



INNOVATION LAB FOR NUTRITION WEBINAR SERIES

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

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



PANELIST: GERALD SHIVELY

PI for the Innovation
Lab for Nutrition
Purdue University,
College of Agriculture



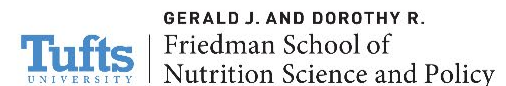
PANELIST: WILL MASTERS

Investigator for the Innovation
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Tufts University Friedman
School of Nutrition Science
and Policy



MODERATOR: SHIBANI GHOSH

Associate Director of the
Innovation Lab for Nutrition
Tufts University Friedman
School of Nutrition Science
and Policy



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

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



The image displays a diverse array of logos from international organizations and academic institutions. The logos are arranged in a grid-like fashion, showcasing a wide range of fields including public health, agriculture, nutrition, and development. Notable logos include the Harvard T.H. Chan School of Public Health, the United Nations World Food Programme (WFP), and the International Food Policy Research Institute (IFPRI). The logos vary in design, with some featuring text, others using symbols or icons, and some combining both. The overall composition highlights the global network of organizations working on food and nutrition issues.



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Topic	Hosted by:
Agriculture to Nutrition Linkages	
Aquaculture-Horticulture and Nutrition in Bangladesh	Innovation Lab for Nutrition
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
Neglected Biological Mechanisms	
Mycotoxins, health and nutrition: Findings from Nepal, Mozambique, Uganda, and Timor Leste	Innovation Lab for Nutrition
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 institutional capacity for nutrition	Innovation Lab for Nutrition
Malawi's First Food Composition Table: The development and use of food composition data	Innovation Lab for Nutrition
The Way Forward	
Distilling 10 years of Innovation Lab research on agriculture-to-nutrition	Innovation Lab for Nutrition



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Markets, Infrastructure, Diets and Nutrition

Evidence from Bangladesh, Nepal and Uganda

July 15, 2020

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GERALD J. AND DOROTHY R.
Friedman School of
Nutrition Science and Policy



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:

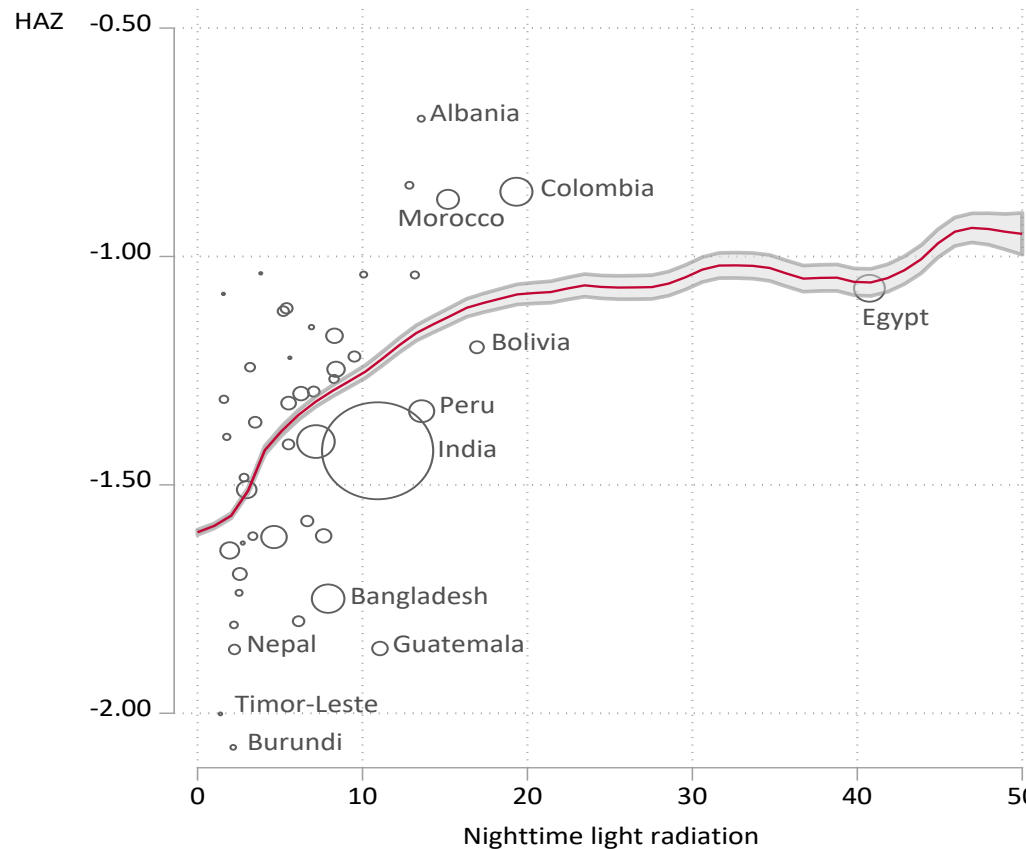
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Children are taller where there is more light at night



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.



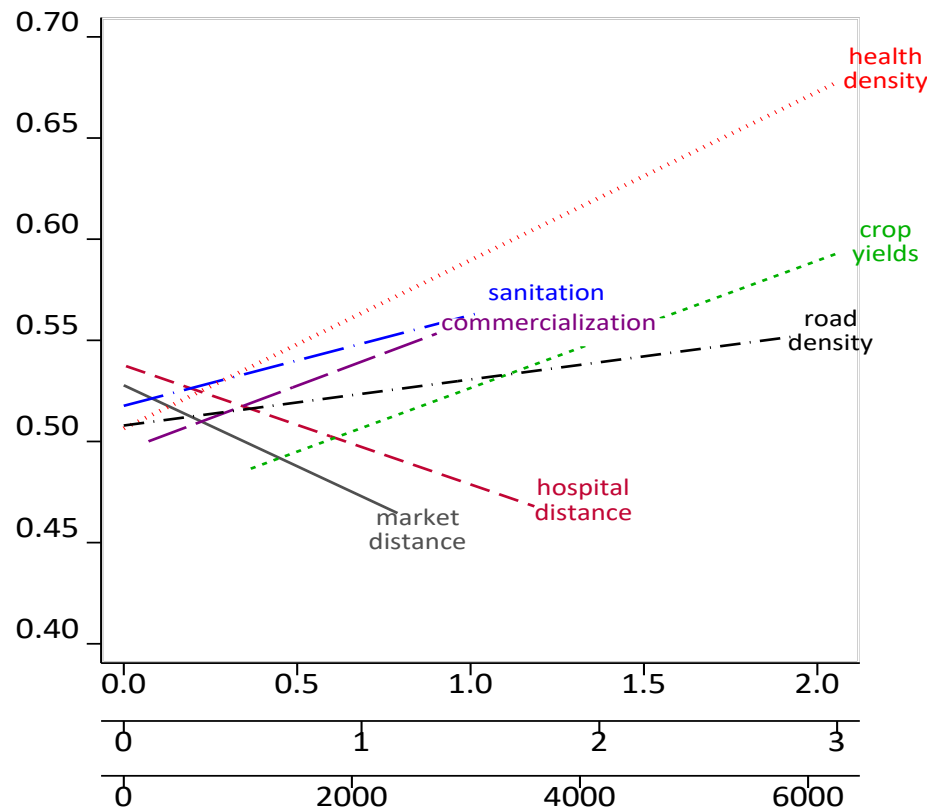
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Many kinds of investment are needed to overcome rural isolation and improve development outcomes

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.

