Food Prices for Nutrition in India:

Measuring and monitoring the cost and affordability of healthy diets

Rachel Gilbert, Tufts University

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1 September 2021

Food Prices for Nutrition

https://bit.ly/foodpricesfornutrition

Photo Credit: IFPRI, 2008

Vision

Availability

Affordability

Food security is when all people, at all times, have physical and economic access to sufficient, safe, nutritious food to meet dietary needs and food preferences for an active and healthy life. – World Food Summit, 1996

Nutrient needs

Dignity

Culture

Protection of health

Accountability requires understanding availability and affordability of healthy diets

Food Prices for Nutrition

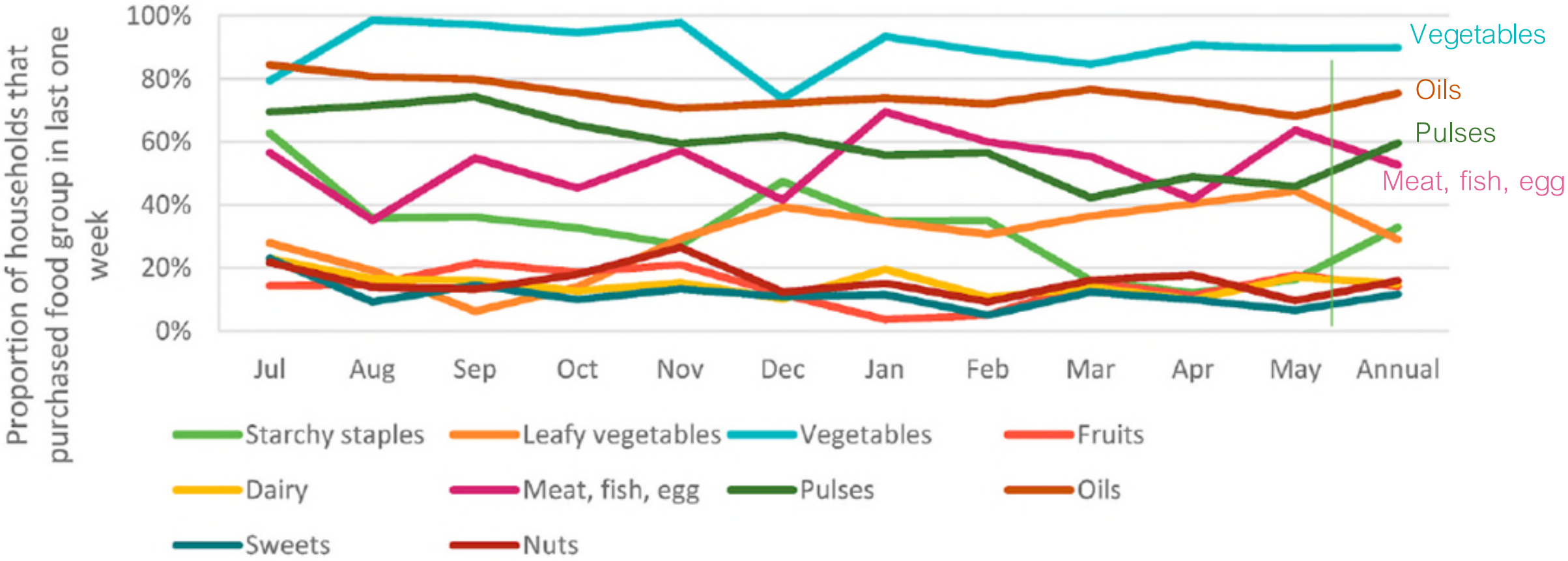
Aims: what do we want to know?

- If you went to the market in India, how much would it cost to obtain nutritious food to meet dietary needs?
- How many people in India can afford that cost?

Photos: W. A. Masters (Ethiopia, Tanzania, Ghana, Morocco) and S. Kaiyatsa (Malawi)

Food Prices for Nutrition

Even rural households rely on market purchases for healthy, diverse diets



Source: Gupta, Vemireddy, Singh and Pingali, 2021

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We estimate three least-cost diets

- "Energy sufficient diet" - Cost of Calorie Adequacy (CoCA)
  - Minimum cost to meet energy requirements using the least expensive, available starchy staple food in each country
- "Nutrient adequate diet" - Cost of Nutrient Adequacy (CoNA)
  - Minimum cost to meet energy and nutrient requirements (23 macro and micro-nutrients, with upper as well as lower bounds)
- "Healthy diet" - Cost of Healthy (Recommended) Diet (CoRD)
  - Minimum cost to meet food-based dietary guidelines, based on food group classifications; a behaviorally realistic way to meet nutrient needs and other needs, including proportionality, norms, culture, and protection of health against NCDs

Food Prices for Nutrition

Least-cost diets

- Most affordable (cheapest, lowest cost) combination of foods that meet the criteria of these diets

- No standard “food basket”
  - Foods chosen depend on time and place
  - Seasonal or locally-available foods selected

Most common items in cost of healthy diet by state in India

State name	Starchy staples	Proteins	Dairy	Fruit	Vegetables	Leafy vegetables
Andhra Pradesh	Bajra, Ragi, Maize	Peas, Gram, Gram dal	Milk (buffalo), Milk (cow), Curd	Banana, Guava, Papaya (ripe)	Gourd, Onion, Tomato	Gogukura, Amranth (chaulai), Palak
Assam	Rice (coarse), Paddy, Bread	Peas, Khesari dal, Gram	Milk (cow), Curd, Milk (buffalo)	Banana, Papaya (ripe), Pineapple	Gourd, Pumpkin, Radish	Bhaji sageaves, Mustard leaves, Gogukura
Bihar	Maize, Paddy, Wheat (coarse)	Peas, Khesari dal, Pea dal	Milk (cow), Milk (buffalo), Ghol (lassi)	Banana, Guava, Papaya (ripe)	Radish, Gourd, Pumpkin	Bhaji sageaves, Palak, Amranth (chaulai)
Chhattisgarh	Bread, Rice (coarse), Wheat (coarse)	Peas, Khesari dal, Gram	Milk (cow), Milk (buffalo), Curd	Banana, Guava, Papaya (ripe)	Radish, Onion, Gourd	Bhaji sageaves, Palak, Amranth (chaulai)
Delhi	Bajra, Wheat (coarse), Jowar	Gram, Peas, Pea dal	Ghol (lassi), Milk (buffalo), Milk (cow)	Banana, Guava, Pineapple	Radish, Onion, Carrot	Amranth (chaulai), Bhaji sageaves, Mustard leaves
Gujarat	Bajra, Maize, Jowar	Peas, Gram, Urd (whole)	Milk (buffalo), Milk (cow), Curd	Banana, Papaya (ripe), Guava	Onion, Radish, Tomato	Palak, Bhaji sageaves, Amranth (chaulai)
Haryana	Bajra, Wheat (coarse), Barley	Gram, Peas, Gram dal	Milk (buffalo), Milk (cow), Curd	Banana, Guava, Papaya (ripe)	Radish, Onion, Carrot	Palak, Mustard leaves, Bhaji sageaves
Himachal Pradesh	Wheat atta, Maize atta, Rice (coarse)	Gram dal, Besan (ground gram dal), Urd (whole)	Milk (cow), Curd, Ghol (lassi)	Banana, Guava, Mango	Onion, Pumpkin, Carrot	Palak, Bhaji sageaves, Amranth (chaulai)

Source: Raghunathan, Headey, and Herforth, 2020

Food Prices for Nutrition

Least-cost diets

- Most affordable (cheapest, lowest cost) combination of foods that meet the criteria of these diets

- No standard “food basket”
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- Provide a conservative estimate (lower bound) on the cost per day
  - Preferences or convenience would add to the cost

