for 3-6 y olds
- Sustainability of programs
- Identification of essential program elements
- Strategies to enhance effects on both growth and development

2014 Science: Effects of Early Child Development on Adult Health & Earnings

Building blocks of adult health, earnings, & well-being based in early child development


RESEARCH ARTICLES

Early Childhood Investments Substantially Boost Adult Health

Campbell, Conti, Heckman, Moon, Pinto, Pungello, Pan, *Science* 2014


RESEARCH

REPORTS

CHILDHOOD DEVELOPMENT

Labor market returns to an early childhood stimulation intervention in Jamaica

Gertler, Heckman, Pinto, Zanolini, Vermeersch, Walker, Chang, Grantham-McGregor, *Science* 2014

Abecedarian Project (NC)
Randomized Trial

- Preschool: caregiving, nutrition, health care
  - Birth – age 5 years
- Follow-up: Ages 12, 15, 21, 30, 35
  - College graduation
  - Lower risk for cardiovascular & metabolic disease (males)
    - Systolic blood pressure
    - Metabolic syndrome (dyslipidemia,
    - Vitamin D deficiency
    - Obesity
    - Hypertension

Campbell, et al., *Science* 2014

Changes in BMI Began < Age 5 Yrs

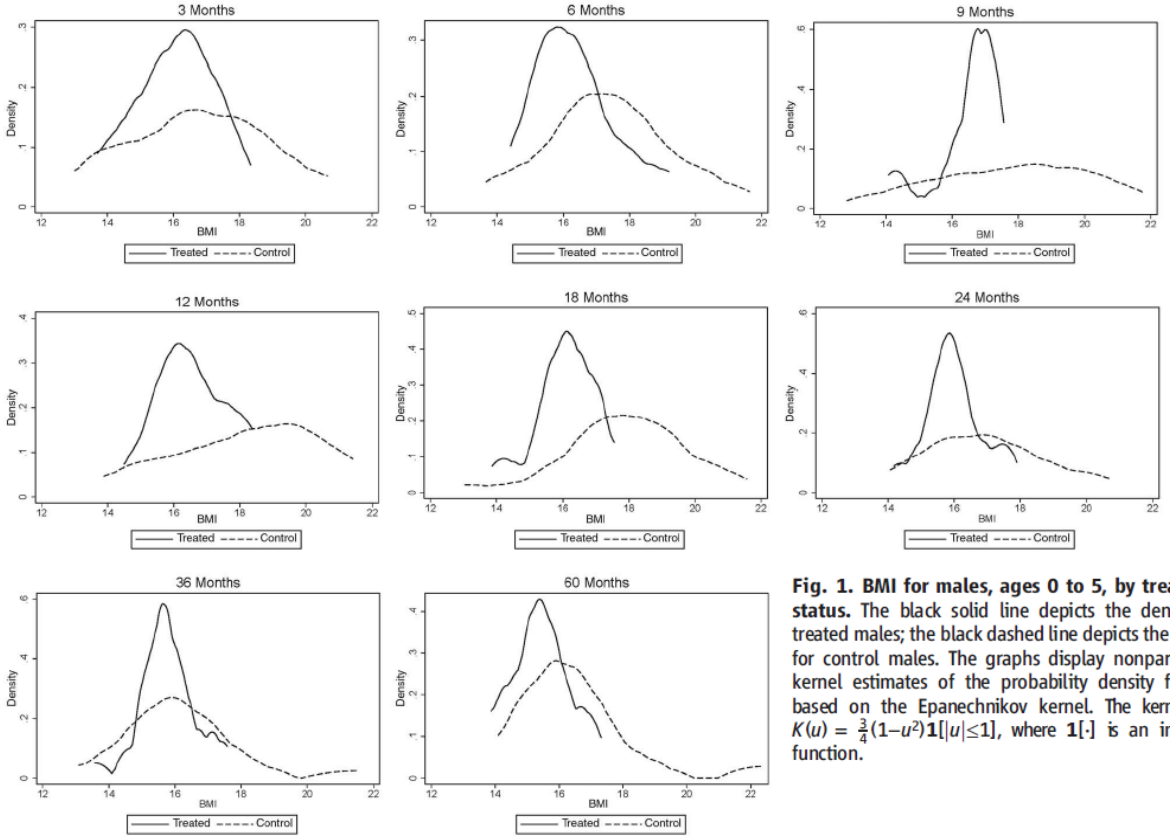


Fig. 1. BMI for males, ages 0 to 5, by treatment status. The black solid line depicts the density for treated males; the black dashed line depicts the density for control males. The graphs display nonparametric kernel estimates of the probability density function based on the Epanechnikov kernel. The kernel K is $K(u) = \frac{3}{4}(1-u^2)\mathbf{1}[|u| \leq 1]$, where $\mathbf{1}[\cdot]$ is an indicator function.

Campbell et al., *Science* 2014

Jamaica Project
(randomized trial)

- Weekly home visits for 2 years – community health workers (stunted children, age 9-24 mos)
  - 1 kg formula (energy and MN) – weekly for 24 months
  - No long term effects of nutrition
- Follow-up age 20
- Intervention – wages
  - Earnings increased by 25%
  - Equal wages of non-stunted controls
- **Timing**

Gertler et al., *Science* 2014

Pakistan Early Development Study (randomized trial)

- Nutrition (MNP) and Responsive Stimulation
- Birth-24 months, Lady health workers