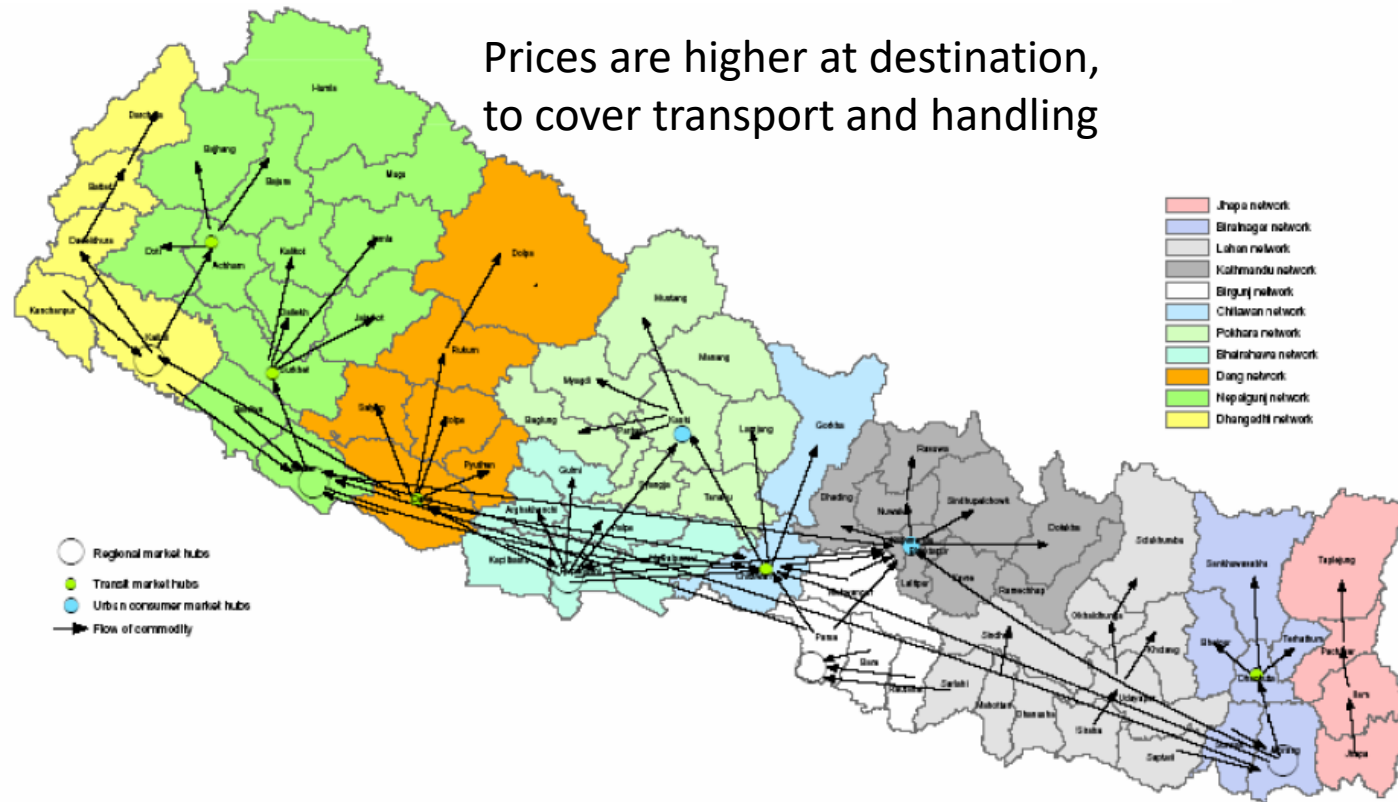


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Food markets reach everywhere, but at very different costs

In Nepal, market linkages are strongly tied to geography



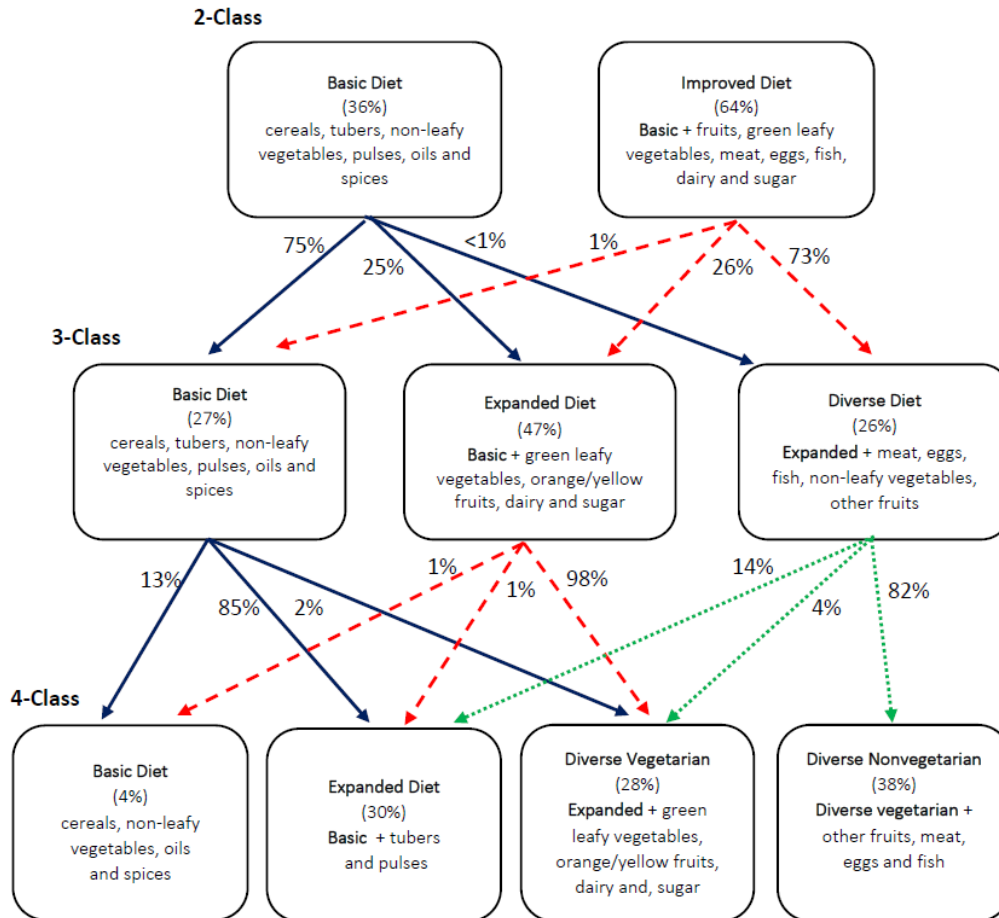
Map 1. Food grain market networks (WFP and FAO, 2007)



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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**

