Relating Seasonal Hunger, Coping and Prevention Strategies, and Household Nutrition: A Panel Analysis of Malawian Farm Households

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Presentation Plan

• Defining and Measuring Seasonal Hunger
• Consequences of Seasonal Hunger
• Research questions for Malawi
• Empirical Results
• Conclusions

http://www.farmfrica.org/kenya/cassava-farming
Defining Seasonal Hunger

• Time period preceding the harvest (Vaitla et al., 2009; Zug, 2006)

• Time after food stocks from previous harvest are exhausted (Mburu et al., 2015; Milgroom & Giller, 2013; Paxson, 1993)

• Approximately 2-6 months, depending on weather and number of harvests/year (Daie & Woldtsadik, 2015; Hadley et al., 2007; Hart, 2009; Lambrechts & Barry, 2003; Rademacher-Schulz, 2014)

http://www.cgiar.org/our-strategy/cgiar-research-programs/cgiar-research-program-on-integrated-systems-humid-tropics/

http://www.cimmyt.org/global-maize-research/
Measuring Seasonal Hunger

• 795 million people globally are hungry, over a quarter of the hungry in Sub Saharan Africa (FAO, 2015)

• Over 400 million people live in poverty in Sub Saharan Africa; 68% of the poor live in rural areas (World Bank, 2014)

• Seasonal hunger is likely not just a rural phenomenon
Consequences of Seasonal Hunger

• **Eating less** (Edeh & Gyimah-Brempong, 2015; Hadley & Patil, 2008; Maxwell, 1996; Mayanja et al., 2015; Rademacher-Schulz et al., 2014)

• **Eating differently (food substitution)** (Daie & Woldtsadik, 2015; Edeh & Gyimah-Brempong, 2015; Hadley & Patil, 2008; Maxwell, 1996; Mayanja et al., 2015)

• **Agricultural “borrowing”**
  - Harvest immature crops (Mayanja et al., 2015)
  - Prematurely slaughter livestock (Mayanja et al., 2015)

• **Financial “borrowing”**
  - **Borrow food or money to buy food** (Edeh & Gyimah-Brempong, 2015; Hadley & Patil, 2008; Maxwell, 1996; Mayanja et al., 2015; Morris et al., 2013; Zug, 2006)
  - **Sell assets to purchase food** (Mayanja et al., 2015; Rademacher-Schulz et al., 2014; Zug, 2006)

• **Changing household composition** (Mayanja et al., 2015)
On-Farm Strategies for Reducing Seasonal Hunger

- **Off-season crops** *(Armond et al., 2011; Krishnal & Weerahewa, 2014)*

- **Early-maturing varieties** *(Herforth, 2010; Keding & Cogill, 2013; Mburu et al., 2015; Powell et al., 2015)*

- **Crop diversification** *(Benfica & Kilic, 2015; Carletto et al., 2015; Abdalla et al., 2013; Afifi et al., 2015; Bacon et al., 2014; Devereux, 2009; Wispelwey & Deckelbaum, 2010; Vaitla et al., 2012)*

http://www.bioversityinternational.org/trees-for-livelihoods-nutrition/

http://ciatblogs.cgiar.org/support/files/2014/04/5445527343_8a4ce1cfbb.jpg
Off-Farm Strategies for Reducing Seasonal Hunger

Income diversification

- **Non-agricultural employment** (Afifi et al., 2015; Daie & Woldtsadik, 2015; Rademacher-Schulz et al., 2014; Sibhatu et al., 2015a; Zug, 2006)

- **Trading labor for money or food** (Mayanja et al., 2015; Zug, 2006)

- **Temporarily migrating in search of work** (Afifi et al., 2015; Hadley & Patil, 2008; Maxwell, 1996; Rademacher-Schulz et al., 2014)

http://teca.fao.org/technologies/african-leafy-vegetables-urban-supply-and-sustainable-diets-0
In Malawi:

1. Is there seasonal hunger distinct from chronic hunger?
2. What explains variation in seasonal hunger among farmers?
3. Is there evidence of recurring and longer term outcomes driven by seasonal pressures?

http://www.cimmyt.org/global-maize-research/
LSMS-ISA Data

- Malawi Integrated Household Panel Survey
  - Waves 1 (2010) and 2 (2013)

- Panel survey with detailed data collection on:
  - Household characteristics
  - Agriculture
  - Community
  - Livestock & Fisheries

