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Innovative Methods and Metrics for Nutrition Research and Programming

Looking Beyond a Decade of Accomplishments in Nutrition
NIL Legacy Event | September 17th, 2021

Richard Deckelbaum Giacomo Zanello William Masters Saurabh Mehta

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Use of Accelerometer Devices to Capture Energy Expenditure in Agricultural and Rural Livelihoods

Giacomo Zanello, University of Reading (UK)
www.giacomozanello.com

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University of Reading

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THE IDEA

KEY PARTNERS

immana
Innovative Methods and Metrics for Agriculture and Nutrition Actions

University of Reading

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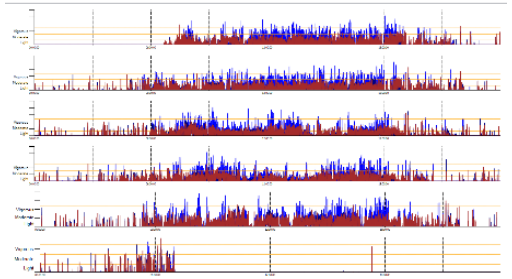
THE CONTRIBUTION



Energy expenditure

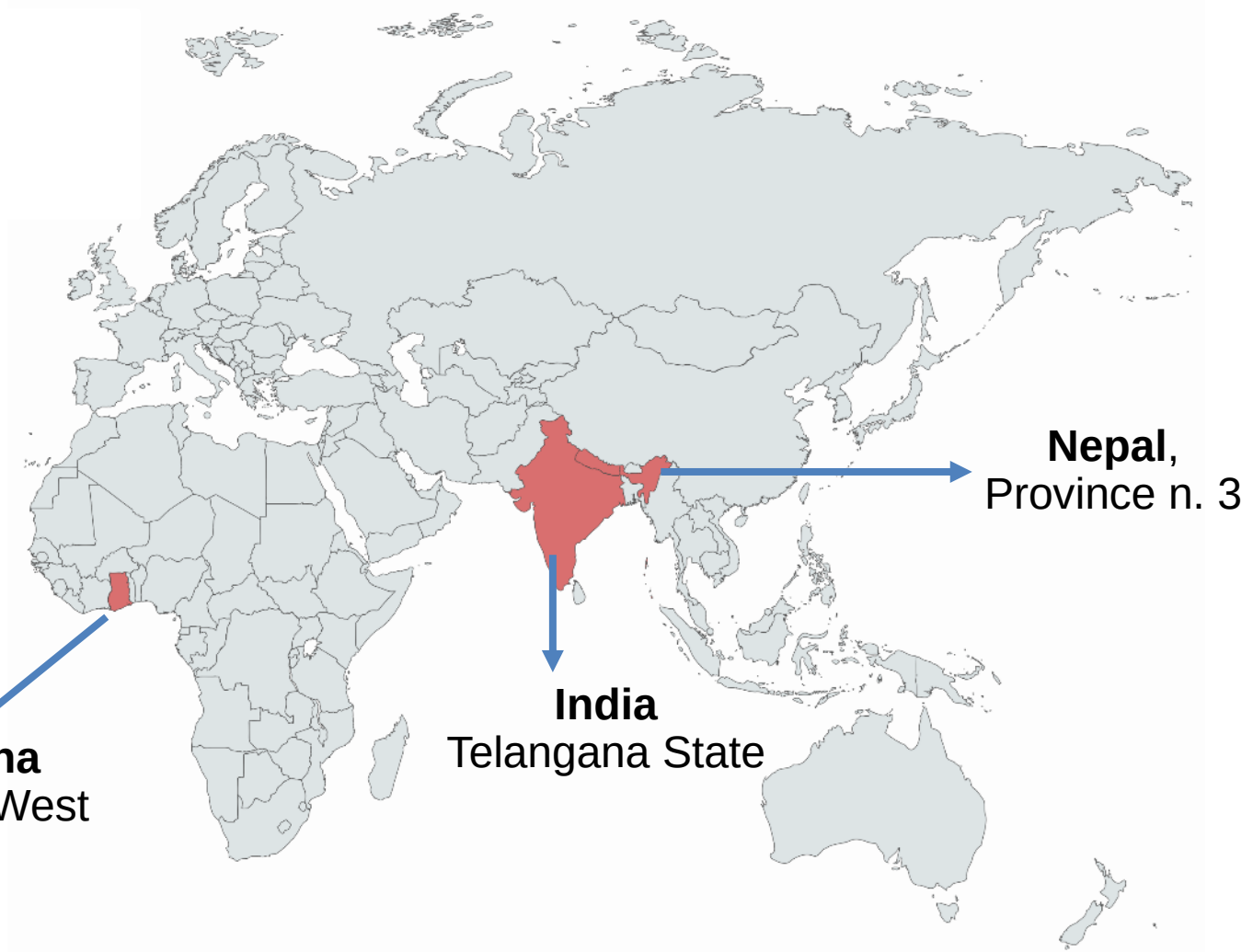
Food intakes

Time-use / activity

Giacomo Zanello, C.S. Srinivasan, Fiorella Picchioni,
Patrick Webb, Paul Nkegbe, Radhika Cherukuri,
Shailes Neupane, Yazidu Ustarz, Nithya Gowdru,
Saurav Neupane, and Amanda J. Wyatt

Field manual for practitioners [LINK]