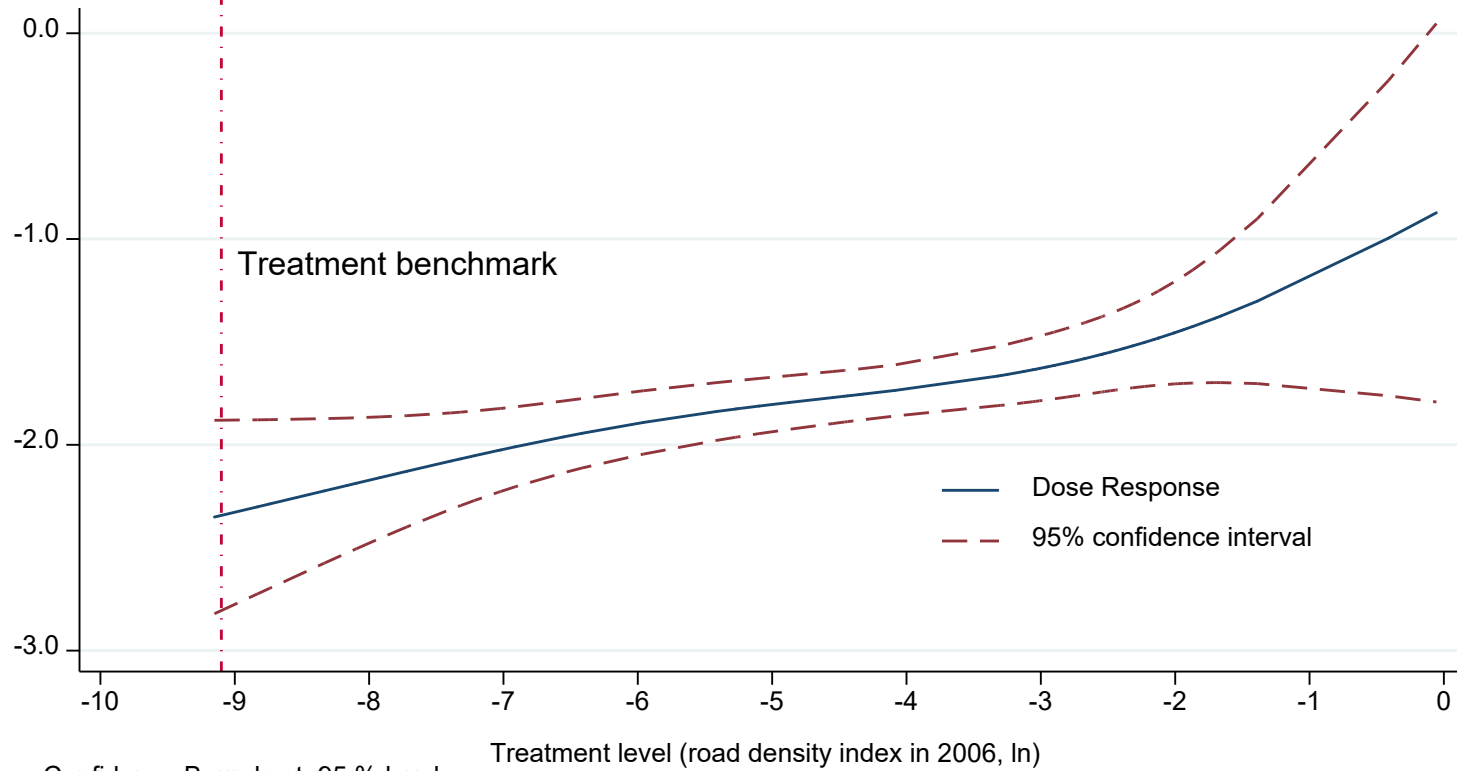
Education (years)	+
Farm size (ha)	+
Income (Rs)	+
Remittances (0/1)	+
Road density (km/km ²)	+
Poverty incidence (%)	-
Nutrition interventions (0/1)	+



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)



Confidence Bounds at .95 % level

Dose response function = Linear prediction for children < 5 years (2011)



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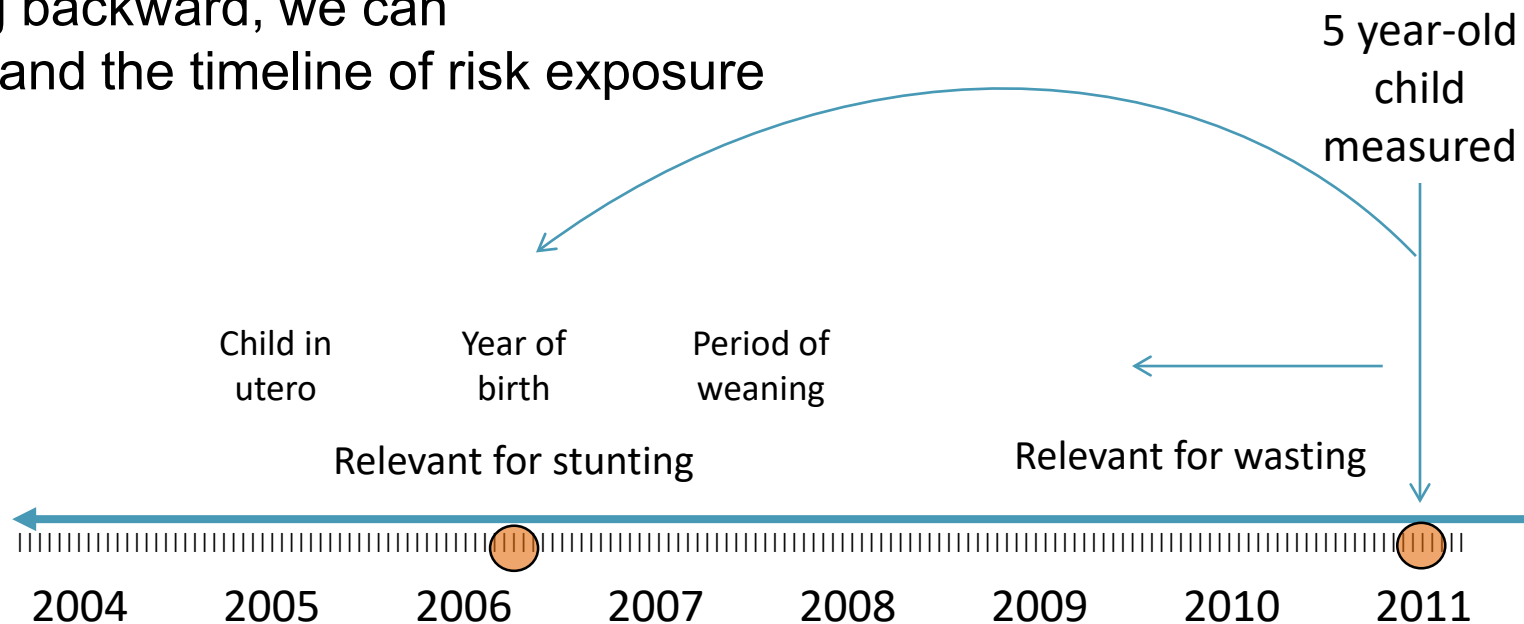
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Our focus is resilience to early-life shocks

