



INTERNATIONAL
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The relative price of healthy & unhealthy foods in 177 countries

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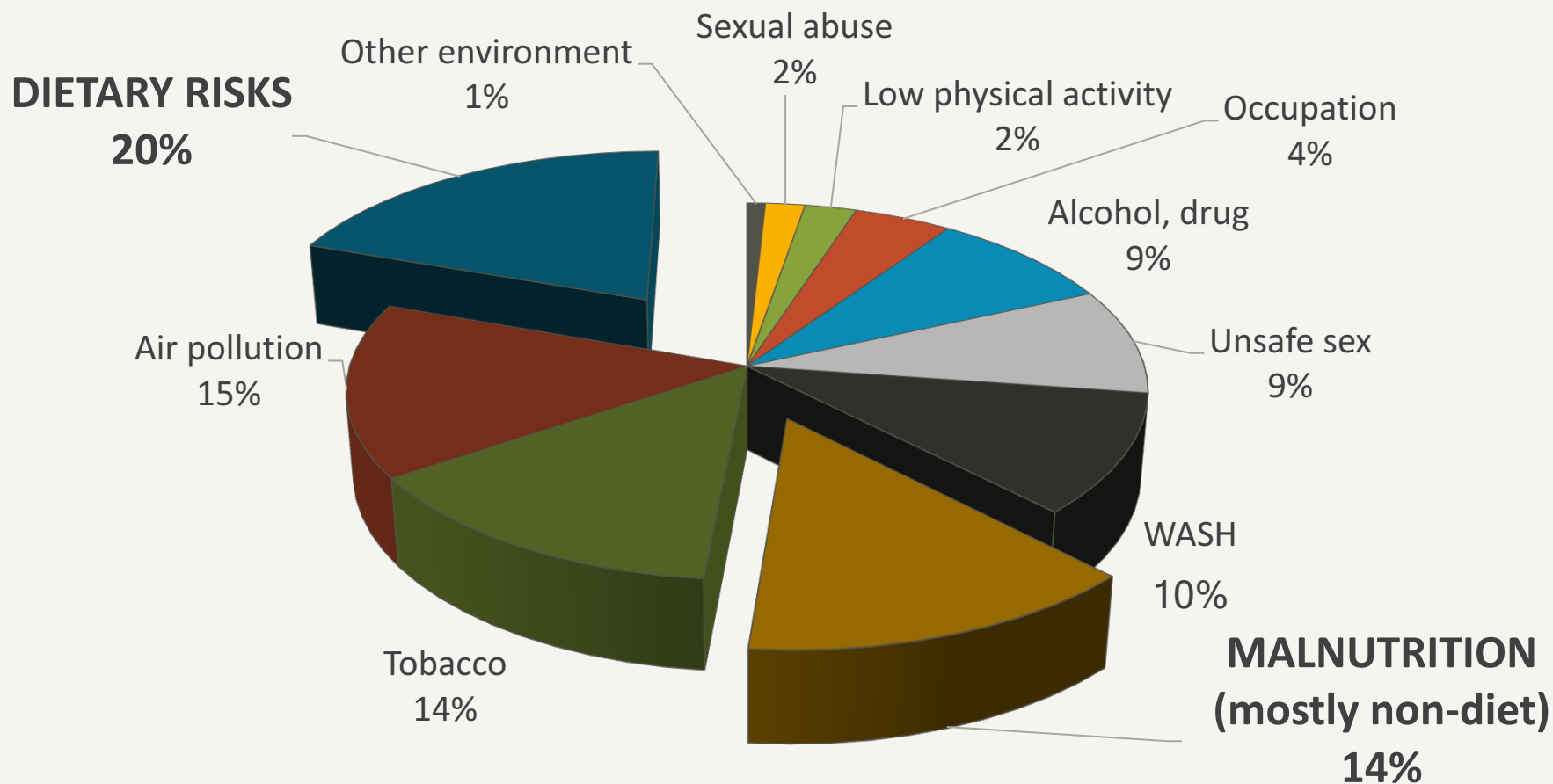
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Introduction



