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Measuring the Nutrient Density of Marketed Complementary Infant Foods: Towards Nutrition-Sensitive Food Markets and Value Chains in Developing Countries

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Objectives summary

Our project will provide the **first global database of marketed complementary foods** intended for infant feeding in developing countries. We will:

-- Compile **descriptive information on all products** now sold in over 80 countries, and

-- Test the **nutrient and anti-nutrient density of 100 samples** from about 20 countries

Observed characteristics will inform policies such as third-party quality assurance programs that could **increase access and lower the cost of high-quality products.**

Motivation

From earlier analyses of 15 samples from Ghana in 2010 and 6 samples from Uganda in 2011, we have found that the macro-nutrient, micro-nutrient and anti-nutrient content of marketed complementary foods are highly variable and often fall short of the nutrient densities required by infants aged 6-24 months when high-density foods are needed to complement breastmilk.

We have found a variety of foods made from locally available ingredients. Such products have proven efficacy in promoting child growth and development, and are often introduced in low-income countries such as Ghana and Uganda. Consumers are aware of their value, as demonstrated by frequent purchase of established global brands of infant food such as Nestle's Cerelac, but the high cost of those global brands leads to the quantity purchased being insufficient to meet childrens' needs.

The current study will test the degree to which marketed complementary foods introduced around the world actually fulfill their potential, identifying opportunities for quality certification programs to assure consistency and build the consumer confidence needed to scale up purchases of nutritious complementary foods after six months of exclusive breastfeeding.

Preliminary results from Ghana

Samples of marketed complementary infant foods available in Ghana in 2010

Of the 13 samples we can compare to Cerelac , Three (samples numbered 5, 8 and 7) offer 97 percent or more of proteins and fats than Cerelac, and 95 percent or more of the iron in Cerelac. However, none of the three have more than 70 percent of Cerelac's density in zinc and they have 110 percent or more of Cerelac's level of undesirable phosphorus.

Nutrient density relative to Nestle's Cerelac of locally-produced infant foods purchased in Greater Accra, Ghana in 2010

	Calories	Macronutrients (g/100 g)			Minerals (mg/100g)			Ash
Sample	(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%
Cerelac	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***
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%

Note: Phosporus is shown as an anti-nutrient, to indicate the level of phytic acid that limits digestibility.
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 Working Paper, February 2011. http://eprints.lse.ac.uk/36372.

Research implications

The current research findings will add to the authors' market experiments and surveys of complementary foods already being sold in Africa, identifying opportunities to improve these products as detailed at **http://sites.tufts.edu/willmasters/research/infant-foods.**

A finding that nutrient densities of locally-produced foods are low and variable would help explain why even poor consumers rarely buy these products despite their low cost, and reveal the need for third party certification to ensure that sellers maintain at least the minimum standards needed for consumer confidence and child health.

Preliminary results from Uganda

Samples of marketed complementary infant foods available in Uganda in 2011

Calorie densities for all six samples are at least 10 percent below that of Cerelac, but are above the calorie densities of the two reference food-aid formulations. The sampled foods are more similar to CSB than they are to Cerelac, but all samples have less fat than the CSB standard, and several fall short of the CSB standards for protein and minerals as well.

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.

Materials and methods

This project involves a two-step research design to be completed in June-December 2013:

Step 1: compile a catalog of composite-flour complementary food products sold throughout the world by contacting potential collaborators in at least 80 developing countries. Each collaborator will be invited to submit identifying information of product labels for all products marketed in that country as complementary foods for infants 6-24 months of age. These are typically cereal-based composite flours, for which the reference products are Nestle's Cerelac in commercial markets, and fortified corn-soy blend in food assistance programs. Local millers typically market similar products, often substituting other cereals and fortificants in varying proportions. Such products are often described in the nutrition-assistance literature, so some contact information will be found in internet searches. We expect to find valid data on at least 200 products in at least 50 countries, with details from product labels for at least 100 products.

Step 2: select a representative sample from the complete catalog of known products described in step 1 and analyze their nutrient profiles for comparison with reference values. We will select a sample of 20 countries and offer payment to collaborators there for samples that they purchase and send to us via express mail. We will then contract with a laboratory to analyze those samples for total energy, protein and fat (as desirable macro-nutrients), iron and zinc (as desirable micro-nutrients), and phosphorus (as a marker of the undesirable phytate antinutrient).

Main hypotheses

1. All countries will have Nestle's Cerelac for sale. Middle-income developing countries will also have at least 4 other multinational and locally-produced brands for sale, and lower-income countries will have a fewer alternatives to Cerelac available in local markets.

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

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

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

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For details and contact information, see **http://sites.tufts.edu/willmasters/research/infant-foods** or email **marc.nene@tufts.edu** or **william.masters@tufts.edu**.