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INNOVATION LAB FOR NUTRITION
WEBINAR SERIES

Markets and infrastructure: the roles of market access in shaping diets in Bangladesh, Uganda, and Nepal

WEDNESDAY, JULY 15TH
9:00AM - 10:30AM (ET)

PANELIST: GERALD SHIVELY
PI for the Innovation Lab for Nutrition
Purdue University, College of Agriculture

PANELIST: WILL MASTERS
Investigator for the Innovation Lab for Nutrition
Tufts University Friedman School of Nutrition Science and Policy

MODERATOR: SHIBANI GHOSH
Associate Director of the Innovation Lab for Nutrition
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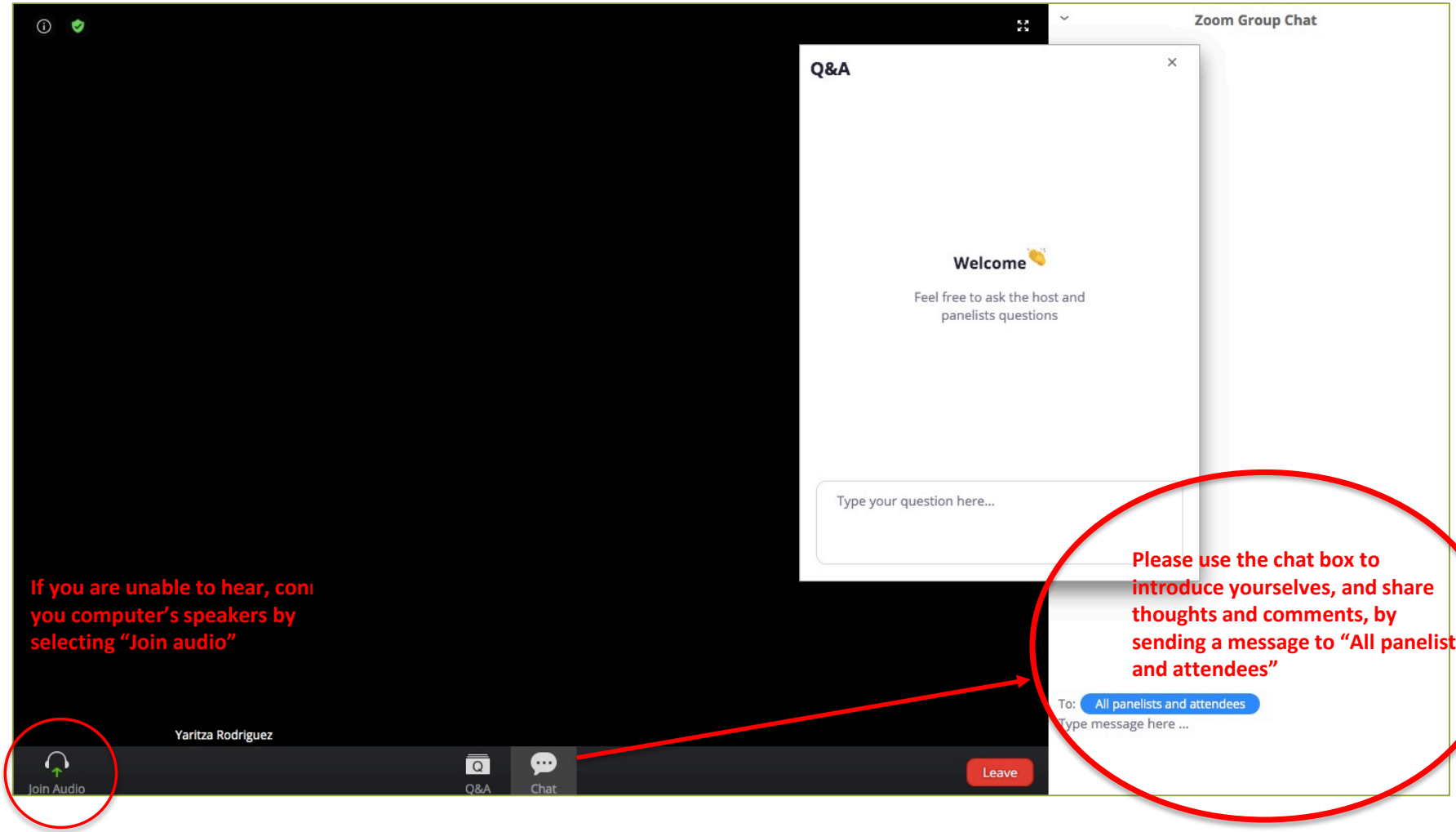

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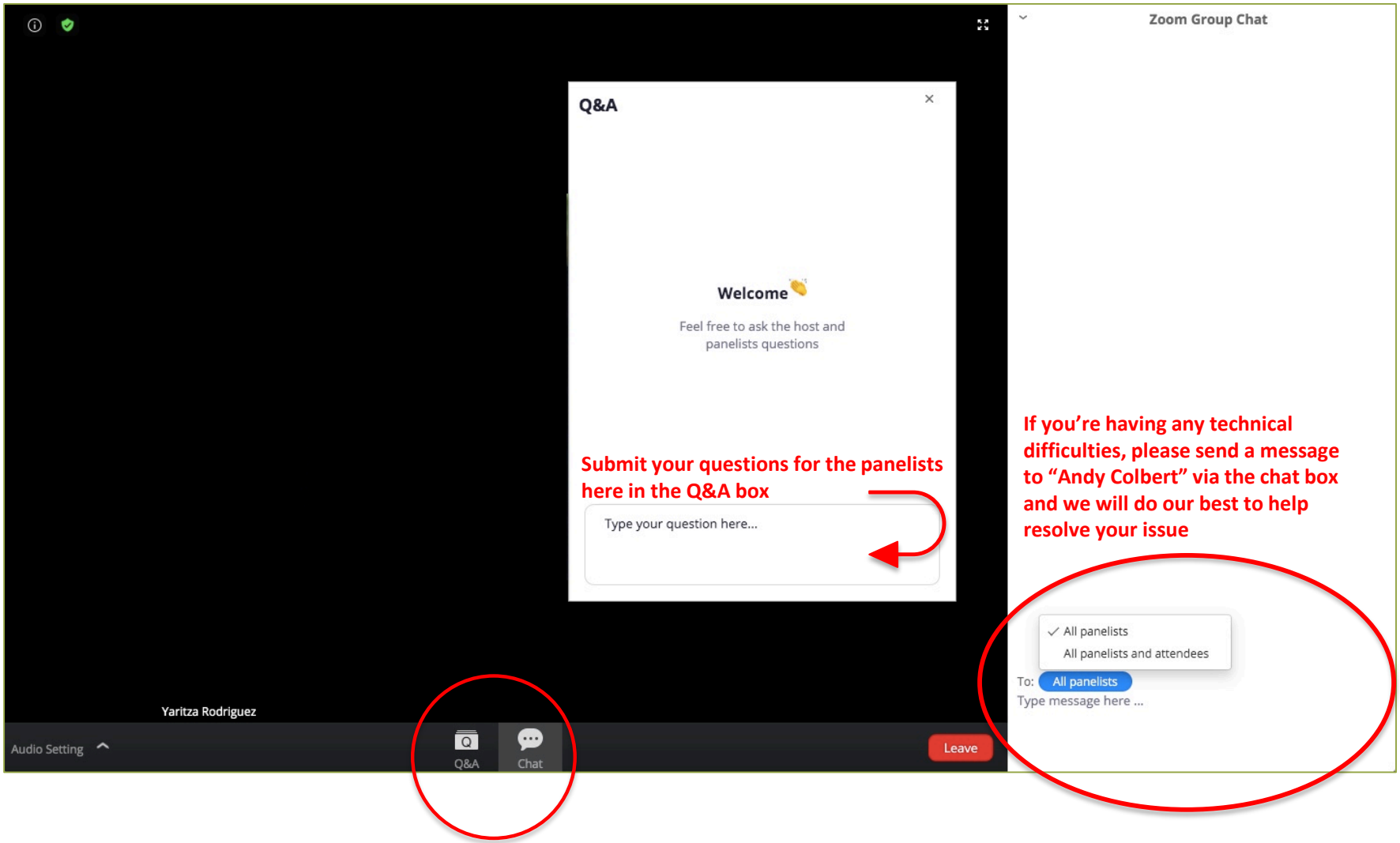
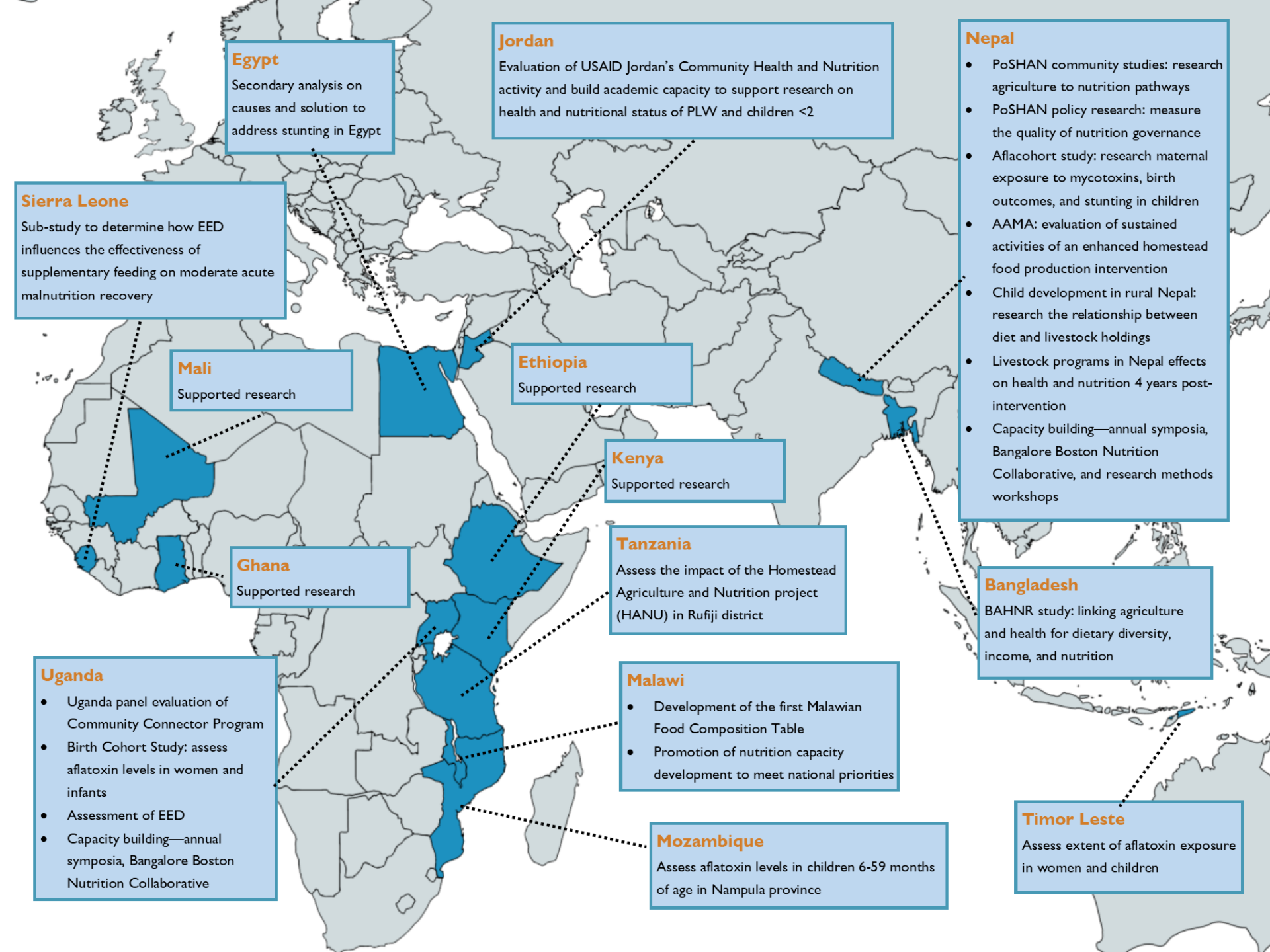
Overview of the Q&A and Chat box




