Food Security in South Sudan: A Spatial Analysis

Presented by Colleen Maher, Data provided by the Pulte Institute for Global Development

Keough School of Global Affairs, University of Notre Dame

Background

The Republic of South Sudan is the world's youngest country, but its short history has been marred by outbreaks of civil war in 2013 and 2019, as well as persistent ethnic violence. The country has further been struck by repeated droughts and floods, which has compounded the fragility of the country's economy and led to widespread poverty and famine. The World Bank estimates that 7.1 million people, particularly women and children, will be in need of food assistance in 2024.

In response to this dire need, USAID funded the two-year Complementary Action for Resilience Building (CARB) project implemented by the Norwegian Refugee Council (NRC). The project providing support and training in the sectors of agriculture and food security, peacebuilding, livelihoods training, group savings organizations, and water, sanitation, and hygiene. Baseline data was collected October-November 2021, and collected surveys from 150 villages in three of the most vulnerable states in South Sudan. The baseline collected information on 20 indicators to determine their level pre-treatment. The project instituted a randomized control trial methodology but given that a t-test revealed they were statistically alike pre-treatment, no distinction between treatment and control groups was made for this study.

Research Questions: What are the spatial components of the distribution of Food Consumption Scores (FCS) in three counties in South Sudan? How might this inform future research or intervention?

Methods

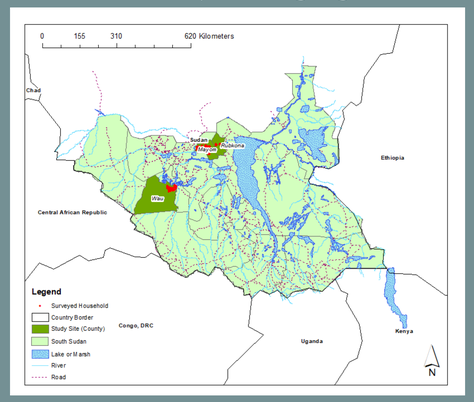
Survey data was collected in the field in YEAR. The resulting dataset (n=3,219) was initially cleaning of survey data was conducted using STATA. STATA was also used to construct an index of Food Consumption Scores (FCS) from participants responses to questions regarding consumption of various food groups. FCS was further categorized into Poor, Borderline, and Acceptable categories (see Table 1), which are standard for this indicator. FCS categories were used for spatial visualization, while continuous data was used for statistical analysis. Spatial analysis was conducted using ArcMap, using symbology to represent FCS and Near analysis to determine distance to nearest towns and water bodies. Additional analysis was conducted in R-Studio and consisted on Ordinary Least Square (OLS) regressions with FCS as the dependent variable. I hypothesized that, because flooding is such a salient threat to this region, Altitude and Distance to Water would be significant independent variables, as they might impact vulnerability to flooding. I further included Distance to Town as an independent variable as an alternative explanatory factor for FCS.

Table 1	
Poor Food Consumption Score	0-21
Borderline Food Consumption Score	21.5-35
Acceptable Food Consumption Score	>35.5

Table 2: Africa with South Sudan highlighted (behind), percent of population within FCS categories (front)

	Kenya	Nigeria	Uganda	*South Sudan*
Poor	0	0.93	39.32	36.07
Borderline	36	48.48	30.69	47.04
Acceptable	61	50.58	37.62	16.89

Figure 1: Country overview of South Sudan with study sites highlighted



Policy Recommendations

1. Create programming that focuses on reaching last mile communities that are geographically and socially remote. Invest in increasing market opportunities for communities removed from market centers.
2. Improve roads and other transportation infrastructure for ease of travel across regions to allow for increased access to aid, agricultural inputs, employment opportunities, etc.
3. Conduct further research on differing characteristics of the three counties, in order to better understand why some counties exhibit higher FCS and how those characteristics can be applied to other counties.