- Responsive Stimulation (24 months)
  - Cognitive, language, and motor scores
- Nutrition (24 months)
  - Linear growth (small, but significant)
  - Language scores
  - No change in hemoglobin
- No synergy between nutrition and responsive stimulation

MNP – multiple micronutrient powder

Yousafzai et al., *Lancet*, 2014

Differential Effects of Stimulation Based on Nutritional Status

- Iron deficiency anemia (IDA) associated with poor cognitive & social development
- Trial in Bangladesh (age 6-24 mos)
  - Effects of psychosocial stimulation differed based on children's baseline anemia status
  - Stronger benefits for children without IDA
- Children with IDA treated with iron
  - Improved iron status, but development lags
- Example of **dose** & **duration** of iron deficiency – **timing** of intervention may have been too late

Tofail, et al., *J Nutr*, 2013

Evolution of Micronutrients and Cognition

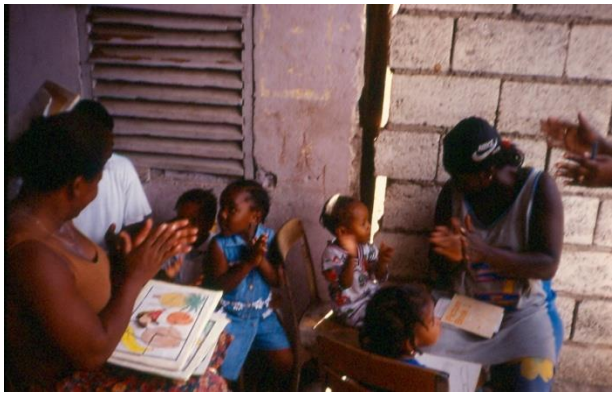
- Single micronutrient deficiencies – observational studies
  - Iron deficiency associated with fatigue, wariness, low mood, poor mental and motor performance
  - Zinc deficiency associated with poor growth, low activity, motor development
- Prevention trials – inconsistent findings
  - Timing, dose, duration
  - Multiple deficiencies

Multiple Micronutrients (MMN)

- Deficiencies often occur in combination
  - Poverty
  - Poor quality diet
  - Limited access to diverse, nutrient rich foods
- Impact of improving one micronutrient in the context of multiple deficiencies
- Interaction/competition among micronutrients
- Timing – when to intervene
- Integrate with early childhood interventions

Recommendations: Integrated Implementation Research

- Consider **timing** and interplay among environmental variables (nutrition, nurturance, protection from illness)
- Evaluate **dose** & **duration** of threat and intervention
- Rigorous, multi-level, multidisciplinary designs, with evaluation of synergy between nutrition and early childhood interventions
- Capacity-building among sectors and workers
- Economic and health indicators
- Focus on first 1,000 days, with longitudinal extensions



Thank You!