World Bank Living Standards Measurement Study - Integrated Surveys on Agriculture
Study Region

Malawi

<table>
<thead>
<tr>
<th></th>
<th>Malawi</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Hungry - Farm</td>
<td>63</td>
</tr>
<tr>
<td>% Hungry - Non-Farm</td>
<td>46</td>
</tr>
<tr>
<td># Hungry - Farm</td>
<td>1,808,796</td>
</tr>
<tr>
<td># Hungry - Non-Farm</td>
<td>391,322</td>
</tr>
<tr>
<td># of Poor People</td>
<td>10,471,805*</td>
</tr>
<tr>
<td>% Poor in Population</td>
<td>70.9*</td>
</tr>
<tr>
<td># of Rural People</td>
<td>14,006,983</td>
</tr>
<tr>
<td>% Rural in Population</td>
<td>83.9</td>
</tr>
</tbody>
</table>
Month of First Harvest

**Month of First Harvest, Wave 1**

**Month of First Harvest, Wave 2**
Malawi 2013 Hunger by Month

Malawi 2013, Farm Households
Months household did not have enough food to eat

- January: 0
- February: 0.3
- March: 0.2
- April: 0.1
- May: 0.1
- June: 0.1
- July: 0.1
- August: 0.1
- September: 0.1
- October: 0.1
- November: 0.1
- December: 0.1

2,785 farm households

Malawi 2013, Non-Farm Households
Months household did not have enough food to eat

- January: 0.2
- February: 0.3
- March: 0.2
- April: 0.1
- May: 0.1
- June: 0.1
- July: 0.1
- August: 0.1
- September: 0.1
- October: 0.1
- November: 0.1
- December: 0.1

1,215 non-farm households
Chronic & Seasonal Hunger

Source: LSMS, 2010-2013

- Malawi 2010
  - Farm
  - Non-farm

- Malawi 2013
  - Farm
  - Non-farm

Legend:
- Purple: Not seasonally or chronically hungry
- Orange: Chronic hunger only
- Green: Both seasonal and chronic hunger
- Light Purple: Seasonal hunger only

Results
Methods - Correlates of Seasonal Hunger

We run exploratory regressions to look at the correlates of seasonal hunger, with the form:

\[ y_h = \alpha + \beta X_h + \varepsilon_h \]

where \( y_h \) is the outcome in household \( h \), \( X_h \) is a vector of household characteristics, and \( \varepsilon_h \) is a household-specific error term. In these regressions we do not make use of the longitudinal nature of the data.
## Correlates of Seasonal Hunger

<table>
<thead>
<tr>
<th>Factor</th>
<th>Coefficient</th>
<th>Wave 2 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of household head</td>
<td>-0.006***</td>
<td>0.153***</td>
</tr>
<tr>
<td>Years of education of head</td>
<td>-0.057***</td>
<td>-0.073</td>
</tr>
<tr>
<td>Male household head</td>
<td>-0.238***</td>
<td>-0.373***</td>
</tr>
<tr>
<td>Household size</td>
<td>0.036***</td>
<td>0.080*</td>
</tr>
<tr>
<td>Distance to nearest road (km)</td>
<td>0.005**</td>
<td>-0.046</td>
</tr>
<tr>
<td>Total rainfall (mm)</td>
<td>-0.000</td>
<td>-0.180***</td>
</tr>
<tr>
<td>Total landholding (acres)</td>
<td>-0.001</td>
<td>-0.389***</td>
</tr>
<tr>
<td>Remittances and gifts (log)</td>
<td></td>
<td>-0.010**</td>
</tr>
<tr>
<td>Wage labor, any household member</td>
<td></td>
<td>0.260***</td>
</tr>
<tr>
<td>Sold any crop</td>
<td></td>
<td>-0.020</td>
</tr>
<tr>
<td>Constant</td>
<td>2.146***</td>
<td></td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.133</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>2411</td>
<td></td>
</tr>
</tbody>
</table>
We next attempt to identify causal relationships between timing of harvest, hunger, and child nutrition outcomes using district/wave fixed effects:

\[ y_{ihjt} = \alpha_h + \phi_{jt} + \delta T_{hjt} + \gamma A_{ihjt} + \beta X_{hjt} + \varepsilon_{ihjt}, \]

where \( y_{ihjt} \) is the anthropometric outcome of interest (weight-for-height or height-for-age) for individual \( i \) in household \( h \) in district \( j \) in survey wave \( t \), \( T_{hjt} \) is the variable of interest (timing of harvest or hunger), and \( A_{ihjt} \) is the child’s age.

