

# Solving Infant Food Quality Challenges: Nutritional Composition of Marketed Complementary Foods in Developing Countries

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**Agriculture for Nutrition and Health (A4NH) Workshop:**  
**Enhancing Nutrition in Value Chains**  
IFPRI, Washington, D.C., June 6-7, 2013

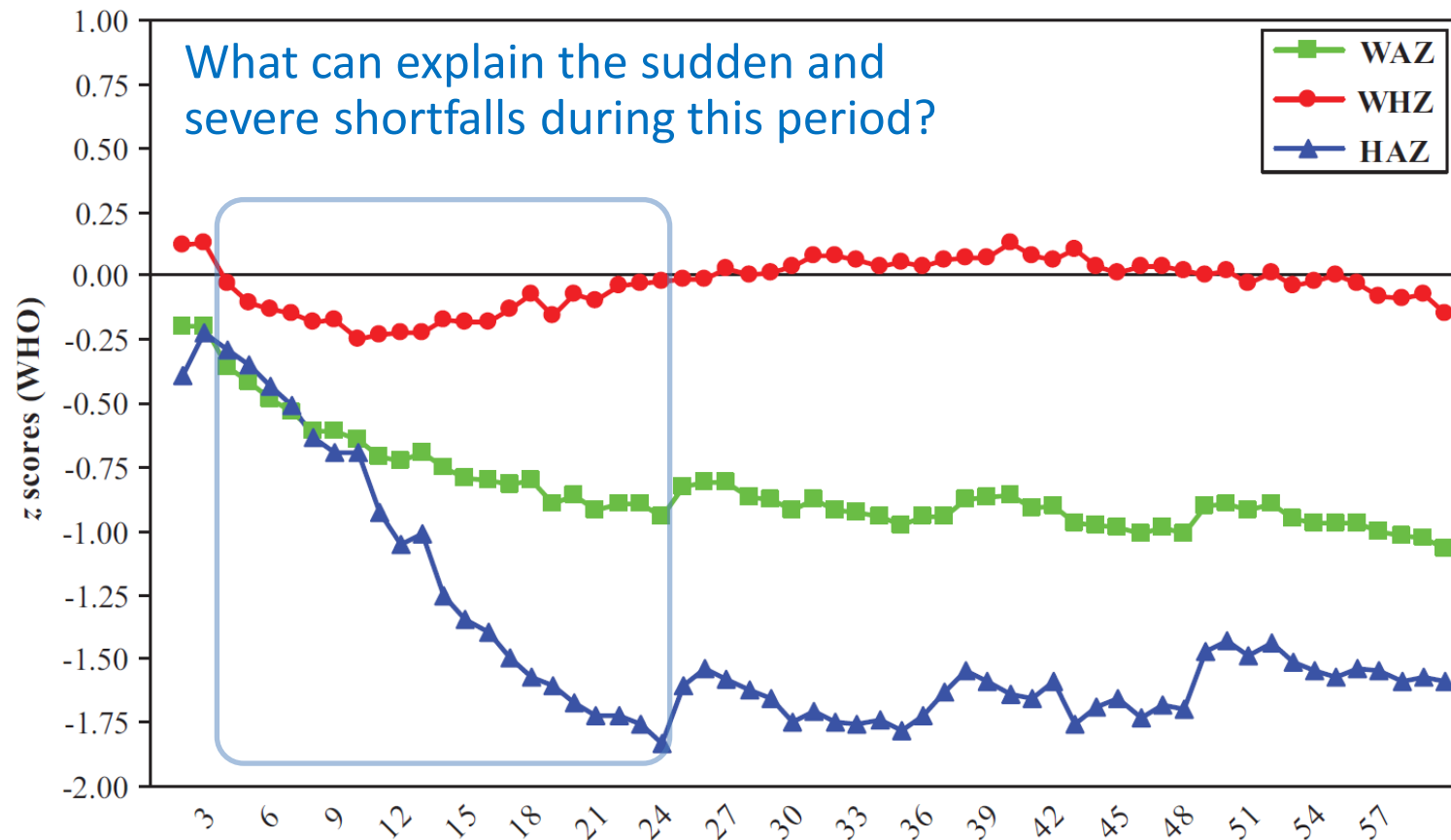


## What's ahead

- An unusual project
- So for today:
  - A lot of background about the market for complementary infant foods, as motivation for
  - A short description of our A4NH project, which in itself is very simple