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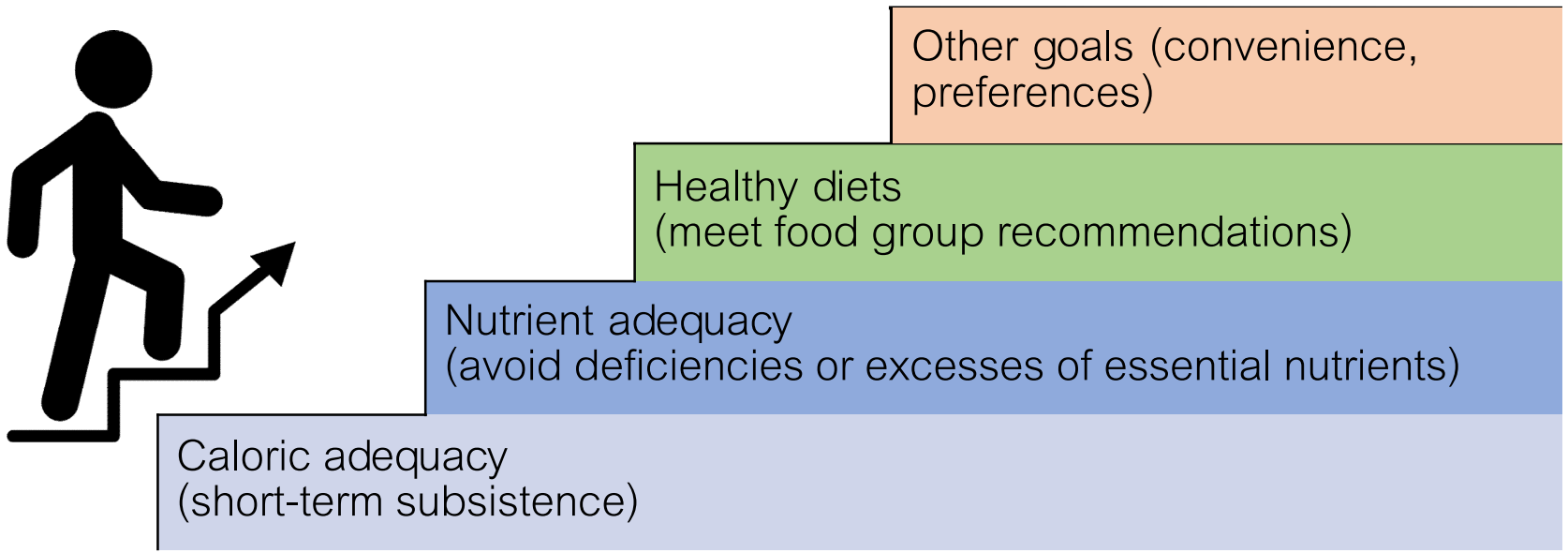
Food prices create a ladder of affordability

When all diets are affordable, food prices are one of many influences on food choice.

When healthy diets are unaffordable, food prices are an insurmountable barrier to improved diet quality.



Source: Food Prices for Nutrition, October 2020

Food Prices for Nutrition

Food price data and methods

Examples of price data

Prices collected by agri-food agencies

- Market information systems (MIS)
  - Farm-gate, wholesale, or retail prices of basic commodities (rarely processed foods)
- Early warning systems (EWS) to guide food aid & emergency interventions
  - Prices of staple or basic foods, at markets in vulnerable areas (rapid availability, but few foods)

Prices collected by national statistical organizations

- Consumer Price Index (CPI) - In India, Ministry of Statistics and Programme Implementation
  - Prices of frequently consumed products, collected monthly in various markets
- World Bank International Comparison Program (ICP) has unique global dataset of retail prices
  - Items limited to comparable products sold in multiple countries; national annual average price per item

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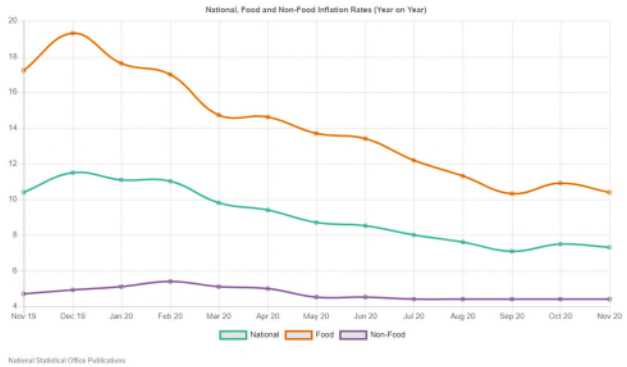
Food price data: national government CPI data

- Main data are food prices collected by national governments
  - Used for measuring inflation with the Consumer Price Index (CPI)
  - In India, for at least 100 food items
  - Collected on a monthly basis



- CPI is generally weighted by share of total expenditure, so culturally acceptable, commonly consumed food items are tracked.

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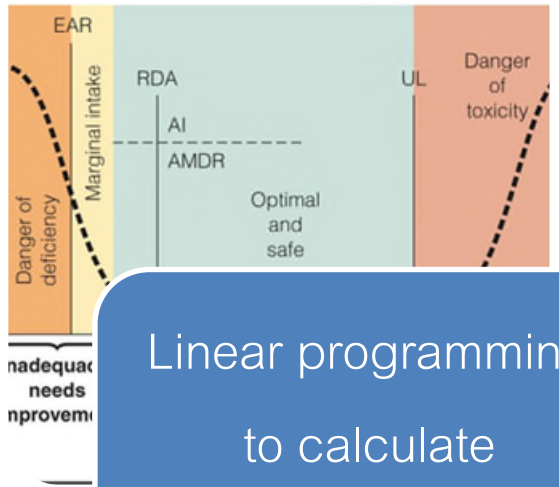
Calculating the Cost of Nutrient Adequacy

Food price data

Combine with food composition data



Linear programming to calculate cheapest diet that meets nutrient and energy requirements

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Energy and nutrient requirements

- Energy requirements based on age, sex, and level of physical activity
- Acceptable ranges for macronutrients - protein, fats, carbohydrates
- Lower and upper bounds for 23 micronutrients + upper bound for sodium

Schneider, Kate, and Anna Herforth. “Software Tools for Practical Application of Human Nutrient Requirements in Food-Based Social Science Research.” Gates Open Research 4 (December 10, 2020): 179. https://doi.org/10.12688/gatesopenres.13207.1.

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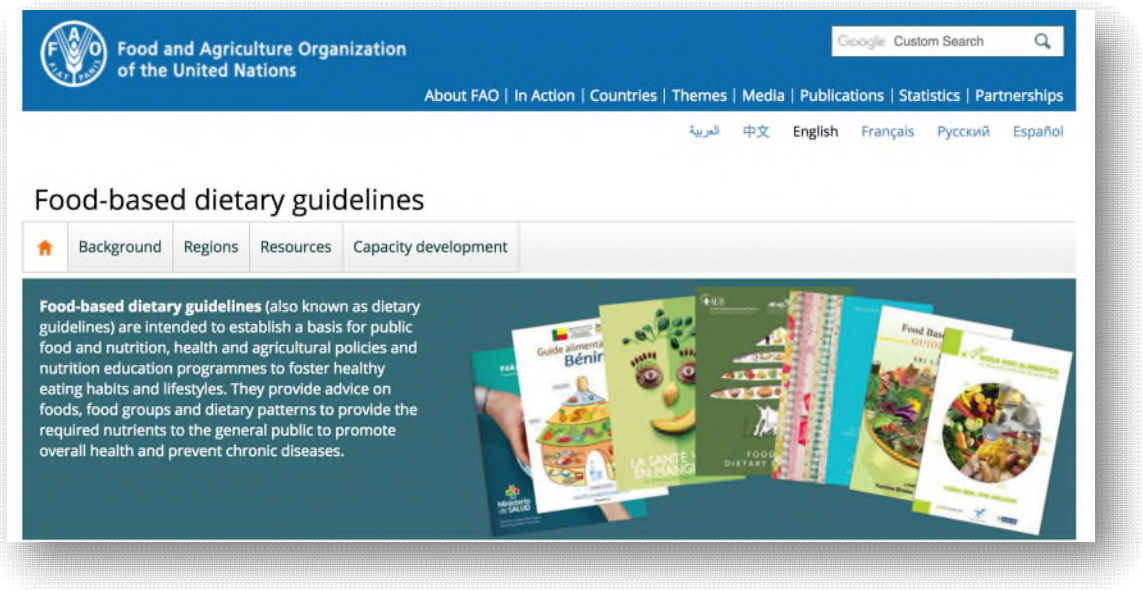
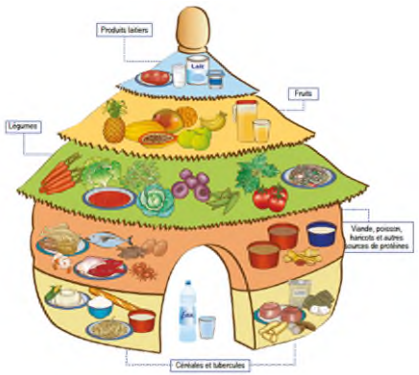
Calculating the cost of a healthy diet

- Healthy diet is operationalized as a recommended diet, based on quantitative food-based dietary guidelines (FBDG)



- ~100 countries have FBDG; FAO maintains FBDG repository
  - Only some are quantitative

India



Benin

Vietnam

India's quantitative food-based dietary guidelines

Balanced Diet for Adults - Sedentary/ Moderate/ Heavy Activity (Number of portions)

	g/portion	Type of work					
		Sedentary		Moderate		Heavy	
		Man	Woman	Man	Woman	Man	Woman
		No. of portions					
Cereals & millets	30	12.5	9	15	11	20	16
Pulses	30	2.5	2	3	2.5	4	3
Milk & milk products	100 ml	3	3	3	3	3	3
Roots & tubers	100	2	2	2	2	2	2
Green leafy vegetables	100	1	1	1	1	1	1
Other vegetables	100	2	2	2	2	2	2
Fruits	100	1	1	1	1	1	1
Sugar	5	4	4	6	6	11	9
Fat	5	5	4	6	5	8	6

- Food groups
- Number of portions per day
- Grams per portion

Source: National Institute of Nutrition, 2011

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Steps to calculate the cost of a healthy diet

