Infant and young child feeding

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Contents of presentation

• Definitions of IYCF practices
• Breast feeding
  • Recommended practices and scientific basis
  • Current situation and potential for change
• Complementary feeding
  • Recommended practices and scientific basis
  • Tools for scaling up
  • Experiences with different intervention strategies
Food energy sources during key periods of infant and young child feeding

- the period when other food sources of energy and nutrients are provided along with breast milk...
Key breast feeding behaviors to optimize infant and young child health

- Initiation of BF within first hour post-partum
- EBF for first six months
- Continued breast feeding as long as possible (>2 years)
### Neonatal mortality risk, by time of BF initiation

<table>
<thead>
<tr>
<th>Time of initiation (hr)</th>
<th>N (%)</th>
<th>Deaths</th>
<th>OR (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>4763 (43)</td>
<td>34</td>
<td>1</td>
</tr>
<tr>
<td>1-23</td>
<td>3105 (28)</td>
<td>36</td>
<td>1.45 (0.90, 2.35)</td>
</tr>
<tr>
<td>24-47</td>
<td>2138 (20)</td>
<td>48</td>
<td>2.70 (1.70, 4.30)</td>
</tr>
<tr>
<td>48-71</td>
<td>797 (7)</td>
<td>21</td>
<td>3.01 (1.70, 5.38)</td>
</tr>
<tr>
<td>72+</td>
<td>144 (1)</td>
<td>6</td>
<td>4.42 (1.76, 11.09)</td>
</tr>
</tbody>
</table>

Data from Edmond et al, Pediatrics, 2006.

2.4-fold increased risk of death if BF initiated after day 1
Risk ratios of sub-optimal BF practices for diarrhea incidence

0-5 months

EBF vs partial-BF, RR = 1.68 (1.03, 2.76)

6-11 months

EBF vs non-BF, RR = 2.65 (1.72, 4.07)

Partial-BF vs non-BF, RR = 1.32 (1.06, 1.63)

From: Lamberti et al, BMC Pub Hlth, 2011
Infant feeding practices and risk of diarrhea mortality

In 2011, suboptimal breast feeding accounted for ~804,000 deaths, 11.6% of total for children <5 yr

Recommended breast feeding practices in relation to disease management

Prevalence of EBF, infants <6 mo

UNICEF, 2011
Selected countries with positive change in prevalence of EBF from ~1993-2009, infants <6 mo

UNICEF, 2011
UNICEF IYCF program review

- Leadership, champions, advocacy
- Enabling environment
- Timing & frequency of contact
- Health facilities & community outreach
- Multiple communication channels
- Coordination
Post-natal growth patterns in LICs


In 2011, stunting and wasting accounted for ~1.9 million deaths, ~28% of total for children <5 yr.

### 30 years of effort to improve complementary feeding

<table>
<thead>
<tr>
<th>Year</th>
<th>Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>Manual on Feeding Infants and Young Children</td>
</tr>
<tr>
<td>1998</td>
<td>Complementary Feeding of Young Children in Developing Countries: A Review of Current Scientific Knowledge</td>
</tr>
<tr>
<td>2000</td>
<td>Guiding Principles for Complementary Feeding of the Breastfed Child</td>
</tr>
<tr>
<td>2003</td>
<td>ProPAN: Process for the Promotion of Child Feeding</td>
</tr>
<tr>
<td>2013</td>
<td>Designing by Dialogue: A Program Planners' Guide to Consultative Research for Improving Young Child Feeding</td>
</tr>
<tr>
<td>2013</td>
<td>Complementary Feeding: Family foods for breastfed children</td>
</tr>
<tr>
<td>2013</td>
<td>optifood</td>
</tr>
</tbody>
</table>
Food components and nutrient sources of complementary feeding regimens

- **Breast milk**: energy, protein, EFA, MNs
- **Staples**: energy, protein, fiber, MNs (bioavail?)
- **ASFs**: all!
- **Oil, fat**: energy, EFA
- **Fruits & veg**: MNs, fiber
- **ASFs**: all!
Estimates of nutrient requirements from complementary foods

Theoretical nutrient requirements

- Nutrients obtained from breast milk
- Nutrients needed from complementary foods

www.who.int/child-adolescent-health/publications/Nutrition/WHO_NUT_98.1.htm

Food Nutr Bull 24:5, 2003
Average energy needs from complementary food, by age group