# Much of the world's undernutrition is experienced by infants between 3 and 24 months

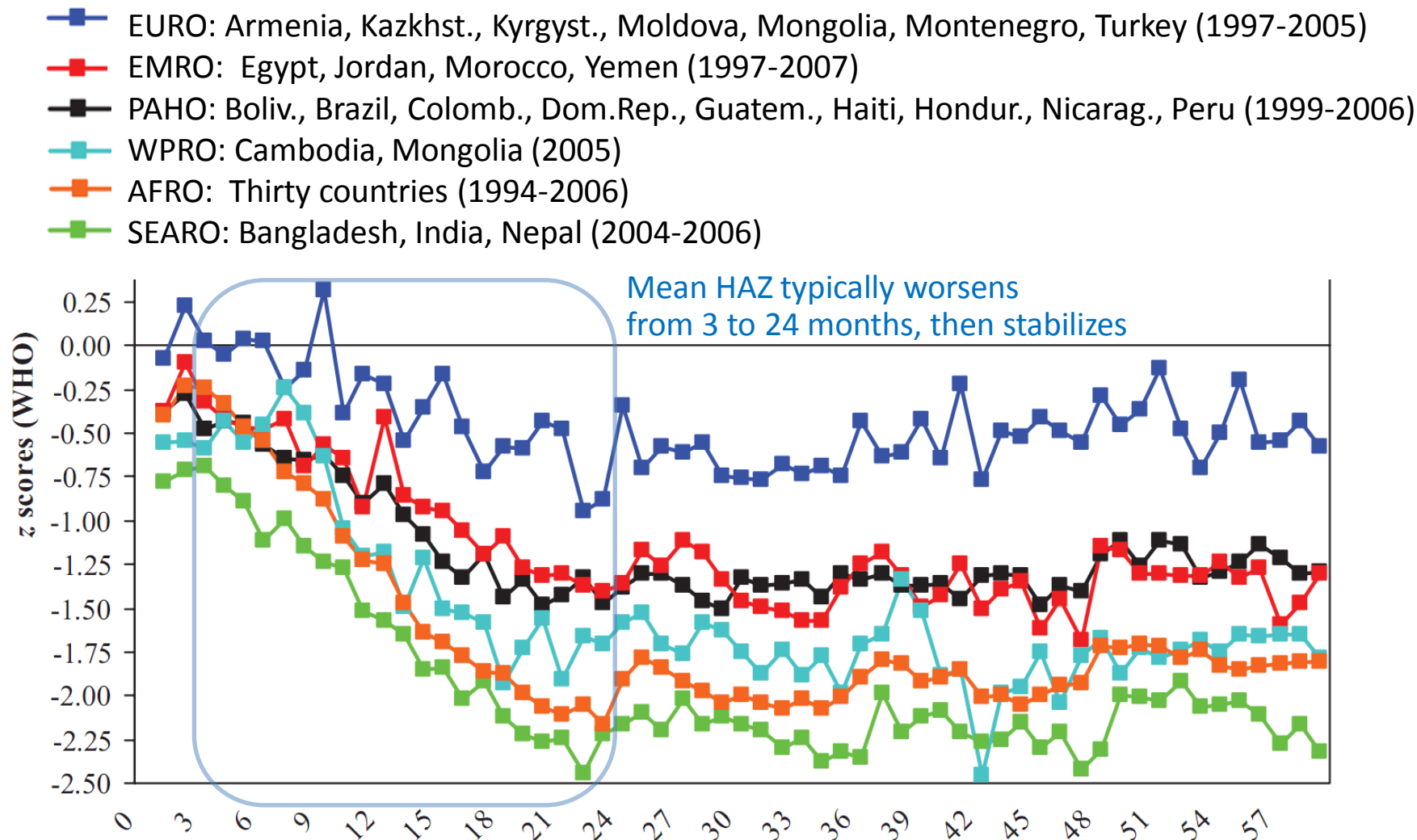
**Mean z scores relative to WHO standards across 54 DHS/MCIS studies, by age (1-59 mo.)**



Source: CG Victora, M de Onis, PC Hallal, M Blössner and R Shrimpton, "Worldwide timing of growth faltering: revisiting implications for interventions." *Pediatrics*, 125(3, Mar. 2010):e473-80.