THE DATA



120 households, 1,120 persons, 26,880 hours. 4 agricultural seasons


UK Data Service
ReShare

Home Legal Review procedures Metrics

Physical activity, time use, and food intakes of rural households in Ghana, India, and Nepal 2017-2018

Zanello, Giacomo and **Srinivasan, Chittur** and **Picchioni, Fiorella** and **Webb, Patrick** and **Cherukuri, Radhika** and **Nkegbe, Paul** and **Neupane, Shailes** (2019). *Physical activity, time use, and food intakes of rural households in Ghana, India, and Nepal 2017-2018.* [Data Collection]. Colchester, Essex: UK Data Service. 10.5255/UKDA-SN-853777

Zanello, G., Srinivasan, C. S., Picchioni, F., Webb, P., Nkegbe, P., Cherukuri, R., & Neupane, S. (2020). Physical activity , time use , and food intakes of rural households in Ghana, India and Nepal. *Scientific Data*, 1–10. https://doi.org/10.1038/s41597-020-0414-x

REDUCING DRUDGERY AND IMPROVING RURAL WELFARE

- Examine the effect of "**drudgery reduction**" – the substitution of less intense for more intense physical activity in rural livelihoods – on energy requirement in India.
- Drudgery reduction can have large effects on human energy (calorie) requirements, with an hour of drudgery reduction reducing energy requirements by **17-24% for men** and **14-17% for women** in India.
- Effects of drudgery reduction vary by **gender** and **socio-demographic characteristics**, and these factors must be considered in the promotion of new agricultural technologies.

Srinivasan, C.S., Zanello, G., Nkegbe, P., Cherukuri, R., Picchioni, F., Gowdru, N., and Webb, P. (2020) Drudgery reduction, physical activity and energy requirements in rural livelihoods. *Economics & Human Biology* 37, 100846.

GENDER, TIME-USE, AND ENERGY EXPENDITURES

- Explore **patterns of time and energy intensity** of rural livelihoods work across the gendered allocation and trade-offs of both energy expenditure and time-use across productive tasks, reproductive work, and leisure in India and Nepal.
- Men and women participate equally in productive work, however **women shoulder most of the reproductive work burdens in rural households at the expense of leisure opportunities**.
- The design of agricultural interventions should pay attention to how they may impose **gender specific demands on energy exertion and time**.

Picchioni, F., Zanello, G., Srinivasan, C. S., Wyatt, A. J., & Webb, P. (2020). Gender, time-use, and energy expenditures in rural communities in India and Nepal. *World Development*, 136, 105137. https://doi.org/10.1016/j.worlddev.2020.105137

INTRA-COUPLE TIME ALLOCATION EFFECTS ON ENERGY ADEQUACY

- Assess couple's own and partner **effects of time allocation** (economic, domestic, leisure activities) **on energy adequacy.**
- There are spousal interdependencies in the correlation of time allocation with calorie intake adequacy and gendered allocation of work is negatively linked with calorie intake adequacy.
- Development efforts can minimize nutrition trade-offs to women empowerment by **encouraging cooperation between spouses** and a **change in socio-cultural norms** around the gendered allocation of work may be required for achieving desirable nutritional outcome.

Afeni, T.A., Srinivasan, C.S., Zanello, G. (2021) Sharing work and food within the household: Intra-couple time allocation effects on energy adequacy in rural Telangana, India. *Under-review*.

A NEW TOOL FOR POLICIES AND PROGRAMS

- New technologies (accelerometers) offer the opportunities to collect **new or better data**; does not imply replacing on-the-ground data collection; rather **complement current approaches.**
- The methods and approach can be used to facilitate a better understanding of:
  - The **link between agricultural development interventions and nutrition outcomes** for different members of rural households.
  - The **intra-household**, gender differentiated **labour allocation and energy expenditure patterns**.
  - The **prevalence**, **depth** and **severity** of **undernutrition** in rural areas in developing countries.

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Food Prices: How Value Chains, Policies and Programs Affect the Affordability of a Healthy Diet