1. Categorize each food in food price list according to the food groups in the selected dietary guideline
2. Remove items not required for a healthy diet (e.g., sweets) and duplicate items
3. Calculate price per day for each item
   - price per kilogram x recommended quantity per day (accounting for edible portion)
4. Take the average of the 1-3 lowest cost items (price/day) in each food group
5. Sum the cost for all food groups

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Affordability of diets

Affordability is the comparison of cost to a defined income standard

- Poverty lines
  - National
  - International (US $1.90)
- Food expenditures
- Income
- Wages
  - Compared to unskilled wages in India, Ethiopia

Photo (CC): skuarua

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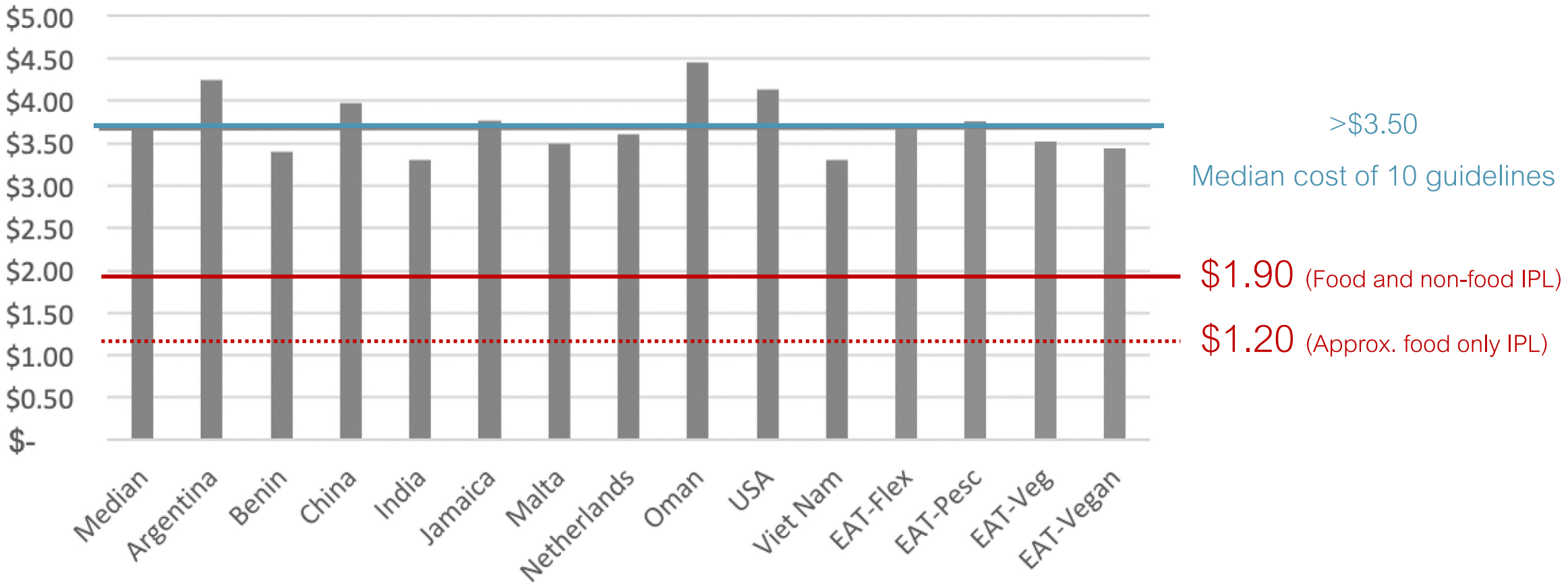
SOFI 2020: Healthy diets by any definition are far more expensive than the entire international poverty line



Source: FAO, 2020

Food Prices for Nutrition

How does Food Prices for Nutrition differ from other initiatives?

- Emphasis on monitoring
- Focus on leveraging the abundance of data already collected in existing national and international monitoring systems
  - Support countries to calculate metrics within their own data systems
- Moving beyond nutrients to look at healthy diet patterns
- Cost of a Healthy Diet does not rely on linear programming → relative ease of computation

Fill the Nutrient Gap
Nutrition situation analysis framework and decision tool

optifood

COST OF THE DIET

Food Prices for Nutrition

National applications

Dr. Kalyani Raghunathan

International Food Policy Research Institute (IFPRI)

Affordability of nutritious diets in India

- Calculate the **Cost of a Recommended Diet (CoRD)**
- India's FBDG: 6 food groups, portion size and number of portions for each
  - Men and women, by activity intensity
- The National Sample Survey (NSS) Rural Price and Wage data collected by MoSPI
  - **Time-span:** October 2001-June 2011 (but October 2007-June 2009 missing)
  - **Geography:** 24 states, 380 districts
  - **Price data:** covers 101 items/commodities

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  - **Time-span:** October 2001-June 2011 (but October 2007-June 2009 missing)
  - **Geography:** 24 states, 380 districts
  - **Price data:** covers 101 items/commodities
- We add in information on **wages** to assess how the affordability of diets has changed over time
- Wage information from the same dataset – in cash and kind, for men and women
- Data for 18 different occupations
  - We use cash wages of **unskilled labourers** as a good proxy for income of the poor

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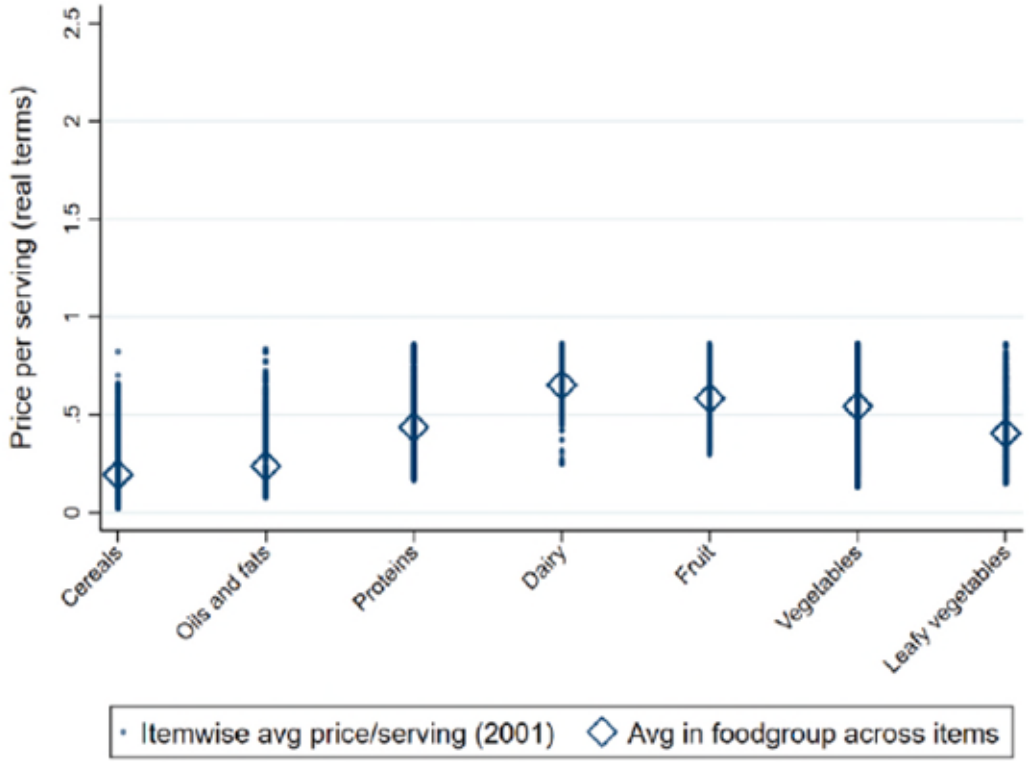
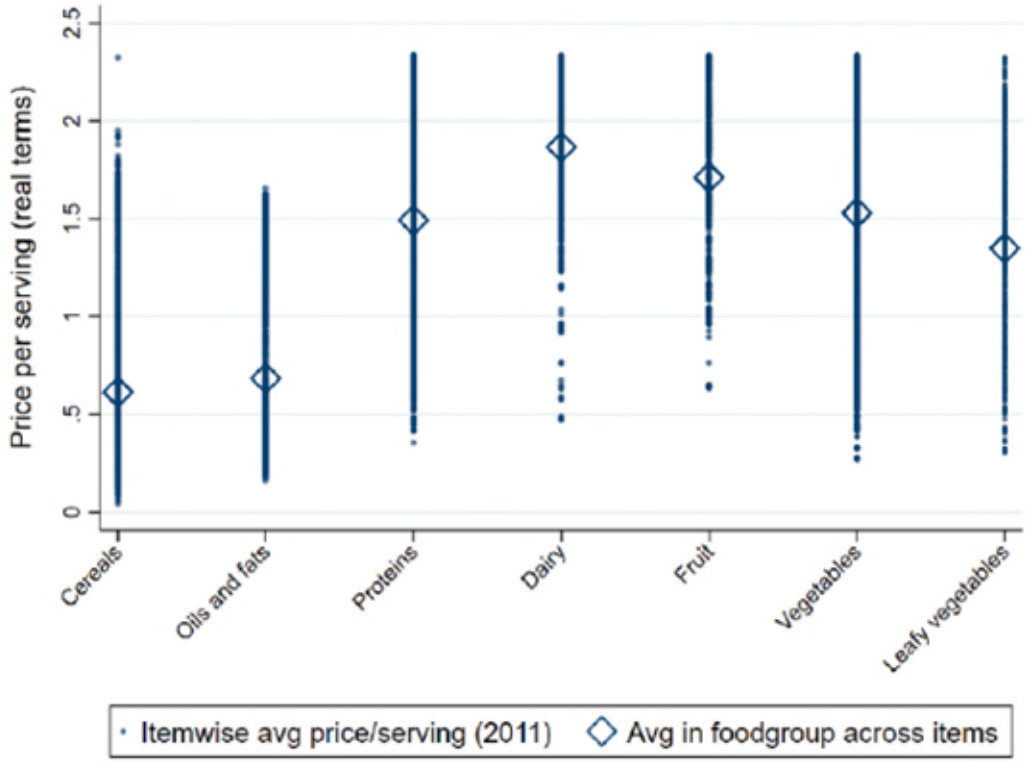
Price per serving over time



