Minimum Dietary Diversity and Minimum Meal Frequency for Children in sub-Saharan Africa

Background

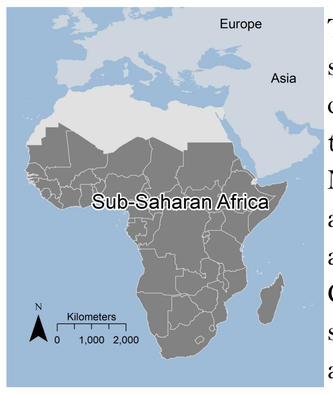
Example of produce market in Central Malawi, June 2018

Sub-Saharan Africa (SSA) faces widespread child malnutrition, which carries implications for health and cognitive functioning during adulthood. The World Health Organization (WHO) indicators for assessing infant and young child feeding (IYCF) practices are commonly used to determine the adequacy of child diets. This study examines the WHO IYCF minimum dietary diversity (MDD) and minimum meal frequency (MMF) indicators across subnational regions of sub-Saharan Africa. MDD refers to the proportion of children 6-23 months who received foods from 4 or more WHO food groups during the previous day and MMF refers to the proportion of children 6-23 months who were fed solid, semi-solid or soft foods the minimum number of times or more as per WHO guidelines, during the previous day[1].

Research Questions

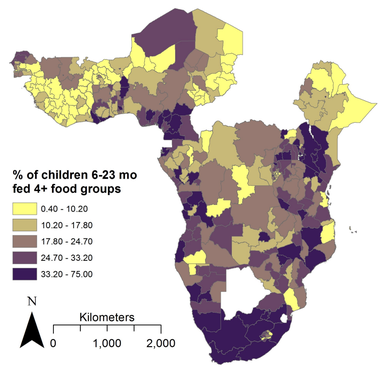
1. Where is there clustering (high-high or low-low) of children between 6 and 23 months old meeting the World Health Organization's MDD and/or MMF indicators in sub-Saharan Africa?
2. What factors predict the percentages of children 6-23 months meeting MDD and MMF indicators across the subnational regions of SSA?

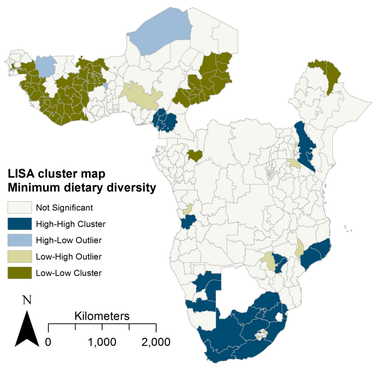
Methods



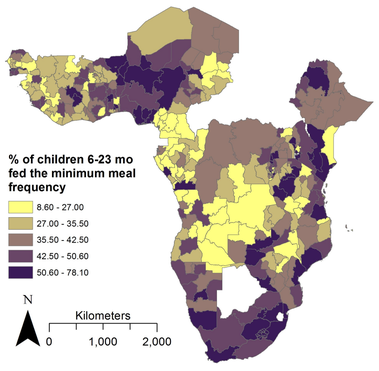
This project used minimum dietary diversity (MDD) data, minimum meal frequency (MMF) data, and other variables thought to be important to MDD and MMF from the IPUMS Demographic and Health Surveys (DHS), as well as aridity index data provided by CGIAR Consortium for Spatial Information. The spatial unit of DHS data and the unit of analysis for this study, was the DHS subnational region boundaries across SSA. Subnational regions for which minimum dietary diversity and minimum meal frequency data were not available were not included in this analysis. Aridity index data was provided as a raster dataset and the ArcMap zonal statistics tool was used to calculate the average index score for each subnational region. PCA was performed to reduce data redundancy and to assess correlation among independent variables. Global Moran's I was used to test for spatial autocorrelation in MDD, MMF, and principle components (PC) with eigenvalues > 1. Univariate local Moran's I was used to identify clustering for MDD, MMF, and PCs. Ordinary least squares and spatial error regressions were run between MDD or MMF and PCs.