Figure 2: Spatial analysis of Mayom County (n=1,377), average FCS 31.31

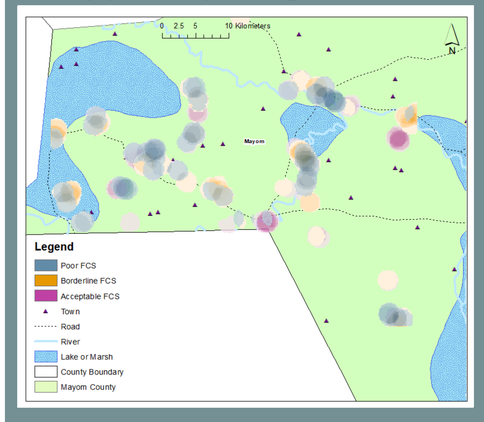


Figure 3: Spatial analysis of Rubkona County (n=1,021), average FCS 45.89

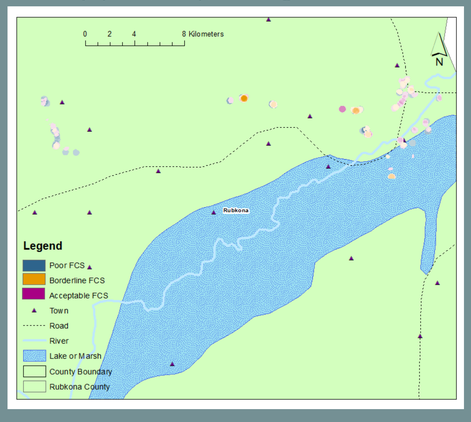


Figure 4: Spatial analysis of Wau County (n= 821), average FCS 45.26

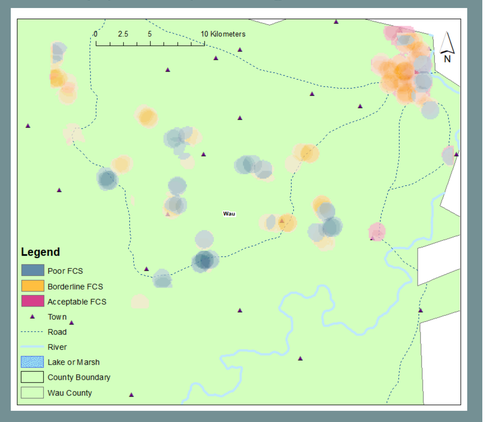


Figure 5: Scatterplot and Regression line of Altitude against FCS

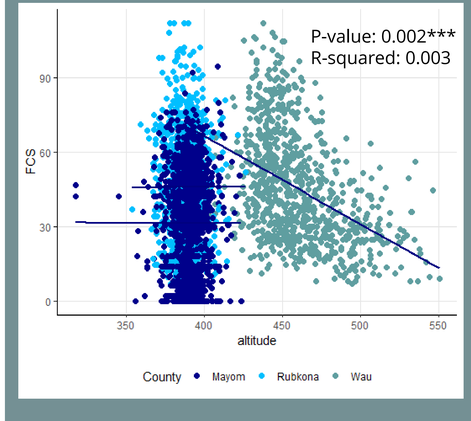


Figure 6: Scatterplot and Regression line of Distance to Town against FCS

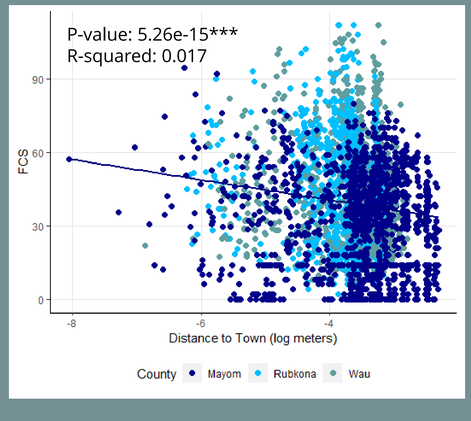
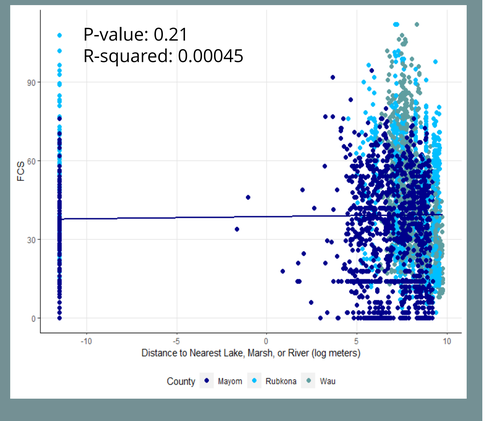


Figure 7: Scatterplot and Regression line of Distance to Water against FCS



Results

Table 2 represents the whole of the South Sudan with study sites highlighted in darker green and surveyed household in red. Figures 2, 3 and 4 demonstrate the spread and distribution of Poor, Borderline, and Acceptable FCS scores for surveyed households, as well as towns and permanent or seasonal water bodies. Finally, Figures , 6 and 7 are scatterplots of regressions of key variables. These figures demonstrate the spatial dimensions of food security in South Sudan. Figure 8 provides regional context for the situation in South Sudan.

My initial hypothesis, crafted from impressions gathered from qualitative research, expected flooding to have a strong impact on food security, as this region has seen significant and prolonged flooding. I therefore expected proximity to water bodies to negatively impact FCS and altitude to positively impact FCS. As Table 1 demonstrates, although altitude did have a slight, although significant, positive association with increased FCS, the impact of distance to water on FCS is not statistically significant, and instead a one unit increase in distance to town is associated a 9.6% decrease in FCS. It is important to note that distance to water and distance to town are strongly correlated with each other, with a correlation coefficient of 0.089. However, in a linear model, these variables are not statistically significant and have a negligible R-squared (when both are is logged), suggesting that the relationship between these two variables is nonlinear or impacted by variables outside the scope of this research.

Sources

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