Nutritional Composition of Infant Foods: Evidence from 109 locally-produced, commercially marketed products in 22 countries

Will Masters
Friedman School of Nutrition Science and Policy
http://sites.tufts.edu/willmasters

with Winnie Bell (MS/MPH student) and Marc Nene (PhD student)

Tufts Center for Global Public Health -- Research and Innovation Day
19 November 2014
Much of the world’s growth faltering is experienced by infants during complementary feeding from 6 to 24 months of age.

Mean z scores relative to WHO standards across 54 DHS/MCIS studies, by age (1-59 mo.)

What can explain the sudden and severe shortfalls during this period?

Many factors could cause this pattern of onset and duration

• For example:
  – Exposure to water-borne pathogens, air pollution etc.
  – Expression of gestational deficits

• ...and also inadequate total nutrient intake:

### Mean intake as a percentage of WHO recommended needs, by age

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>6–8 months</th>
<th>9–11 months</th>
<th>12–18 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (kcal)</td>
<td>84%</td>
<td>90%</td>
<td>91%</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>89%</td>
<td>99%</td>
<td>88%</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>66%</td>
<td>69%</td>
<td>78%</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>33%</td>
<td>44%</td>
<td>75%</td>
</tr>
<tr>
<td>Vitamin A (IU)</td>
<td>535%</td>
<td>663%</td>
<td>443%</td>
</tr>
<tr>
<td>Vitamin B1 (mg)</td>
<td>59%</td>
<td>67%</td>
<td>60%</td>
</tr>
<tr>
<td>Vitamin B2 (mg)</td>
<td>48%</td>
<td>50%</td>
<td>35%</td>
</tr>
<tr>
<td>Niacin (mg)</td>
<td>53%</td>
<td>41%</td>
<td>44%</td>
</tr>
</tbody>
</table>

Note: Data shown are mean values for a sample of 400 children in Eastern Ghana.
Why might sufficient nutrient intake be difficult to achieve?

• Total quantity is small and inexpensive relative to family budget...but nutrient density and digestibility must be higher than family diet

• Complementary foods have high-cost ingredients and processing
  — Starchy staple must be fortified with protein, fats and micronutrients
  — Processing at home using traditional methods is labor intensive
  — Availability from artisanal or industrial manufacturers is limited

• Since *Incaparina* in the 1960s, donors have funded startups to produce and sell high-quality complementary foods at lowest possible cost
  — Many different recipes and production methods are possible
  — Locally-adapted products are readily acceptable, have proven efficacy, and cost much less than either home production or imports from industrialized countries

• So what products do we now see in places with widespread malnutrition?
Low-income country markets are still dominated by Nestle’s Cerelac
There are *many* alternatives:

Generics, e.g. “weanimix” in Ghana:

Many small-scale local start-ups, e.g. these from around Africa:

And various multinationals, typically sold in supermarkets and pharmacies:
This project asks:
What’s for sale, and is it any good?

• A global catalog of marketed complementary foods:
  – Step 1: Invite collaborators to identify products on local markets in 2014
    • Criterion: marketed as complement to breastmilk, for >6 months of age
    • Typical product: a fortified composite flour
  – Step 2: Pay them to send us a random sample for nutrient testing
    • Goal: at least 20 countries, averaging 5 products from each country
    • Test for protein, fats, calories, iron, zinc, and phosphorus (for phytates)
  – Step 3: Test predictions from the economics of product quality
    • Hypothesis: Consumers cannot detect nutrients, so composition will vary widely
    • Remedy would be third-party quality assurance
• If products can be good but often aren’t, quality assurance can help
  – both plant inspections and product sampling with nutrient testing
  – 3rd-party label, e.g. “INQAP—OK for babies over 6 months”
  – local advertising to establish this third-party brand
For now:
Results from 109 products in 22 countries

Energy density varies widely within and across countries

Energy density by country of purchase relative to the WFP SuperCereal+ benchmark

Energy density varies widely within and across countries.
For now: Results from 109 products in 22 countries

Macronutrients typically fall short of international standards
For now:
Results from 109 products in 22 countries

Zinc and Iron also often fall short of international standards

Zinc content by country of purchase relative to the WFP SuperCereal+ benchmark

Iron content by country of purchase relative to the WFP SuperCereal+ benchmark
For now:
Results from 109 products in 22 countries

Energy density depends mainly on fat content

- Fat content (g/100g dry matter)
- Protein content (g/100g dry matter)
- Carbohydrate content (g/100g dry matter)
For now:
Results from 109 products in 22 countries

For zinc and iron, both typically fall below international standards.
Packaging lists the product’s energy content for 75 products in 18 countries.

Actual energy content often exceeds labelled energy, and varies less.

Note: the WFP’s SuperCereal Plus has minimum energy content of 410 kcal/100g.
Packaging lists protein for 77 products and fat for 72 products, both in 19 countries

Both protein and fat typically fall short at the higher labeled values

Note: the WFP’s SuperCereal Plus has minimum fat content of 9 g/100g, and minimum protein content of 16 g/100g.
Packaging lists iron for 53 products in 17 countries

Iron content is widely scattered around labeled values

Note: the WFP’s SuperCereal Plus has minimum iron content of 12.5 g/100g.
Conclusions:
These products can have adequate nutrients but they usually don’t

To remedy this market failure, would need quality assurance
Its effectiveness could be measured by an RCT:

1) Establish an Infant Nutrition Quality Assurance Project (INQAP)
2) Recruit manufacturers to participate, and issue time limited INQAP-OK stickers
3) Roll out billboards and demonstrations at randomly-chosen market locations
4) Use household surveys and growth monitoring to track food purchases & infant bodyweights
5) Use child’s age at the time of market advertisements to identify causal effect of certification on growth
Acknowledgements

Funding: International Food Policy Research Institute Linkage Grant ($50,000)

Research: Marc Nene (PhD student) and Winnie Bell (MS/MPH student)


Thank you!