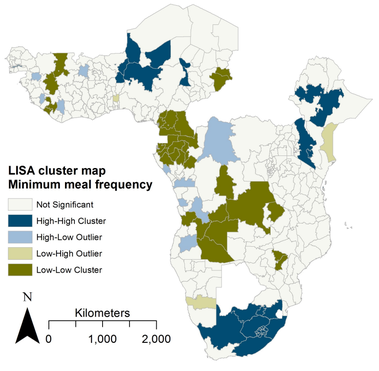
Minimum dietary diversity





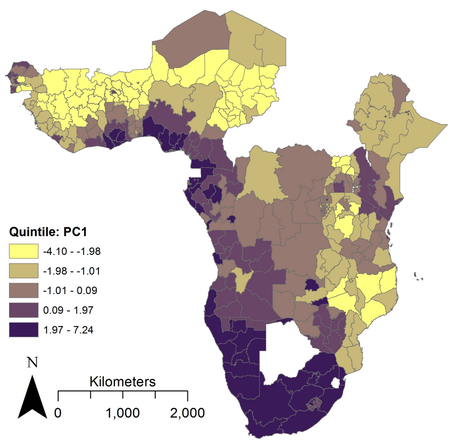
Minimum meal frequency

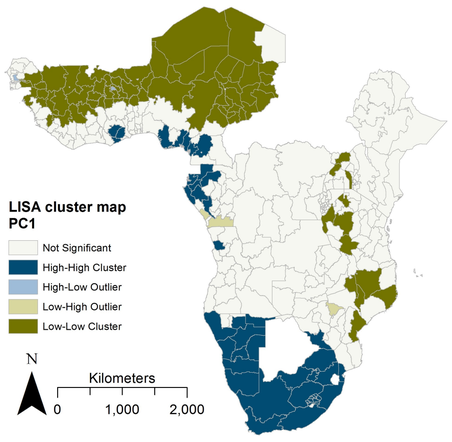




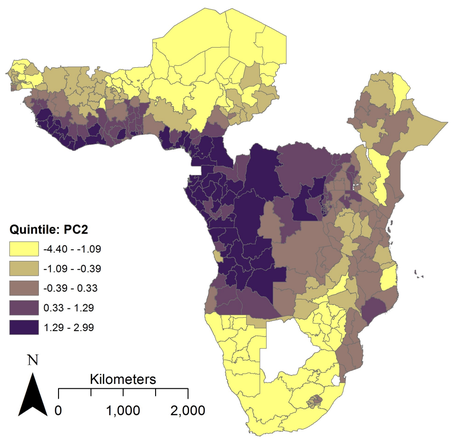
Results

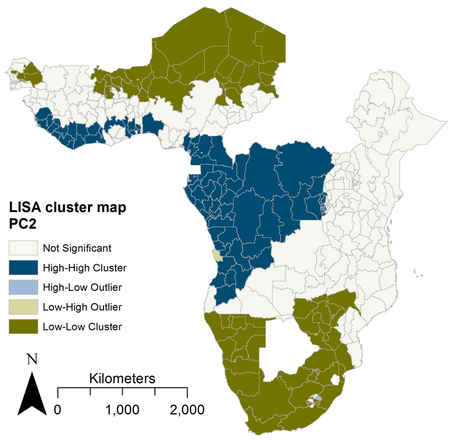
PC1: *Wealth*



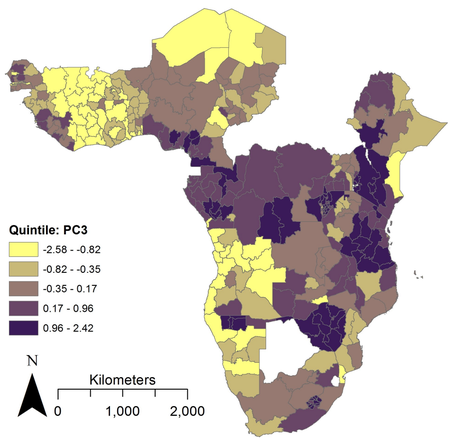


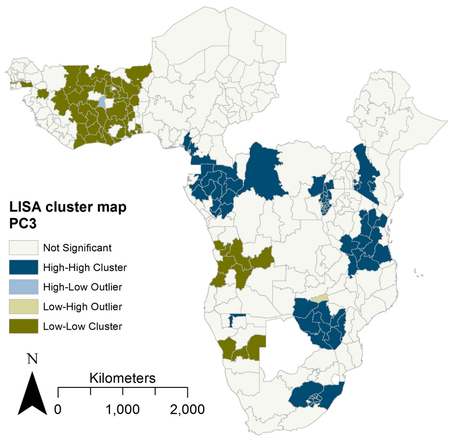
PC2: *Environment*





PC3: *Women's empowerment*





Variables included in PCA

Aridity index score
% households owning livestock
% households owning agricultural land
% women with secondary education or higher
% women who are literate
% women with unmet need for family planning
median age at first marriage [women]
% households cooking inside the house
% households with electricity
% households with refrigerator
% households with bicycle
% households with private car

PCA Results

Component	Description	Explained Variance (%)
PC1	*Wealth:* Indicator of wealth, access to amenities	48.2
PC2	*Environment:* indicator of harsh environmental conditions, drought risk	14.1
PC3	*Women's empowerment:* indicator of women's empowerment, literacy, education	8.8

Spatial Autocorrelation

	Global	Z-score	*P*
Dependent variables			
MDD	0.40	11.97	0.00
MMF	0.35	10.49	0.00
Independent variables			
PC1	0.61	18.20	0.00
PC2	0.78	23.31	0.00
PC3	0.59	17.58	0.00

Ordinary Least Squares and Spatial Error Regressions between Principle Components and Minimum Dietary Diversity and Minimum Meal Frequency Indicators

	Ordinary Least Squares				Spatial Error			
	MDD		MMF		MDD		MMF	
	Coeff.	*P*	Coeff.	*P*	Coeff.	*P*	Coeff.	*P*
PC1: *Wealth*	3.68	0.00	0.55	0.06	3.79	0.00	0.48	0.17
PC2: *Environment*	-0.65	0.14	-3.32	0.00	-1.05	0.09	-3.23	0.00
PC3: *Women's empowerment*	1.35	0.02	-0.01	0.99	1.15	0.09	0.14	0.86

Discussion & Conclusions