William A. Masters, Tufts University
https://sites.tufts.edu/willmasters

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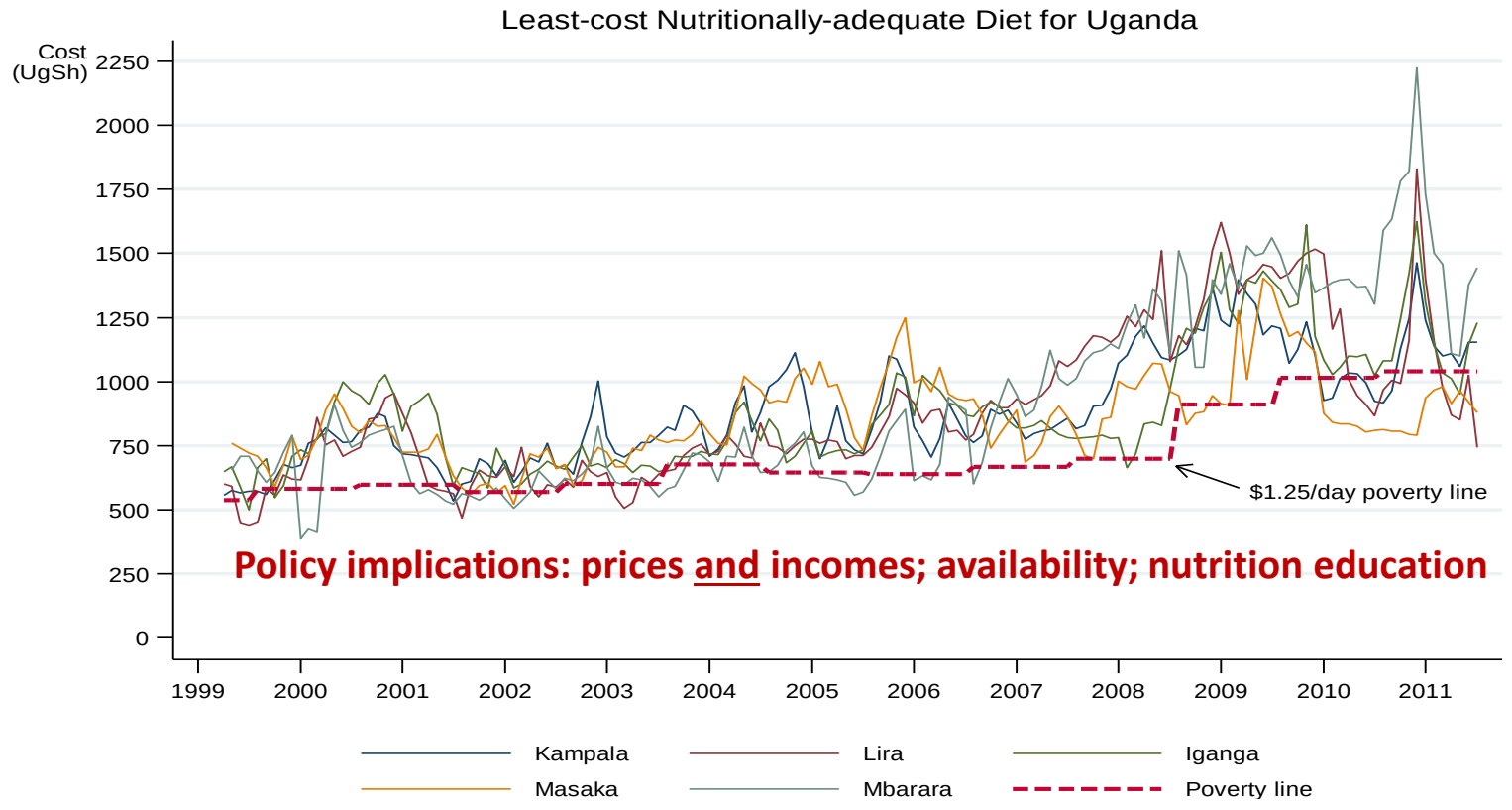
Early work for the Nutrition Innovation Lab in Uganda established that even the lowest-cost nutrient adequate diet is often far out of reach, with high volatility and spatial variation



Source: Omiat and Shively (2017) Charting the cost of nutritionally-adequate diets in Uganda, 2000-2011. *African Journal of Food, Agriculture, Nutrition and Development* 17(1): 11571-11591. doi:10.18697/ajfand.77.16340.

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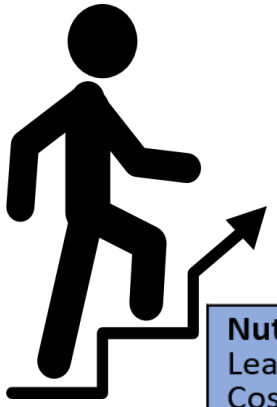
What have we learned about how well food markets work for the poor?

Foods with healthy attributes are too costly for the poorest, and affordable but often not chosen by richer people



Other factors
(time use and kitchen equipment, taste and preferences, advertising etc.)

Healthy diets (balance of food groups)
Least-cost way of meeting dietary guidelines costs around $3.50/day, with much variation)

Nutrient adequacy (balance of macro & micronutrients)
Least-cost diet has legumes, some F&V, little ASFs
Cost is around $2.00/day, with some variation)

Daily energy (calories)
Least-cost items are starchy staples (also vegetable oil and sugar)
Cost is around $0.75/day, with some temporal and spatial variation

nature food
BRIEF COMMUNICATION
https://doi.org/10.1038/s43016-021-00323-8

COVID-19 pandemic leads to greater depth of unaffordability of healthy and nutrient-adequate diets in low- and middle-income countries

David Laborde[1], Anna Herforth[2], Derek Headey[3] and Saskia de Pee[4]

Food and Agriculture Organization of the United Nations

Cost and affordability of healthy diets across and within countries

Background paper for *The State of Food Security and Nutrition in the World 2020*

SCIENCE ADVANCES | RESEARCH ARTICLE

ECONOMICS

Seasonality of diet costs reveals food system performance in East Africa

Yan Bai, Elena N. Naumova, William A. Masters*

American Journal of Agricultural Economics

ASSA Meeting Invited Paper | Open Access

Measuring the Affordability of Nutritious Diets in Africa: Price Indexes for Diet Diversity and the Cost of Nutrient Adequacy

William A. Masters, Yan Bai, Anna Herforth, Daniel B. Sarpong, Fulgence Mishili, Joyce Kinabo, Jennifer C. Coates

ELSEVIER

Food Policy
Volume 99, February 2021, 101983

Cost and affordability of nutritious diets at retail prices: Evidence from 177 countries

Yan Bai [a], Robel Alemu [b, d], Steven A. Block [b], Derek Headey [c], William A. Masters [a, d]