Looking backward, we can understand the timeline of risk exposure



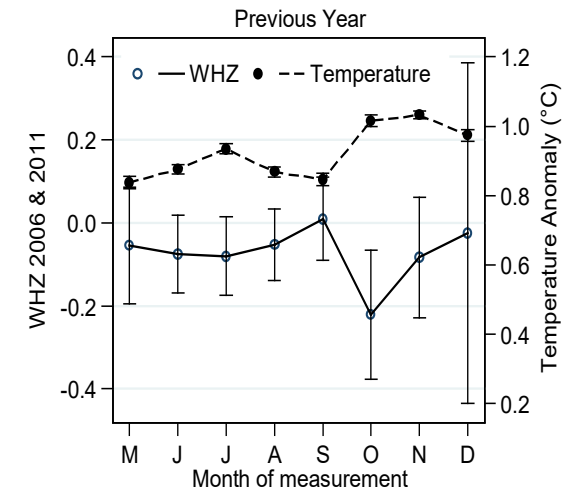
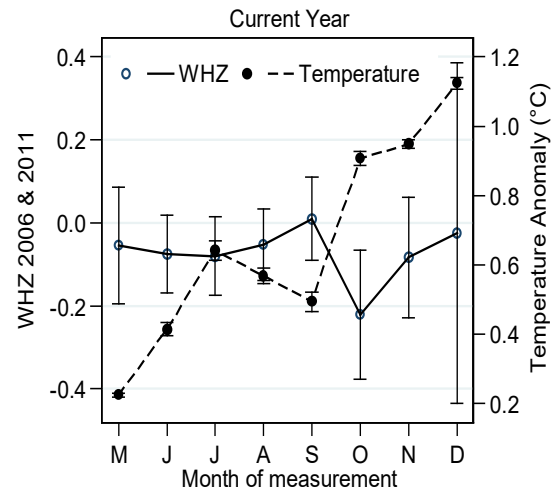
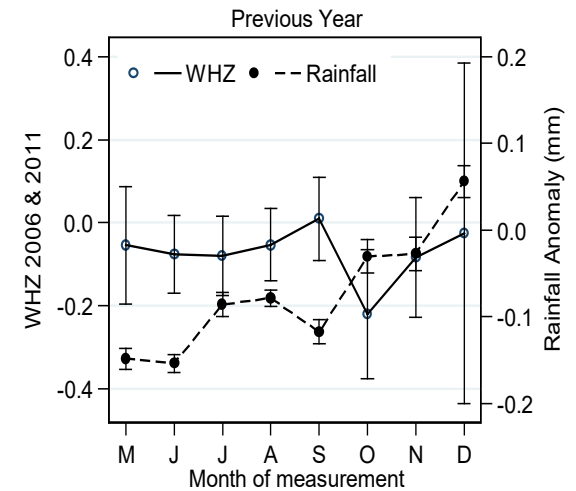
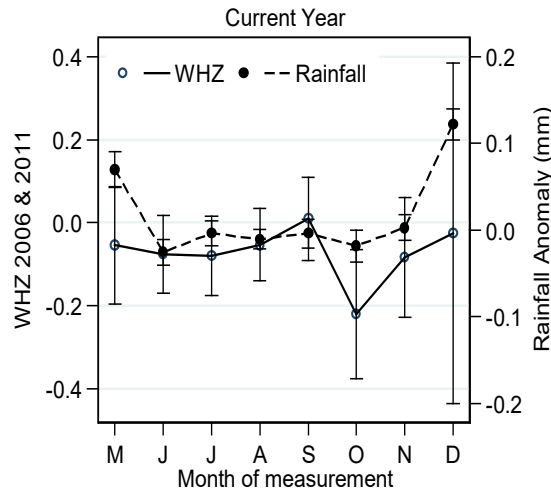
1. What periods are critical for child growth? Match on time.
2. What crops are relevant for locations? Match on agronomy.



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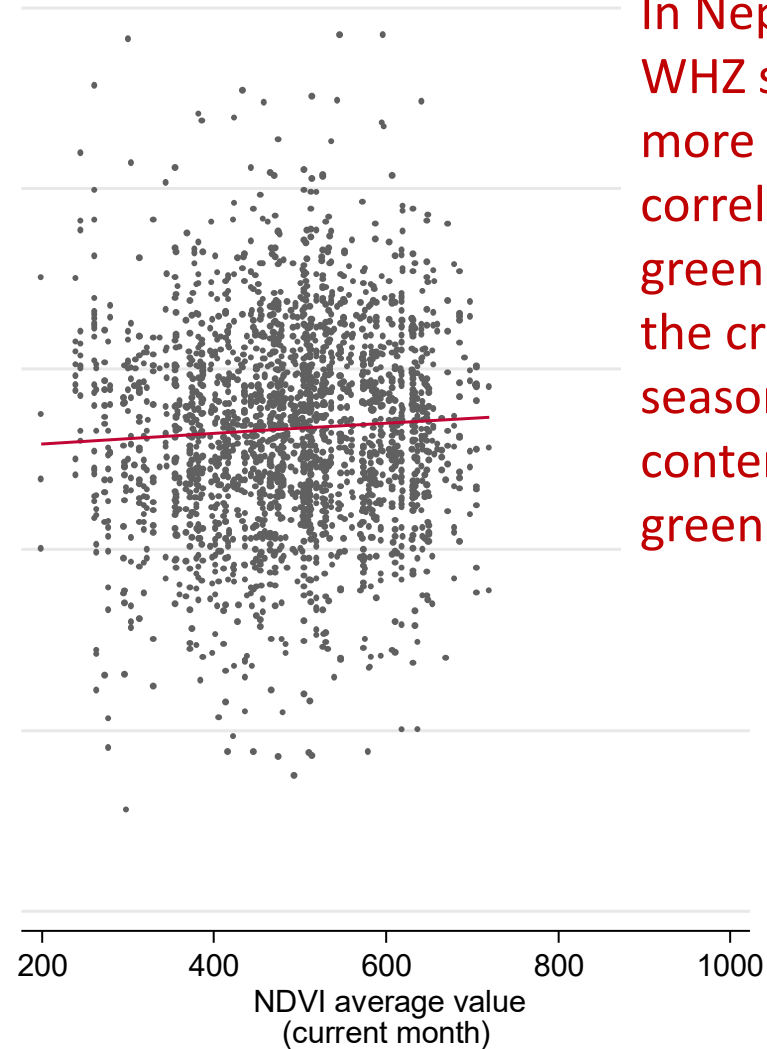
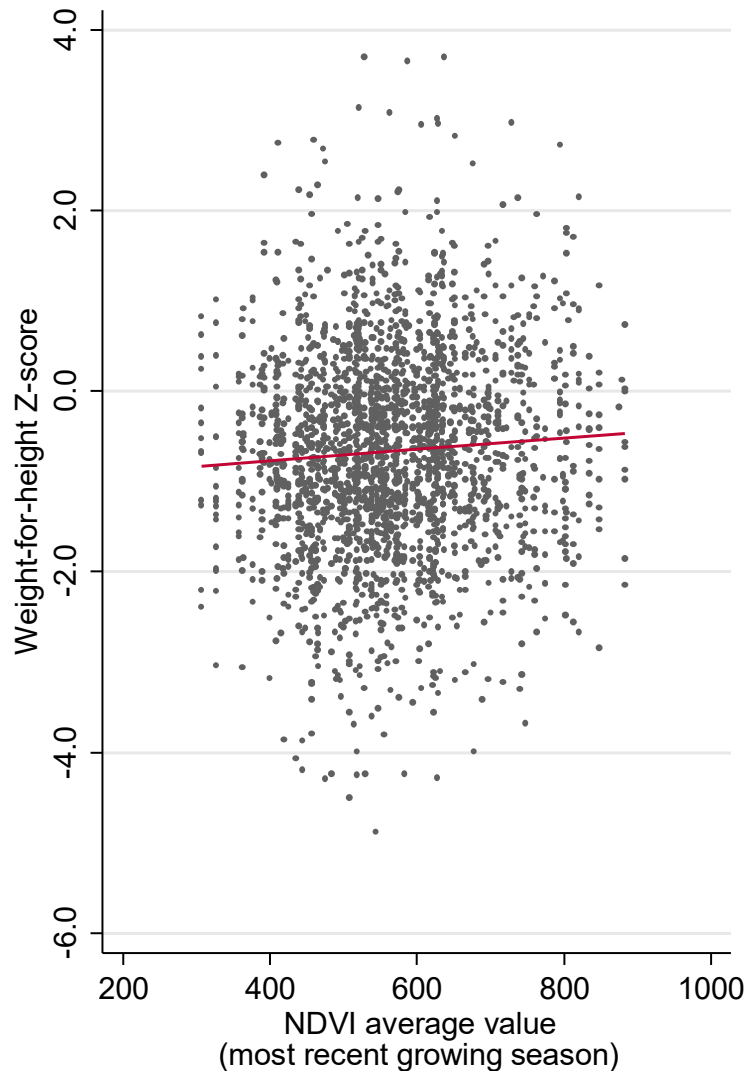
In Uganda,
WHZ varies
by month of
measurement,
as does its
correlation
with rainfall
and temp.





