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

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

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USAID
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Tufts
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

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

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

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

Bangladesh
BAHNR study: linking agriculture and health for dietary diversity, income, and nutrition

Timor Leste
Assess extent of aflatoxin exposure in women and children
### Agriculture to Nutrition Linkages

- **Aquaculture-Horticulture and Nutrition in Bangladesh**
- **Markets, Infrastructure and Diets: Evidence from Bangladesh, Nepal and Uganda**
- **Animal source foods (ASFs) and child nutrition: new lagged and contemporaneous effects in Bangladesh, Nepal and Uganda**
- **Improving Food Security and diets in Sub-Saharan Africa and South Asia: The intersection of agriculture, nutrition and health**
- **Gender, agriculture, diets and nutrition: Findings from Nepal, Uganda and Tanzania**
- **Consumption of Animal source foods (ASFs), linear growth and stunting in Bangladesh, Nepal and Uganda**
- **Ecology and Prevention of Linear Growth Faltering in Nepal**

### Neglected Biological Mechanisms

- **Mycotoxins, health and nutrition: Findings from Nepal, Mozambique, Uganda, and Timor Leste**
- **WASH, Environmental Enteric Dysfunction and nutritional status of infants and young children: Findings from Uganda, Nepal and Sierra Leone**

### 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**
- **Methods for Measuring Resilience: Application to Diets of Rural Women and Children in Nepal and Bangladesh**

### 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**
- **Malawi's First Food Composition Table: The development and use of food composition data**

### The Way Forward

- **Distilling 10 years of Innovation Lab research on agriculture-to-nutrition**
Markets, Infrastructure, Diets and Nutrition

*Evidence from Bangladesh, Nepal and Uganda*

July 15, 2020

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Department of Agricultural Economics
Purdue University
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
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4. Key messages
Children are taller where there is more light at night

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).

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

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

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)

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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.

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

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

Note: WHZ in Nepal (n=2,335 children below 5 years; unweighted DHS data 2006 & 2011).
Children in the mountains are more sensitive to weather anomalies than those in the Terai.

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

Policy implications: prices and incomes; availability; nutrition education

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)
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.
In Nepal, many children experience growth faltering

A question of resilience:
When we observe growth faltering, who recovers and why?

All of these worsened from round 1 to round 2

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

Observations in this quadrant are improvements after decline. **Is that resilience?**

For a given set of observations and slope estimate:

- All slopes above mean reversion imply resilience
- Equal slopes imply mean reversion
- All slopes below mean reversion imply non-resilience

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
We find more recovery in Nepal than elsewhere

<table>
<thead>
<tr>
<th>Evidence of resilience</th>
<th>Daily DDS</th>
<th>Weekly DDS</th>
<th>BMI/WHZ</th>
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</thead>
<tbody>
<tr>
<td><strong>Bangladesh</strong></td>
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</tr>
<tr>
<td>Women</td>
<td>no</td>
<td></td>
<td>no</td>
</tr>
<tr>
<td>Children</td>
<td>no</td>
<td></td>
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<tr>
<td><strong>Nepal</strong></td>
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<tr>
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</tbody>
</table>

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:

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