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

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

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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

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

**Nutrition Specific Activities**

- Improved nutrition-related behaviors
- Improved use of maternal and child health and nutrition services

**Nutrition Sensitive Activities**

- Household adoption of appropriate water and sanitation practices
- Availability and equitable access to quality food

**Cross Cutting Strategies**

- Gender and Empowerment
- Governance

- 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

**Second level Objectives**

- 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

- Maternal/Pre-natal: 40%
- Diarrhea: 20%
- Feeding: 30%
- EE: 10%

**KEY**
- Maternal/Pre-natal
- Diarrhea
- Feeding
- 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.

Microbial translocation

Microbial products cross into blood stream

Chronic immune activation

Diverts nutrients from growth to infection-fighting

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


• 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

<table>
<thead>
<tr>
<th></th>
<th>quantity</th>
<th>E. coli*</th>
</tr>
</thead>
<tbody>
<tr>
<td>chicken feces</td>
<td>1 gm</td>
<td>13,800,000</td>
</tr>
<tr>
<td>laundry area soil</td>
<td>20 gm</td>
<td>2,340</td>
</tr>
<tr>
<td>contaminated water</td>
<td>400 ml</td>
<td>800</td>
</tr>
</tbody>
</table>

*mid points of 95% confidence intervals

• 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.
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!

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?
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.
• 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
New Evidence Linking Nutrition and Early Child Development

Maureen Black, Ph.D.
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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\(^1,2\)

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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:
Example of Nutrition & Early Child Development Integration

- Breastfeeding
- Complementary Feeding
- Responsive Feeding
- Responsive Play & Learning Curriculum

Context for Home Visits
Developmental Perspective

Human Brain Development

1000 days

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 health & 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

Campbell, Conti, Heckman, Moon, Pinto, Pungello, Pan, *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 $K(u) = \frac{3}{4}(1-u^2)1[|u|\leq 1]$, where $1[.]$ is an indicator function.
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!