THE LANCET Global Health
Volume 8, Issue 1, January 2020, Pages e59-e66

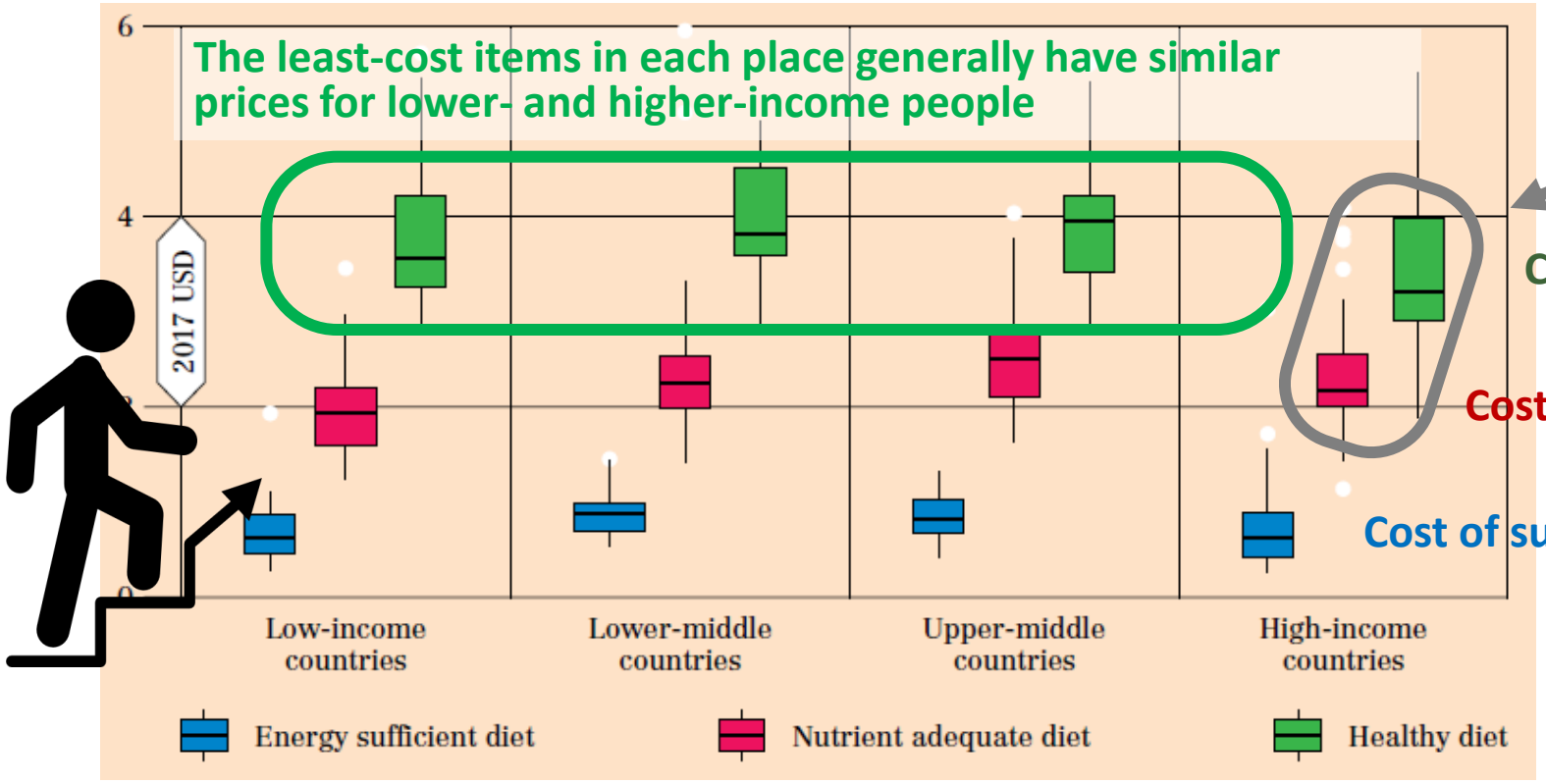
Articles

Affordability of the EAT–*Lancet* reference diet: a global analysis

Kalle Hirvonen PhD [a], Yan Bai MIB [b], Derek Headey PhD [d], Prof William A Masters PhD [b, c]

Diet composition varies, but each step up in quality adds to the cost

Cost of the most affordable diets for energy sufficiency, nutrient adequacy and overall health by country income group in 2017

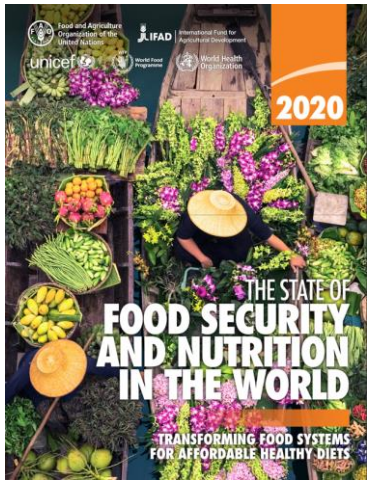


Smaller step up, due primarily to lower prices for dairy

Cost of recommended diets > $3.50/day

Cost of nutrient adequacy ≈ $2.00/day

Cost of survival ≈ $0.75/day



Source: Figure 2 of Herforth et al. (2020). Cost and affordability of healthy diets across and within countries. Background paper for The State of Food Security and Nutrition in the World 2020. FAO Agricultural Development Economics Technical Study No. 9. Rome, FAO. https://doi.org/10.4060/cb2431en