# The timing of growth faltering is similar across regions

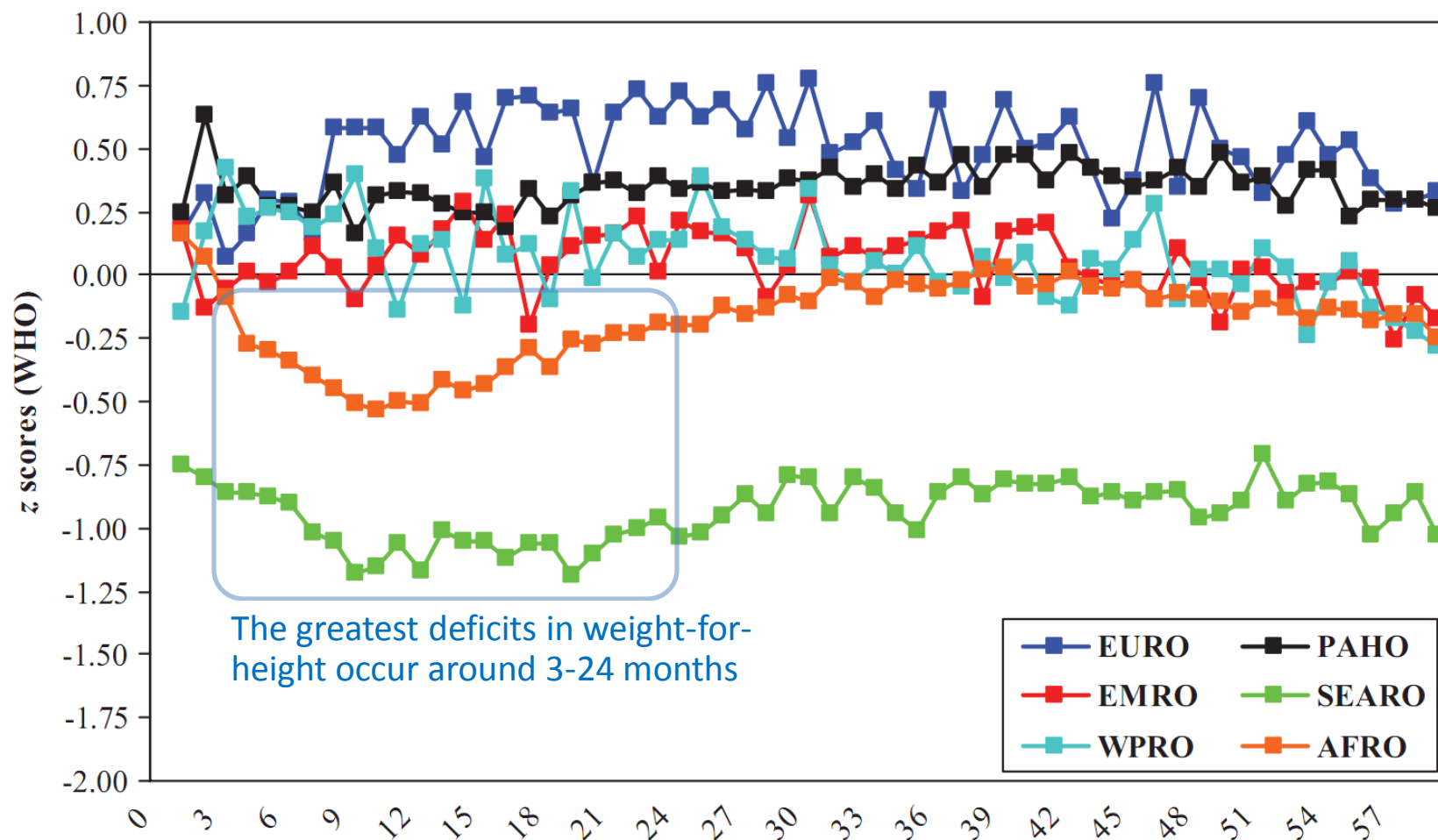
## Mean height-for-age z scores relative to WHO standards, by region (1-59 months)



Source: CG Victora, M de Onis, PC Hallal, M Blössner and R Shrimpton, "Worldwide timing of growth faltering: revisiting implications for interventions." *Pediatrics*, 125(3, Mar. 2010):e473-80.