Egypt
Secondary analysis on causes and solution to address stunting in Egypt
Jordan
Evaluation of USAID Jordan's Community Health and Nutrition activity and build academic capacity to support research on health and nutritional status of PLW and children <2
Nepal
PoSHAN community studies: research agriculture to nutrition pathways
PoSHAN policy research: measure the quality of nutrition governance
Aflacohort study: research maternal exposure to mycotoxins, birth outcomes, and stunting in children
AAMA: evaluation of sustained activities of an enhanced homestead food production intervention
Child development in rural Nepal: research the relationship between diet and livestock holdings
Livestock programs in Nepal effects on health and nutrition 4 years post-intervention
Capacity building—annual symposia, Bangalore Boston Nutrition Collaborative, and research methods workshops
Sierra Leone
Sub-study to determine how EED influences the effectiveness of supplementary feeding on moderate acute malnutrition recovery
Mali
Supported research
Ethiopia
Supported research
Kenya
Supported research
Tanzania
Assess the impact of the Homestead Agriculture and Nutrition project (HANU) in Rufiji district
Ghana
Supported research
Bangladesh
BAHNR study: linking agriculture and health for dietary diversity, income, and nutrition
Uganda
Uganda panel evaluation of Community Connector Program
Birth Cohort Study: assess aflatoxin levels in women and infants
Assessment of EED
Capacity building—annual symposia, Bangalore Boston Nutrition Collaborative
Malawi
Development of the first Malawian Food Composition Table
Promotion of nutrition capacity development to meet national priorities
Mozambique
Assess aflatoxin levels in children 6-59 months of age in Nampula province
Timor Leste
Assess extent of aflatoxin exposure in women and children

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Topic	Hosted by:
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Markets, Infrastructure and Diets: Evidence from **Bangladesh, Nepal and Uganda**	USAID Advancing Nutrition
Animal source foods (ASFs) and child nutrition: new lagged and contemporaneous effects in **Bangladesh, Nepal** and **Uganda**	Innovation Lab for Nutrition
Improving Food Security and diets in **Sub-Saharan Africa and South Asia**: The intersection of agriculture, nutrition and health	Innovation Lab for Nutrition
Gender, agriculture, diets and nutrition: Findings from **Nepal, Uganda and Tanzania**	Innovation Lab for Nutrition
Consumption of Animal source foods (ASFs), linear growth and stunting in **Bangladesh, Nepal and Uganda**	Innovation Lab for Nutrition
Ecology and Prevention of Linear Growth Faltering in **Nepal**	Innovation Lab for Nutrition
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WASH, Environmental Enteric Dysfunction and nutritional status of infants and young children: Findings from **Uganda, Nepal and Sierra Leone**	USAID Advancing Nutrition
Resilience, Metrics and Measurement	
Novel technologies and metrics to support research, programming and policy in agriculture, nutrition and health: Findings from **India, Nepal and Ghana**	USAID Advancing Nutrition
Methods for Measuring Resilience: Application to Diets of Rural Women and Children in **Nepal and Bangladesh**	Innovation Lab for Nutrition
Capacity Building: Our Initiatives and Lessons Learned	
Malawi's First Dietetics Program: Lessons from a multi-pronged approach to building human and	Innovation Lab for

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Markets, Infrastructure, Diets and Nutrition

Evidence from Bangladesh, Nepal and Uganda

July 15, 2020

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Outline:

1. Setting the stage with data and a thought experiment

- Nutrition outcomes depend on diet and health
- Diet and health both depend on a broad set of factors

2. Nutrition outcomes are driven, in part, by early-life exposures

3. Evidence on food prices, "adequate" diets, and resilience

4. Key messages

- Isolation (in all of its forms) creates nutritional risks
- Markets and infrastructure help to mitigate these risks
  - Higher household incomes
  - Lower food prices
  - Lower food price volatility
  - Greater dietary diversity(with caveats)
  - Potentially greater resilience

Outline:

1. **Setting the stage with data and a thought experiment**
2. Nutrition outcomes are driven, in part, by early-life exposures
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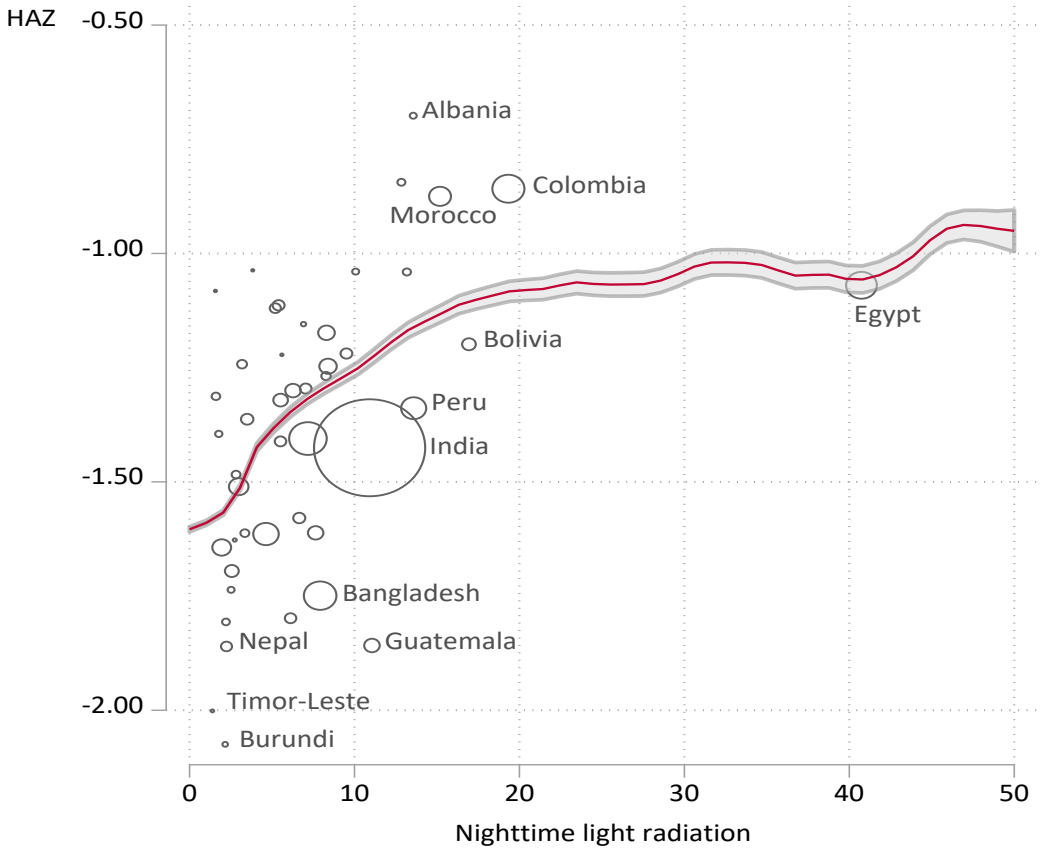
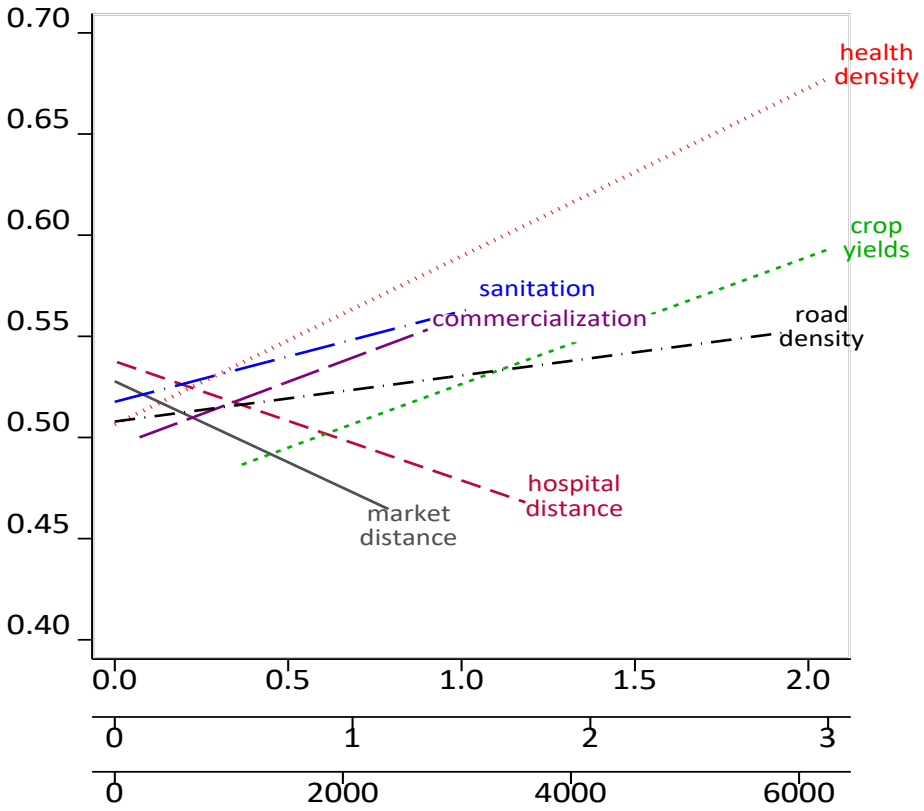
Children are taller where there is more light at night