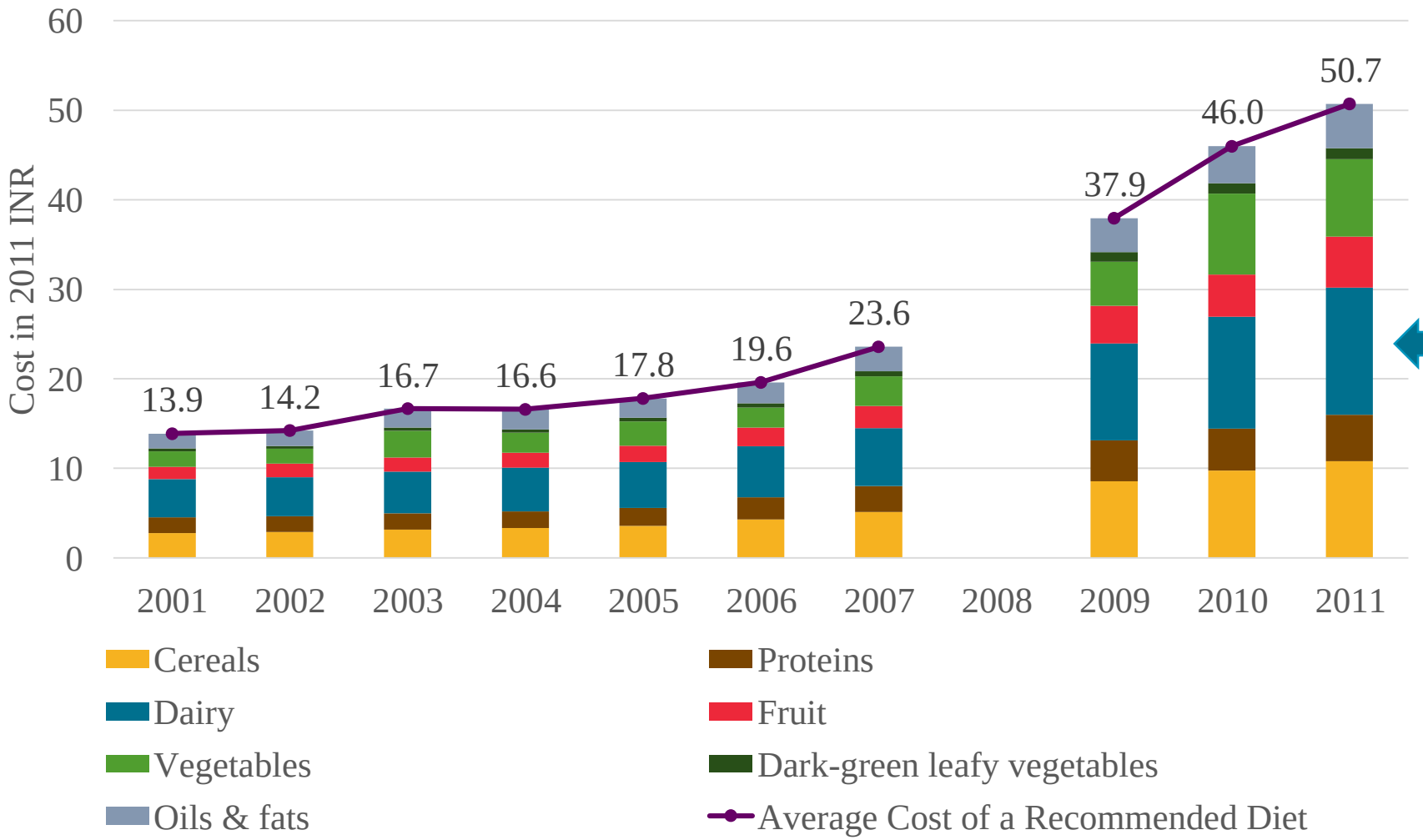
Panel A: 2001



Panel B: 2011

- Dairy has the highest average price per serving at both time points, followed by fruits and vegetables
- Both the average price per serving and the dispersion by food item increased in 2011 relative to 2001

CoRD increased more than three-fold (in real terms)



Dairy is the biggest contributor to overall cost

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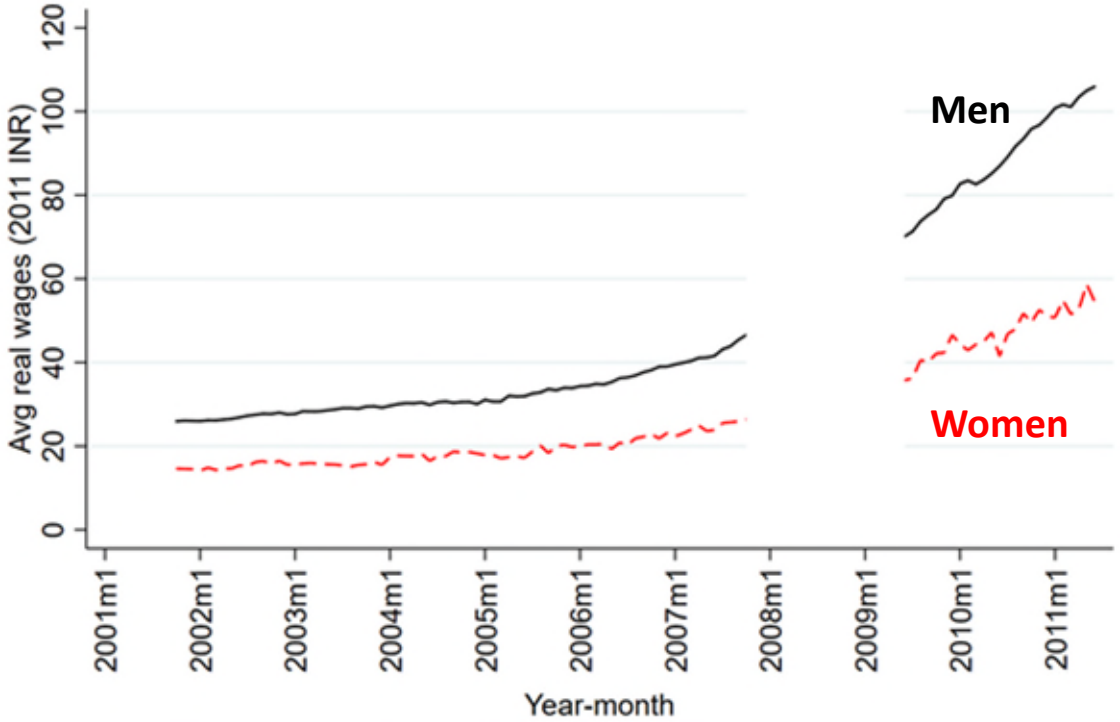
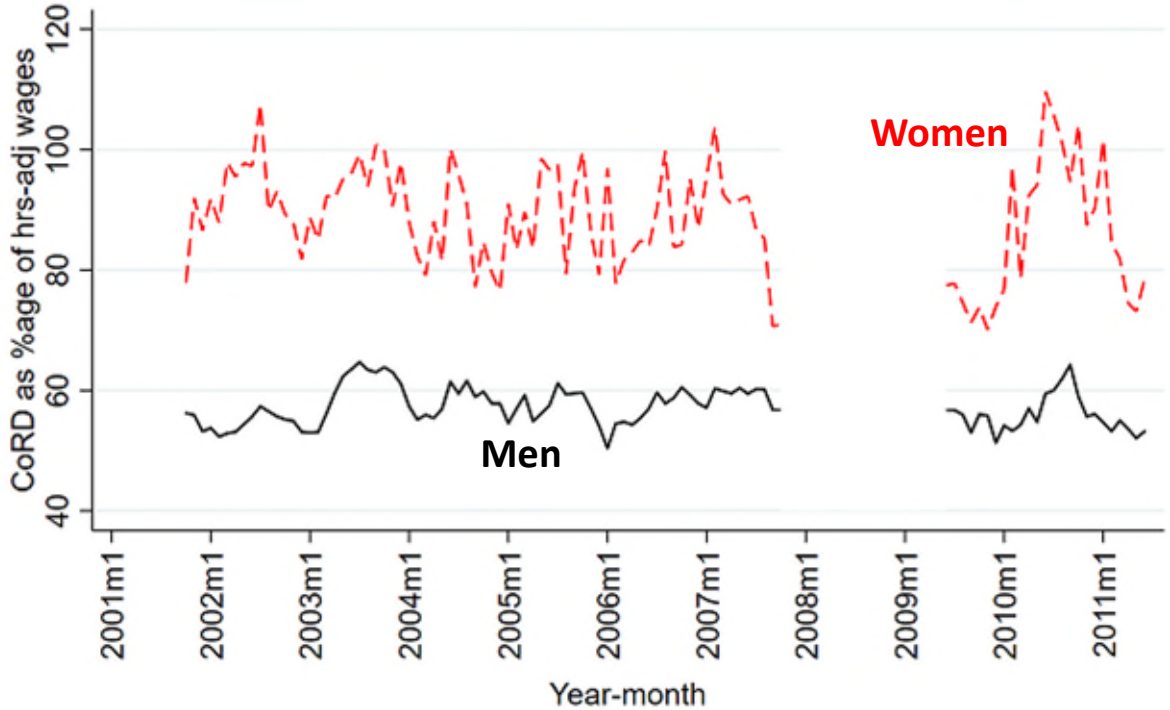
Real wages have gone up more for men; affordability is worse for women