<table>
<thead>
<tr>
<th>Age group (mo)</th>
<th>Average energy needs from CF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kcal/d</td>
</tr>
<tr>
<td>6-8</td>
<td>202</td>
</tr>
<tr>
<td>9-11</td>
<td>307</td>
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<tr>
<td>12-23</td>
<td>548</td>
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</table>
Intake of diets of varied energy density by frequency of feeding

Recommended energy density of CF, by age group and number of meals

<table>
<thead>
<tr>
<th>Meals</th>
<th>Age group (mo)</th>
<th>Energy dens (kcal/g)</th>
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<tr>
<td>1</td>
<td>6-8</td>
<td>1.4</td>
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<tr>
<td></td>
<td>9-11</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>12-23</td>
<td>2.2</td>
</tr>
</tbody>
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# Recommended energy density of CF, by age group and number of meals

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<td>2.2</td>
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<tr>
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<td>0.7</td>
</tr>
<tr>
<td></td>
<td>9-11</td>
<td>0.8</td>
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<td></td>
<td>12-23</td>
<td>1.1</td>
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<td>0.6</td>
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<td>0.8</td>
</tr>
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<td>6-8</td>
<td>0.4</td>
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<td></td>
<td>9-11</td>
<td>0.4</td>
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<td>0.6</td>
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Estimated percent of nutrients required from complementary foods, by age group (assumes average level of breast milk intake)
Estimated percent of nutrients required from complementary foods, by age group (assumes average level of breast milk intake)

- **Calcium**
- **Copper**
- **Iodine**
- **Iron: Low bioav**
- **Iron: Med bioav**
- **Iron: High bioav**
- **Sodium**
- **Zinc**

- 6-8 mo
- 9-11 mo
- 12-23 mo
Problem nutrients

• Definition – nutrients for which there is a large discrepancy between the amounts usually contained in existing complementary foods and physiological requirements

• Nutrients – iron, zinc, calcium, vitamin A, thiamin, (niacin), riboflavin, pyridoxine
Possible strategies for increasing the intake of micronutrients in CFs

- Dietary diversity to include animal-source foods (flesh, organs, eggs, dairy products); fruits & veggies
- Large-scale food fortification(?)
- Processed, fortified CFs
- Point-of-use fortification (adding MNs to CFs; e.g., powders, pastes, tablets)
- Supplementation
ProPAN modules for planning CF programs

Modules

I. Assessment
II. Testing recipes and recommendations
III. Developing the intervention plan
IV. Designing a monitoring and evaluation system

Products

List of suboptimal feeding practices and socio-economic and cultural factors influencing them. Potential recommendations and recipes.

Final recommendations and recipes (feasible and acceptable).

Set of strategies and activities designed to change the behaviors of the target population.

Plan specifying how to assess inputs and outputs (monitoring), and outcomes and impact (evaluation).
Effects of CF intervention strategies on children’s weight gain and linear growth

Dewey and Adu-Afarwuah, Mat Child Nutr, 2008
Effectiveness of an educational intervention delivered through the health services to improve nutrition in young children: a cluster-randomised controlled trial

Mary E Penny, Hilary M Creed-Kanashiro, Rebecca C Robert, M Rocio Narro, Laura E Caulfield, Robert E Black

Lancet 2005; 365: 1863–72
Published online
Nutrition education/behavior change intervention

- Educational messages delivered through local health centers
- Specific messages:
  - Thick CFs
  - Adequate quantity (portion size)
  - Three meals/d
  - Add chicken liver, egg, or fish
  - Serve with love, patience, and good humor
Intakes of energy, iron and zinc from CFs, by age group and intervention group

Figure 2: Unadjusted mean energy and nutrient intakes from complementary foods (24-h recall)

Weight-for-age, length-for-age, and rates of stunting, by age and intervention group

Figure 3: Changes in weight-for-age and length-for-age Z scores in children in the cohort. Error bars = SE.

Figure 4: Cumulative rate of stunting from 0 to 18 months

Can large scale fortification programs improve young children’s nutritional status, health and survival?
How nutrients in fortified foods reach young children

- Directly via food
- Indirectly via breast milk
It depends……

Nutrient (whether or not transferred via breast milk)
Child age and food intake
Breast feeding
Food
Fortificant
Targeted fortified foods for young children

- **Fortified complementary food**…
  ….processed products specifically developed to meet the nutritional needs of young children

- **Point-of-use fortification**…
  …fortified products designed to enhance micronutrient content of the child’s diet. Added at the time of consumption.
Effect of preventive point-of-use fortification of CF on hemoglobin and plasma ferritin concentrations