Source: Shively & Schmiess (2020). Altitude, Child Stunting, and Mitigating Factors in 49 Countries. Working Paper, Purdue Univ.
Note: Derived from unweighted DHS data. Circle size proportional to country's population of children below age 5.

Many kinds of investment are needed to overcome rural isolation and improve development outcomes

Human Development Index
(weighted average of life expectancy, education, and income).

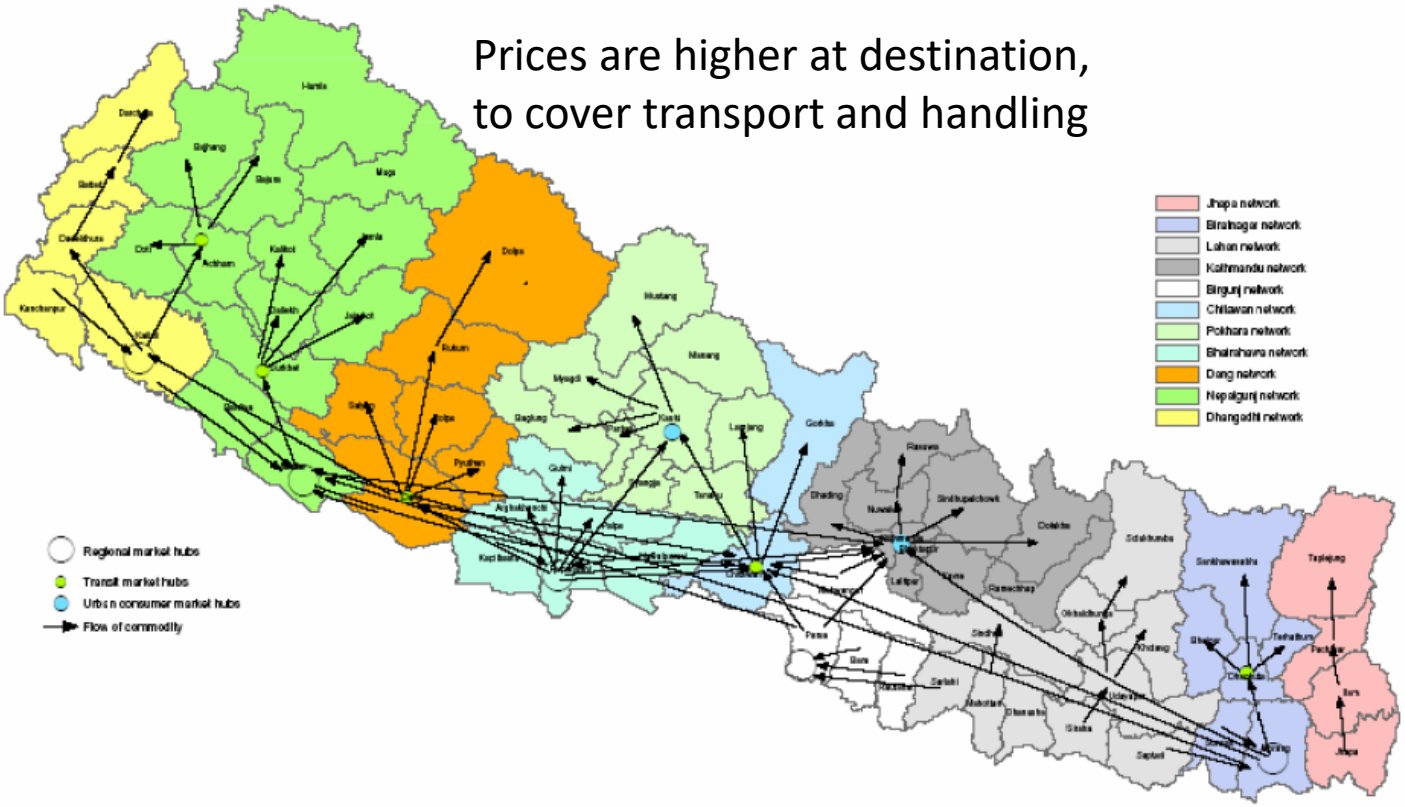


Source: Shively (2017). Infrastructure mitigates the sensitivity of child growth to local agriculture and rainfall in Nepal and Uganda. *Proceedings of the National Academy of Sciences*. doi:10.1073/pnas.1524482114.

Food markets reach everywhere, but at very different costs

In Nepal, market linkages are strongly tied to geography

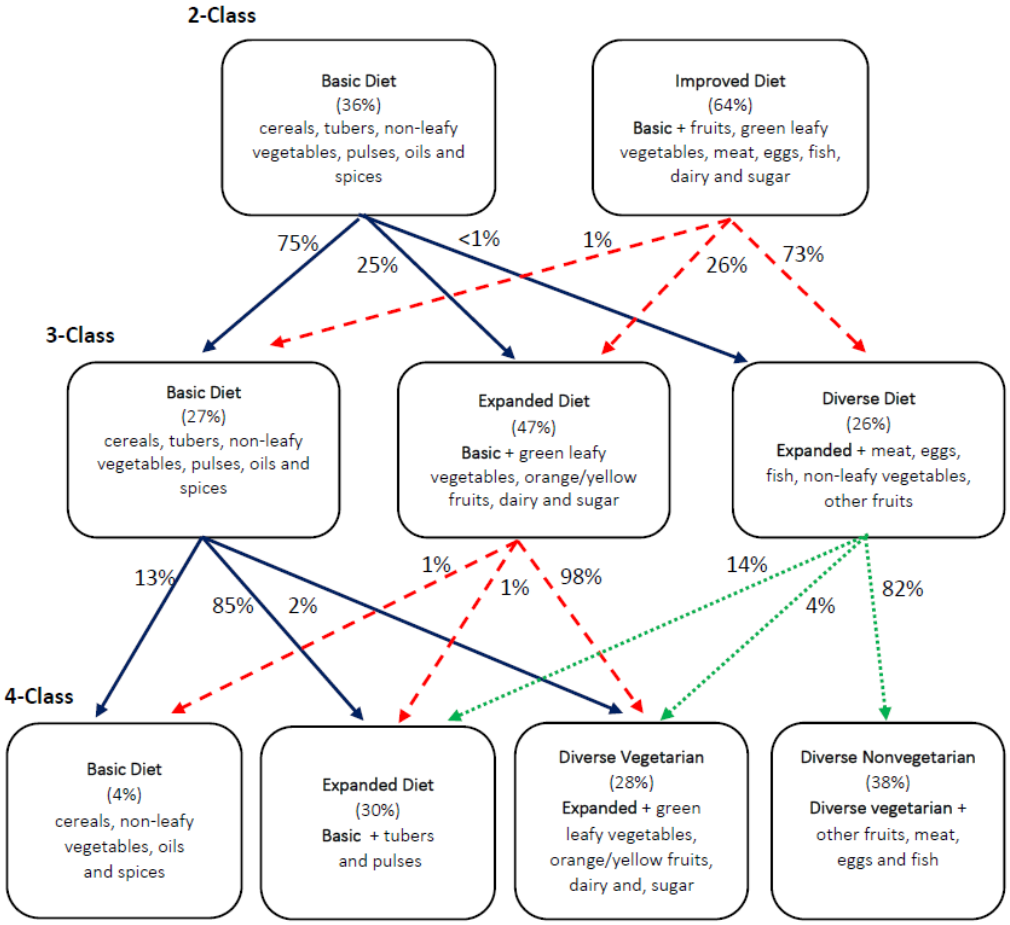
Prices are higher at destination, to cover transport and handling



Map 1. Food grain market networks (WFP and FAO, 2007)

Source: Shively & Thapa (2017) Markets, transportation infrastructure and food prices in Nepal. *American Journal of Agricultural Economics*. 99(3): 660-682. doi: 10.1093/ajae/aaw086.

