Migration and Urban Food Security in a Secondary City of Zambia

Abstract:
Urbanization is rapidly occurring across sub-Saharan Africa (SSA), somewhat as a result of migration patterns. Rapid urbanization through migration often leads to the spatial expansion of cities in SSA. Expansion in this manner is not typically paired with planning efforts, which can create challenges to the living conditions of urban residents. We use a reduced version of the Household Food Insecurity Access Scale (rHFIAS) to evaluate urban food security among 135 households in Mumbwa, Zambia. We divide households into three groups based on their migratory status in Mumbwa, Zambia: non-migrants, those that migrated since 2014, and those that migrated before 2014. Then we examine whether spatial patterns exist with regard to significant differences in food access throughout Mumbwa. We find more recent migrants have significantly higher food security outcomes than non-migrant residents and residents that migrated before 2014. We find household asset ownership, access to a farm, and more wage earning household members are all significantly associated with higher food security. We also find two statistically significant clusters of lower and higher than average food accessibility. These results illustrate the complex challenge policymakers face in addressing urban food security, due to the spatial, economic, and social complexity of the phenomenon.

Introduction

By 2050, more people in sub-Saharan Africa (SSA) will live in urban areas than rural areas (United Nations, 2018). An increasing share of the shift in population dynamics will occur in secondary cities (Shifa & Borel-Saladin, 2018). Secondary cities are urban areas with less than 500,000 inhabitants (Christiaensen et al., 2013).

The growth of secondary cities occurs through a number of mechanisms, including rural-to-urban migration (Boadi et al., 2005). In general, migration from a rural area to a secondary city is associated with a statistically significant reduction in poverty, as compared to migration to large, primary cities (Christiaensen et al., 2013). However, secondary cities often feature low public service provision and poor infrastructure (Cohen, 2006). This can create challenges to the livelihoods of recent migrants upon moving to an urban area. Recent migrants often settle in low-income residential areas far from the city center (Peyton et al., 2015). Low-income residential areas typically feature poor service provision (Cobbinah et al., 2015; Cohen, 2006), which can lead to increases in urban poverty et al., 2018). The situation is compounded by chronic high unemployment rates (Crush & Frayne, 2010). Lacking sustainable economic opportunities, recent migrants face challenges finding and maintaining employment (Cobbinah et al., 2015). These challenges may spillover to other aspects of their lives, such as food security. Previous research suggests urban food security is worse for households of recent migrants (Crush, 2013).

Due to the relationship between rapid urbanization, spatial expansion of cities, and the inability of governments to ensure basic services, understanding how migration is associated with urban food security is important. We ask, how does the food security status of recent migrants and those living in the city for longer differ in a secondary city? Are there spatial patterns to the differences in food security outcomes throughout Mumbwa?

Background

Urbanization is defined as an increased share of the population of a nation living in urban areas (Tacoli et al., 2015). The process can occur through natural birth rate increases, physical expansion of cities and reclassification of rural areas, and rural-to-urban migration (Boadi et al., 2005; Shifa & Borel-Saladin, 2018; Tacoli et al., 2015). Rural-to-urban migration is of particular interest for food security research as rural-to-urban migration is often linked to pursuits of better economic opportunity (Cobbinah et al., 2015; Flahaux & De Haas, 2016; Guedes et al., 2009). Urbanization traditionally leads to higher

standards of living, but this has not occurred in SSA. Unfortunately, this is also one of the regions in the world undergoing the greatest population transition (United Nations, 2018).

Rapid urbanization creates numerous challenges for regional policymakers. In the Global South, urbanization tends to lead to spatial extensification, rather than intensification (Cobbinah et al., 2015; Crush et al., 2018; Nagendra et al., 2018). Spatial extensification of urban centers is driven in part by the rapid settlement of spontaneous settlements (Nagendra et al., 2018). As new residents migrate to urban centers, they tend to settle in sprawling residential areas away from the city center (Peyton et al., 2015). This creates a disjointed, checkerboard pattern of urban development (Nagendra et al., 2018). Spatial extensification in this manner can drive increased urban poverty and affect multiple aspects of urban livelihoods (Cobbinah et al., 2015).

Perhaps the most pressing challenge for recent migrants in urban SSA has to do with low employment opportunities. The region faces chronically high unemployment rates (Crush & Frayne, 2010). Most migrants to urban areas in SSA unemployed or unable to maintain employment (Cobbinah et al., 2015). In the absence of formal or steady employment, low-income urban residents, including recent migrants, often attempt to to ensure their livelihoods through casual labor opportunities (Boadi et al., 2005). The casual labor market and informal economy are characterized by periodic labor opportunities, unstable income, and limited interactions with formal labor regulations (Bargain & Kwenda, 2011; Valodia et al., 2006). The limited access to sustained employment for low-income urban residents is a considerable challenge in attaining urban food security (Crush & Frayne, 2010). Crush et al. (2012) find a significant association exists between food insecurity and households with more casually employed members. Unpredictability of the casual labor market and the informal economy can drive higher rates of food insecurity (Cohen & Garrett, 2010). The casual labor market and informal economy operate largely through cash-based transactions. Declines in income or increases in food prices can consequently affect the food security of low-income urban residents (Tacoli, 2017).