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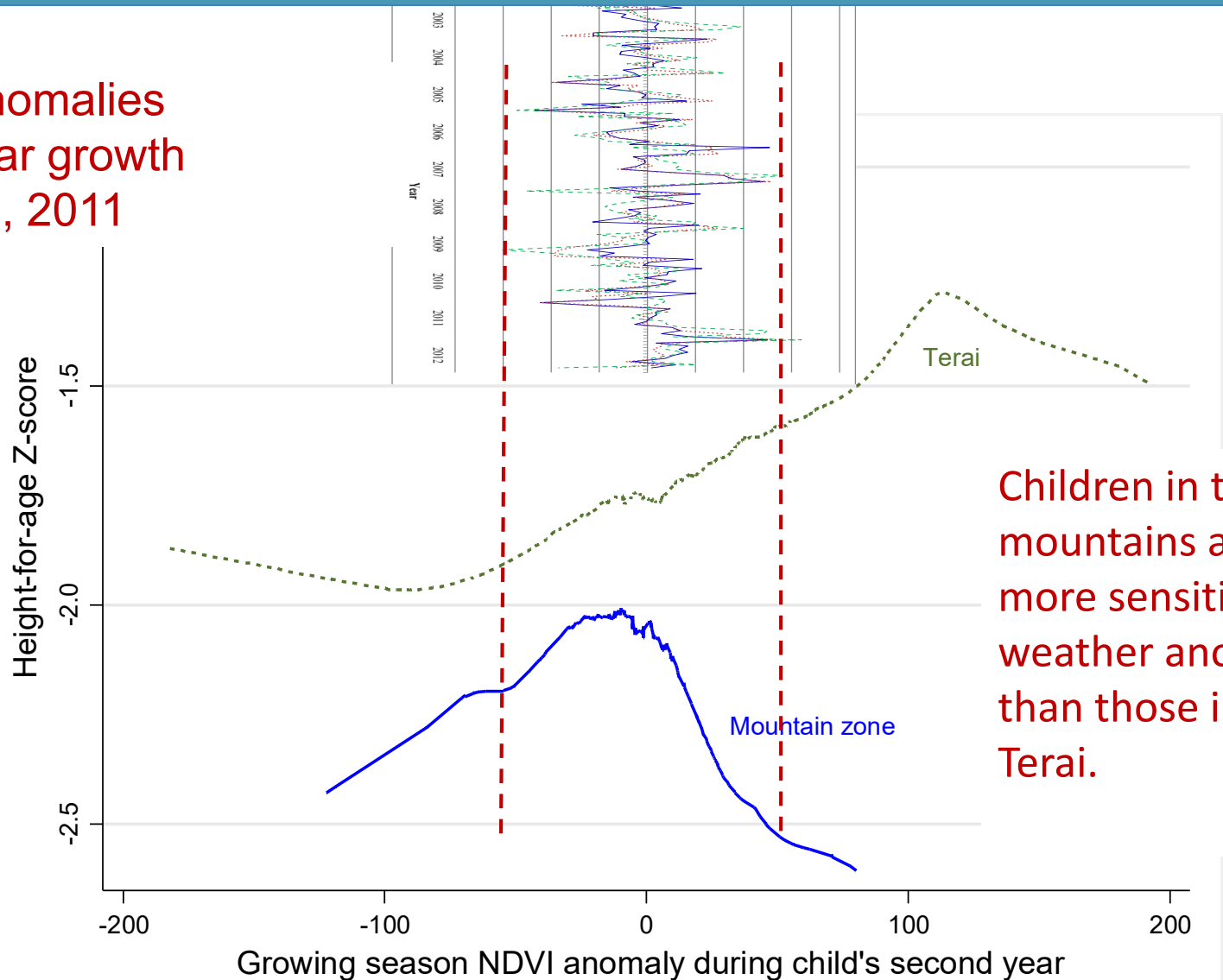
In Nepal,
WHZ somewhat
more strongly
correlated with
greenness during
the cropping
season than with
contemporaneous
greenness.

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.



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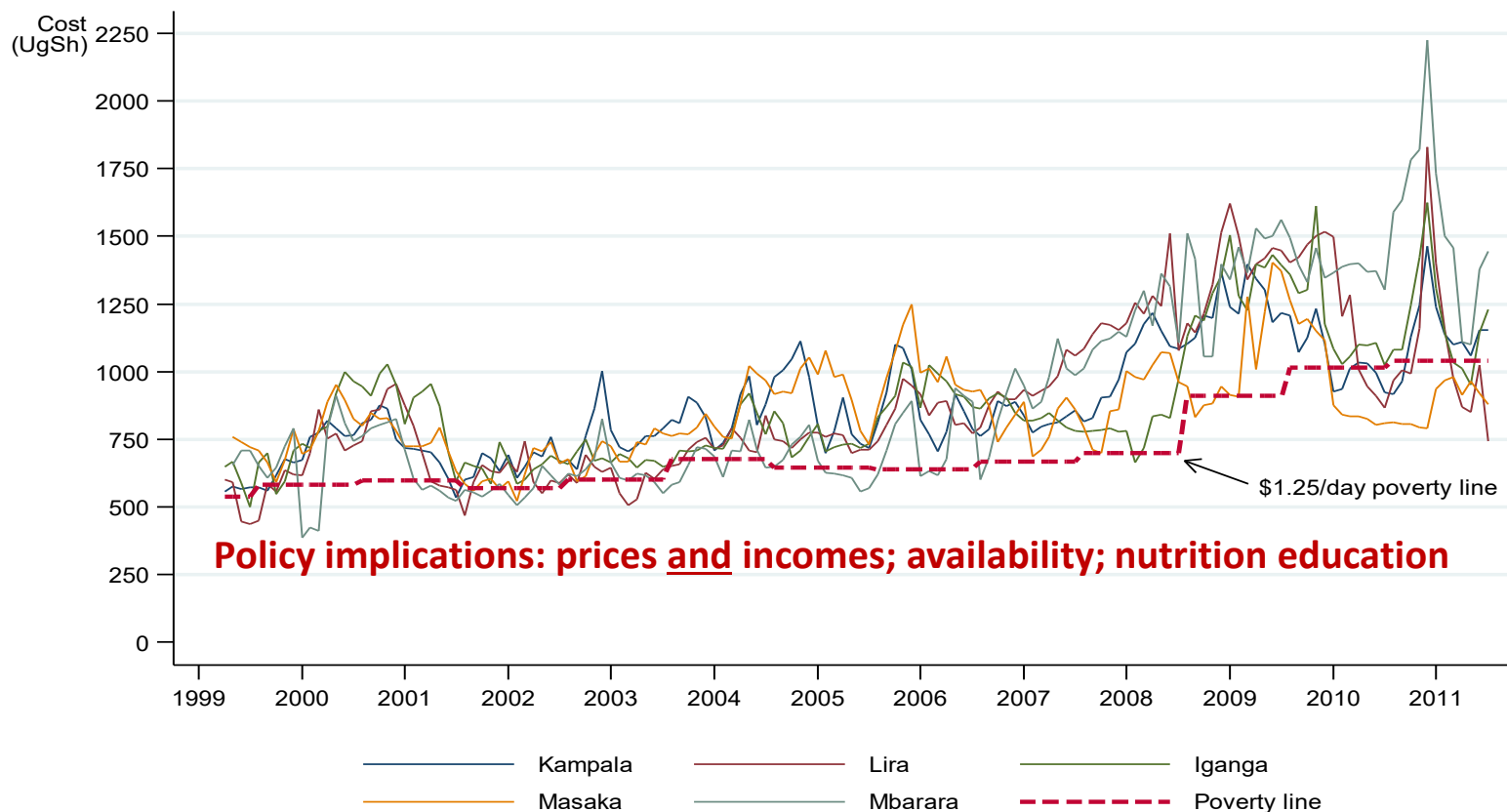
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In Uganda, the lowest-cost nutrient-adequate diet is far out of reach, with high volatility and spatial variation



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.