Diet quality is closely linked to diet diversity



In Nepal, diets:

- range from basic to diverse
- "choices" constrained by
  - availability
  - circumstance
  - knowledge
  - income and prices

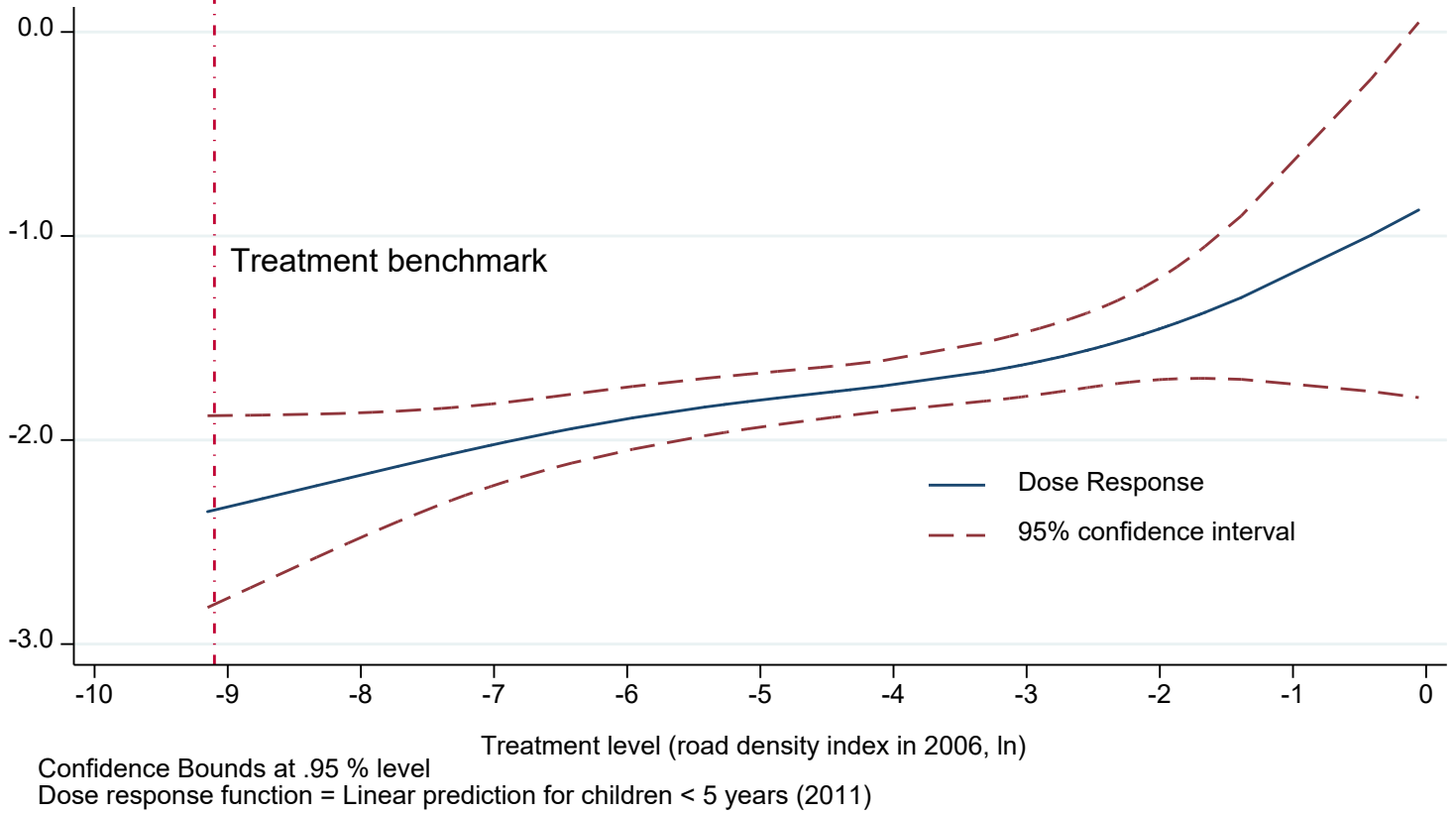
	Correlation w/ complexity
Education (years)	+
Farm size (ha)	+
Income (Rs)	+
Remittances (0/1)	+
Road density (km/km²)	+
Poverty incidence (%)	-
Nutrition interventions (0/1)	+

Source: Shively & Evans (2020) Dietary Diversity in Nepal: A Latent Class Approach. Working Paper, Purdue University. N=11,771.

The most basic form of infrastructure is road density

Height-for-age z scores

HAZ is correlated with road density (ag inputs, incomes, food prices, food variety, health services)



Source: Thapa & Shively (2018) A dose-response model of road development and child nutrition in Nepal. *Research in Transportation Economics* 70: 112-24. doi.org/10.1016/j.retrec.2018.11.002

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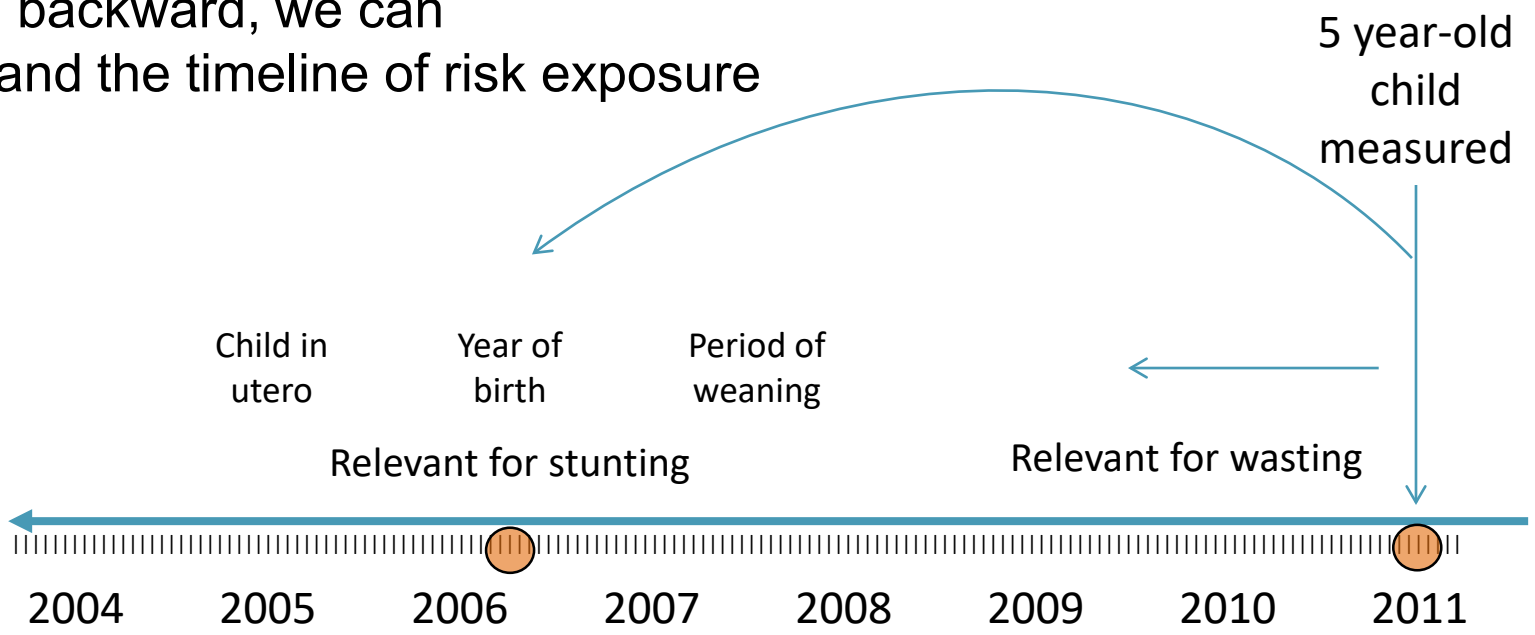
Our focus is resilience to early-life shocks

Looking backward, we can understand the timeline of risk exposure

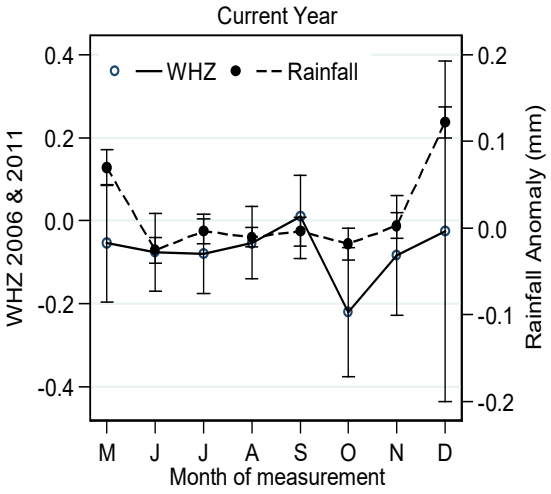


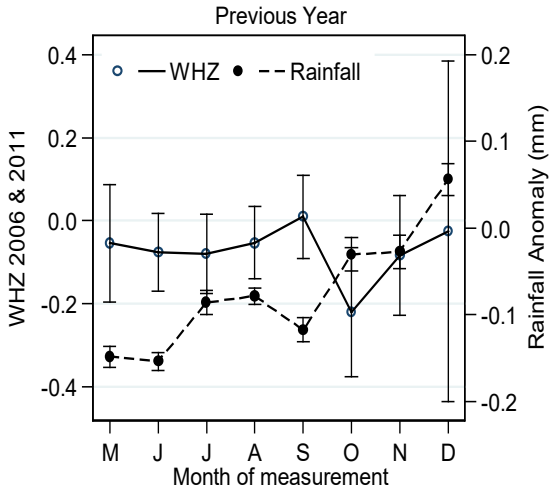
1. What periods are critical for child growth? Match on time.