# In poorest regions, there is also widespread wasting and low weight for height at this time

Mean weight-for-height z scores relative to WHO standards, by region (1-59 mo.)



Source: CG Victora, M de Onis, PC Hallal, M Blössner and R Shrimpton, "Worldwide timing of growth faltering: revisiting implications for interventions." *Pediatrics*, 125(3, Mar. 2010):e473-80.

# Many factors could cause this pattern of onset and duration

- For example:
  - Exposure to water-borne pathogens
  - Exposure to indoor air pollution
  - Expression of earlier deficits
- ...and also inadequate total nutrient intake:

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

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

Note: Data shown are mean values for a sample of 400 children in Eastern Ghana.

Source: C.A. Nti and A. Lartey (2007). "Young child feeding practices and child nutritional status in rural Ghana."

*International Journal of Consumer Studies*, 31: 326-332.

# 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 see today in African markets?

# Low-income country markets are still dominated by Nestle's Cerelac



*Accra, Ghana (2010)*



# There are *many* alternatives:

Generics, e.g.

“weanimix” in Ghana:



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



Kenya



Mali



Senegal

Other branded  
multinationals,  
typically sold in  
supermarkets  
and pharmacies:



## Here is the market I studied first:

### All infant foods for sale in Bamako, Mali (1999)

Brand name	Packaging	Retail Prices (FCFA/unit)*		
		Mkt.	Stores	Pharmacy
Cérélac (wheat)	400 g. can	1400	1500	1615
Cérélac (wheat)	200 g. box	600		850
Cérélac (rice)	400 g. can		1600	
Cérélac (wheat/Banana)	400 g. can		1750	
Cérélac (wheat +3 fruits)	400 g. can			2240
Blédilac** (wheat)	250 g. can			1270
Blédina** lactée fruits	250 g. box			1830
Farinor** (maize/soy)	400 g. box		1690	1750
UCODAL (e.g. Sinba)	200 g. bag		200	
MISOLA	500 g. bag			300

All branded imports charged much more than local products, which could be just as nutritious

...but despite low cost had very few sales, except to institutional buyers

Of the branded imports, only Cerelac was widely available.

D. Sanogo and W.A. Masters (2002), "A market-based approach to child nutrition: mothers' demand for quality certification of infant foods in Bamako, Mali," *Food Policy*, 27(3): 251-268.

Here is the full range of what I bought from diverse vendors around Accra in 2010





And here's a shop well-stocked with locally-made complementary foods in Kampala



W.A. Masters, "Notes on nutrient density of infant foods in Kampala, Uganda." 18 June 2011.

But low-income country markets really are still dominated by Nestle's Cerelac



*Accra, Ghana (2010)*

# What might explain the continued dominance of an expensive brand, when cheaper substitutes exist?

- Advertising and consumer misunderstanding
    - Plausible for some times and places, but why so consistent and long-lived?
  - Advertising and consumer status
    - Allows richer people to signal wealth, but can't explain private use by the poor
  - Advertising and consumer confidence
    - George Akerlof won Nobel for this: asymmetric information between buyers & sellers
      - Initial example was used cars (“The Market for Lemons”, *Q.J.Econ.* 1971)
      - If buyers' can't see qualities that the seller controls, they won't buy “generics” at any price
      - Buyers will trust only brands supported by relationships, advertising etc., despite high prices
    - Infant food buyers cannot detect nutritional value of even high-quality foods
      - Quality is masked by confounding influences on child appetite, health and growth
      - Taste, etc. are known soon after purchase, but
      - Nutrient density may never become visible to the buyer
    - For such “credence goods”, trusted brands can charge high premiums forever
      - Other examples include specialized legal or medical services, etc.
- => The only remedy is 3<sup>rd</sup> party quality testing and certification**

# How do we know why consumers choose Cerelac?

## Evidence from a market test in Bamako\*

The question is,

Why would women buy this?

*Cerelac (400 g. cans)*

1617 FCFA = \$2.49



Instead of this?

*Sinba (2 x 200 g. bags)*

2 x 200 FCFA = \$0.61



Or just raw ingredients  
to mix at home...