We then look at relationships between month of first harvest in the previous year and hunger or month of first harvest in the current year again using fixed effects:

\[ y_{hjt} = \alpha_h + \phi_{jt} + \delta T_{hjt} + \beta X_{hjt} + \varepsilon_{hjt}, \]

where \( y_{hjt} \) is the outcome of interest (month of first harvest in the current year or one of the hunger variables) and \( T_{hjt} \) is month of harvest in the previous year.
## Child Anthropometrics and Seasonal Hunger

<table>
<thead>
<tr>
<th>Model</th>
<th>Weight-for-height</th>
<th>Height-for-age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td>Seasonal hunger (count)</td>
<td>0.014</td>
<td>-0.081</td>
</tr>
<tr>
<td>Months hungry in previous year</td>
<td>-0.007</td>
<td>-0.018</td>
</tr>
<tr>
<td>Age</td>
<td>0.000</td>
<td>-0.000</td>
</tr>
<tr>
<td>Household size</td>
<td>0.050</td>
<td>0.050</td>
</tr>
<tr>
<td>Male household head</td>
<td>-0.062</td>
<td>-0.058</td>
</tr>
<tr>
<td>Total landholding (acres) (log)</td>
<td>-0.035</td>
<td>-0.036</td>
</tr>
<tr>
<td>Herfindahl index (crop diversity)</td>
<td>-0.120</td>
<td>-0.122</td>
</tr>
<tr>
<td>Other livestock (count)</td>
<td>-0.014</td>
<td>-0.015</td>
</tr>
<tr>
<td>Poultry (count)</td>
<td>0.003***</td>
<td>0.003***</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.220</td>
<td>0.220</td>
</tr>
<tr>
<td>Observations</td>
<td>3357</td>
<td>3357</td>
</tr>
</tbody>
</table>

Standard errors are in parentheses. Standard errors are clustered at the household level. All regressions include wave/district fixed effects. The dependent variable in columns 1 and 2 is weight-for-height, defined using the WHO’s statistics and methodology. The dependent variable in columns 3 and 4 is height-for-age, similarly defined. Seasonal hunger is defined as the number of months hungry in the four months preceding the first maize harvest of the season (including the month of harvest). * p<0.10 ** p<0.05 *** p<0.01
Harvest Month by Hunger Category, Wave 2
## Effect of Hunger on Harvest Month

<table>
<thead>
<tr>
<th></th>
<th>Month of Harvest in Current Season</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
</tr>
<tr>
<td>Seasonal hunger (count)</td>
<td>-0.081***</td>
</tr>
<tr>
<td>Number of months hungry in previous year</td>
<td>0.091***</td>
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<tr>
<td>Household size</td>
<td>-0.015</td>
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<tr>
<td>Male household head</td>
<td>0.005</td>
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<tr>
<td>Total landholding (acres) (log)</td>
<td>-0.032</td>
</tr>
<tr>
<td>Herfindahl index (crop diversity)</td>
<td>-0.025</td>
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<tr>
<td>Other livestock (count)</td>
<td>-0.000</td>
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<tr>
<td>Poultry (count)</td>
<td>-0.001*</td>
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<tr>
<td>Adjusted R²</td>
<td>0.575</td>
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<tr>
<td>Observations</td>
<td>5137</td>
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</tbody>
</table>

Standard errors are in parentheses. Standard errors are clustered at the household level. Both regressions include household fixed effects. The dependent variable in both regressions is the month of first harvest in the current year.

* p<0.10 ** p<0.05 *** p<0.01
Conclusions

• Seasonal hunger differs from chronic hunger in terms of drivers and affected populations, but understanding of its dynamics is still limited.

• Both farm and non-farm households in Malawi are vulnerable to seasonal food shortages.

• Age and education of household head, crop diversity, and crop storage are all correlated with lower likelihood of experiencing seasonal hunger.

• Seasonal hunger is associated with early harvesting - an outcome with implications for both nutrition and household income.

• Harvesting earlier one year is associated with harvesting earlier the following year, so seasonal hunger may be part of a cycle.

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*Please direct comments or questions about this research to Principal Investigators C. Leigh Anderson and Travis Reynolds at epar.evans.uw@gmail.com.*