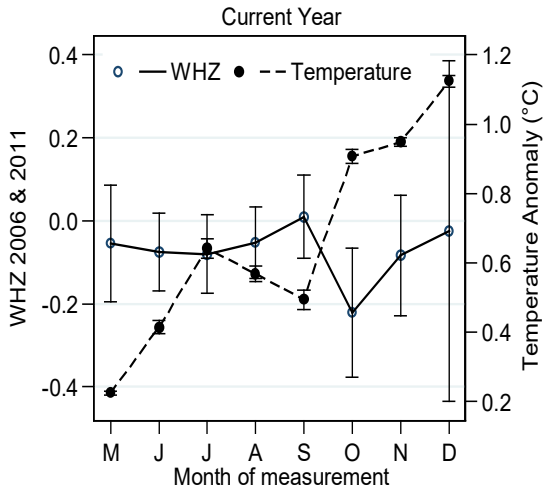
2. What crops are relevant for locations? Match on agronomy.

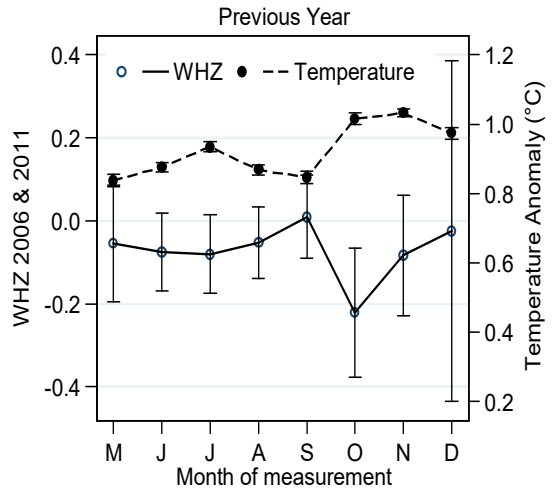
Source: Brown, Grace, Shively, Johnson and Carroll (2014). Using Satellite Remote Sensing and Household Survey Data to Assess Human Health and Nutrition Response to Environmental Change. *Population and Environment* 36(1): 48-72.

In Uganda, WHZ varies by month of measurement, as does its correlation with rainfall and temp.

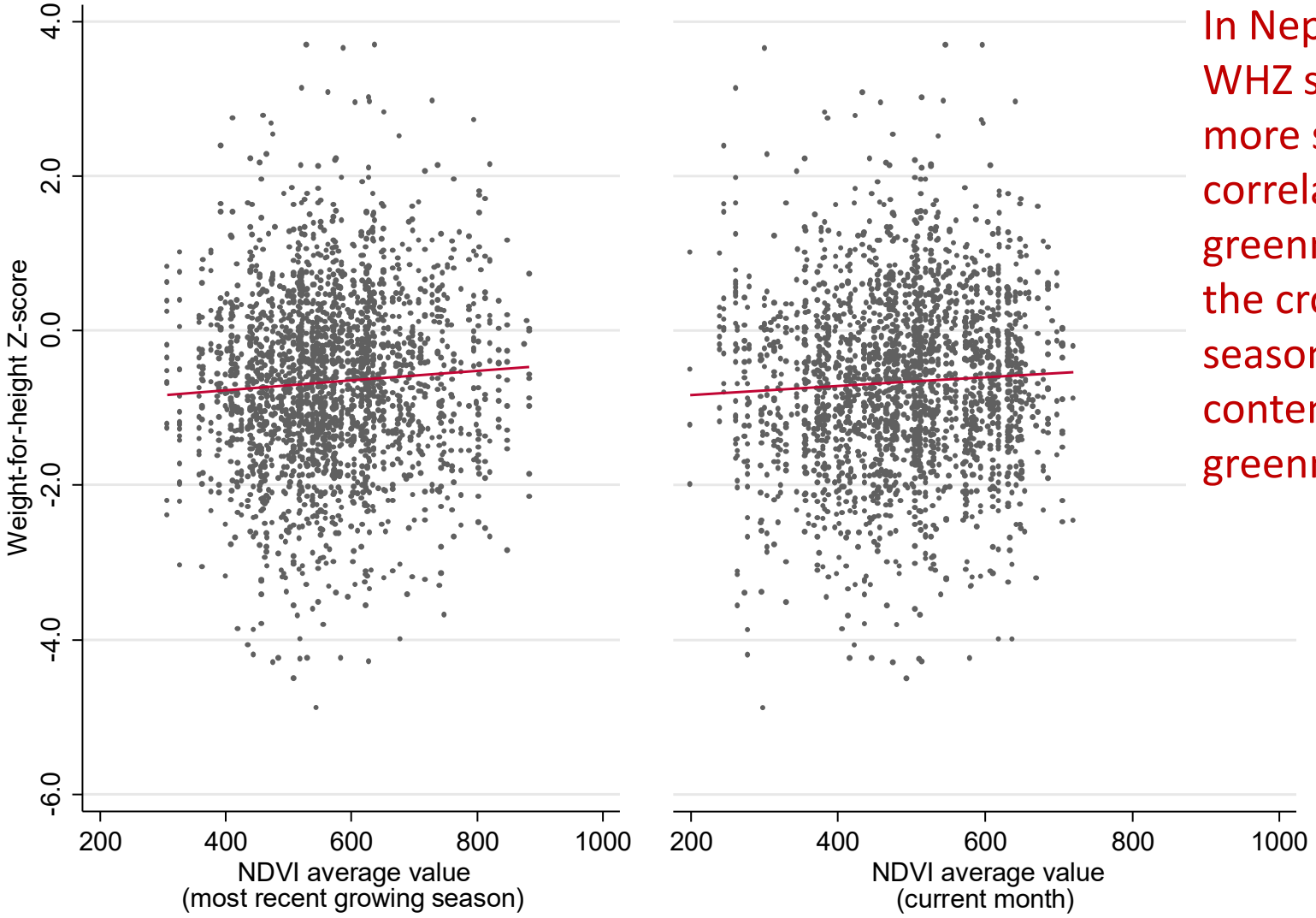








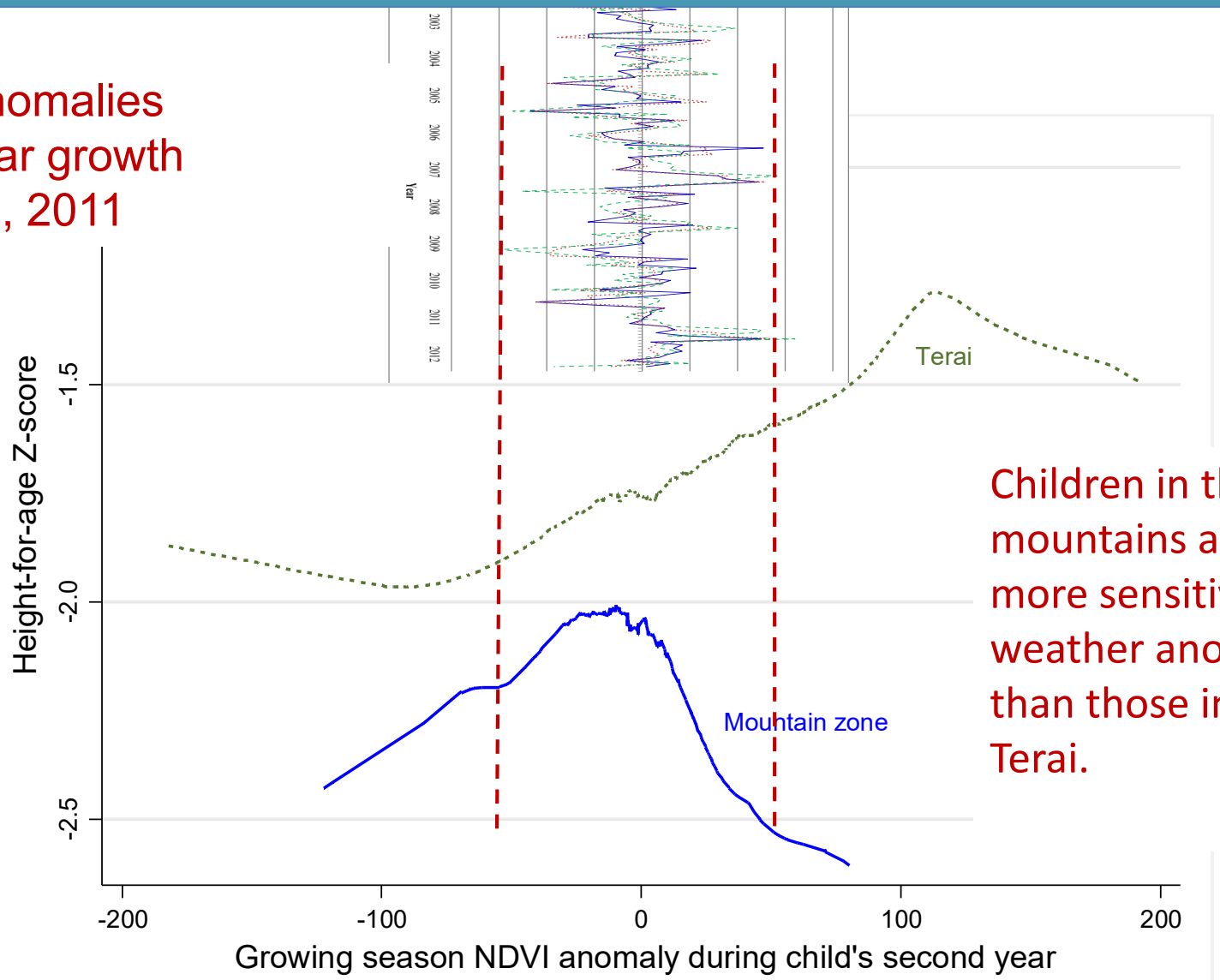
Source: Omiat & Shively (2020) Rainfall and Child Weight in Uganda. *Economics and Human Biology* 38. doi.org/10.1016/j.ehb.2020.100877.