Real wages (hours adjusted) have increased for both men and women, more for men

Diets cost 50-60% of men's daily wages, 80-90% of women's daily wages.

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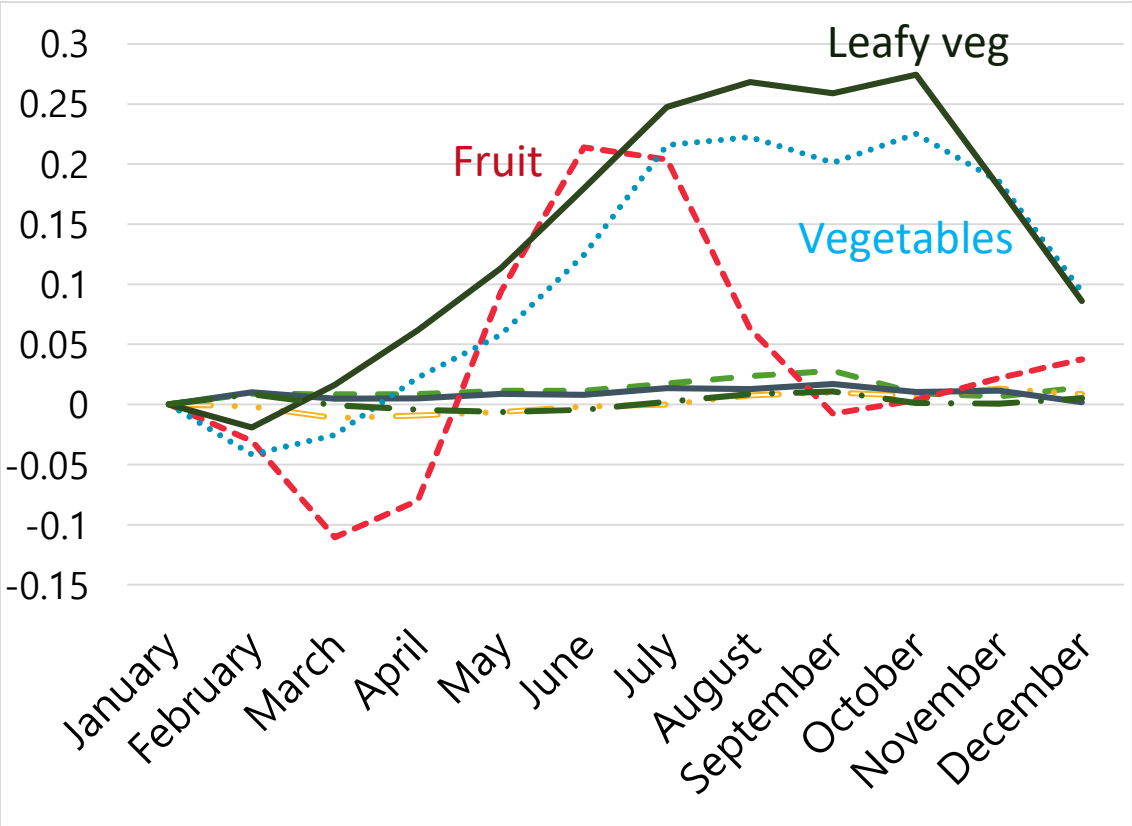
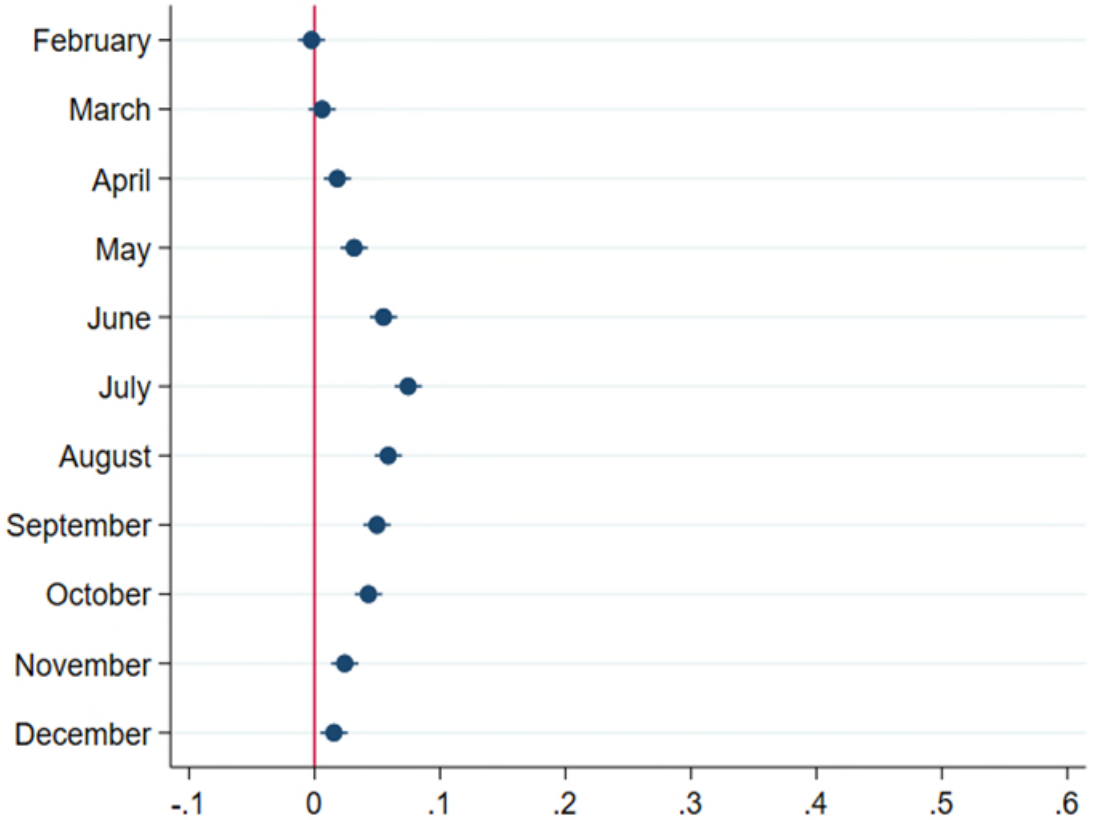
Season matters: Prices highest, affordability lowest June-August



A. Prices by food group



B. CoRD relative to wages, for men

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How affordable were these diets pre-COVID?

Indicator	Estimates
Food and non-food costs	
Cost of Recommended Diet - women, June 2011 (2011 rupees)	45.1
Purchasing power parity conversion factor, 2011 (2011 PPP$)	14.98
CoRD - women, June 2011 (2011 PPP$)	$3.01
Assumed requirements for non-food expenditure (2011 PPP$)	$0.63
HH spends ALL their income on food	
Estimate 1 (lower benchmark)	
Rural population unable to afford $3.01 CoRD (poverty headcount)	63.3%
Gap between expenditure of CoRD-poor and CoRD (poverty gap)	20.0%
Adding a 63 cent/day non-food spending requirement	
Estimate 2 (upper benchmark)	
Rural population unable to afford $3.01 CoRD + $0.63 non-food expenditures (poverty headcount)	76.2%
Gap between average expenditure of CoRD-poor and CoRD + non-food spending requirements (poverty gap)	28.7%

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Media coverage: we got “lucky” with the timing!

Hindustan Times

Home / India News / 60 per cent of rural India can't afford nutritious diets

INDIA NEWS

60 per cent of rural India can't afford nutritious diets

The paper highlights an important fact: freedom from poverty, even foc security — the way in which it is defined by the United Nations Food an Agricultural Organisation (FAO) — do not guarantee nutrition security.