Non-metabolic risk factors in the 2015 Global Burden of Disease Study: Percentage of total DALYs



Introduction



Dietary problems vary across regions and income groups:

❑ **Low Income Countries (LICs):**

Protein-energy undernutrition, multiple micronutrient deficiencies; lack of high quality protein (animal sourced foods)

❑ **High Income Countries (HICs):**

Excess intake of carbs, sugar, trans-fats, processed red meat, sodium; low intake of fruit & veg and wholegrains

❑ **Middle Income Countries (MICs):**

Most now have double burdens (as do many LICs)



Are overnutrition and undernutrition problems connected by affordability of healthy and unhealthy foods?

- ❑ Most work on food prices and nutrition has focused on obesity in specific HICs (e.g. Drewnowski et al.)
- ❑ 2 studies do comparative analysis (ODI; PURE study)
- ❑ In LICs & MICs only a few contributions:
 - Demand analysis (own-price elasticities)
 - Biofortification literature (Bouis): MNs expensive!
 - Recent ag-nutrition literature on India and Bangladesh (Headey et al.; Sen et al) & forthcoming work from IANDA

Introduction



- ❑ Use prices for standardized foods in 177 countries, for 2011
- ❑ Calorie content is an important factor in making food decisions
- ❑ In most countries cereals are the main source of calories
- ❑ Hence we measure **calorie-price ratios**:
Cost of 1 egg calorie to 1 cereal calorie (e.g. rice)
- ❑ Captures cost of diversifying out of staples at a given income

Hypotheses?

H0: Law of one price across countries (little price variation)

H1_A: Food prices vary a lot across countries

More true for perishable fresh fruits & veg and ASFs

H1_B: Non-tradable food prices influenced by productivity

H1_C: Variation in food prices explains child feeding patterns

Data & methods



- ❑ 2011 International Comparison Program data (ICP), typically used for estimates of national accounts, income & poverty
- ❑ Cost-of-living, or purchasing power, is at the heart of ICP
- ❑ Requires price collection for “*standard definition products*”
 - Incomplete data on 200 food products in 177 countries
- ❑ National average prices are reported (no vendor-level data)
- ❑ Supplement with national data sources where needed
- ❑ Combine with USDA food conversion data for calorie content
- ❑ Assign foods to 17 groups, measure cheapest food in each
- ❑ Strengths: High degrees of standardization
- ❑ Weaknesses: Fruit, veg, pulses and fish are under-populated

Data & methods



Short name	Description
Long grain rice - Parboiled	Number of units: 1: Unit of measurement: Kilogram: Min: 0.5: Max: 1.2: Brand: Well known: Type: Long grain, white rice (milled rice): Packaging: Pre-packed; paper or plastic bag: Quality: High grade: Preparation: Parboiled : Share of broken rice: Very low (not more than 5%): Other features: Not enriched, not aromatic (fragrant), not sticky: Exclude: Premium rice e.g. Basmati rice, Jasmine rice
Short-grained rice	Number of units: 1: Unit of measurement: Kilogram: Min: 0.5: Max: 1.2: Brand: Brandless: Type: Short grain White: Packaging: Pre-packed; paper or plastic bag: Quality: High grade: Preparation: Uncooked, non-parboiled: Milling: Extra-well-milled: Share of broken rice: Very low (not more than 5%): Other features: Not enriched, not aromatic (fragrant), not sticky: Exclude: Premium rice e.g. Basmati rice, Jasmine rice
Sweet potatoes	Number of units: 1: Unit of measurement: Kilogram: Min: 0.5: Max: 1.2: Brand: Brandless: Type: Sweet potato (color: yellow, orange, purple or light brown): Packaging: Loose : Quality: Good quality; fresh, Intact (unbroken, unmarked) skin: Exclude: Organic vegetables, yam

Number of units: 1: Unit of measurement: Kilogram: Min: 0.5: Max: 1.2: Brand: Well known: Type: Long grain, white rice (milled rice): Packaging: Pre-packed; paper or plastic bag: Quality: High grade: Preparation: Parboiled : Share of broken rice: Very low (not more than 5%): Other features: Not enriched, not aromatic (fragrant), not sticky: Exclude: Premium rice e.g. Basmati rice, Jasmine rice