In Nepal, WHZ somewhat more strongly correlated with greenness during the cropping season than with contemporaneous greenness.

Source: Shively, Sununtnasuk & Brown (2015) Environmental Variability and Child Growth in Nepal. *Health and Place* 35: 37-51.
Note: WHZ in Nepal (n=2,335 children below 5 years; unweighted DHS data 2006 & 2011).

NDVI anomalies and linear growth in Nepal, 2011



Children in the mountains are more sensitive to weather anomalies than those in the Terai.

Source: Shively, Sununtnasuk and Brown (2015) "Environmental Variability and Child Growth in Nepal." *Health and Place* 35:37-51.
Based on 2011 Nepal DHS; children > 24 months only; n=273 (mountain zone), n=556 (Terai)

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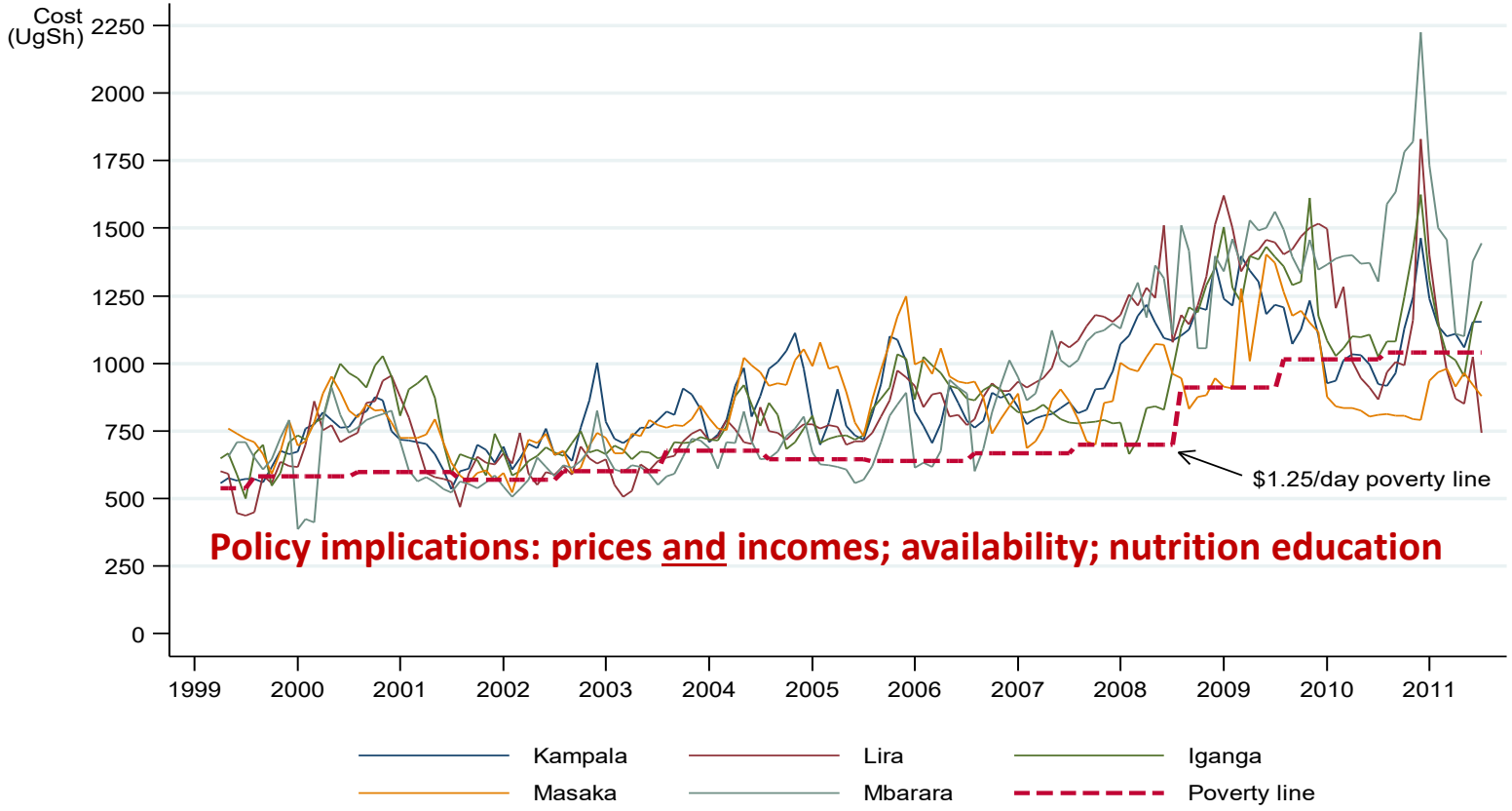
In Uganda, the lowest-cost nutrient-adequate diet is far out of reach, with high volatility and spatial variation



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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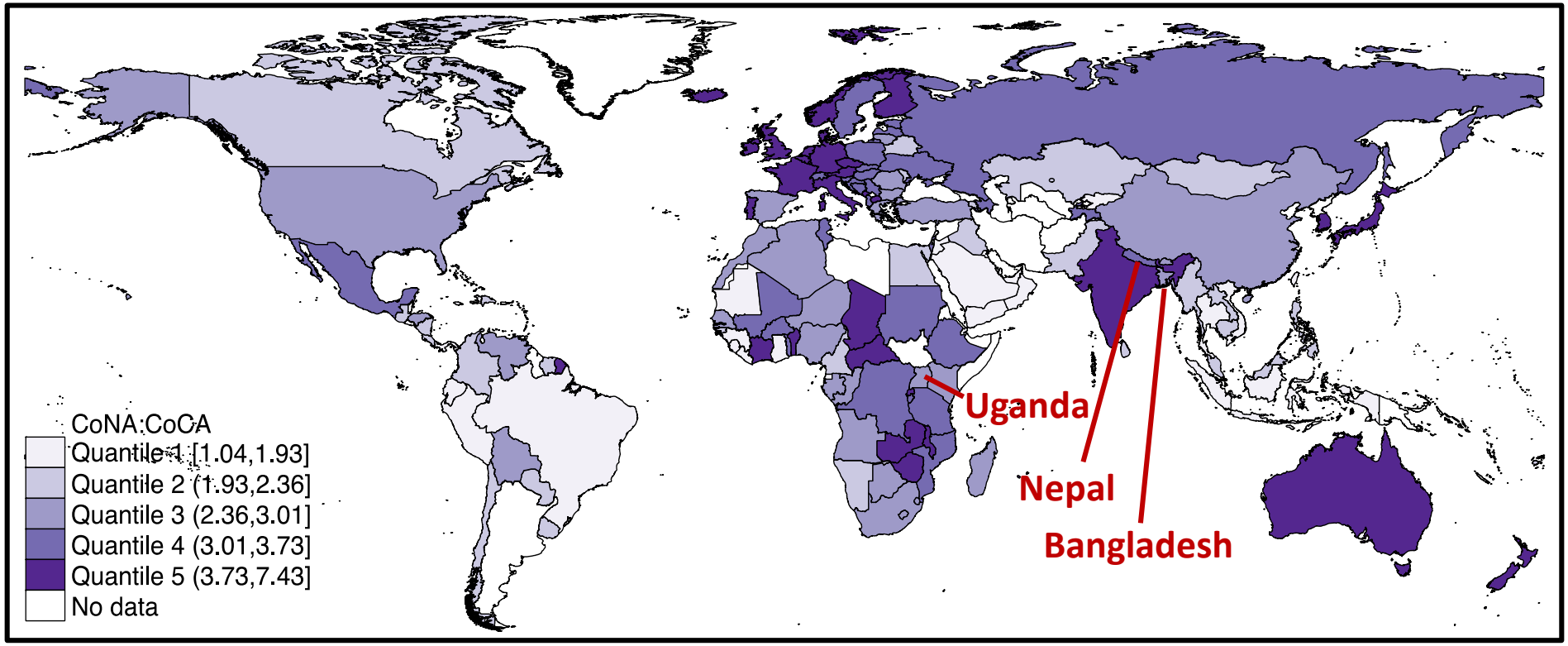
Comparing the cost of nutrient adequacy to just daily energy reveals each food system's premium for nutrients

Cost of nutrient adequate diets as multiple of subsistence cost of daily energy from starchy staples



Notes: Calculated from ICP food prices for 2011, USDA food composition data and IOM nutrient requirements for an adult woman, from Bai, Alemu et al. (2020)