\* W.A. Masters and D. Sanogo (2002), "Welfare Gains from Quality Certification of Infant Foods: Results from a Market Experiment in Mali", *American Journal of Agricultural Economics*, 84(4): 974-989.



# How do we know why consumers choose Cerelac?

## Evidence from a market test in Bamako

A “framed field experiment”  
with 240 low-income mothers in peri-urban markets



We gave participants a can of Cerelac, then offered to swap  
for increasing quantities of other infant foods

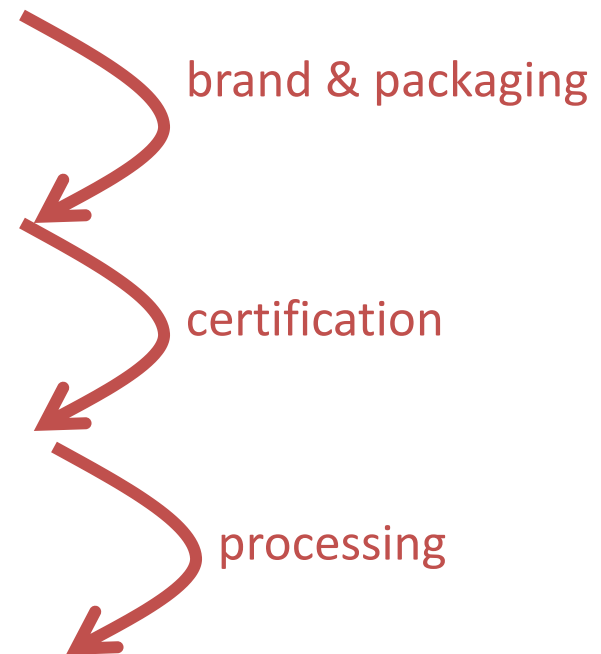


# The experiment allowed people to reveal their preferences one step at a time

*We asked them to compare:*

- The well-known brand  
(*Cerelac*, in 400 g. metal canister)
- A sealed, “certified” mix  
(*Certilac*, in 400 g. plastic bag)
- An open, unidentified mix  
(*Anonymous*, in open bags)
- Raw materials in fixed proportions  
(*Ingredients*, in open bags)

*the only difference is:*



These were real choices;  
they took home one of their actual choices



On average, the mothers in our experiment  
cared about product certification  
almost as much as processing

*Mean willingness  
to pay for product:*

- Certilac: 1160 FCFA
- Generic: 705 FCFA
- Ingredients: 120 FCFA

*Implied willingness to  
pay for the difference:*

455 FCFA for certification  
(=\$0.70 per 400 g. bag)

585 FCFA for processing  
(=\$0.90 per 400 g. bag)



## We also estimated the cost of certification

- We found that:
  - introducing certification would be worth at least \$20 per year per child needing infant foods (between 6 mo. and 2 yrs. of age)
  - this amounts to a value of about \$1 million per year for the city of Bamako as a whole
- This is money that they're still not getting
  - since they don't yet have a certification system

Many years later in 2010, DFID funded a scoping study to revive the question for Ghana...

- This time, we could address two other questions:
  - Are the locally produced infant foods actually available?
  - Are the locally produced infant foods actually high quality?
- Our economic theory has clear predictions:
  - After start-up the products will be rarely available, because buyers will be skeptical about quality
  - and skepticism will be justified, because quality will be low and variable since the sellers lack motivation to keep it high

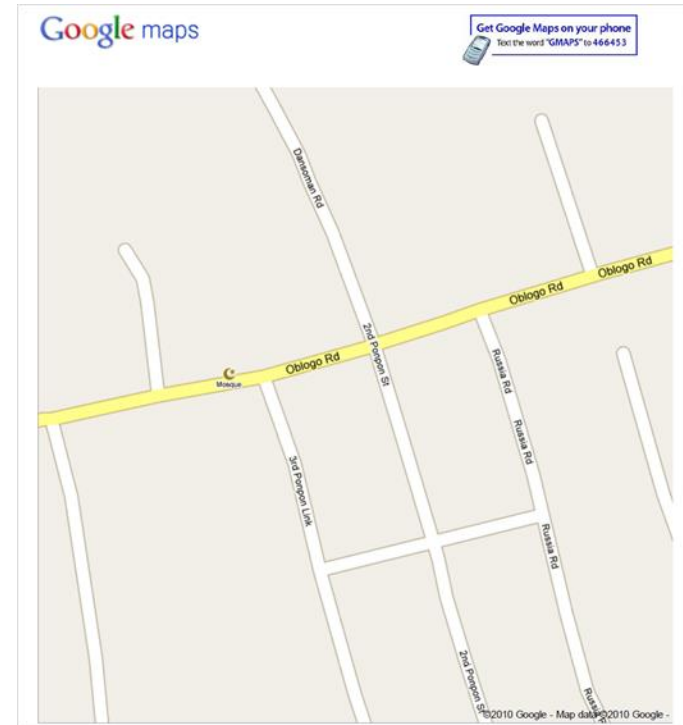
# Question #1:

## Are local infant foods as available as Cerelac?

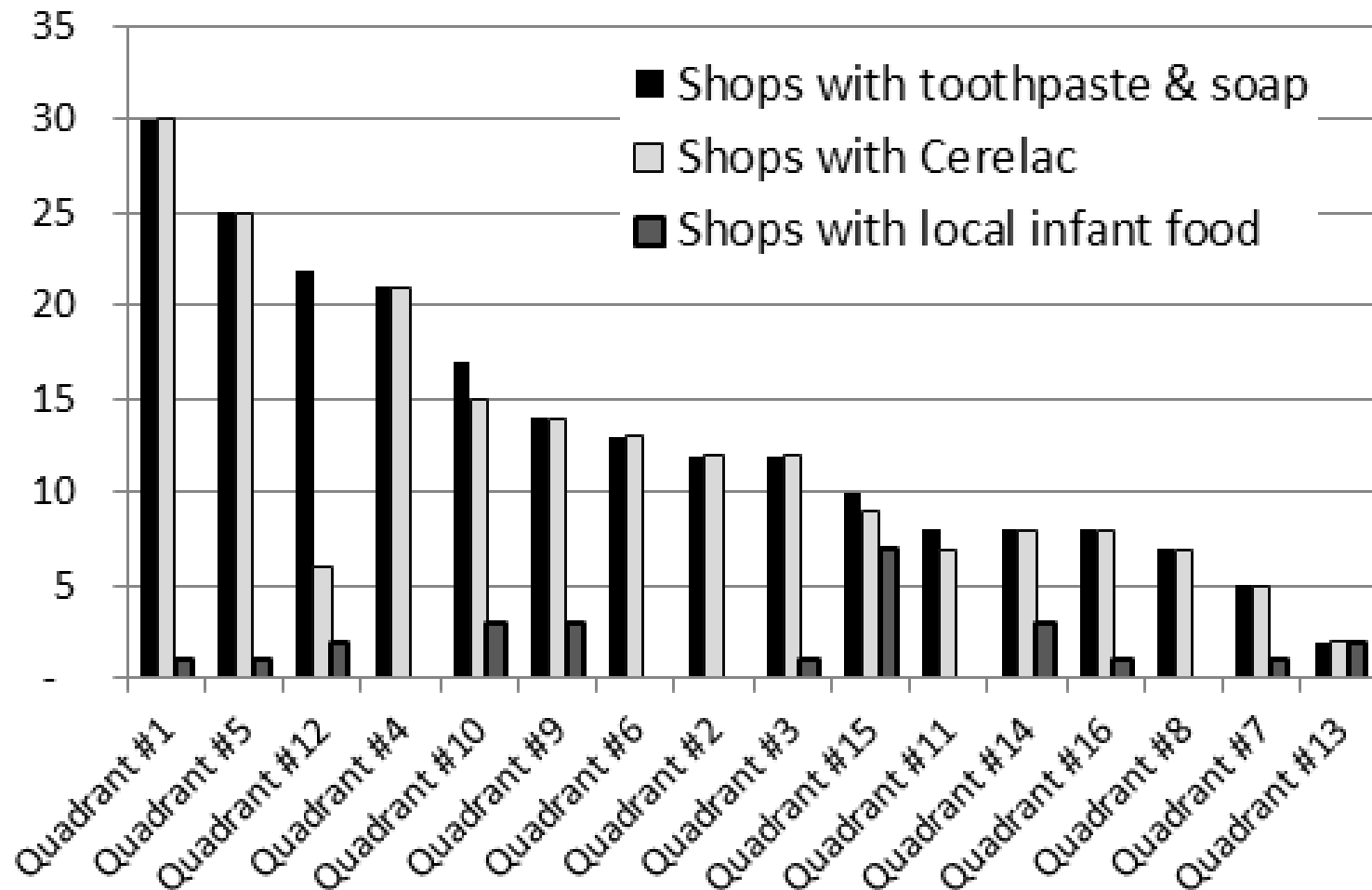
- This is a difficult question...
- To answer in terms of Greater Accra as a whole, we divided the city into quadrants defined like this:

[http://maps.google.com/maps?](http://maps.google.com/maps?&ll=5.558740,-.253961&spn=0.0025,0.0025&pw=2)  
[&ll=5.558740,-.253961](http://maps.google.com/maps?&ll=5.558740,-.253961&spn=0.0025,0.0025&pw=2)  
[&spn=0.0025,0.0025](http://maps.google.com/maps?&ll=5.558740,-.253961&spn=0.0025,0.0025&pw=2)  
[&pw=2](http://maps.google.com/maps?&ll=5.558740,-.253961&spn=0.0025,0.0025&pw=2)

- Then randomly generated latitude and longitude locations and visited each one until we found over 200 shops to judge...



# Are local infant foods as available as Cerelac?



Source: W.A. Masters, J. Kuwornu and D. Sarpong, "Improving Child Nutrition through Quality Certification of Infant Foods: Scoping Study for a Randomized Trial in Ghana." London: International Growth Centre Working Paper, February 2011.

## Question #2: Are local infant foods as good as Cerelac?

- To answer, we took 14 samples and sent them without labels to a commercial lab in Omaha
- We did proximate analysis for macronutrients, plus iron & zinc, and also phosphate as an indicator of phytic acid





# Are local infant foods as good as Cerelac?

## Nutrient Density of Sampled Foods in Ghana (% of Cerelac)

Sample	Calories	Macronutrients (g/100 g)			Minerals (mg/100g)			Ash
	(kCal/100g)	Protein	Fat	Carb.	Iron	Zinc	Phos.	(g/100 g)
5	101%	119%	105%	95%	95%	62%	110%	102%
8	100%	129%	103%	93%	95%	70%	114%	101%
<b>Cerelac</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>
7	99%	163%	97%	86%	153%	68%	118%	132%
2	97%	108%	77%	104%	61%	48%	64%	54%
9	97%	81%	78%	109%	53%	65%	99%	71%
6	97%	109%	77%	104%	65%	55%	80%	62%
12	97%	76%	76%	110%	27%	52%	89%	70%
1	97%	110%	75%	103%	55%	54%	79%	73%
14	95%	186%	81%	82%	129%	54%	102%	198%
3	94%	48%	53%	122%	66%	34%	54%	31%
4	94%	131%	59%	101%	117%	60%	111%	102%
10	93%	92%	48%	113%	28%	51%	79%	51%
13	92%	77%	38%	119%	11%	43%	49%	24%

Source: W.A. Masters, J. Kuwornu and D. Sarpong, 2010. "Improving Child Nutrition through Quality Certification of Infant Foods: Scoping Study for a Randomized Trial in Ghana." London: International Growth Centre, forthcoming.

We had visited several of these manufacturers,  
and were surprised:



This producer's mix had  
similar nutrient density  
to Cerelac



This product had a  
much lower fat  
content

Products of very different density were sold to us  
by the same vendor, anonymously



More nutrient-dense than  
Cerelac (sample #5)



Less nutrient-dense than  
Cerelac (sample #4)

Four of the six had lower fat density  
than *any* of the 14 Ghana samples

**Nutrient Density of Ugandan Samples and Reference Foods (% of Cerelac)**

	Calories	Macronutrients (g/100 g)			Minerals (mg/100g)		
Sample	(kCal/100g)	Protein	Fat	Carb.	Iron	Zinc	Phosphorus
1	87%	107%	39%	103%	561%	311%	589%
2	85%	79%	25%	112%	21%	38%	56%
3	88%	92%	56%	101%	159%	104%	88%
4	83%	94%	25%	106%	264%	45%	91%
5	87%	103%	28%	108%	54%	48%	51%
6	88%	80%	26%	116%	316%	313%	396%
Cerelac	100%	100%	100%	100%	100%	100%	100%
CSB13	80%	101%	63%	na	115%	126%	158%
CSB++	82%	97%	70%	na	136%	160%	101%

Note: Reference values are from labels of Cerelac and two CSB food-aid products.  
Source: W.A. Masters, "Notes on nutrient density of infant foods in  
Kampala, Uganda." 18 June 2011.