Data & methods



<u>Starchy staples</u>	
Cereals (N=13)	Rice (5), bread products (5), maize flour, maize, tortilla
Roots/tubers (N=3)	Brown potatoes, sweet potatoes*, cassava
<u>Healthy vegetal foods</u>	
Legumes (N=2)	Lentils (dry), mung beans (dry)
vA-rich fruits/veg (N=7)	Carrot, sweet potatoes*, red pepper, grapefruit, mango, papaya, peach
DGL veg. (N=3)	Spinach, Lettuce, Green Cabbage
Other Veg (N=4)	Cauliflower, tomato, onion, eggplant
Other fruit (N=8)	Apple (2 varieties), avocado, grapes, orange, lemon, watermelon, melon
<u>Baby cereal (N=1)</u>	Baby cereal: dry mix, typically fortified
<u>Animal sourced foods (ASFs)</u>	
Milk (N=5)	Pasteurized fresh milk (3 types), condensed milk, powdered milk
White meat (N=4)	Whole chicken (2 types), chicken breast, chicken leg
Red meat (N=16)	Beef/veal (7), Lamb/mutton (4), Pork (4), Goat
Eggs (N=2)	Large brown eggs, medium brown eggs
Fish (N=5)	Fresh Carp, Mackerel or Tilapia; canned Sardines or Tuna (HIC only)
<u>Unhealthy condiments, junk food</u>	
Oils/fats (N=9)	Butter (3), sunflower, olive, palm, soybean, peanut, vegetable
Sugar (n=2)	White sugar, brown sugar
Potato chips (N=1)	Plain salted potato chips
Coca-Cola (N=1)	Coca Cola, bottled

Data & methods



We analyze the data in several steps

1: Differences in calorie-prices across foods & regions

- Classify countries into geographical sub-regions, but pool HICs
- Focus on differences in mean calorie-prices across food groups, and variation across countries within food groups
- Then look at differences in calorie-prices across regions

