Precipitation Data in Analysis of Seasonal Hunger in Malawi

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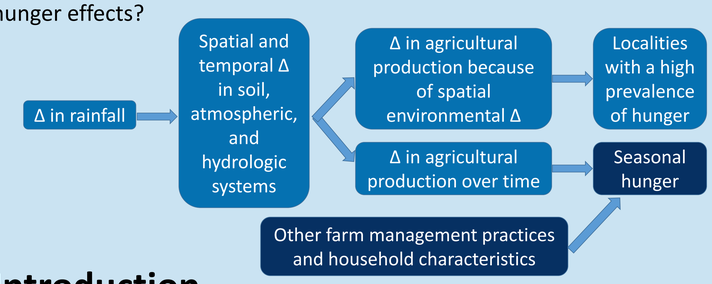
Research Question

As many as 55% of rural and 32% of urban households in Malawi suffer from seasonal hunger. Given this, in Malawi, does variation in precipitation alone explain household seasonal hunger patterns, or does changing household and farm management practices provide an opportunity to mitigate seasonal hunger effects?



Introduction

Relative to chronic hunger, seasonal hunger in rural and urban areas of Africa is poorly understood. Throughout Sub-Saharan Africa the rural poor depend heavily on subsistence agriculture and, as such, are particularly susceptible to seasonal hunger in the months leading up to the annual harvest (Abdalla et al., 2013; Becquey et al., 2012; Barrett, 1996). Our research examines the extent and potential drivers of seasonal hunger in Malawi using panel data, with Wave 1 the 2010-11 growing season and Wave 2 the 2012-13 growing season.

Malawi's agriculture is predominately rain-fed, thus rainfall variation year-to-year and across regions affects crop yield, and, by extension, a household's harvest. If seasonal hunger is due solely to changes in crop production driven by rainfall, the potential for remedial measures is limited. But to the extent that other farm and household characteristics increase vulnerability to seasonal hunger, policies and programs might provide an opportunity to mitigate seasonal hunger effects through targeted approaches that focus on adjustments to farm management practices.

Data

We use data from the Malawi Integrated Household Panel Survey (IHPS), a part of the World Bank Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA). The LSMS-ISA program is implemented by national statistics offices in participating countries, with support from the World Bank. Two waves of IHPS data were collected in 2011-2013 by the Malawi National Statistics Office.

We measure seasonal hunger on a 0-4 scale reflecting the number of months a household reports any hunger during the three months prior to plus the month of first harvest by that household. We use a simple count rather than consecutive months of hunger pre-harvest as the "hunger" months may be interrupted (for example, if a household experiences hunger in January, sells an asset or borrows money in February to smooth consumption, then is hungry again in March prior to April's harvest).

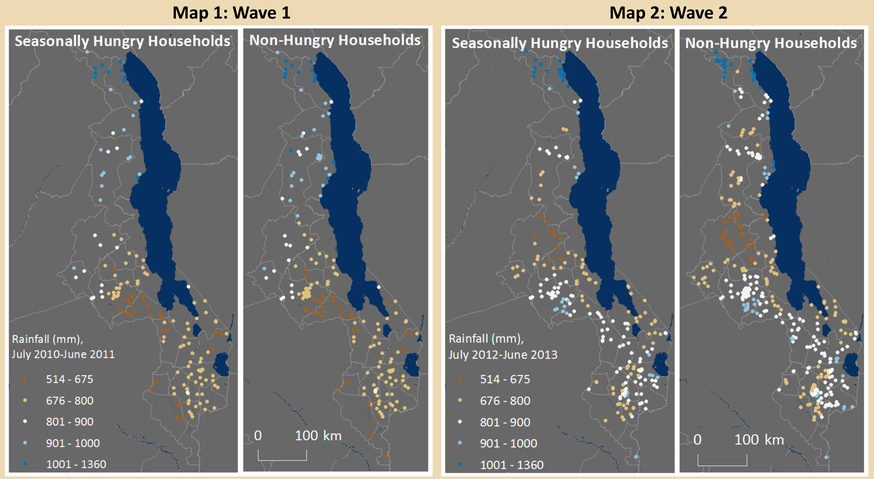
Methods

We first mapped seasonal hunger with rainfall data to establish that its prevalence was not completely explained by rainfall (thus motivating our exploration of additional sources of household variation, see Maps 1 & 2). Rainfall variables were provided as a part of the LSMS-ISA data, and were constructed from annual National Oceanic and Atmospheric Administration (NOAA) data (see Table 1). We then used Ordinary Least Squares regressions, including household fixed effects, to identify relationships between household and farm management characteristics and seasonal hunger and the timing of harvest and seasonal hunger.

Descriptive Results

The maps indicate that variation in rainfall only partially explains the observed patterns in seasonal hunger as seasonally hungry households exist across Malawi and in every identified rainfall category.

Maps 1 & 2: Maps depicting the incidence of seasonal hunger for households against rainfall totals for Wave 1 (left) and Wave 2 (right). Households throughout Malawi experience seasonal hunger in all rainfall categories, so rainfall alone does not explain why a household is seasonally hungry.