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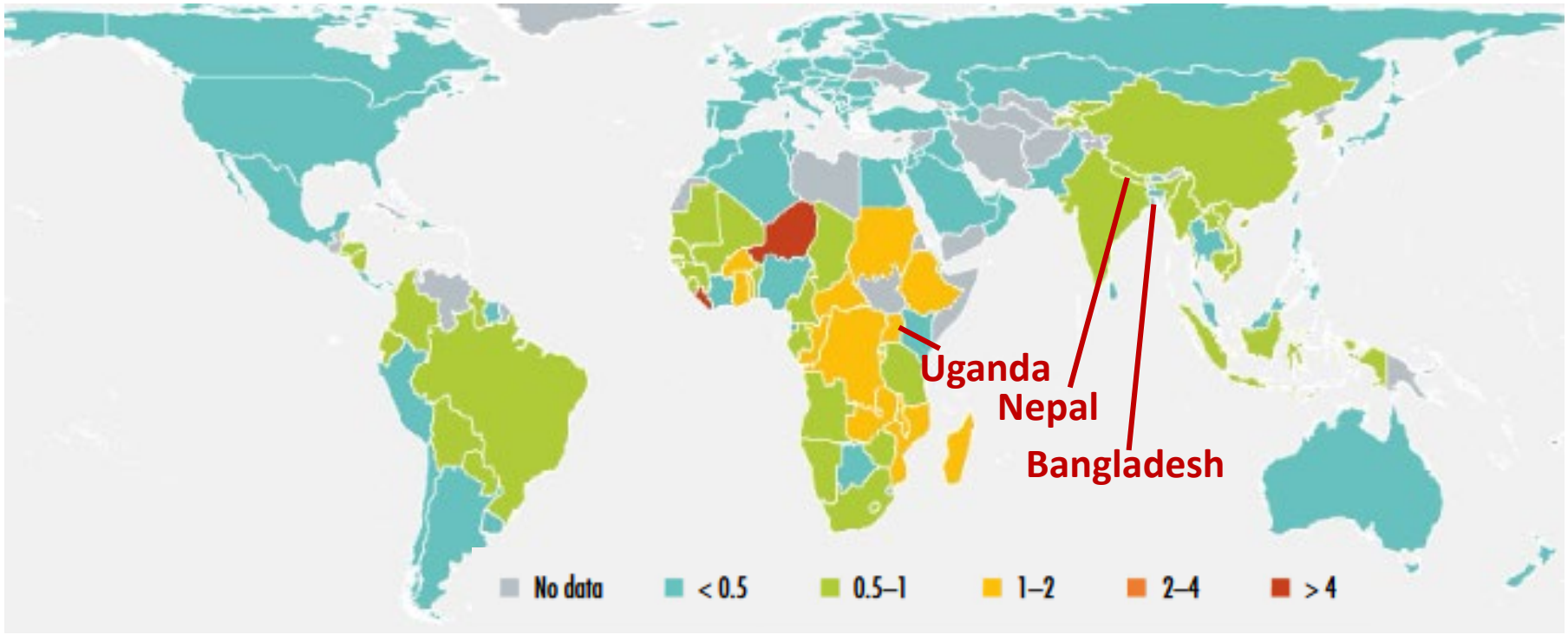
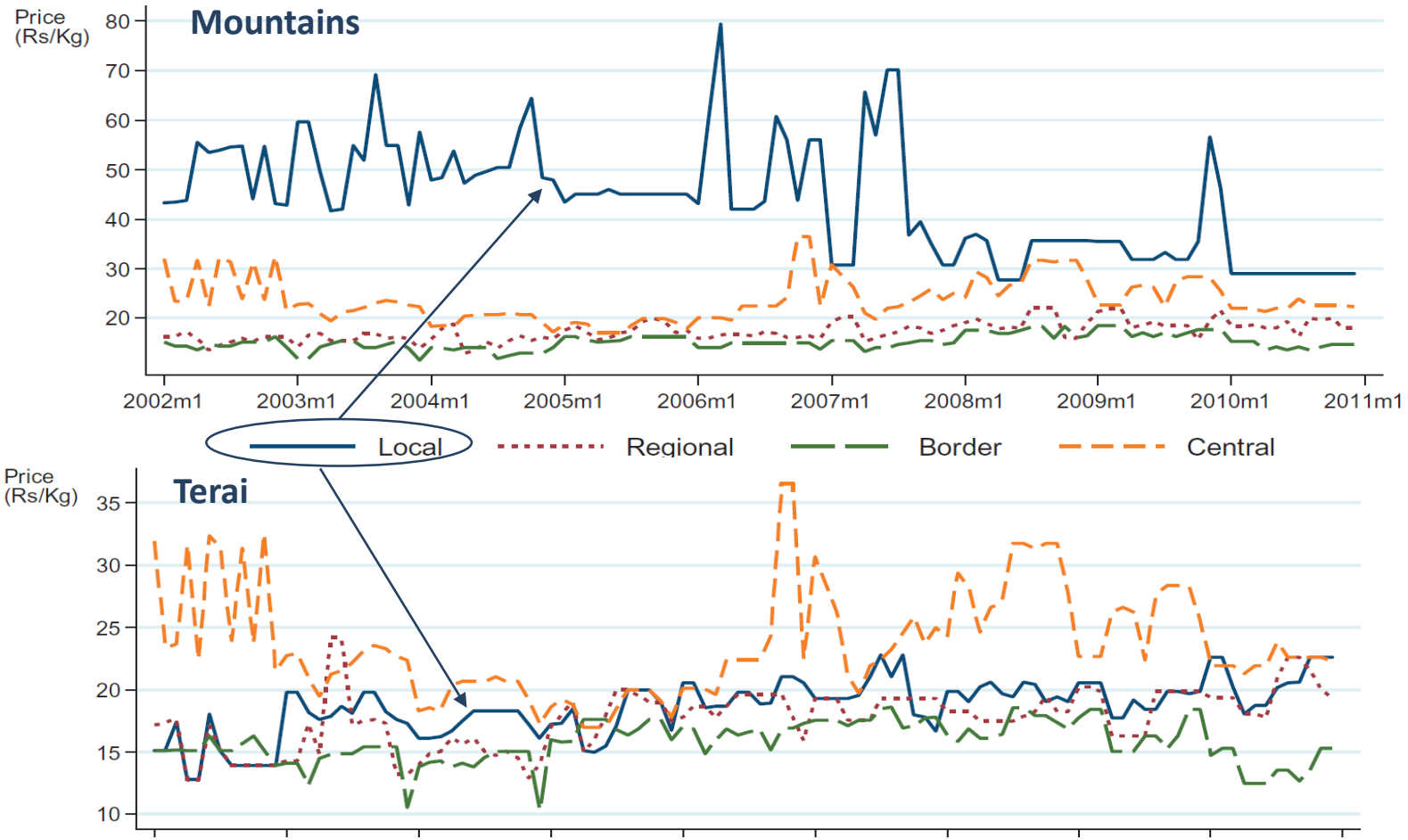
Comparing the cost of nutrient adequacy to actual food expenditure reveals its affordability in each country

Cost of nutrient adequate diets as multiple of average national food expenditures per capita



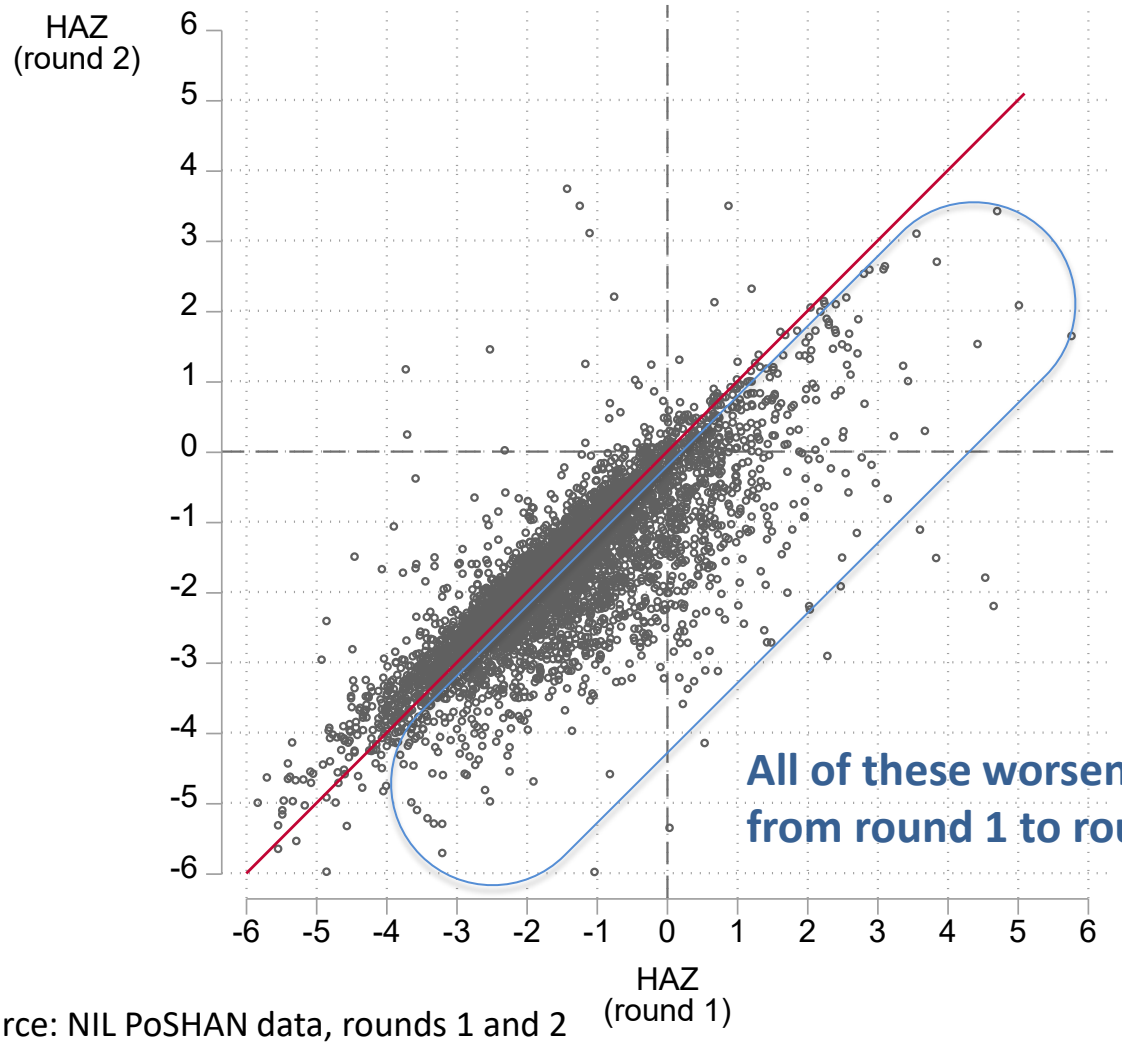
Notes: Calculated from ICP food prices for 2017, USDA food composition data and IOM nutrient requirements for an adult woman, from SOFI 2020