2: Linking calorie-prices to child diets & stunting

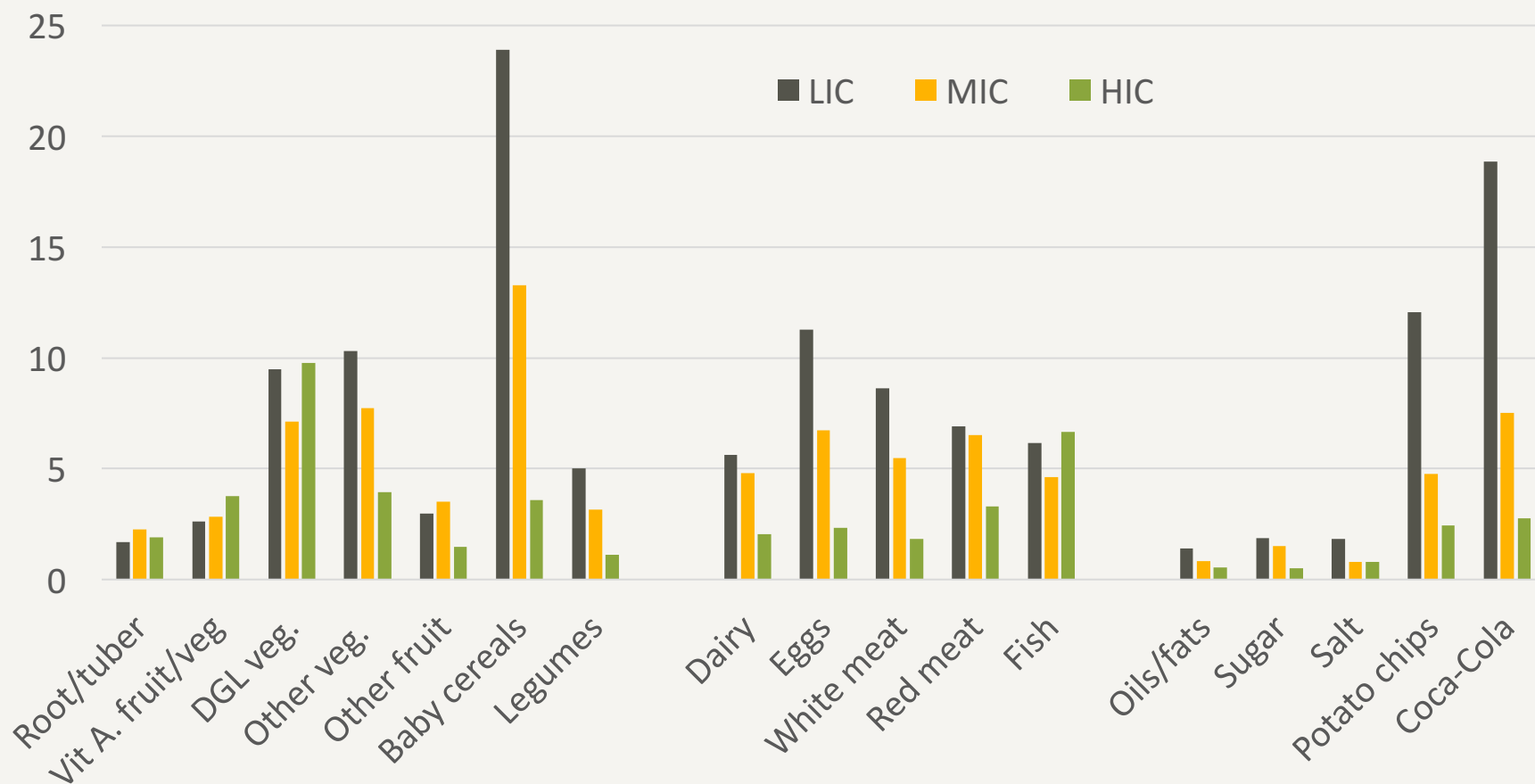
- DHS data on children's 24hr food group recall: 45-60 countries
- Use WHO data on prevalence of stunting
- All regressions control for GDP per capita

Price differences across income groups



F1. Population-weighted mean CPRs by income level

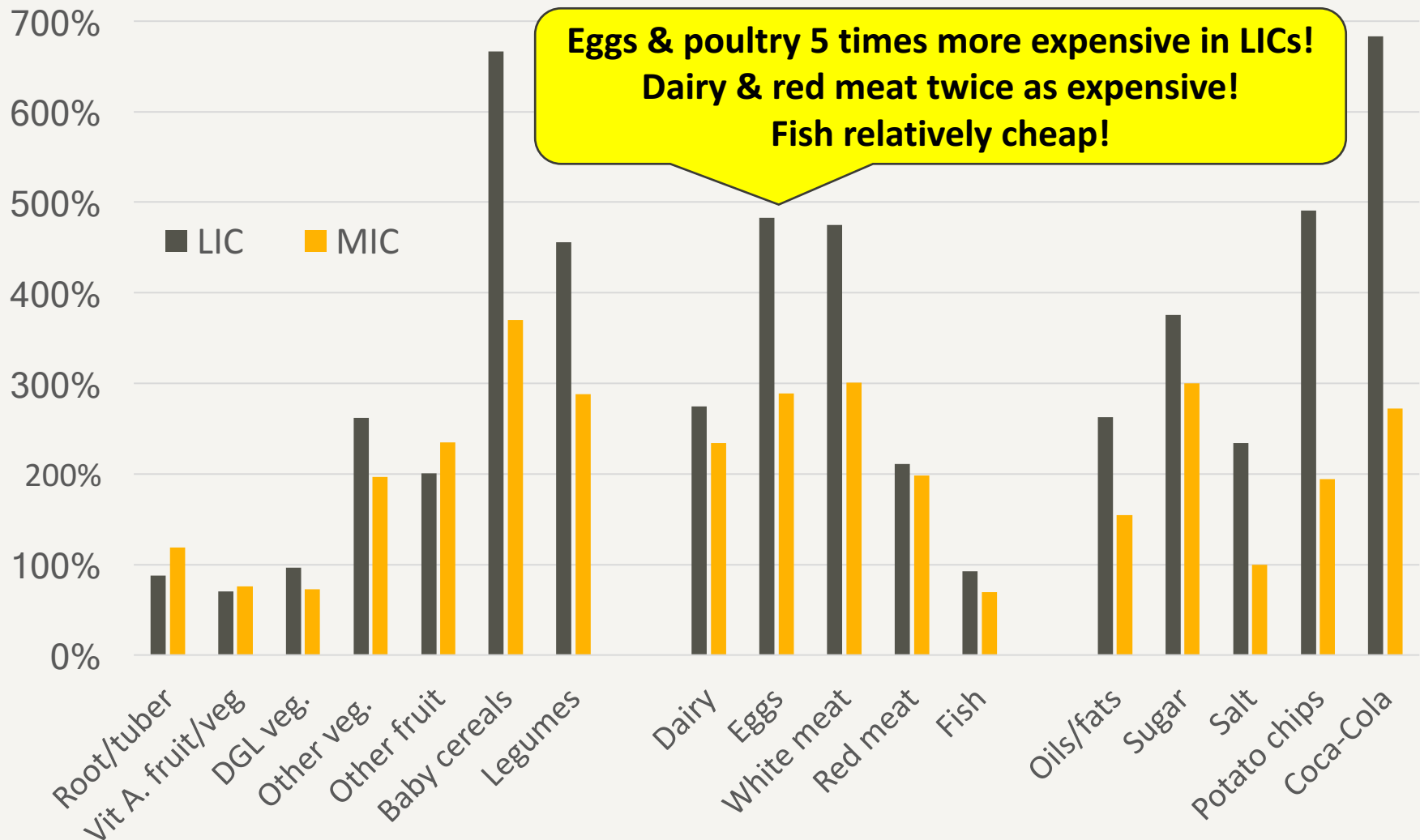
Panel A: CPRs across low, middle and high income countries



