

# Fortified infant cereals in low-income countries

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# Infant feeding is surprisingly difficult

- Quantity of food needed is small (<50g/day to start)
  - daily cost of is low, even for poor households
  - ...but infants have small stomachs
- For growth and development, infants need:
  - foods with high nutrient density and digestibility
  - fed more frequently than older family members
- Getting it right is surprisingly difficult!
  - time to prepare special foods 3-5 times per day
  - with correct mix of macro- and micro-nutrients



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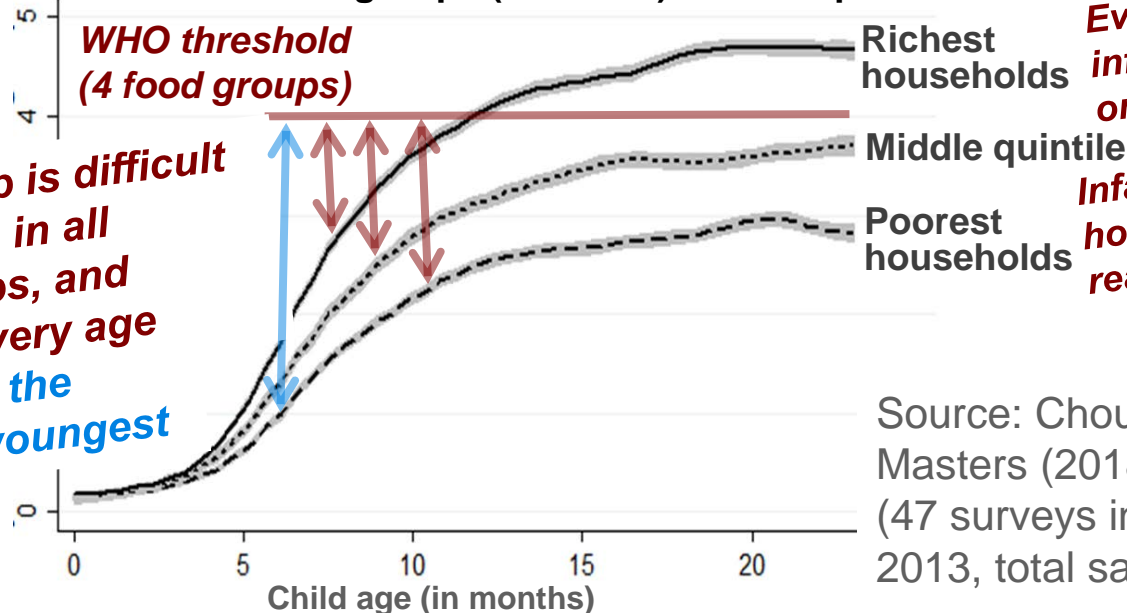
# Every child has some kind of baby food but in poor countries, not enough nutrients especially at 6+ months of age

The WHO recommends:

- From 0 to 6 months: breastfeeding
- From 6 to 23 mo.: breastfeeding plus solid foods
  - diverse items of high nutrient density ( $\geq 4$  food groups)
  - fed more often than older children (4-6 times/day)
- From 2 years of age: transition to the family diet

What do kids actually eat? Diet quality surveys find:

Number of food groups (out of 12) fed over previous 24 hrs



*Filling this gap is difficult for caregivers in all income groups, and children of every age. Especially for the poorest and youngest*