By Roshan Kishore

UPDATED ON OCT 14, 2020 09:16 AM IST

Indian tribal girls walk on a road in Umswai village, outskirts of Guwahati, India.(AP)

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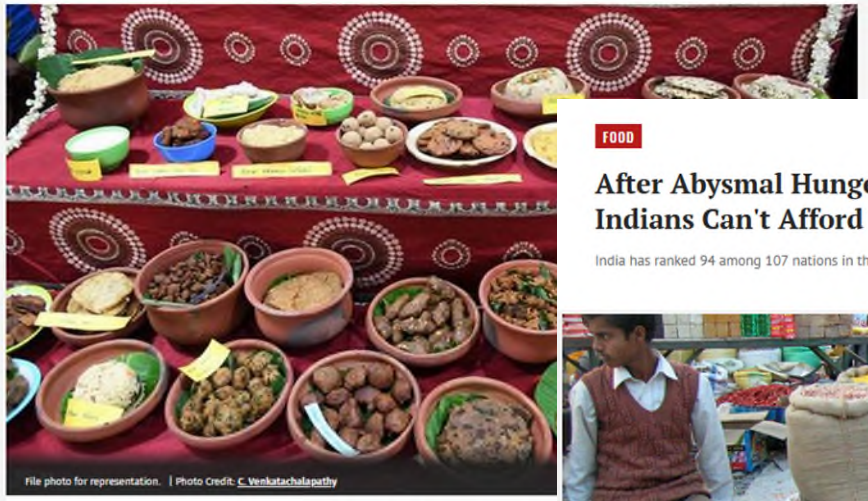
76% of rural Indians can't afford a nutritious diet: study

SPECIAL CORRESPONDENT

NEW DELHI, OCTOBER 17, 2020 19:25 IST
UPDATED: OCTOBER 18, 2020 08:37 IST

SHARE ARTICLE PRINT A | A | A



File photo for representation. | Photo Credit: C. Venkatachalapathy

Paper uses latest available food pric
National Sample Survey's 2011 datas

Three out of four rural Indians cannot a
paper recently published in journal *Foc*
income on food, almost two out of thre
pay for the cheapest possible diet that r
government's premier nutrition body, i

FOOD

After Abysmal Hunger Index Rank, Paper Points Out 3 of 4 Rural Indians Can't Afford Nutritious Diet

India has ranked 94 among 107 nations in the Global Hunger Index 2020 and is in the 'serious' hunger category.

Representative image of a village market in north India. Photo: Ajay Tallam/Flickr (CC BY-SA 2.0)

The Wire Staff

FOOD 18/OCT/2020

New Delhi: A paper published by the International Food Policy Research Institute and reported on by news outlets including *The Hindu* has noted that three out of four Indians living in villages cannot afford diet which can be considered nutritious.

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Updated analyses: what should we expect post COVID-19?

- Studies* noted adverse initial impacts on food supply in 2020
  - o Temporary closure of wholesale markets and disruptions to inter-state trade
  - o Loss of migrant labour, which moved back home during the crisis
  - o Initial increases in prices of pulses, oils, vegetables, with some signs of recovery after ~6 weeks
- More importantly, rising unemployment rates and falling HH incomes
  - o Huge spike in the unemployment rate right after the lockdown, peaking at ~24% in May with slow recovery since
  - o Some suggestive evidence that job loss was worse for women than for men
  - o Evidence also of increased informality/self-employment in post-lockdown transitions
  - o An estimated **230 million additional individuals** fell below the national minimum wage poverty line (of ~$5 per day)

[*Narayanan & Saha (2020), Lowe & Roth (2021), Rawat and Verma (2020), Mahajan and Tomar (2020)]

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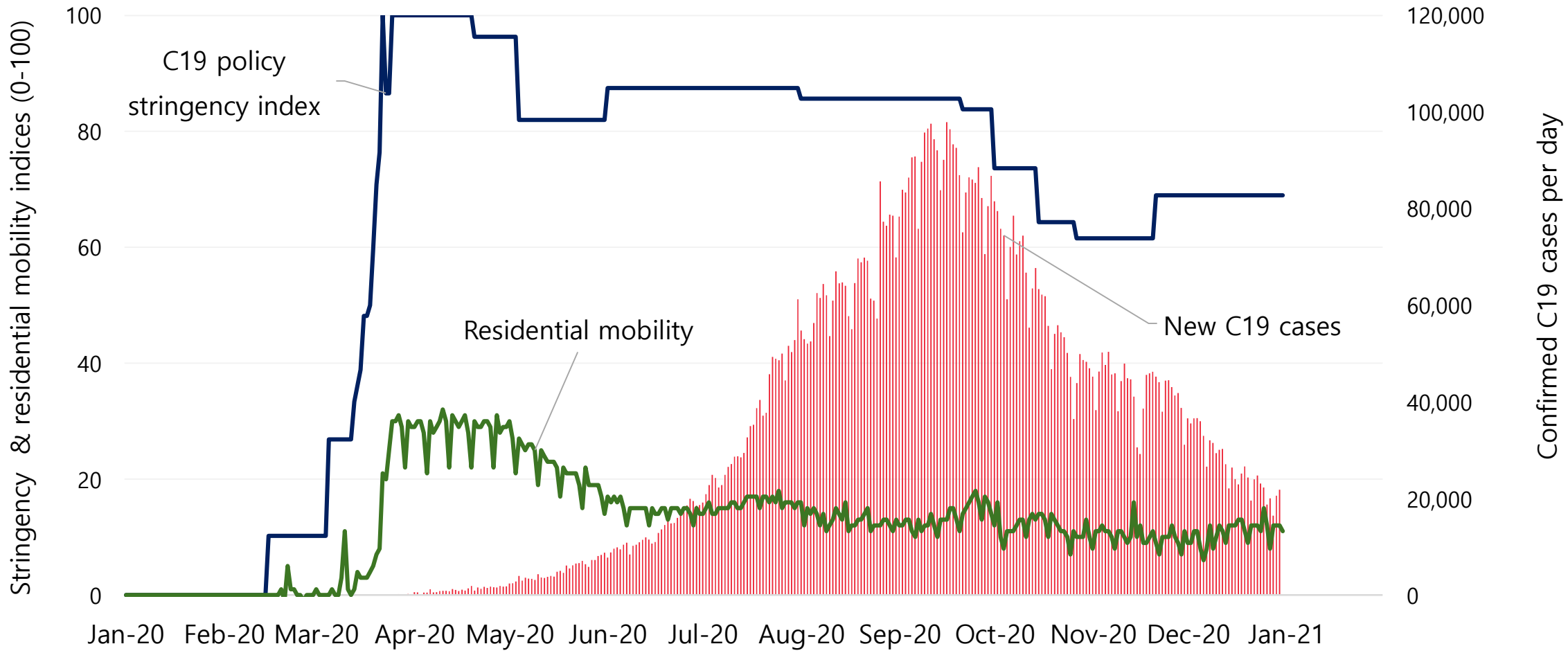
India: COVID-19 cases, policy stringency & residential mobility

We want to see how prices relate to **actual mobility**, not policy proxies



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Data – new sources, urban focus

Department of Consumer Affairs	National Horticulture Board	Ministry of Agriculture

• Daily retail and wholesale
• 22 commodities
  • Common foods only
• 122 urban centres
	• Daily retail & wholesale
	• 24 commodities:
	  • fruits & vegetables
	• 31 urban centres
		• Weekly retail prices
		• 46 commodities
		  • Wide range of foods
		• 75 urban centres

PRICES

- Weekly district-level dataset: January 2018 - January 2021
- Retail prices for 68 commodities from 149 urban centres in 141 districts in 33 states
- Deflated using state-month level general urban CPI

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Data – new sources

PRICES

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MOBILITY

- Data on consumer mobility from Google Community Mobility Reports.
- Results here use the inverse of the residential mobility measure; catch-all 'going out' mobility index
  - Could reflect policy restrictions, or consumer behavioral responses, or both

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Hypotheses: how are prices related to mobility?