Price differences across income groups



Panel B: Ratio of mean CPRs in LICs and MICs to mean CPRs in HICs



Price differences across regions



	High income	E. Euro C. Asia	South America	Central America	Small Islands	M. East N. Africa	East Asia	South Asia	East Africa	Sth. Africa	West Africa	Central Africa
N	44	16	7	10	28	9	10	5	6	11	16	7

Plant-based foods

Root/tuber	1.6	1.4	1.4	1.4	3.4	1.9	1.9	1.7	1.2	3.4	1.5	1.7
Legumes	1.2	1.7	2.9	2.6	2.3	1.9	3.1	2.2	4.6	4.5	6.0	5.3
VA-rich FVs	3.0	4.0	3.0	2.8	4.2	2.4	2.8	2.4	1.7	4.4	2.1	2.7
DGL veg.	9.0	11.4	6.2	5.6	15.3	5.9	8.1	7.3	5.1	11.0	14.0	13.4
Other Veg.	3.3	3.1	8.4	6.0	9.9	4.1	9.6	6.2	6.9	12.9	10.8	16.6
Other fruit	1.7	1.8	1.6	1.3	3.1	2.5	3.8	3.0	2.0	4.2	3.6	3.0
Baby cereal	5.0	7.7	9.6	5.0	8.8	11.2	15.3	12.1	25.9	15.5	18.0	22.6

Animal-sourced foods

Dairy	2.0	2.7	2.9	2.5	2.2	2.5	3.7	4.1	4.9	6.0	4.0	4.5
White meat	2.0	2.7	3.2	2.5	3.6	4.2	5.2	7.0	9.8	7.7	6.2	5.3
Red meat	3.5	4.1	5.3	4.1	6.1	9.9	6.6	8.4	5.0	7.3	6.6	6.7
Eggs	3.0	3.7	5.0	4.2	6.6	4.4	7.1	6.9	7.8	10.0	9.8	10.9
Fish/seafood	4.3	5.2	3.4	3.8	9.4	4.8	4.7	5.4	6.2	5.5	4.4	5.1