*Even in the richest hhlds, infants reached 4 groups only after 12 mo. of age*

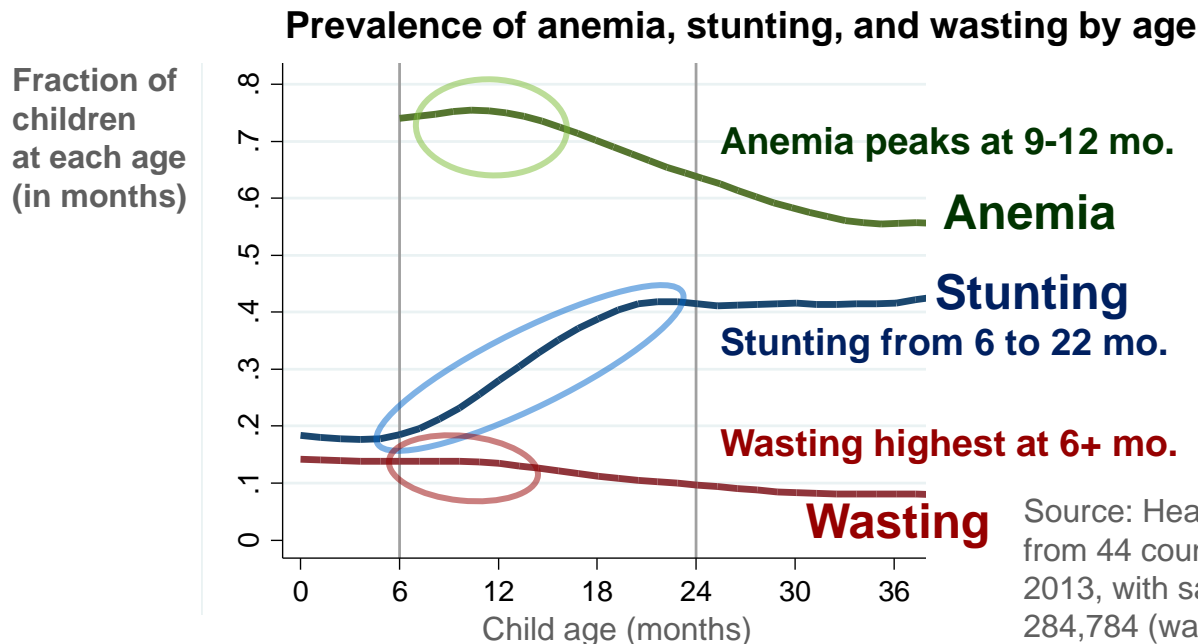
*Infants in most surveyed households never reached 4 groups*

Source: Choudhury, Headey & Masters (2018), from DHS data (47 surveys in 39 countries, 2006-2013, total sample size = 67,241)

# Every child has some kind of baby food but in poor countries, not enough nutrients especially at 6+ months of age

Nutritional outcomes fall behind children's potential mainly during the 6-24 month period.

Dietary deficits at that age cause permanent damage beyond deficits in utero and infancy (-9 to 4 months), with few opportunities for later recovery



Source: Headey & Masters 2018, using DHS data from 44 countries surveyed between 2006 and 2013, with sample sizes of 296,370 (stunting), 284,784 (wasting), and 139,356 (anemia)

# Fortified cereals can help meet infant needs

Switzerland  
(1870s)



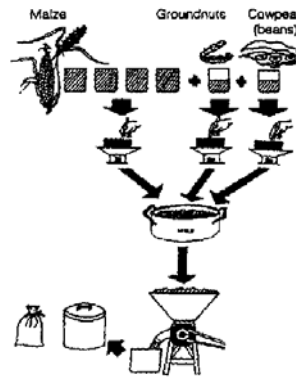
France  
(1880s)



Now, Unilever:



Home and artisanal  
production projects, 1980s  
Weanimix Misola



Many small-scale  
millers making  
premixed cereals  
since 1990s



Toronto  
Hosp. for  
Sick Kids  
(1931)



INCAP  
(1961)



Food aid => SuperCereal+  
(2010)





# Fortified cereals are widely sold

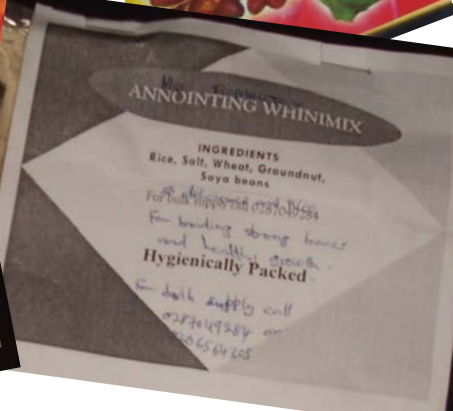
Accra, Ghana (2010)

Also available in stores  
From S. Africa

Locally made:



From Brazil



# We tested 108 products from 22 countries

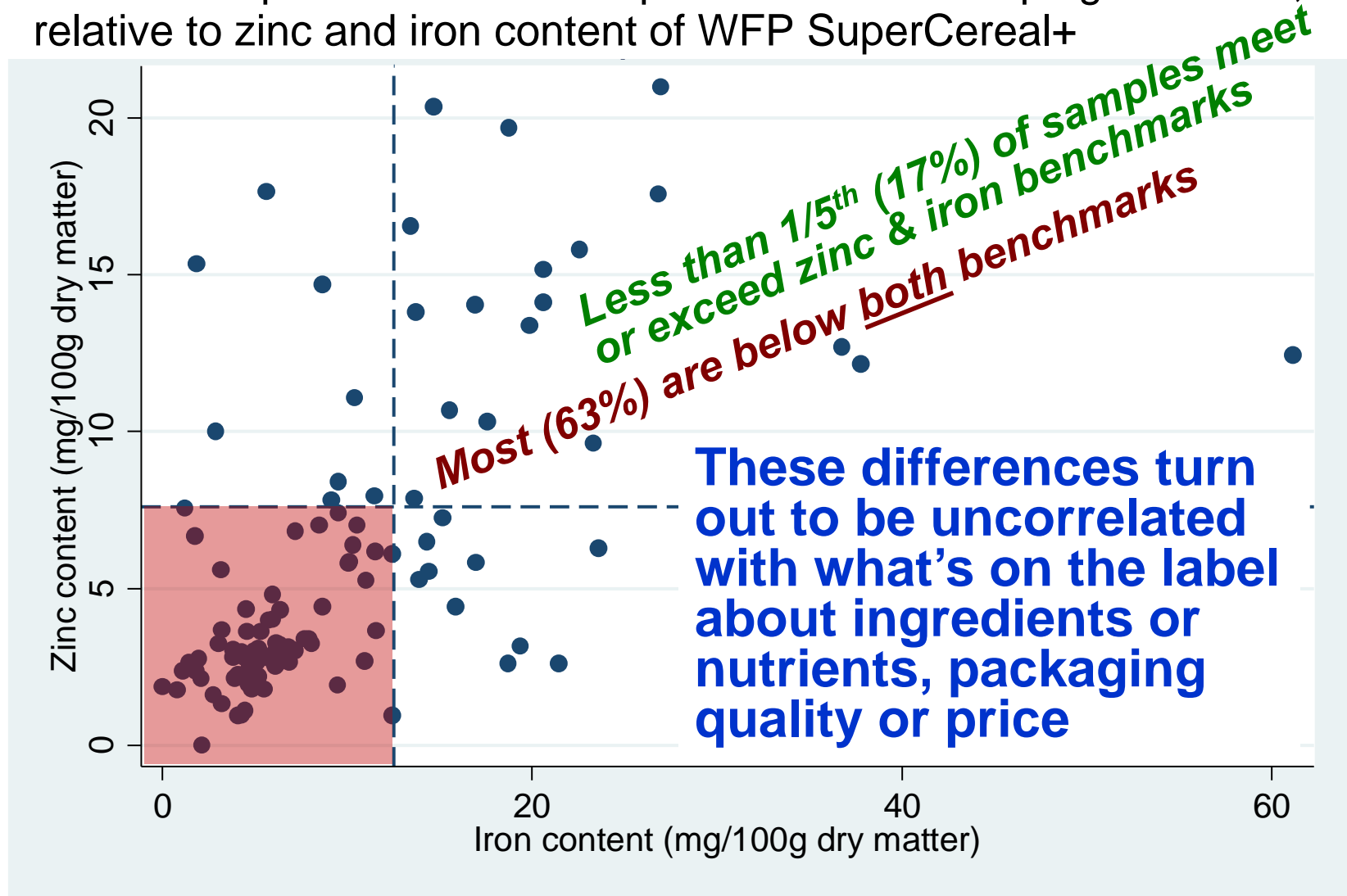
**Samples are from Africa (18) and Asia (3), plus Haiti**