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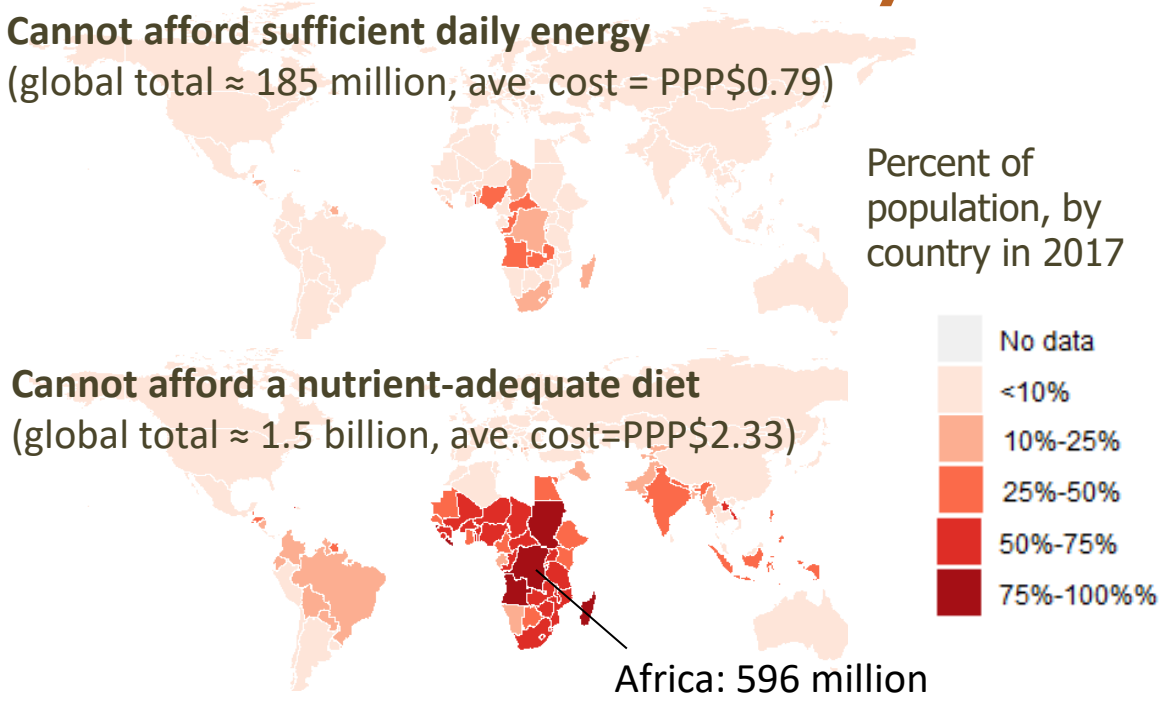
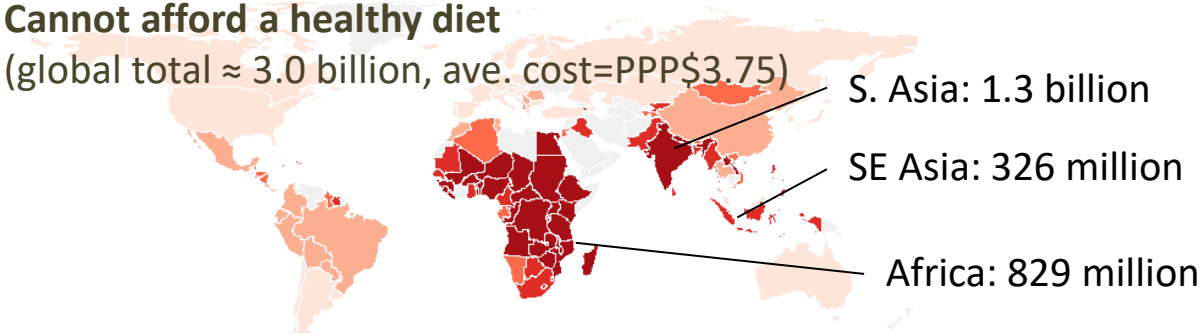
Differences in affordability are mainly due to income distribution

Cannot afford sufficient daily energy
(global total ≈ 185 million, ave. cost = PPP$0.79)

Cannot afford a nutrient-adequate diet
(global total ≈ 1.5 billion, ave. cost=PPP$2.33)



Cannot afford a healthy diet
(global total ≈ 3.0 billion, ave. cost=PPP$3.75)

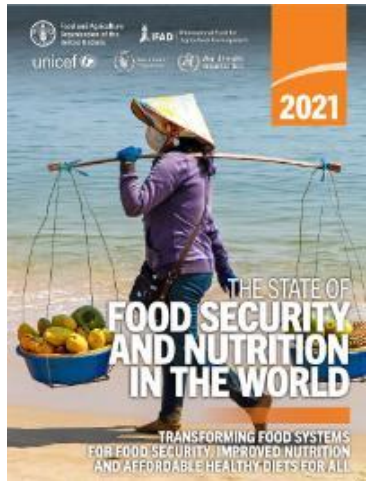


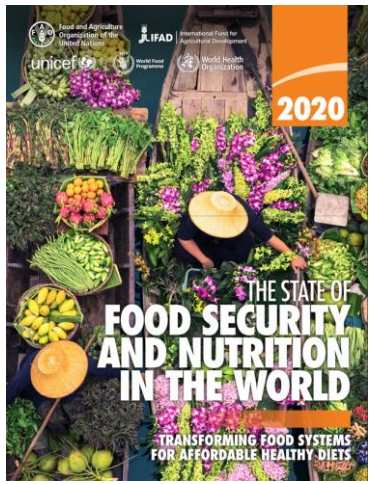
About 3 billion people (38% of the world population) could not afford a healthy diet in 2017