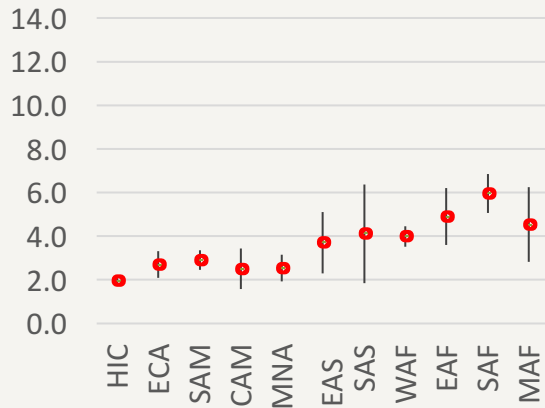
Unhealthy processed foods

Oils/fats	0.4	0.6	0.7	0.7	0.8	0.7	0.8	0.9	1.3	1.6	1.2	1.0
Sugar	0.5	0.8	1.0	0.7	1.1	1.0	1.4	1.5	1.6	1.8	1.9	1.7
Potato chips	2.5	4.4	7.1	5.9	7.2	4.4	4.2	4.2	8.3	10.3	10.1	12.7
Coca-Cola	3.0	4.7	5.9	4.8	7.9	4.8	8.2	10.5	15.4	15.3	17.3	20.9