**Table 1. Number of samples by country of purchase**

<i>Country</i>	<i>Number of samples</i>	<i>Country</i>	<i>Number of samples</i>
Benin	5	Kenya	5
Botswana	5	Madagascar	3
Burkina Faso	5	Malawi	2
Cameroon	5	Mali	7
<i>China</i>	1	Mauritania	3
Cote d'Ivoire	4	Morocco	2
DR Congo	1	<i>Nepal</i>	5
Ethiopia	12	Rwanda	6
Ghana	10	Senegal	4
<i>Haiti</i>	4	South Africa	6
<i>Indonesia</i>	8	Uganda	5
<i>Total number of countries</i>		22	
<i>Total number of samples</i>		108	

# The actual content of fortified cereals is unpredictable and often below standards

Tested composition of 108 samples from 22 developing countries, relative to zinc and iron content of WFP SuperCereal+

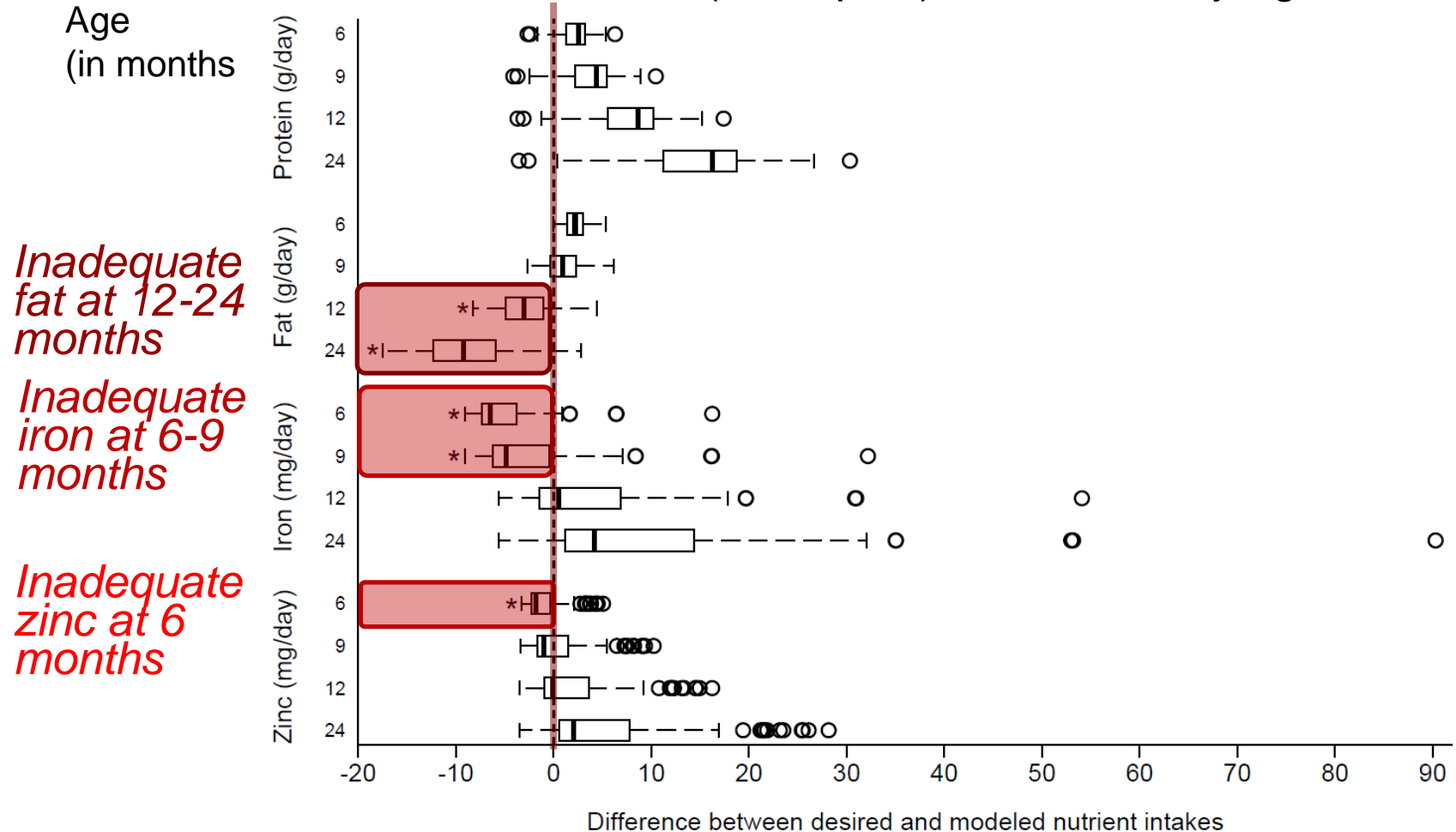


Source: Masters, Nene and Bell (2016) in *Maternal & Child Nutrition*



# The actual content of “fortified” cereals is often far below what infants need

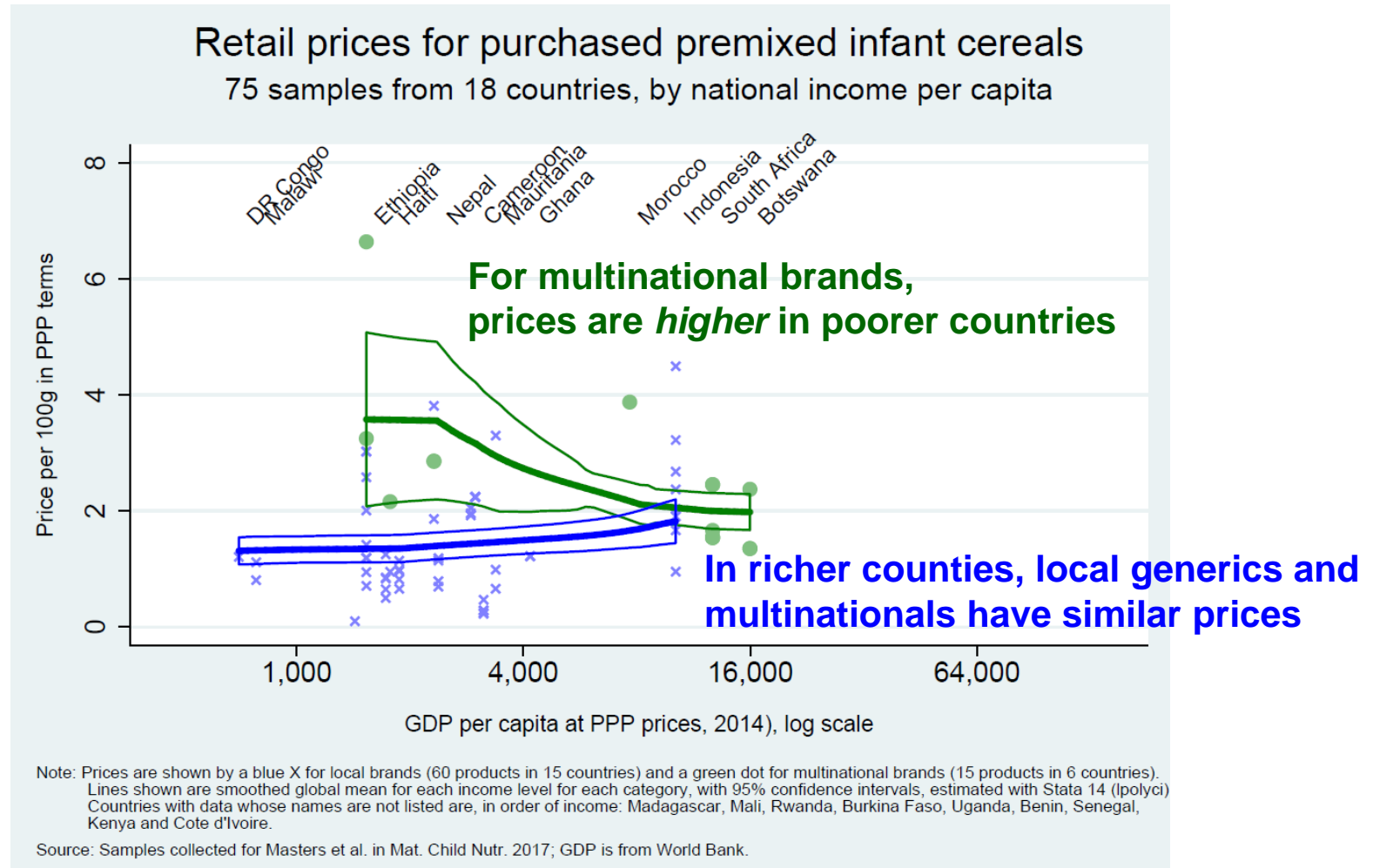
Modeled deficit (or surplus) of nutrients by age



Boxes show 25<sup>th</sup>-50<sup>th</sup>-75<sup>th</sup> percentile; whiskers extend to +/- 1.5 IQR; circles show outliers.