LISA cluster maps show high-high clustering for the percent of children fed 4 or more food groups (MDD) and percent of children fed the minimum number of times or more (MMF) in South Africa. Low-low clustering for MDD was identified around Burkina Faso, Cote d'Ivoire and Chad, while the largest low-low cluster for MFF is located in the DRC and Angola. PCA yielded three components with eigenvalues > 1 and variable loadings for these principle components aligned with the categories: 1) wealth, 2) environment, and 3) women's empowerment. Lagrange multiplier diagnostics accompanying ordinary least squares regressions indicated that spatial error regressions should be employed for both MDD and MMF regressions. A spatial error regression between PCs and MMD showed significance for PC1, indicating that as wealth (PC1) increases, the percentage of children fed four or more food groups increases. A spatial error regression between PCs and MMF showed significance for PC2, indicating that as the environment becomes more harsh/arid (PC2), the percentage of children fed the minimum number of times or more decreases. Importantly, this analysis shows differing spatial distributions for MDD and MMF and slightly different spatial relationships between PCs and MDD and MMF. This work does not capture the variation that likely occurs within subnational regions. Future research could used a similar analytical framework to examine spatial predictors of MDD and MMF at a smaller scale (e.g. DHS cluster-level). Such work may be important for informing policy and programmatic changes to improve child nutritional outcomes.

Cartographer: Jessica Wallingford
Projection: Africa Albers Equal Area Conic
Class: UEP 0294, Spring 2019
Data Sources: The Demographic and Health Surveys Program, Spatial Data Repository, accessed May 2019; CGIAR Consortium for Spatial Information, Global Aridity and PET Database, January 2019.

References: World Health Organization, Indicators for assessing infant and young child feeding practices, November 2007.

Tufts University
Gerald J. and Dorothy R. Friedman School of Nutrition Science and Policy