- **"Perishables hypothesis":** Significantly different price responses for perishable and non-perishable foods
  - Perishable foods have supply chains more vulnerable to disruptions
  - Demand for non-perishable foods could increase during C19, hoarding
- **"Adaptation hypothesis":** Price dynamics during "surprise lockdown" may be very different to post-lockdown "new normal"
  - Policy makers and implementers often got it wrong during lockdown
  - Traders and retailers adapt: e.g. digital platforms, ICTs, home delivery
- **"City-size hypothesis":** differences between small and large cities
  - Some mega-cities more drastically affected by C19 and had stricter prevention measures
  - Some smaller cities may be more closely connected to rural markets, with shorter supply chains
  - However, response quite disparate across cities of different sizes; priors are somewhat ambiguous

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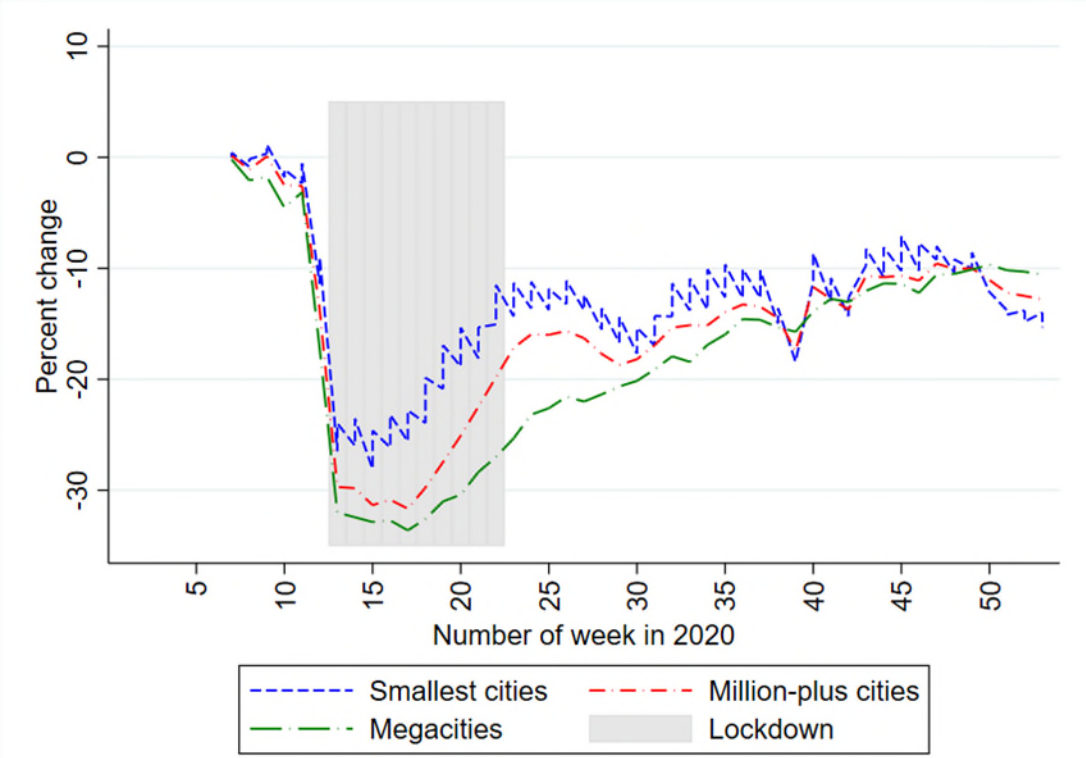
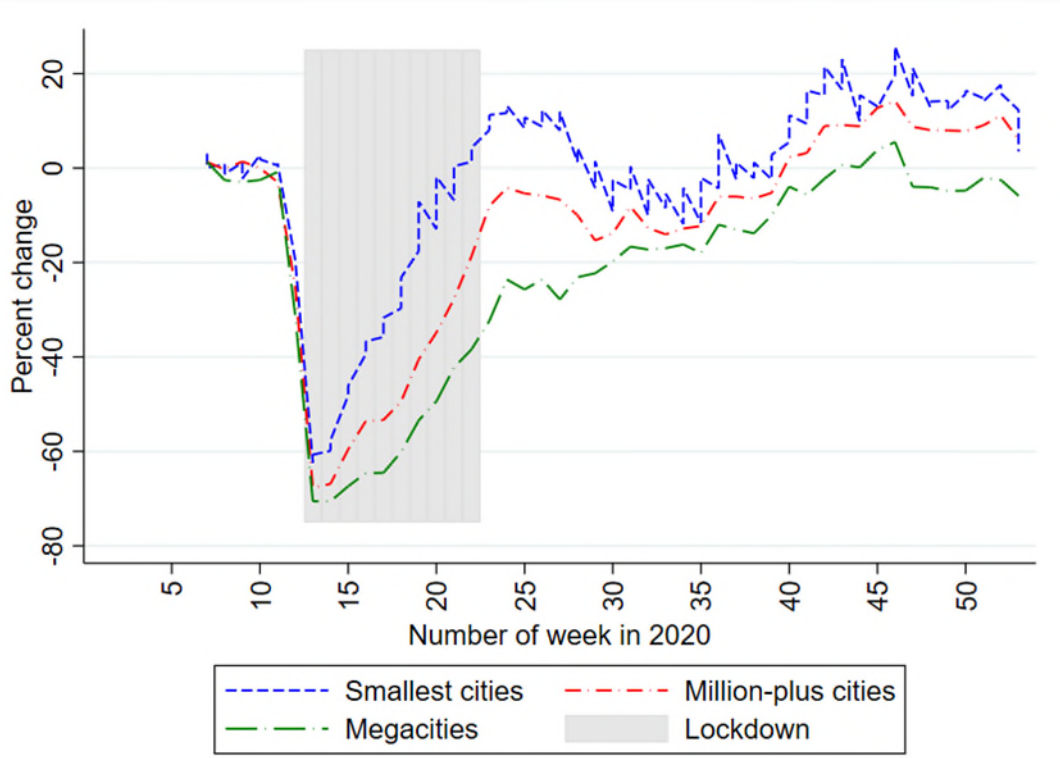
Mobility by city-size classifications

Residential mobility (inverted)

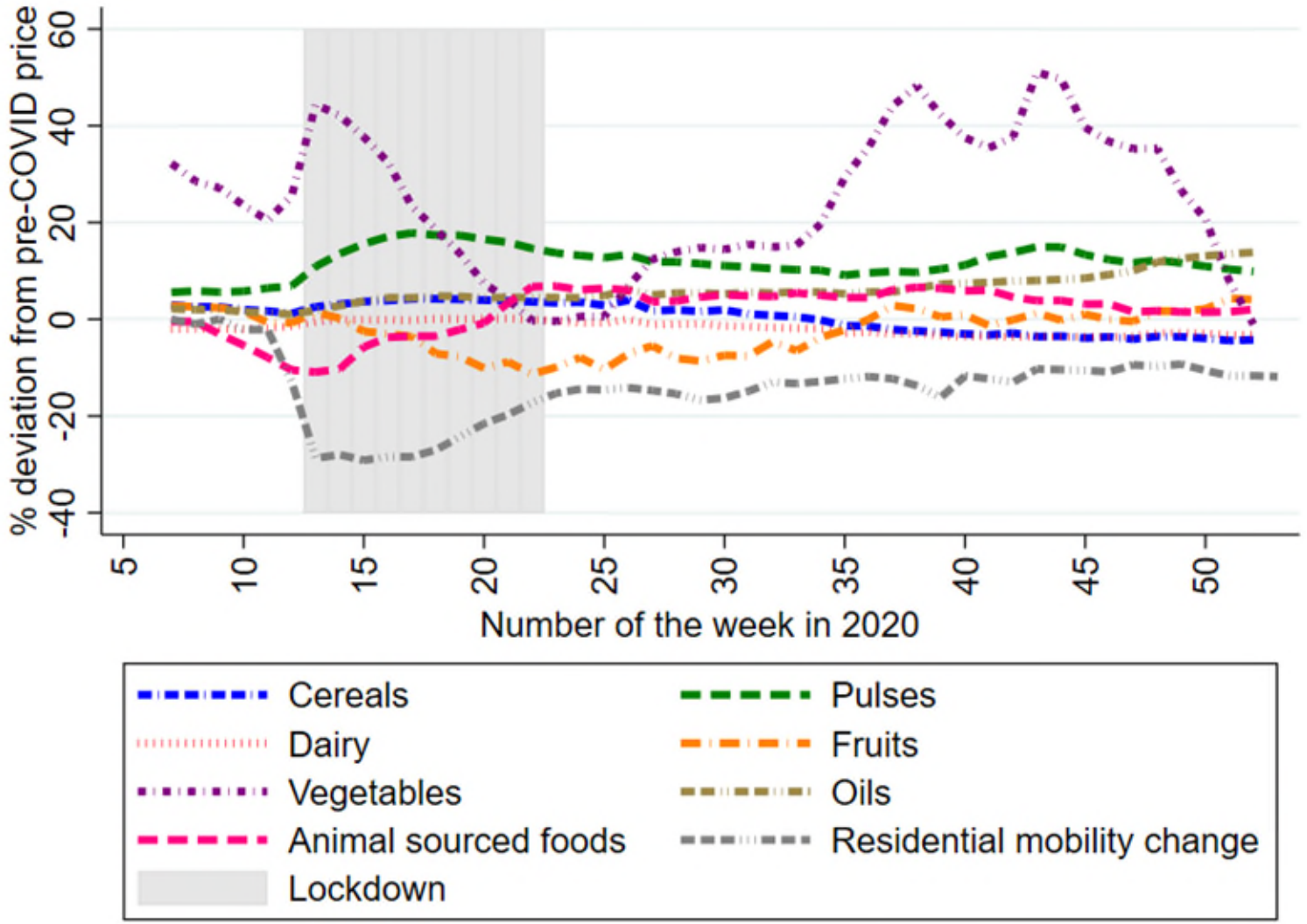


Grocery/pharmacy mobility



- Mobility patterns for residential and grocery/pharmacy mobility similar cities of different sizes
- Grocery mobility recovers to pre-COVID levels faster
- But percentage reductions in mobility are positively correlated with city size
  - Largest reductions in megacities
  - Smallest in small cities