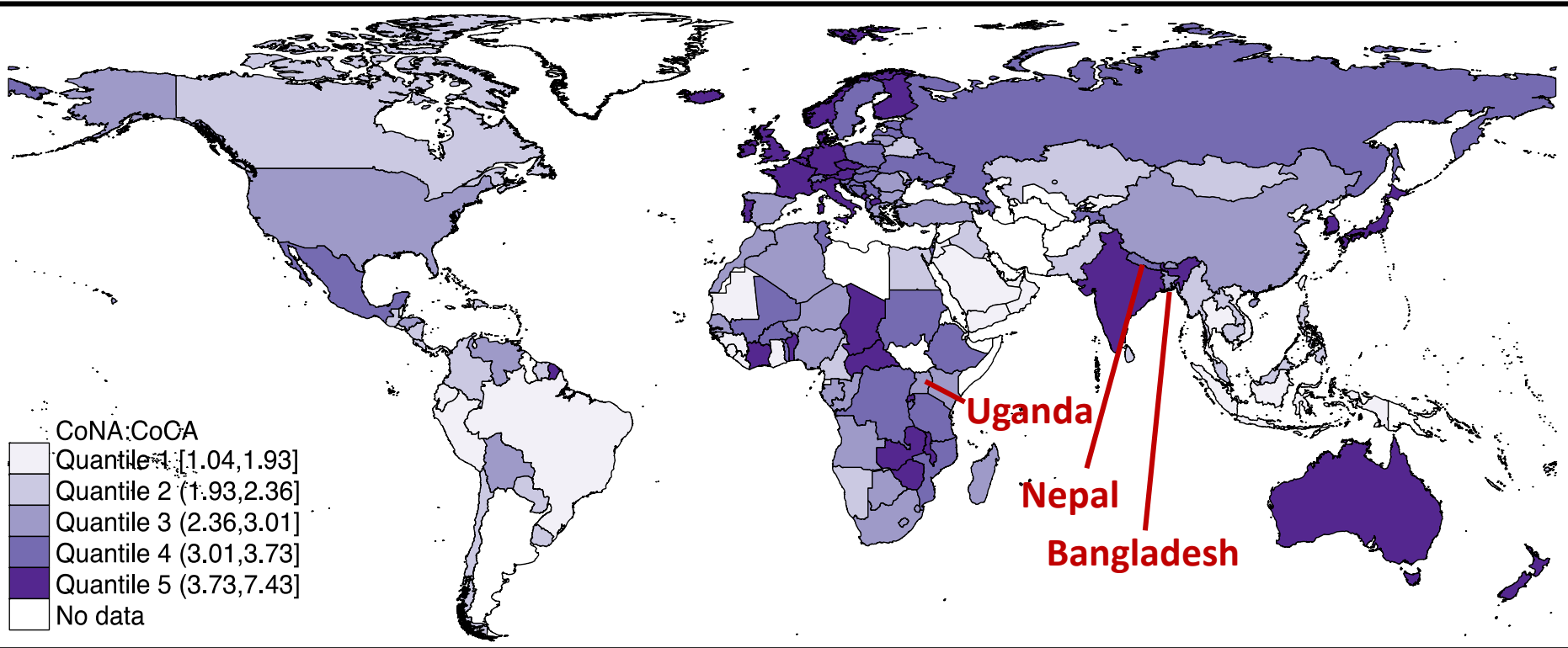


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Comparing the cost of nutrient adequacy to just daily energy reveals each food system's premium for nutrients

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)

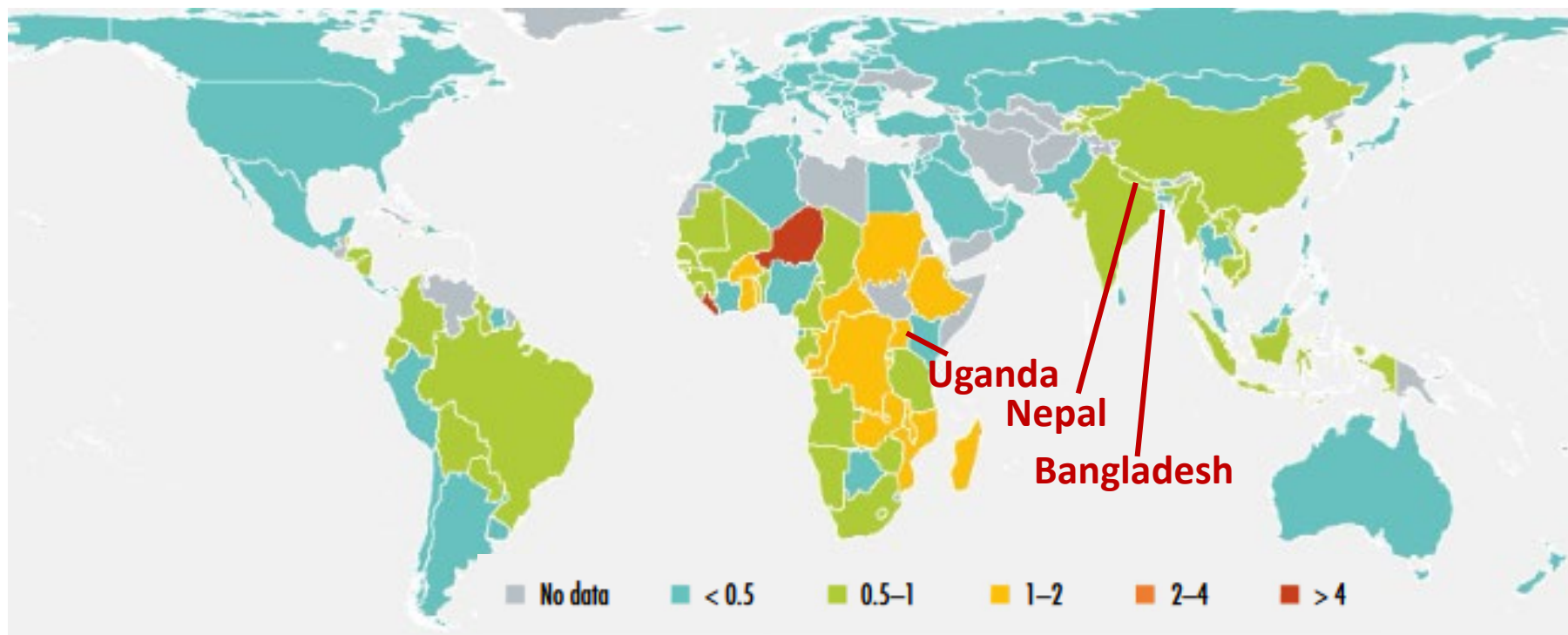


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Comparing the cost of nutrient adequacy to actual food expenditure reveals its affordability in each country

