

Nutritional Composition of Locally-Manufactured Complementary Infant Foods in Africa

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Abstract

This project provides the first global database of locally-manufactured complementary foods sold for children aged 6-24 months in developing countries. These are dry mixtures of cereals, legumes and sometimes other ingredients, produced by local grain millers and other entrepreneurs. To date, we have descriptive data on 311 products from 26 countries, including 94 products from 13 African countries, sourced from market visits, key informants and internet searches. Data include manufacturer contact information, product photographs, ingredient lists and nutritional claims. So far we have obtained and tested the actual nutrient density of 21 samples from Ghana and Uganda, finding wide variation in both macro- and micronutrients, with results often far from labeled quantities. Our findings call for third-party quality assurance to protect consumers from harm, while improving access and lowering cost of products that meet known nutritional standards.

Motivation

A wide variety of complementary foods can be made from locally available ingredients, with proven efficacy in promoting growth and development among children aged 6 to 24 months. At that age children need to complement breastmilk with small quantities of solid foods offering higher nutrient density, consumed more frequently than the family diet. The most time- and cost-effective approach is typically to use premixed composite flour cooked in water. Such flours are typically made from a starchy staple, fortified with a legume and possibly additional sources of flavor and nutrients. Infant cereals of this type have been introduced in many countries by donor-funded projects and local entrepreneurs, and can be more accessible and lower cost alternatives to multinational brands or donor-funded food aid. Building on our previous research (<http://sites.tufts.edu/willmasters/research/infant-foods>), this project describes differences and similarities in these products, assessing the degree to which locally-produced complementary foods actually fulfill their potential to provide adequate nutrients.

Hypotheses

Our methods test the following hypotheses:

- (H1) Countries at all levels of per-capita income have some locally-manufactured complementary foods available for sale in commercial markets, and
- (H2) Samples of these products obtained vary widely in density of macro- and micronutrients,
- (H2a) relative to international standards such as WFP's Super Cereal Plus, and
- (H2b) relative to any nutrient composition claims made on their own packaging.

Results for H1: Number of products available

As of June 2014, our database has descriptive information on the following:

Sub-Saharan Africa	#	Other Countries	#
Benin	9	India	25
Botswana	4	Indonesia	37
Burkina Faso	6	Nepal	8
Cameroon	10	Pakistan	3
Cote d'Ivoire	8	Philippines	6
Ghana	10	Thailand	9
Kenya	15	Vietnam	40
Madagascar	5	Egypt	5
Malawi	1	Jordan	22
Mali	3	Morocco	2
Mauritania	3	Haiti	4
Tanzania	13	Brazil	32
Uganda	7	Belarus	24
S-S Africa subtotal (13 co's.)	94	World total (26 countries)	311

Source: Authors' calculation from sources to be posted at <http://sites.tufts.edu/willmasters/research/infant-foods>.

Results for H2a: Variation in nutrient density -- Ghana

Samples of marketed complementary infant foods available in Ghana in 2010



Table 2. Nutrient density of samples from Ghana, relative to WFP Super Cereal Plus*

Sample #	Energy (kCal/100g)	Moisture (%)	Macronut. (g/100 g)		Minerals (mg/100g)		
			Protein	Fat	Iron	Zinc	Phos.
5	109%	70%	108%	148%	65%	36%	101%
11*	107%	100%	90%	140%	67%	57%	90%
8	106%	129%	114%	142%	63%	39%	102%
7	105%	126%	144%	134%	102%	38%	106%
12	104%	111%	68%	105%	18%	29%	80%
9	102%	156%	71%	107%	34%	37%	88%
6	102%	168%	95%	104%	42%	30%	71%
1	101%	164%	96%	103%	36%	30%	70%
2	101%	182%	93%	104%	40%	26%	56%
4	100%	129%	116%	81%	78%	33%	100%
14	98%	213%	159%	108%	83%	29%	89%
3	95%	249%	41%	69%	42%	18%	46%
10	93%	278%	77%	62%	18%	26%	67%
13	92%	293%	64%	49%	6%	22%	41%
SCP*	410	7.00	16.00	9.00	12.5	7.6	334

*Notes: Ghana test results include 4 products produced by multinationals (on right side of photo), excluded from product counts in Table 1. Sample #11 is Nestle's Cerelac. Percentages are relative to the WFP standard for SuperCereal Plus (SCP), as detailed in note to Table 3.

Results for H2a: Variation in nutrient density -- Uganda

Samples of marketed complementary infant foods available in Uganda in 2011



Table 3. Nutrient density of samples from Uganda, relative to WFP Super Cereal Plus*

Sample #	Energy (kCal/100g)	Moisture (%)	Macronut. (g/100 g)		Minerals (mg/100g)		
			Protein	Fat	Iron	Zinc	Phos.
3	95%	138%	83%	78%	107%	59%	79%
6	94%	93%	71%	37%	213%	177%	358%
1	93%	125%	96%	54%	379%	176%	532%
5	93%	113%	92%	39%	37%	28%	46%
2	92%	124%	71%	35%	14%	22%	51%
4	89%	136%	84%	35%	178%	25%	82%
SCP*	410	7.00	16.00	9.00	12.5	7.6	334

*Notes: Percentages are relative to the WFP standard for Super Cereal Plus (SCP), formerly known as CSB++. All sample numbers are random, shown here in order of energy density. Nutrient composition of samples are authors' calculations, from tests performed by Midwest Laboratories, Inc. For SCP macronutrient and moisture levels, source is WFP (2011), Technical Specifications for the Manufacture of SuperCerealPlus Corn Soya Blend, version 2.0, Dec. 1st 2011, available online as document wfp251145.pdf. For SCP micronutrient levels, source is Webb et al. (2011), "Delivering Improved Nutrition: Recommendations for Changes to US Food Aid Products and Programs", http://pdf.usaid.gov/pdf_docs/PNADZ842.pdf.

Conclusions

We find nutrient densities of tested products to be highly variable relative to international standards and to each other, even among products from the same manufacturer. Protein and fat densities range from 159% to 35% of the WFP standard for Super Cereal Plus, and mineral densities range even more widely. Products often have a high density of some nutrients and low density of others, with little or no link to product price or packaging. In the few cases where packaging lists nutrient composition, actual densities range from 350% to 4% of the labeled quantity. This unpredictability could help explain why consumers rarely buy these products, and reveals the need for third party certification to ensure that sellers maintain at least the minimum standards needed for child health. Offering certification could help manufacturers compete on price and marketing, leading to more affordable and more widely available products of uniformly high quality.

Acknowledgments and contact information

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Results for H2b: Variation relative to packaging claims

Table 4. Nutrient density of samples relative to their own nutrient labels*

Country	Sample #	Energy (kCal/100g)	Macronutrients (g/100 g)		Minerals (mg/100g)		
			Protein	Fat	Iron	Zinc	Phos.
Uganda	3	106%	104%	128%	169%	41%	
	1*	105%	120%	89%	350%	5%	
	5	100%	67%	95%	63%	46%	
	6*	97%	116%		4%	18%	
	2						
Ghana	3*	106%	89%	126%			
	11	102%	96%	105%	113%	108%	
	9*	82%	82%		40%		
	Fraction above 100%	0.71	0.43	0.60	0.50	0.20	

*Notes: Percentages are relative to each product's own packaging claims, and are shown only for nutrients whose density is listed on the package. Sample numbers are as for Tables 2 and 3, presented in order of the product's actual percentage of its labeled energy density. Uganda samples 1 and 6 are from the same manufacturer, as are Ghana samples 3 and 9.