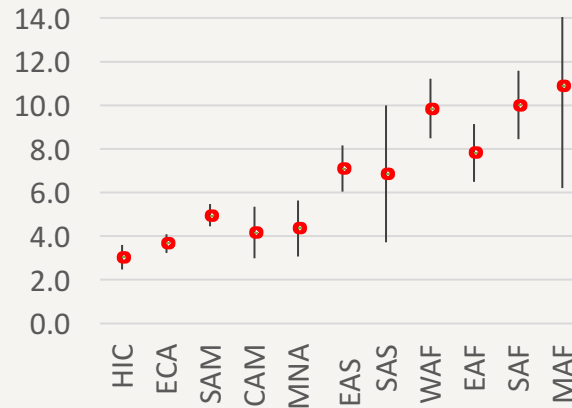
Price differences across regions



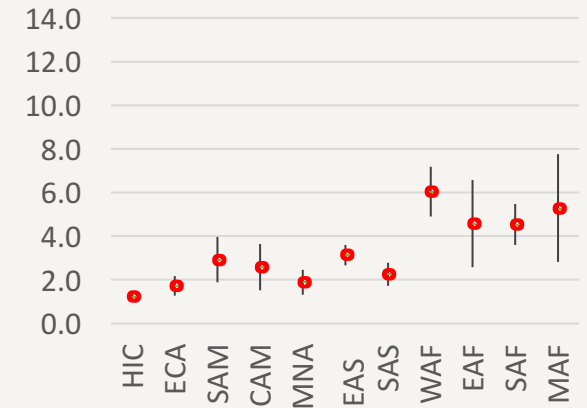
Dairy



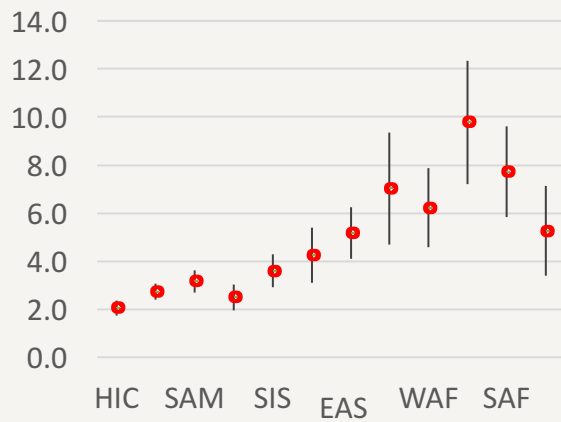
Eggs



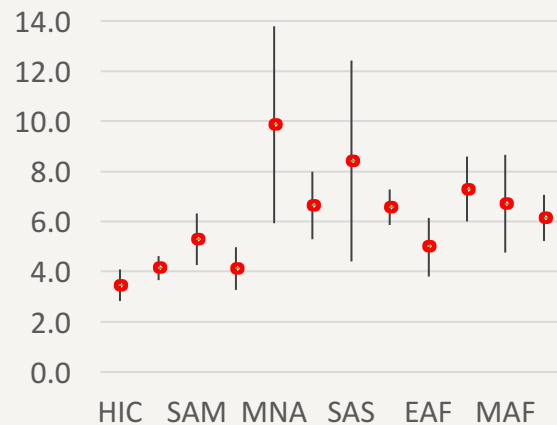
Legumes/nuts



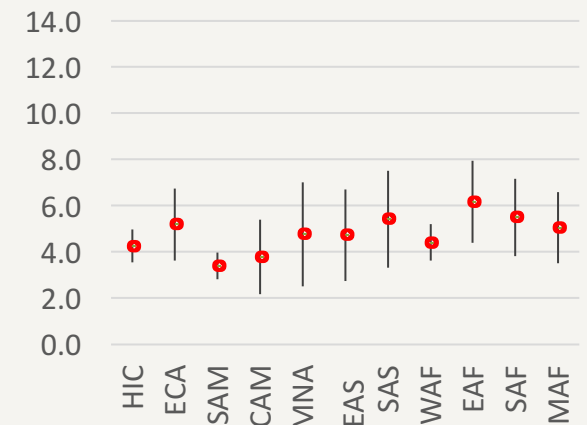
Poultry meat



Red meat



Fish



Prices and children's dietary diversity



Robust regressions of the consumption of different food groups against food-specific CPRs & GDP per capita (children 12-23 months old), LICs & MICs

	1	2	3	4	5
	Root/tuber	vA fruit/veg	Other fruit	DGL Veg	Legumes
Log food-specific CPR	-0.06	0.01	-0.10**	-0.01	0.01
Log GDP per capita	0.10***	-0.02	0.12***	-0.10***	0.01
R-squared	0.15	0.19	0.45	0.19	0.23
N	58	58	53	52	45
	6	7	8	9	10
	Dairy	Eggs	Fish	Meat	Flesh food
Log food-specific CPR	-0.12**	-0.15***	-0.09	-0.06	-0.11
Log GDP per capita	0.19***	0.07***	-0.07**	0.11***	0.06**
R-squared	0.65	0.62	0.3	0.35	0.26
N	60	53	46	55	55

Prices and child stunting



Robust regressions of stunting rates against CPRs and GDP per capita (children 0-59 months old), LICs and MICs

	1	2	3	4	5
	Root/tuber	vA fruit/veg	Other fruit	DGL Veg	Legumes
Log food-specific CPR	-0.74	1.85	-0.26	-1.54	-0.06
Log GDP p.c.	-9.31***	-9.19***	-9.35***	-9.07***	-9.21***
R-squared	0.58	0.59	0.58	0.59	0.58
N	106	108	105	107	91
	6	7	8	9	10
	Dairy	Eggs	Fish	Meat	Flesh food
Log food-specific CPR	4.80***	5.01**	-0.83	8.25***	8.53***
Log GDP p.c.	-8.40***	-7.71***	-9.47***	-8.24***	-7.99***
R-squared	0.62	0.61	0.57	0.64	0.63
N	108	103	99	108	108

Conclusions



- ❑ First paper to measure food prices in a comparative, highly standardized cross-country framework

- ❑ **Main findings**
 - Food prices *highly* variable across regions and income levels
 - Most foods relatively cheap in HICs, fruits & veg exceptions
 - Unhealthy foods expensive in LICs, but cheap in MICs
 - ASFs *much* more expensive in LICs & MICs; esp. eggs, meat
 - Dairy and egg prices explain child consumption & stunting

Conclusions



Important policy implications:

- Foods rich in protein & micronutrients are expensive in LICs
- Prices strongly associated with local productivity levels, and agroecological constraints (e.g. livestock disease)
- High prices might constrain behavioral interventions, but income transfers could complement such interventions

Important research implications:

- How do calorie-relative food prices vary within countries?
- How do calorie-relative food prices vary over time?
- What production, value chain or trade interventions could most effectively reduce prices in different kinds of settings?



- Thank you