Evolution of retail prices by food group over 2020



- Vegetable prices highly volatile (normal?)
- Pulse prices rose 10-20% after lockdown imposed; prices of animal-sourced foods actually fell by about 10%
- Modest increase in cereal prices & oil prices
- Decline in fruit prices after lockdown imposed
- Little/no change in dairy

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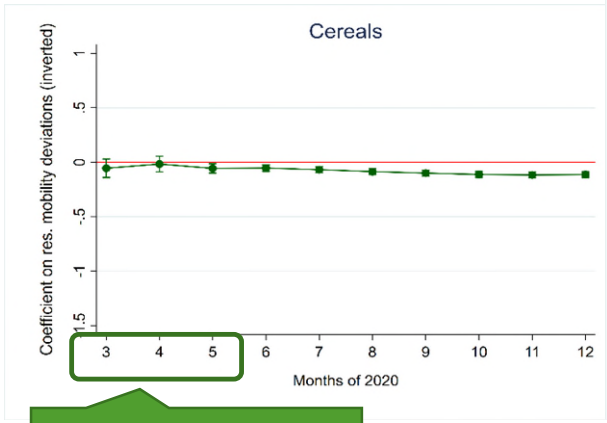
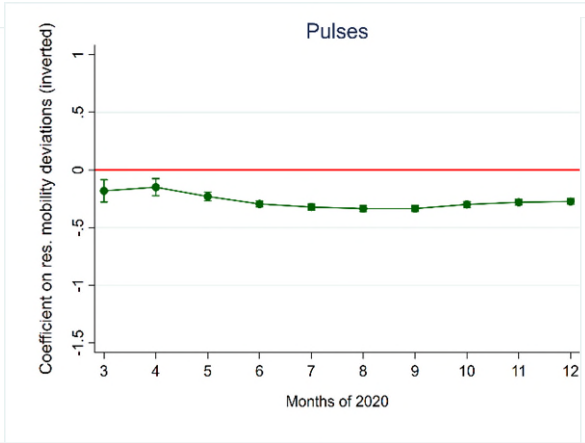
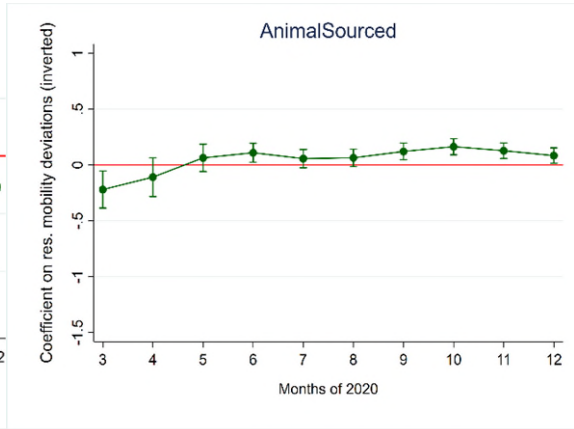
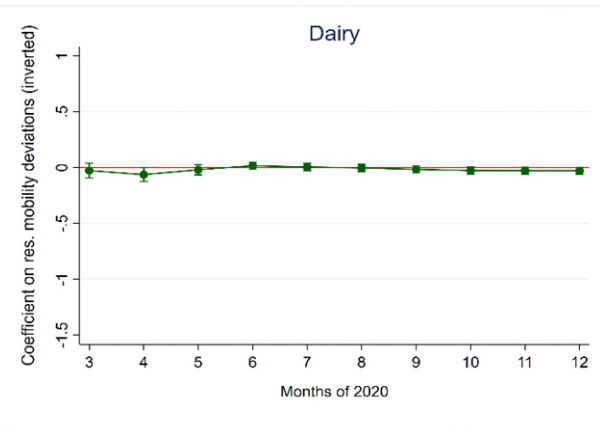
How are price and mobility deviations related?

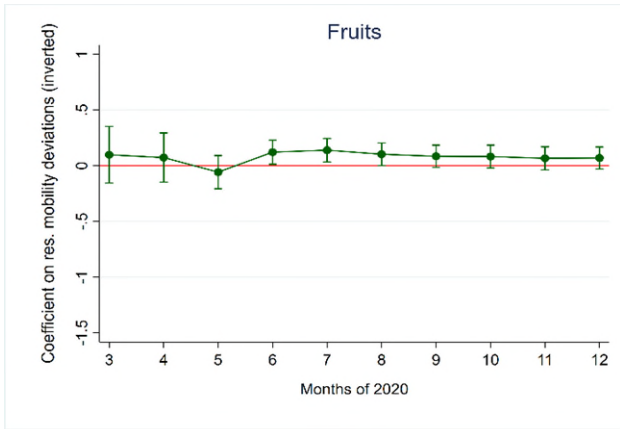


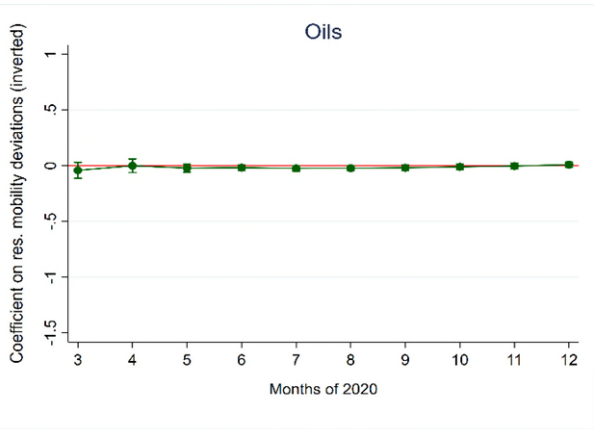






Lockdown months





- Cereals, oils, pulses show little movement (non-perishables, can be and usually are stored);
- Greater impacts for perishables and semi-perishables – animal sourced foods, fruits and vegetables.
- We also see some distinct patterns for larger cities (not shown here)

IFPRI

Summary of findings on price and mobility

- **Perishables hypothesis**: *partially confirmed*, with prices of vegetables increasing during lockdown, but fruit prices declining, while cereal/oil prices increased only marginally
- **Adaptation hypothesis**: *substantially confirmed*. Lockdown periods generally show larger elasticities between mobility and prices, but these converge to some new normal over time, often quite quickly
- **Small vs big cities hypothesis**: *partially confirmed*. Larger cities often had quite different prices responses in early 2020:
  - Dairy & fruit prices went down in large cities only: likely reflect demand shocks more than supply-shocks + great demand falls in larger cities
  - Cereal prices seemed to fall in large cities only

IFPRI

Implications for cost of diet work (ongoing)

- Our earlier work suggests that the biggest contributors to cost are
  - o dairy (2020: little change overall, fall in price in largest cities)
  - o vegetables (2020: **increase** in prices)
  - o cereals (2020: marginal **increase**)
- Possible that the cost of a recommended diet has gone up, especially in smaller cities
- Adaptation or "recovery" has also taken longer in the smaller cities


Questions?

Next steps in Food Prices for Nutrition

Project purpose: Scale up monitoring and analysis of food prices, to guide agricultural production and food markets for improved nutrition

Support use of new metrics in high-priority countries

Build a global system to monitor change in food prices for nutrition

Analyze change in cost and affordability of healthy diets

Actively disseminate data and results on food prices, diet costs, and affordability

Tufts University | Gerald J. and Dorothy R. Friedman School of Nutrition Science and Policy

International Comparison Program

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Food Prices for Nutrition

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BILL & MELINDA GATES foundation

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Food Prices for Nutrition

Tools being developed

- An Excel searchable spreadsheet of food item quantities for calculating the Cost of a Healthy Diet
  - Shows which food group each food item belongs in
  - Shows how much of each item, as purchased in the market, would satisfy recommendation in food-based dietary guidelines (including India's FBDG)
  - Simplifies task of identifying least-cost items
- User guide for calculating the Cost of a Healthy Diet

Food Prices for Nutrition

Food Prices for Nutrition eLearning course

- Will be hosted on the World Bank's Open Learning Campus (OLC) platform
- 3-hour self-paced course for government officials, program planners, researchers, and others
- Two modules
  - Construction of diet cost indices
  - Use and potential applications of diet cost indices in relation to policymaking

Food Prices for Nutrition

Stay in touch with us!

- Give us feedback & stay in touch with the Google Form:

bit.ly/fpnindiafeedback

- Visit our website: bit.ly/foodpricesfornutrition

- Reach out with questions or interest – Rachel.gilbert@tufts.edu

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Questions?
rachel.gilbert@tufts.edu

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Discussion

- Opportunities for using these metrics in India
  - Which stakeholders?
- Opportunities for incorporating into routine monitoring
  - What is needed? Next steps?
  - Where and how frequently could the indicator be made available?

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