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



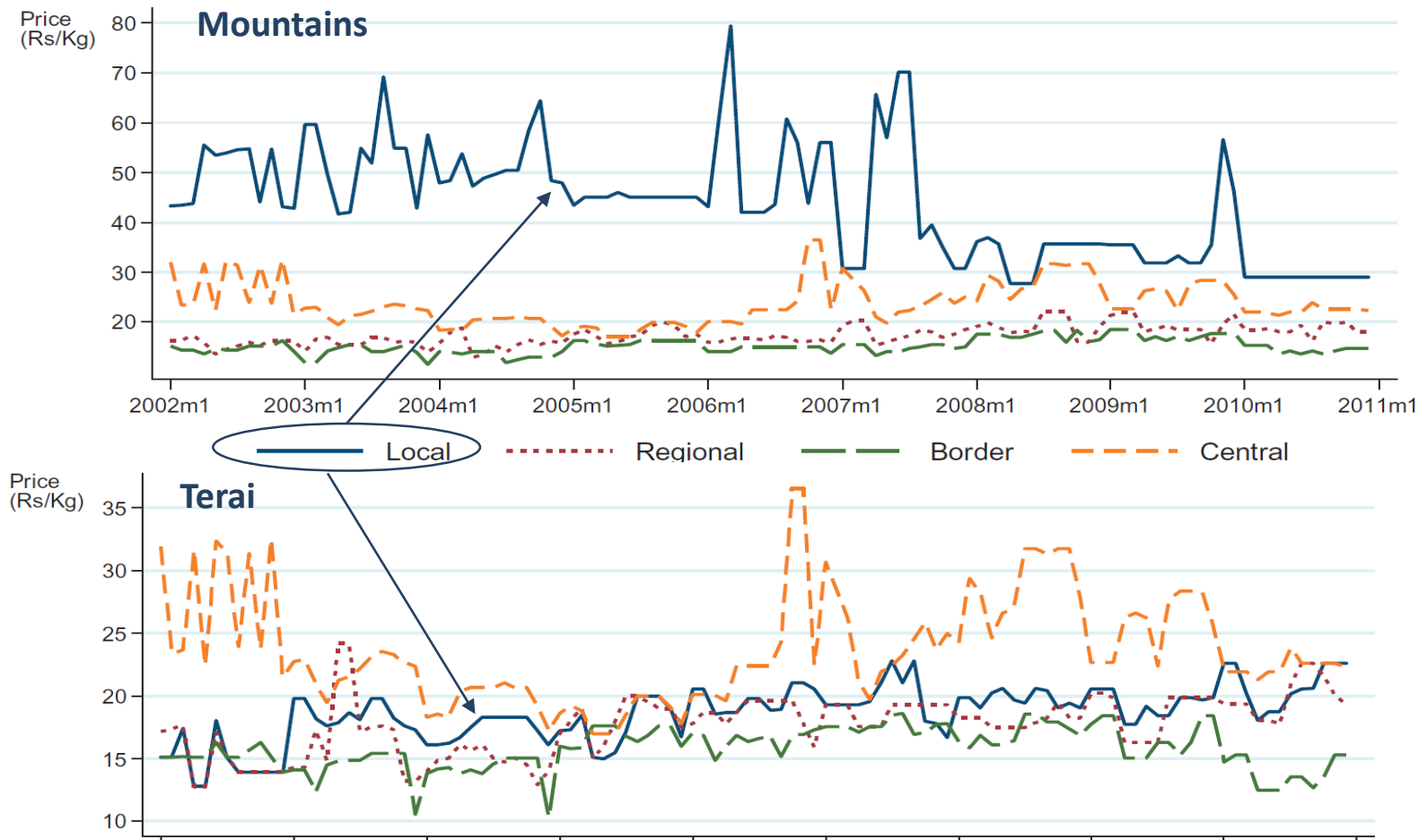
Notes: Calculated from ICP food prices for 2017, USDA food composition data and IOM nutrient requirements for an adult woman, from SOFI 2020



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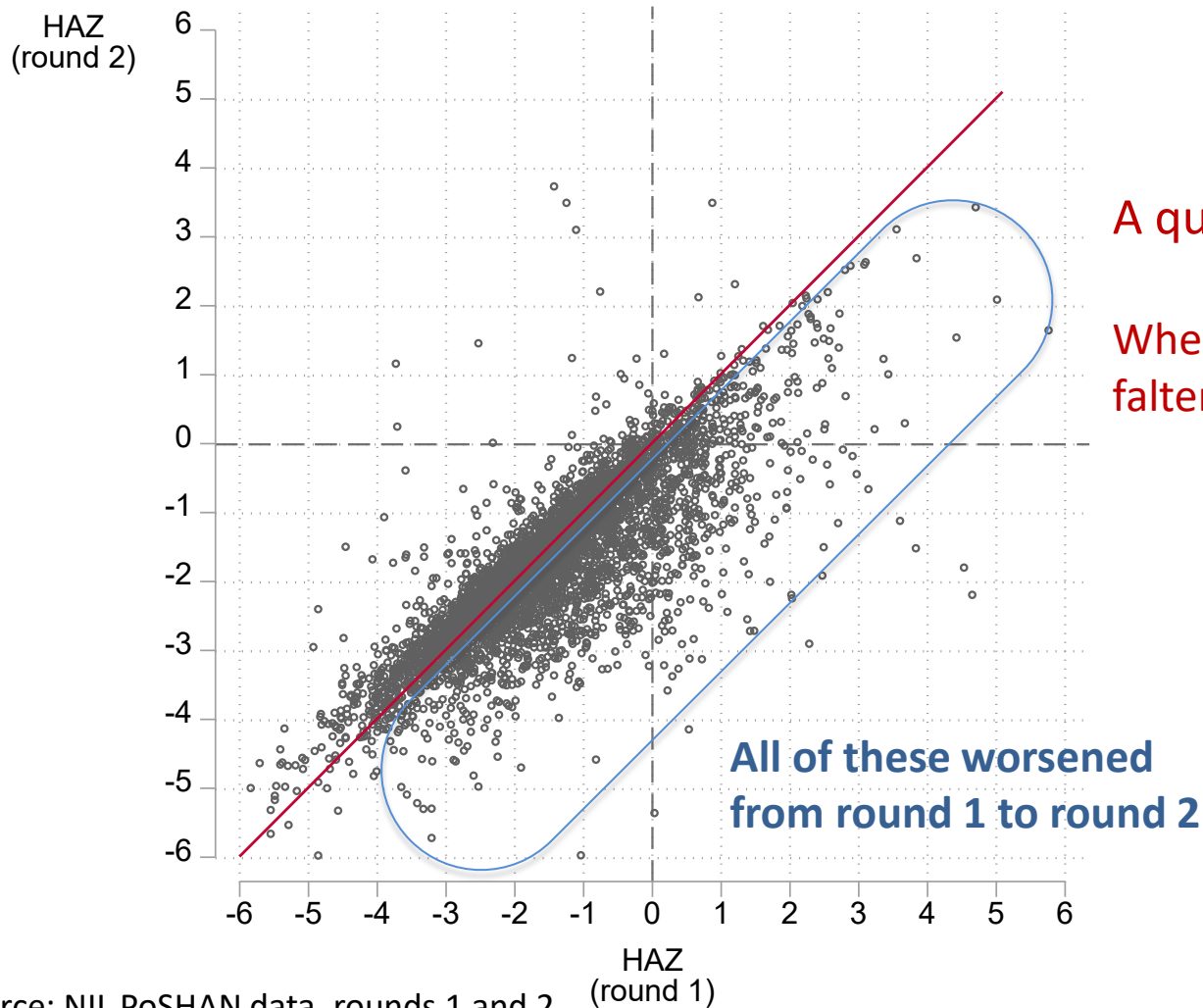
In Nepal, rice prices higher and more volatile in the mountains than in the terai