Monitoring diet cost and affordability complements other ways of measuring poverty and food insecurity:

- ≈ 690 m. below $1.90/day (World Bank)
- ≈ 653 m. undernourished (PoU, from 1960s)
- ≈ 1.9 b. experience food insecurity (FIES)

Latest updates (through 2019) are here:

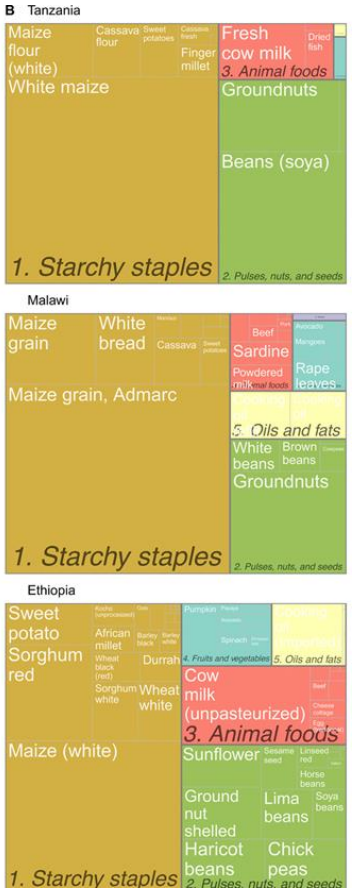




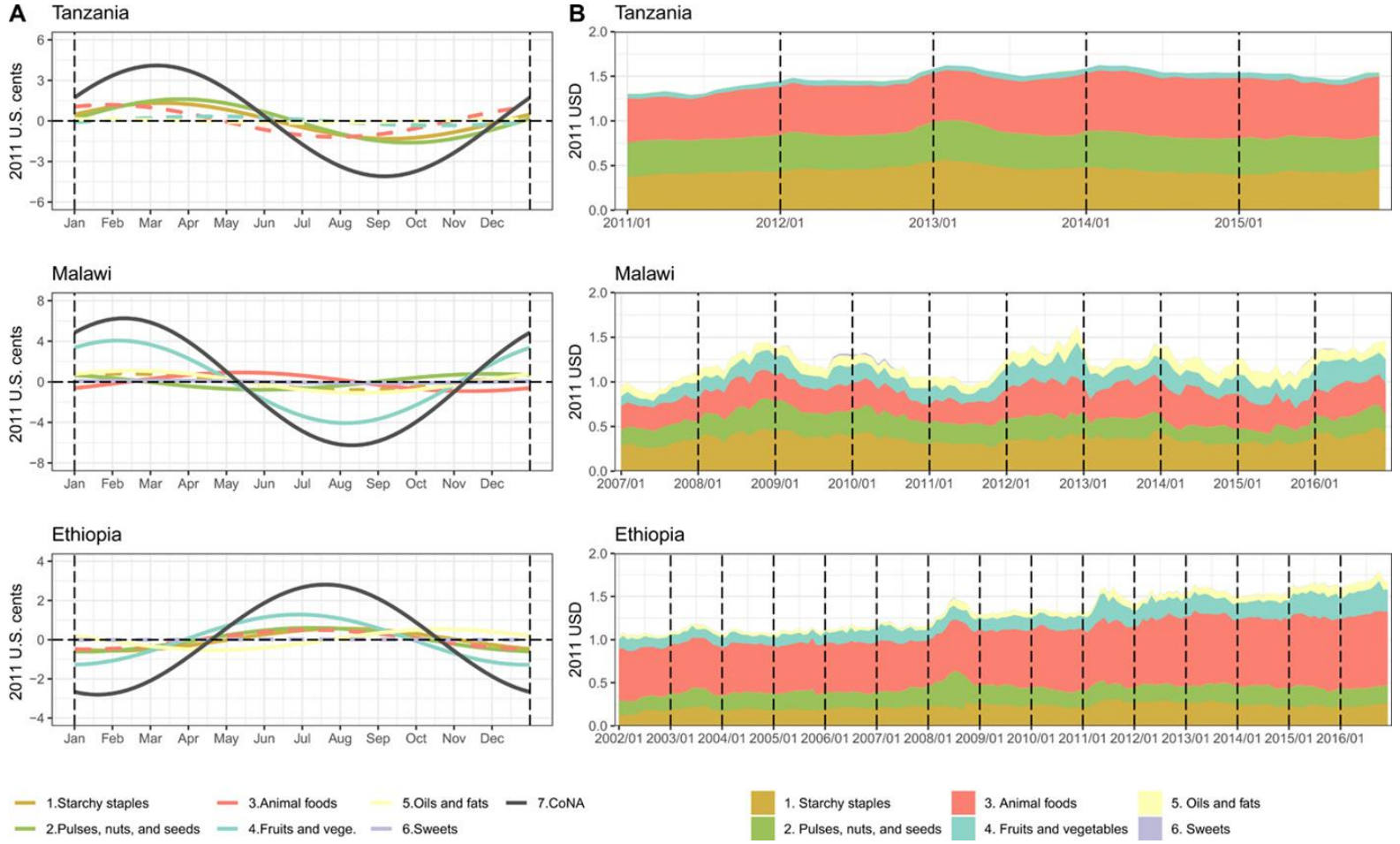
Source: FAO, IFAD, UNICEF, WFP and WHO (2020). *The State of Food Security and Nutrition in the World 2020,* FAO, Rome.
Details at https://sites.tufts.edu/foodpricesfornutrition

Within countries we see some similarities and some differences

Energy shares of least-cost diets



Seasonality of diet costs and cost by food group in Tanzania, Malawi and Ethiopia



Source: Bai, Y., E. Naumova and W.A. Masters (2020). [Seasonality in diet costs reveals food system performance in East Africa](). *Science Advances*, eabc2162.