Source: Masters, Nene and Bell (2016) in *Maternal & Child Nutrition*

# Pricing of baby foods is also a surprise



# Could research lead to introduction and enforcement of new quality standards?

Maternal & Child Nutrition

Maternal & Child Nutrition

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ORIGINAL ARTICLE

## Nutrient composition of premixed and packaged complementary foods for sale in low- and middle-income countries: Lack of standards threatens infant growth

William A. Masters , Marc D. Nene, Winnie Bell

First published: 22 December 2016 [Full publication history](#)

DOI: 10.1111/mcn.12421 [View/save citation](#)

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 score < 103

Children would be healthier if an international agency tested brands and certified them as nutritious, the study's authors argued.

The New York Times

December 20, 2016

Global Health | DONALD G. McNEIL Jr.

### Baby Food: Ubiquitous but Unpredictable

Baby food is sold in every country on Earth, but in poor and middle-income countries, its quality is completely unpredictable, a new study has found.

Children would be healthier if an international agency tested brands and certified them as nutritious, the study's authors argued.

"Some of these products are fine, but some are just awful, and there's no way for consumers to tell the difference," said William A. Masters, an economist with the Friedman School of Nutrition Science and Policy at Tufts University and the study's lead author. "A wonderful food category is languishing for lack of quality certification."

His team tested 108 brands of infant porridge from 22 countries and found that less than a quarter met international standards for fat, protein, iron and zinc. The study is to be published soon in the journal Maternal and Child Nutrition.

It would be relatively easy for a laboratory to collect samples, test them and issue seals of quality that the makers could display

on their packages, Dr. Masters said.

His team simply wired \$20 payments to friends and colleagues around the world to cover the cost of shipping samples to Boston. On-site plant inspections, of course, would cost more.

Why this problem was not solved long ago is puzzling, Dr. Masters said. A reason, he surmised, "could be prejudice in the public-sector nutrition community."