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



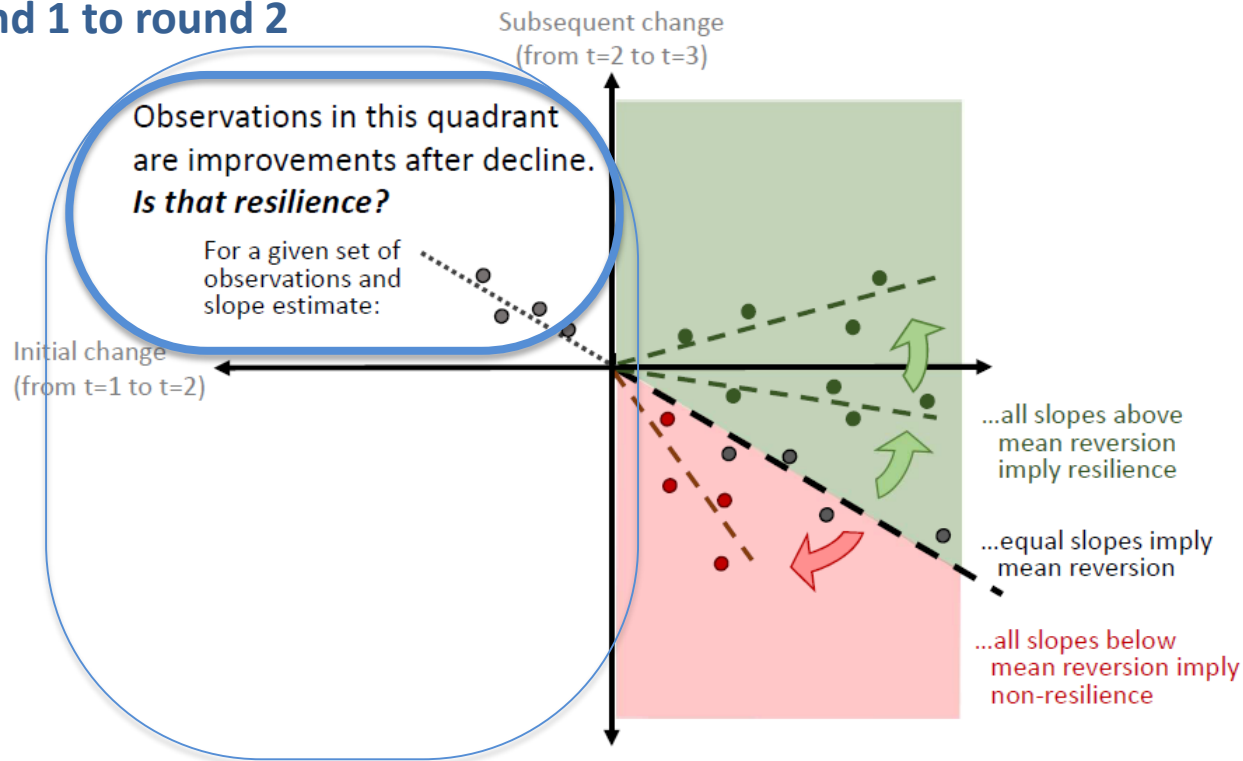
A question of resilience:

When we observe growth faltering, who recovers and why?



Who recovers after a setback, and why?

All of these worsened
from round 1 to round 2

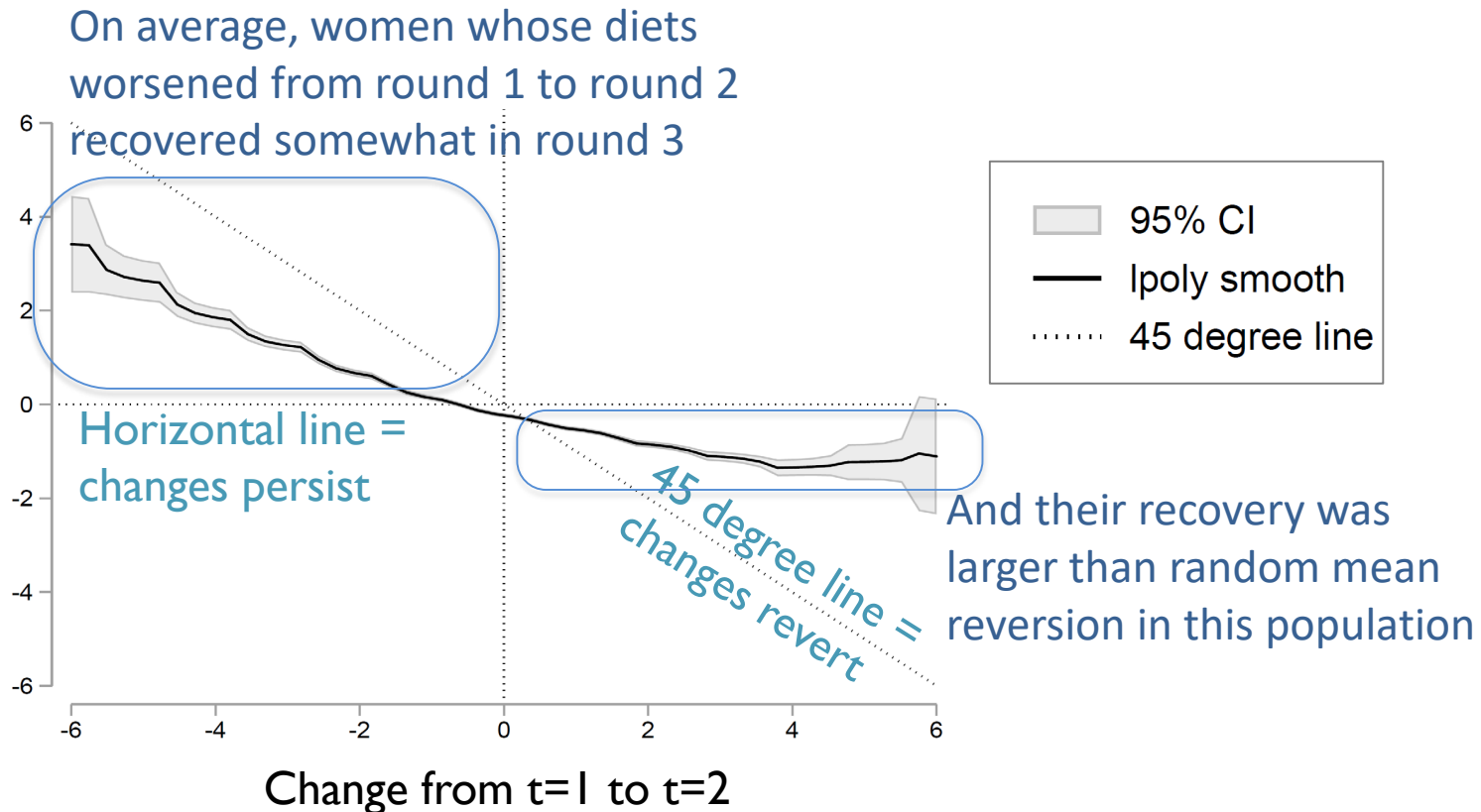




In Nepal, women generally recover after diets worsen

Women dietary
diversity scores
(Nepal)

Change from
 $t=2$ to $t=3$





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).



Recap:

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