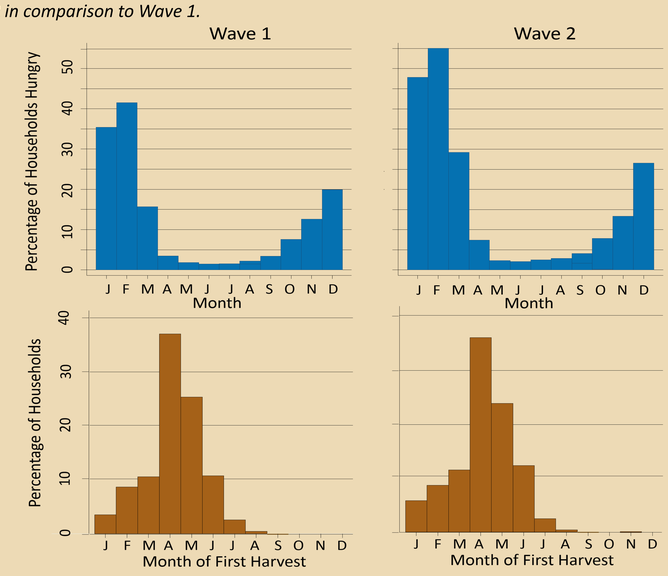


Within our sample, average rainfall varies by almost 36 mm between Wave 1 and Wave 2, although the higher rainfall values are experienced in Wave 2 when the percentage of households hungry is much higher.

Table 1: Summary Statistics for Rainfall in Malawi						
Wave 1 (3,227 Households)	Mean	25%	Median	75%	95%	99%
July-June total rainfall (mm), 2010/11	787.13	703	753	876	1021	1070
Wave 2 (3,980 Households)						
July-June total rainfall (mm), 2012/13	822.69	749	819.50	876	966.50	1075

Months of household hunger and the month of first harvest exhibit an inverse relationship, indicating that households have more food available to them soon after harvest, and less food in the months before their first harvest of the next season. This phenomenon illustrates why our results suggest that each additional month of seasonal hunger causes households to harvest their first crop almost a quarter of a month earlier.

Figures 1-4: Graphs depicting the percentage of hungry households by month (blue) and the percentage of households that reported starting their first harvest in each respective month (brown). Hunger and the month of first harvest have an inverse relationship. Also, the percentage of seasonally hungry households surges in Wave 2 in comparison to Wave 1.



Regression Results

OLS regression results predicting the number of months of seasonal hunger (Columns (1) and (2)) and the month of first harvest (Column (3)) are presented below (see Table 2). Other variables included in the models but not shown include age and education of household head, distance to the nearest road, and fertilizer use.

Table 2: Partial descriptive regression results, with months of seasonal hunger (1 & 2) or month of first harvest (3) as the outcome variable. Total rainfall of the reference growing season is negative and significant in columns 1 and 2, indicating that an increase in rainfall slightly reduces the number of seasonally hungry months a household experiences.

Predictor of Seasonal Hunger	**(1) Wave 1**	**(2) Wave 2**	**(3) EA/Wave Fixed Effects**
Male household head	-0.149** (0.072)	-0.322*** (0.075)	-0.247*** (0.054)
Household size	0.026** (0.012)	0.068*** (0.013)	0.052*** (0.010)
Total rainfall in reference growing season (mm)	**-0.001*** (0.000)**	**-0.001*** (0.000)**	**-0.000 (0.001)**
Acres owned	-0.018** (0.008)	-0.000 (0.000)	-0.001 (0.001)
Constant	1.839*** (0.212)	2.886*** (0.300)	1.476** (0.690)
N	2052	2589	4641
Adjusted R^2	0.039	0.086	0.165
Standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01			

Discussion & Conclusions

Hunger and food insecurity have long been a focus of development practitioners and researchers. Much of the focus in recent decades has been on chronic hunger, however, which differs from seasonal hunger both in terms of drivers and in terms of affected populations.

This research contributes to the growing literature on seasonal hunger in several ways. First, we document the prevalence of seasonal hunger in Malawi. Moreover, we consider our seasonal hunger measure to be conservative in that it will more likely underestimate than overestimate the prevalence of hunger due to seasonal causes – since very food-insecure households may experience hunger for a season of longer than four months if they run out of crop and income stores within a few months following harvest.

In answering our research question, OLS regression results suggest age, education, and male gender of the household head as well as crop diversity and amount of rainfall are all associated with lower levels of seasonal hunger. Similarly, households that sold crops and households with livestock are also less likely to be seasonally hungry. Robustness checks suggest our results are not sensitive to alternate definitions of seasonal hunger.

Finally, we provide some evidence of one of the effects of seasonal hunger. We find that seasonal hunger is associated with household decisions to harvest earlier in the year – an outcome with implications both for household nutrition and for household incomes. Our results suggest that strategies to increase yield without simultaneously smoothing consumption may be ineffective at reducing seasonal hunger and its health and productivity effects, especially to the extent that climate change heightens rainfall variability.

Evans School Policy Analysis & Research Group (EPAR)

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Learn more about EPAR at http://bit.ly/EPAREvans and EPAR's work on seasonal hunger at http://bit.ly/2jmb3CS

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EPAR. (2016). Relating Seasonal Hunger, Coping and Prevention Strategies, and Household Nutrition: A Panel Analysis of Malawian Farm Households. EPAR Technical Brief #337. Evans School of Public Policy & Governance, University of Washington. http://evans.uw.edu/sites/default/files/EPAR_UW_337_Seasonal%20Hunger%20in%20Malawi_Brief_6.22.16_0.pdf

References

Abdalla, S., Leonhäuser, I. U., Bauer, S., & Elamin, E. (2013). Households Coping Strategies and Food Consumption Gap in Sudan. *NAF International Working Paper Series*, 13(6).

Barrett, C.B. (1996). Urban bias in price risk: The geography of food price distributions in low-income economies. *The Journal of Development Studies*, 32(6), 830-849.

Becquey, E., Delpeuch, F., Konaté, A. M., Delsol, H., Lange, M., Zoungrana, M., & Martin-Prevel, Y. (2012). Seasonality of the dietary dimension of household food security in urban Burkina Faso. *British Journal of Nutrition*, 107(12), 1860-1870.