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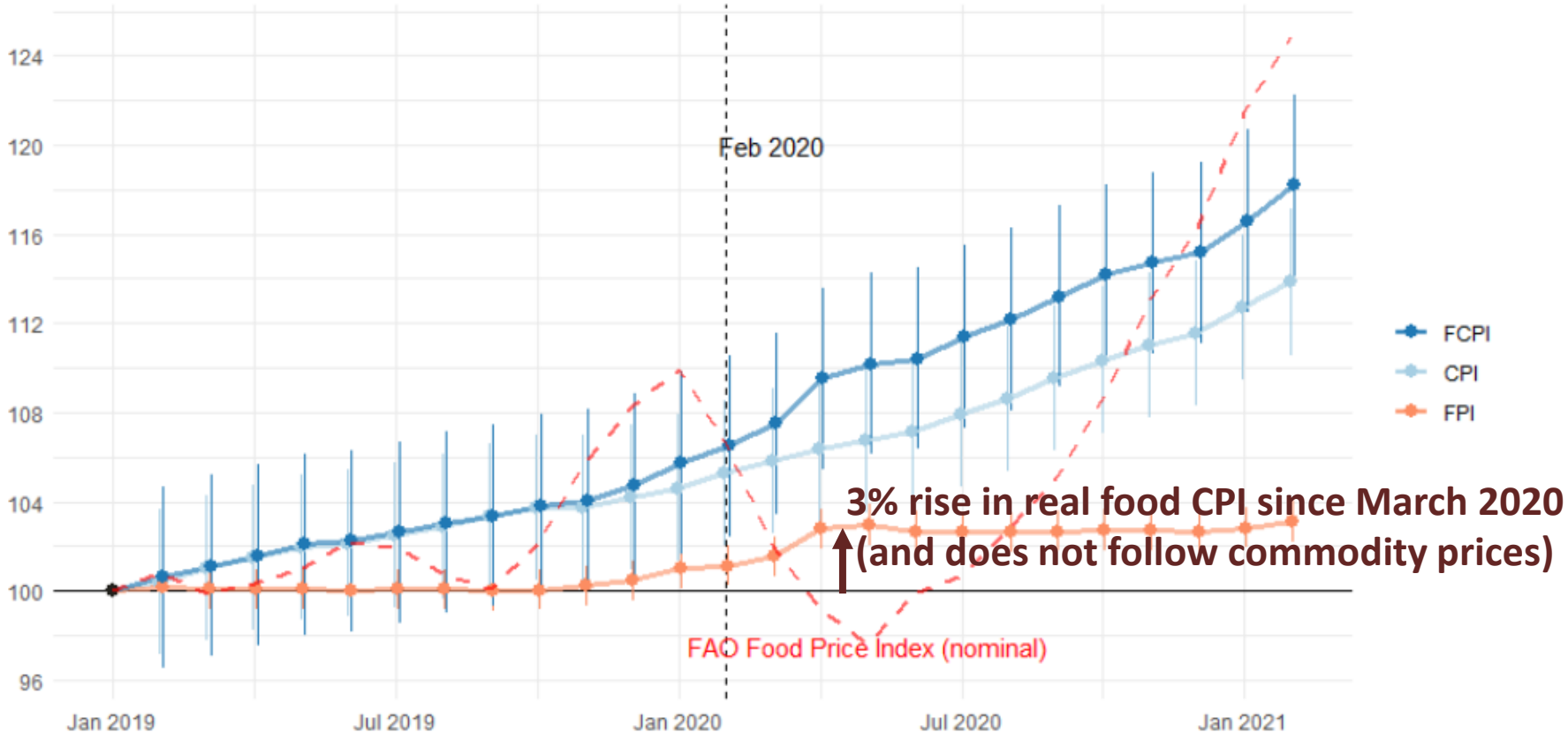
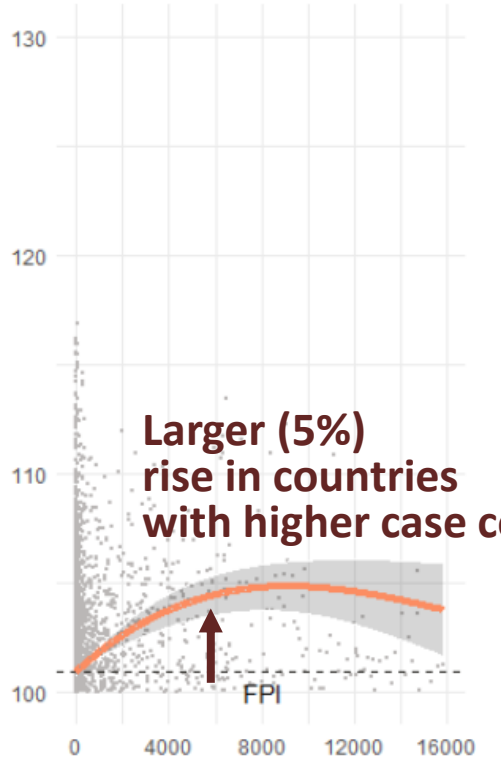
COVID brought higher food prices due to higher farm-to-retail margins