Length-for-age Z-score at 12 mo by study group

iLiNS-ZINC study: Change in length and stunting prevalence

Change in length 9 to 18 months

Results shown as mean ± SD

Hess SY et al, 2013.
Remaining issues – POUF

- Distribution platforms
- How best to link with dietary counseling for complementary feeding (effects on BF)
- Adherence to recommended regimen
- Optimizing nutrient formulations
- Concerns about possible adverse effects of iron
- Environmental impact of packaging
- Sustainability
Possible distribution strategies

• Child Health Days
• EPI contacts
• Growth monitoring
• Linked to CMAM screening to prevent malnutrition
• Social marketing
• Private sector
• Others ideas?
Difficult to justify, except for VAS which can be given twice yearly.

Often integrated with de-worming, other interventions.

Challenges are delivery channels, social mobilization, financing, sustainability.
Integrated programs to control MN deficiencies

Breast milk

Frt & veg

Pulse

Fortified(?) oil, fat

Fortified(?) staple

ASF

MNP

LNS

VAS
Some remaining issues

- Environmental sanitation, infection
  - Systemic inflammation
  - Sub-clinical malabsorption
  - Role of microbiota

- Food safety
  - Microbiological
  - Toxicological

Breast milk
Staple
Frt & veg
Pulse
Oil, fat

Malaria control
(Bednets, IPT)

Diarrhea rx
(ORS, Zn)

Integrated Nutrition and Health programs to control MN deficiencies

MNP
LNS

ASF

Deworming

VAS

Staple
Thank you!
Micronutrient Powders (MNP)

- Mixed with the child’s regular diet
- Good acceptability of use in field settings
- Proven impact on preventing and treating anemia among young children
- Effective even when used intermittently and flexibly
- Affordable and easy to use
- Number of commercial suppliers available
- MNPs are a new approach which requires behavior change
Lipid-based nutrient supplements (LNS)

- Fat-based spread, often based on peanut butter and vegetable oil
- Provide energy, protein, essential fatty acids and micronutrients
- Can be fed alone or mixed with child’s regular diet
- Has been shown to reduce anemia rates and increase child growth in several countries
Trends in young child height-for-age and weight-for-age, by region

Population attributable risks of for stunting, by risk categories of SGA and pre-term births

<table>
<thead>
<tr>
<th></th>
<th>SGA-Term</th>
<th>Preterm-AGA</th>
<th>SGA-Preterm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global</td>
<td>0.17</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>South Asia</td>
<td>0.24</td>
<td>0.02</td>
<td>0.04</td>
</tr>
<tr>
<td>Southeast/East Asia</td>
<td>0.09</td>
<td>0.007</td>
<td>0.01</td>
</tr>
<tr>
<td>Africa</td>
<td></td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td>Latin America</td>
<td></td>
<td>0.05</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Worldwide, SGA births account for ~20% of stunting at 2 years

Data from Christian et al, unpublished.
In 2005, deficiencies of vitamin A and zinc together accounted for nearly 10% of mortality for children <5 yr.
Global health spending on selected diseases, by disease-specific mortality

Figure 1: 2001 worldwide mortality versus 2005 disbursements of World Bank, US Government, Bill & Melinda Gates Foundation, Global Fund to fight HIV/AIDS, Tuberculosis and Malaria

Solutions to improve nutrition in the 1,000 day window are readily available, affordable and cost-effective.

- Promoting good nutritional practices, including breastfeeding and appropriate, healthy foods for infants;
- Ensuring that mothers and young children get the necessary vitamins and minerals they need; and
- Treating malnourished children with special, therapeutic foods.

• Rapid scaling up of nutrition interventions of proven effectiveness
• Implementation of nutrition-sensitive sectoral strategies
Thank you
## Stages of Preparedness for Scaling Up