# Actual nutrient densities differed widely from products' own labels

## Nutrient Density of Ugandan Samples (% of labeled values)

	Calories	Macronutrients (g/100 g)			Minerals (mg/100g)		
Sample	(kCal/100g)	Protein	Fat	Carb.	Iron	Zinc	Phosphorus
1	105%	120%	89%	na	350%	5%	na
2	na	na	na	na	4%	18%	33%
3	106%	104%	128%	na	169%	41%	na
4	na	na	na	na	na	na	na
5	100%	67%	95%	na	63%	46%	153%
6	97%	116%	na	97%	na	na	na

Note: Nutrients not labeled are marked “na”.

Source: W.A. Masters, “Notes on nutrient density of infant foods in Kampala, Uganda.” 18 June 2011.

So...

Locally produced foods *could* be widely available at much lower cost and similar nutrient density as Cerelac

- ...and yet they are not.
  - They are rarely available, and when found their quality is variable
  - Certification could help them be more widely sold with higher quality
- There is no demand for quality certification.
  - Better-off buyers can afford enough Cerelac, since quantities are small
  - Potential beneficiaries don't know it would help them
  - Demand for certification arises only to protect from contamination
- So the market is stuck!
  - This is a classic economics problem, with a clear but difficult remedy...

## Our A4NH project: What's for sale, and is it any good?

- A global Consumer's Report investigation of marketed complementary foods:
  - Step 1: A complete global catalog of what's marketed in 2013
    - All products found by our collaborators in at least 75 developing countries
    - Criterion: marketed as complement to breastmilk, for >6 months of age
    - Typical product: a fortified composite flour
  - Step 2: Random sampling to test for nutrient profiles
    - A sample of 20 countries, 5 products from each country
    - Test for protein, fats, calories, iron, zinc, and phosphorus (for phytates)
  - Step 3: Correlate measured quality with potential determinants
    - Country, market and governance factors (income, city size, policies)
    - Manufacturer and retailer influences (foreign/local, formal/informal etc.)

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# Our A4NH project:

## Hypotheses

### *1. Availability of manufactured complementary foods*

Hypothesis 1a. All countries will have Nestle's Cerelac for sale.

Hypothesis 1b. The number of different multinational and locally-produced brands for sale as alternatives to Cerelac will be positively correlated with per-capita income.

### *2. Nutrient labeling of available manufactured complementary foods*

Hypothesis 2a. All of the multinational brands and some locally-produced brands will have some nutrient information on their labels.

Hypothesis 2b. The fraction of brands with nutrient information on their labels will be positively correlated with per-capita income.

### *3. Nutrient content of available manufactured complementary foods*

Hypothesis 3a. The actual nutrient content of locally-produced products will be weakly correlated with the nutrient profile of reference products, and weakly correlated with their own nutrient labels.

Hypothesis 3b. The deviation in nutrient content of locally-produced products from the nutrient profile of reference products or their own nutrient labels will be weakly correlated with per-capita income.

Hypothesis 3c. At least half of the products will have sufficiently low nutrient density that they cannot meet an infant's complementary-food needs.

## Our A4NH project: Timeline and follow-up

- Timeline for this projects
  - Database of product characteristics: Sept 15, 2013
  - Draft report with initial results: Dec. 31, 2013
  - Final report: June 30, 2014
- Impacts and follow-on activities
  - If results are as hypothesized, then could introduce quality assurance systems
    - both plant inspections and product sampling with nutrient testing
    - 3<sup>rd</sup>-party label, e.g. “INQAP—OK for babies over 6 months”
    - Local advertising about the use and expiration of these labels by color
  - Historically, quality assurance is introduced most often after scandals, to avoid harm or to introduce new attributes
  - But the nutritional quality of complementary foods might need it!