Monthly change in global consumer price indexes for food versus other items (180 countries, Jan. 2019 – Feb. 2021)



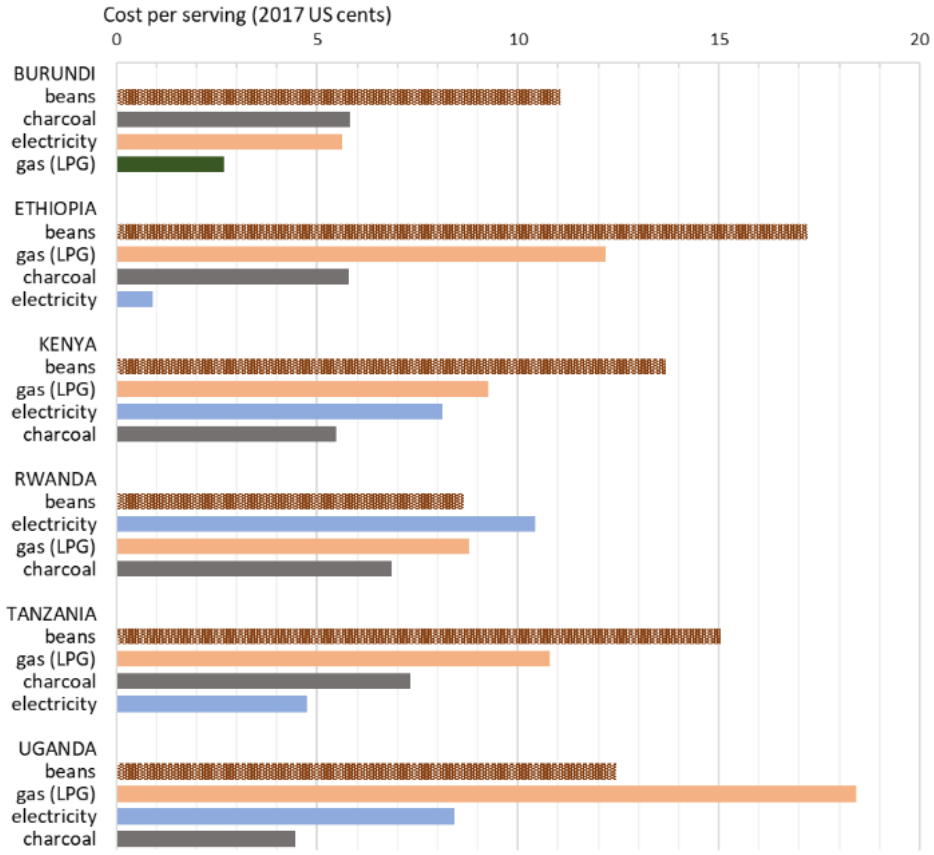
Association with cumulative COVID case counts



Source: Bai, Y. et al., Food prices in a pandemic: Global data show higher costs for nutritious food groups (2021). https://doi.org/10.21203/rs.3.rs-710555/v1.

New work includes other costs of meal preparation, not just food items

Cost per serving of cooking fuel, relative to the cost of dried beans in East Africa



Note: Data shown are the nationally-representative retail price of 57.25g for the most affordable kind of pulse, which in each country is spotted beans, compared to the cost of fuel using quantities from MECS (2019) and prices from ICP (2021) as detailed in the text.

Food Prices for Nutrition | Tufts University | United Nations Food Systems Summit 2021 | WFP World Food Programme

United Nations Food Systems Summit 2021
Scientific Group
https://sc-fss2021.org/

Food Systems Summit Brief
Prepared by Research Partners of the Scientific Group for the Food Systems Summit
May 2021

COST AND AFFORDABILITY OF PREPARING A BASIC MEAL AROUND THE WORLD

by William A. Masters, Elena M. Martinez, Friederike Greb, Anna Herforth, Sheryl L. Hendriks

Source: Masters WA, Martinez EM, Greb F, Herforth A, Hendriks SL (2021). Cost and Affordability of Preparing a Basic Meal around the World. UN Food System Summit Scientific Group Partners' Brief (23 pages), available online at https://sc-fss2021.org/materials/fss-briefs-by-partners-of-scientific-group

Conclusions:
What do we know about diet costs and affordability?

- For many people (3 billion, 40% of world), healthy diets remain beyond reach
  - Perishable or bulky foods are more costly to grow and distribute than starchy staples, oil and sugar
  - Affordability requires income growth and safety nets, as well as food system change to lower prices
- For most people (4.9 b., 60%), healthy diets are affordable but not chosen?
  - Price barrier is not insurmountable; other factors often drive choice
    - meal preparation (time, fuel, water, equipment)
    - preferences (food culture, taste and satiation)
    - marketing of packaged foods (availability and advertising)
  - COVID lowered income and raised food prices, but magnitude is not yet known
- Research on diet costs is evolving rapidly!
  - Increased data availability and standardized methods
  - Greater depth of spatial, temporal and demographic variation

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