In Nepal, rice prices higher and more volatile in the mountains than in the terai



Source: Shively & Thapa (2017) Markets, transportation infrastructure and food prices in Nepal. *American Journal of Agricultural Economics*. 99(3): 660-682. doi: 10.1093/ajae/aaw086.

In Nepal, many children experience growth faltering



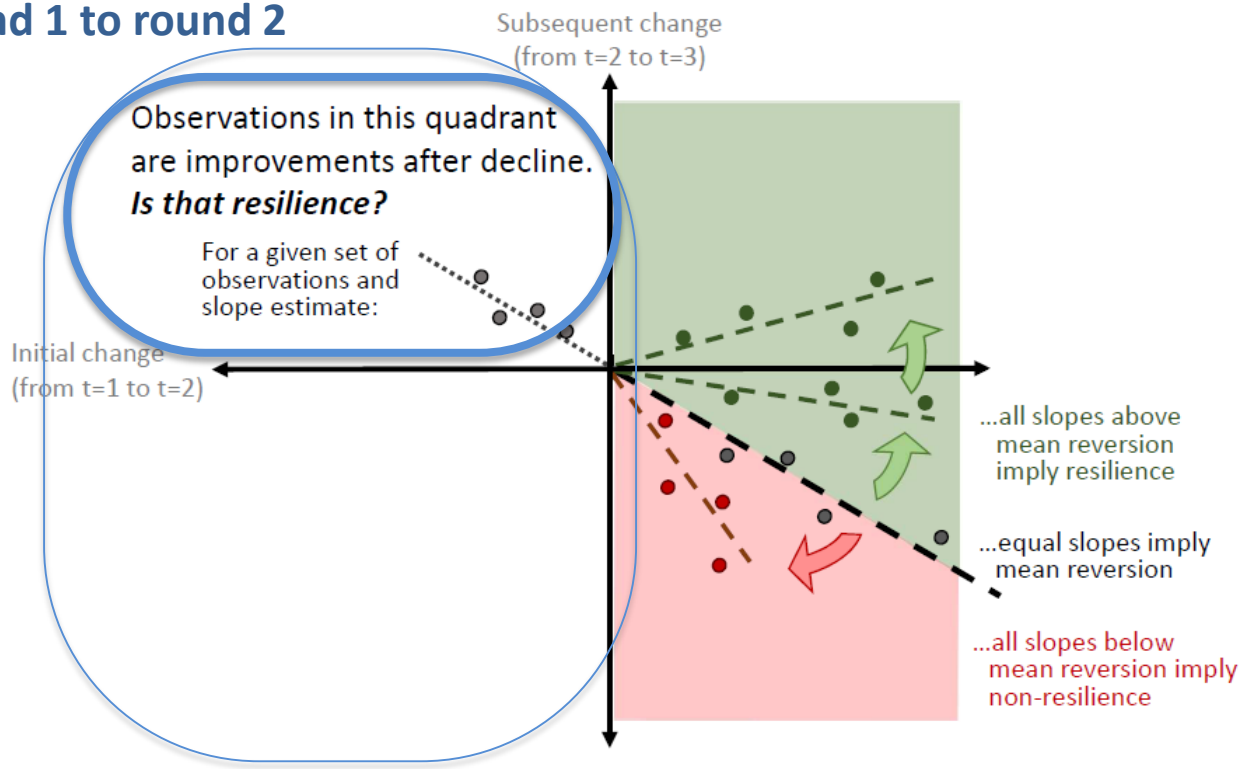
A question of resilience:

When we observe growth faltering, who recovers and why?

Source: NIL PoSHAN data, rounds 1 and 2

Who recovers after a setback, and why?

All of these worsened from round 1 to round 2



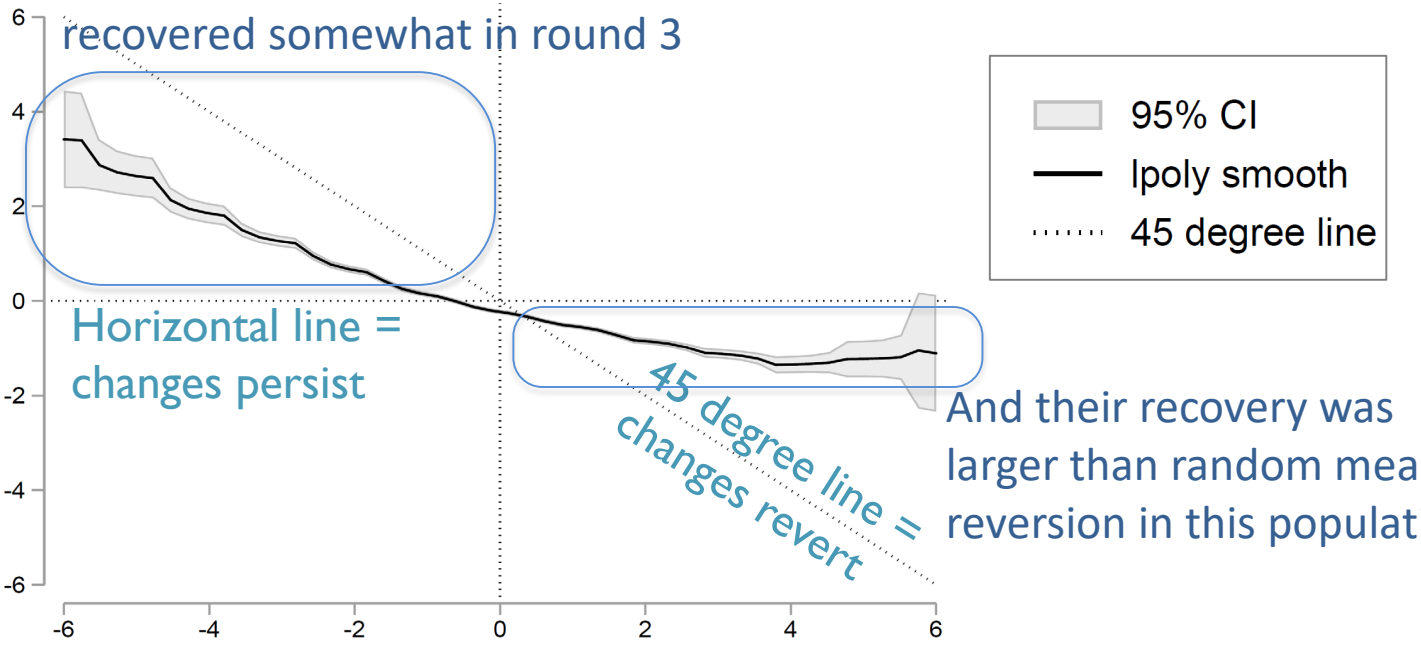
Source: Hypothetical observations, from Zaharia et al 2020

In Nepal, women generally recover after diets worsen

Women dietary diversity scores (Nepal)

Change from t=2 to t=3

On average, women whose diets worsened from round 1 to round 2 recovered somewhat in round 3



And their recovery was larger than random mean reversion in this population

Source: NiL PoSHAN survey data, from Zaharia et al 2020

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We find more recovery in Nepal than elsewhere

Evidence of resilience

	Daily DDS	Weekly DDS	BMI/WHZ
Bangladesh			
Women	no		no
Children	no		no
Nepal			
Women	yes	yes	no
Children	yes	yes	no
Uganda			
Women	no		no

In Nepal, resilience varies across districts and households.

Who is most resilient?

-- Women and children from more market-oriented households, and those with more assets and better access to credit.

-- Children from districts with more developed infrastructure (e.g. paved roads, markets, schools, hospitals).

Source: Zaharia, Masters, Shively & Webb (2020) Measuring Resilience as Asymmetric Mean Reversion. Working Paper, Tufts University. Bangladesh (n=2753 women; 1547 children); Nepal (n=3752 women; 2203 children); Uganda (n=1617 women).

Recap:

1. **Setting the stage with data and a thought experiment**
   - Nutrition outcomes depend on diet and health
   - Diet and health both depend on a broad set of factors

2. **Nutrition outcomes are driven, in part, by early-life exposures**

3. **Evidence on food prices, "adequate" diets, and resilience**

4. **Key messages**
   - Isolation (in all of its forms) creates nutritional risks
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