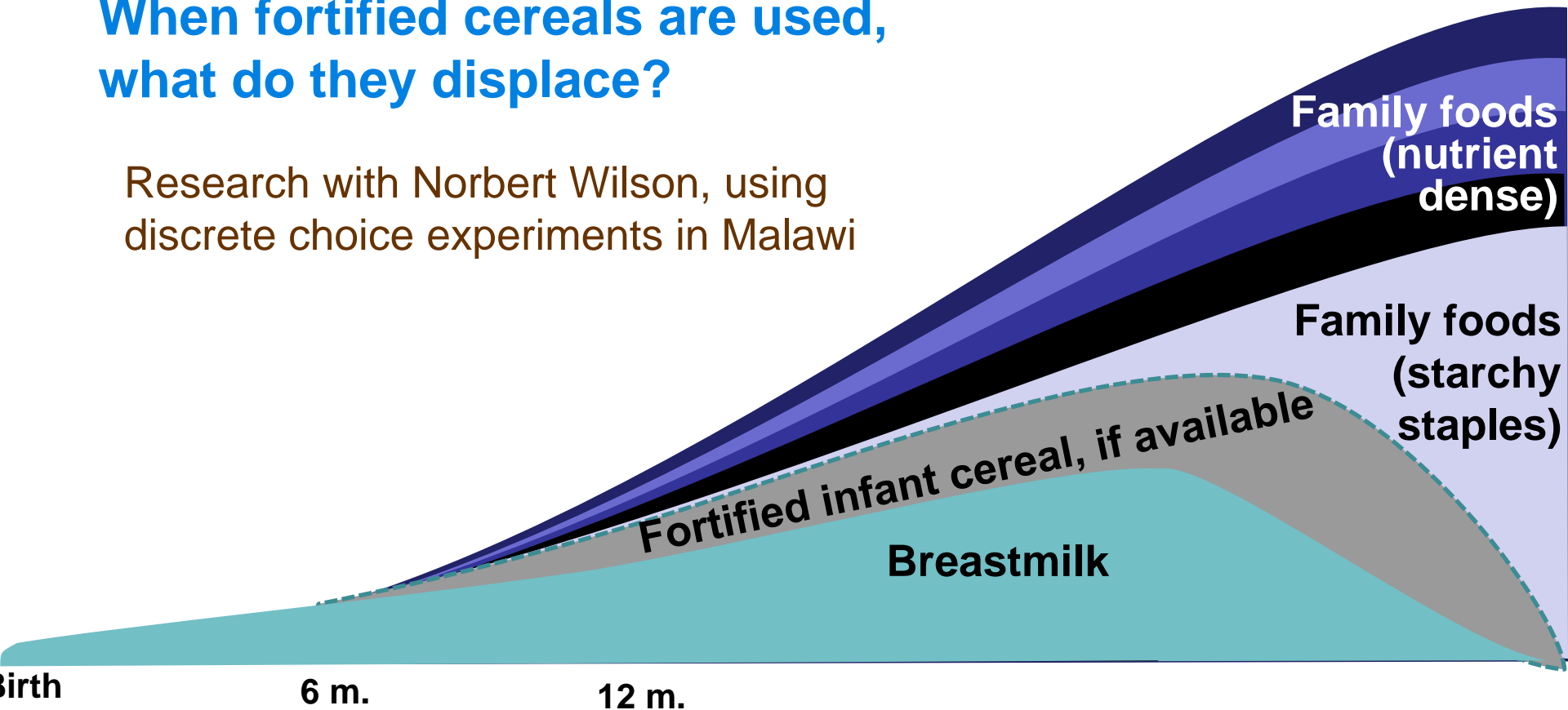
Nutrition advocates endorse some expensive additives like micronutrient sprinkles and fortified peanut butters, he said. Yet they often demonize packaged foods from private companies, even though they are cheap and popular, because of the extra salt and sugar in adult foods and because of the long battle to keep women breast-feeding instead of using formula from food companies like Nestlé.

As long as porridges are used only to supplement breast-feeding for children over 6 months old, and as long as they contain proper levels of nutrients, he argued, "they can be lifesavers."

# New work: Substitution for other foods

## When fortified cereals are used, what do they displace?

Research with Norbert Wilson, using discrete choice experiments in Malawi



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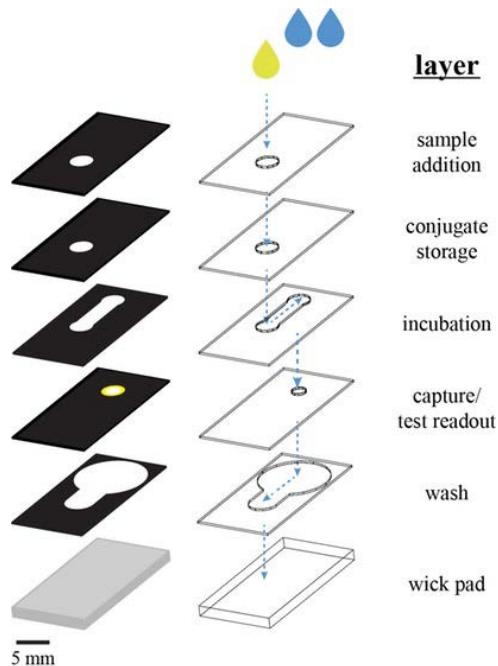


# New work: Fast, cheap field testing kits?

Making nutrient testing easier could boost policymakers' interest in new quality standards

With Charlie Mace in analytical chemistry

## Paper-Based Microfluidics and Chromatography



Source: <http://ase.tufts.edu/chemistry/mace>



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# Conclusion:

## A market ready for disruption

- Premixed flours can meet infant needs at low cost
  - but they usually don't
- To remedy this market failure, would need quality assurance
  - but institutional obstacles are daunting
- Economics can guide social change, but that's just a start
  - need stakeholder demand
  - and new technologies can help



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# Thank you!

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+ Winnie Bell and Marc Nene (for quality testing)  
+ Charlie Mace (for analytical chemistry)



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