<table>
<thead>
<tr>
<th>Stage 1: Taking stock and starting out</th>
<th>Stage 2: Ready for scaling up</th>
<th>Stage 3: Scaling up rapidly to deliver results</th>
<th>Sustaining impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Enabled Environment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Confirming executive level political endorsement</td>
<td>• Embedding of active executive level political leadership</td>
<td>• Championing by executive level political leadership</td>
<td>• Enduring executive level political leadership</td>
</tr>
<tr>
<td>• Engaging line ministries and multiple stakeholders</td>
<td>• Strengthening of multi-sector/stakeholder platforms to enhance alignment</td>
<td>• Effective multi-sector/stakeholder platform to deliver at scale</td>
<td>• Reinforcing high performing platforms to innovate and improve efficiency</td>
</tr>
<tr>
<td><strong>Shared Practices</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Updating or reviewing policies, plans and strategies</td>
<td>• Finalizing of coherent policy and legal framework</td>
<td>• Performing, coherent policy and legal framework well established</td>
<td>• Refining of policy and legal framework to cement cross-sectoral alignment</td>
</tr>
<tr>
<td><strong>Integrated Action</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Taking stock of alignment between nutrition specific interventions and nutrition-sensitive programs</td>
<td>• Agreeing to a Results Framework to align nutrition-specific and relevant sectoral programs, set targets and milestones</td>
<td>• Using agreed results framework performance-manage the scale up effort</td>
<td>• Expansion of results framework as needed to sustain impact, accommodate new interventions etc.</td>
</tr>
<tr>
<td><strong>Increased Resources</strong></td>
<td></td>
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</tr>
<tr>
<td>• Taking stock of financial resources available and required</td>
<td>• Aligning and mobilizing funds behind a set of agreed priorities</td>
<td>• Flowing of financial resources required for agreed gaps based on a functioning financial tracking system</td>
<td>• Ensuring no fall off in the financial resources</td>
</tr>
</tbody>
</table>
Adequate complement feeding with BFing
Control of anemia
Control of vitamin A deficiency
Control of iodine deficiency disorders
Estimated decrease in child mortality: 25%
Pathways to stunting at 2 years -- rural Gambia

**Fig. 3.** Early height growth curves for positive and negative growth deviants in rural Gambian children. Growth deviance is defined as the tallest versus the shortest 12.5% of children from a random sample of 200.  

- **a** Post-natal growth trajectories for the tallest and shortest groups at birth.  
- **b** Antecedent growth trajectories of the tallest and shortest groups at 2 years of age.  
- **c** Trajectories of those children who show greatest positive and negative centile crossing between birth and 2 years. Means ± 95% CI (n = 25 for each curve).

*a = HAZ at birth; b = HAZ at 24 mo; c = Δ HAZ from birth-24 mo.*

### Definition of the period of complementary feeding

The period when other food sources of energy and nutrients are provided along with breast milk.....
Nutrition phases of the first 1000 days

- Pre-conception
- Gestation
- Exclusive breast feeding
- Complementary feeding

- 280 days
- 180 days
- 550 days
Mean length-for-age Z-score, by age and study group

Definitions

• Fortification – the addition of one or more essential nutrients to a food (whether or not it is normally contained in the food) with the purpose of preventing or correcting a demonstrated deficiency in the population or a specific segment of the population (WHO, CODEX alimentarius)
ORIGINAL COMMUNICATION

Participatory nutrition education and adoption of new feeding practices are associated with improved adequacy of complementary diets among rural Malawian children: a pilot study

C Hotz and RS Gibson

1Department of Human Nutrition, University of Otago, Dunedin, New Zealand

Objective: To introduce practices for improving complementary feeding and evaluate their adoption and association with improved dietary intakes.
Design: A quasieperimental pilot study comparing dietary intakes from complementary foods among three intervention communities and one control community before and after the intervention, and adoption of new complementary feeding practices among intervention communities following the intervention.
## iLiNS-ZINC study: Mean length and weight at 18 months

<table>
<thead>
<tr>
<th></th>
<th>Intervention groups</th>
<th>Non-Intervention</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length-9 mo (cm)</strong></td>
<td>68.7 ±0.1</td>
<td>68.9 ±0.2</td>
<td>0.40</td>
</tr>
<tr>
<td><strong>Length-18 mo (cm)</strong></td>
<td>77.7 ±0.1  a</td>
<td>76.9 ±0.1  b</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td><strong>Stunting prevalence</strong></td>
<td>29.3 ±0.1  a</td>
<td>39.0 ±0.1  b</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td><strong>Weight-9 mo (kg)</strong></td>
<td>7.40 ±0.04</td>
<td>7.44 ±0.06</td>
<td>0.63</td>
</tr>
<tr>
<td><strong>Weight-18 mo (kg)</strong></td>
<td>9.30 ±0.02  a</td>
<td>9.03 ±0.04  b</td>
<td>&lt; 0.0001</td>
</tr>
</tbody>
</table>

Results shown as LSMeans ± SE
Prevalence of anemia (Hb <110 g/L) and iron deficiency (sF <12 ug/L) at 12 mo, by study group.

Integrated approaches
Effect of preventive point-of-use fortification with or without energy on length-for-age Z-score

Intake of diets of varied energy density by frequency of feeding