We use the term urban food security to describe the broad phenomenon; however, urban food accessibility is a more apt term in the context of this paper. Food security is not caused by shortfalls in the availability of food, but rather accessibility to food (Sen, 1981). In the urban context, food accessibility is the result of the spatial structure of the city, patterns in employment, and the food system of the city (Battersby, 2012; Christiaensen et al., 2013). These three aspects create unique challenges in the attainment of food security for recent migrants.

Rapid urbanization has led to settlement patterns that feature long traveling times (Nagendra et al., 2018). This creates difficulties for urban consumers to procure food from the supplier types they wish, challenges in finding time to cook what they want, and can hinder accessibility to employment opportunities. These challenges are especially prevalent for recent migrants. Past research from multiple

countries in Southern Africa finds notable differences in food accessibility between recent migrant households and those that have lived in urban areas for longer (Crush, 2013).

The local food system can improve the food security of such groups if the system is broad in terms of food supplier types and quantities of food sold (Battersby & Watson, 2018). Typical urban food systems in SSA feature a wide range of food suppliers that operate at different scales (Blekking et al., 2017), and offer food types at varying prices throughout a city (Tacoli, 2017). Functional food systems aid in the attainment of individual and household food security. For low-income urban consumers, However, the structure of the local food system can create a disparity between the location of particular suppliers and urban consumers. Explicit consideration of the spatial factors of urban food security been neglected throughout the Global South (Battersby, 2012). Consideration of spatial components will allow for an improved understanding of the food system and how it relates to food security.

Data

We analyze data collected from 135 households in Mumbwa, Zambia, during June 2019. Mumbwa is located in the western extent of the Central Province of Zambia, about two hours west of Lusaka, the national capital. Technically, the city is 36 square kilometers, however the settled portion of the city is about 10 square kilometers. Households were sampled using a stratified area random sampling technique within low- and low-middle income residential areas (Figure 1) (Montello & Sutton, 2006). Residential areas were selected through consultation with the Mumbwa City Council's Urban Planning Office of the Mumbwa City Council. Sampled residential areas represent both formally-designated and informally-established residential areas. We sampled a minimum of 30 households in each residential areas in order to ensure geographic distribution across areas of interest throughout the city.

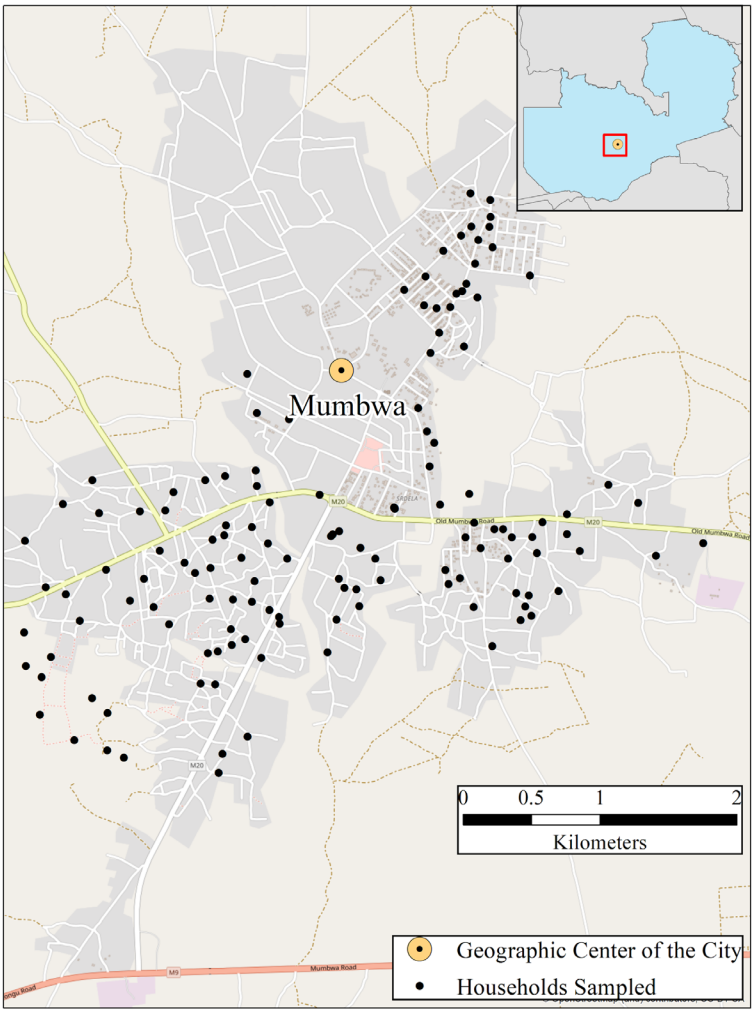

Figure 1: The spatial extent (gray area) of Mumbwa, and the households sampled during data collection in Mumbwa, Zambia, during June 2019. N=135.

During administration of the survey, one household member over the age of 18 and with working knowledge of the household and its members responded to the survey. There were instances when multiple household members were present. We asked the primary respondent of the survey a battery of questions regarding the demographic composition of the household, inter-household relationships, employment opportunities, and food purchasing and consumption behavior.

To measure household food accessibility and related anxiety we use a reduced version of the Household Food Insecurity Access Scale (rHFIAS). The complete HFIAS was developed by the United States Agency for International Development's Food and Nutrition Technical Assistance (FANTA) Project. The measure is designed to quantify experiences with and responses to food insecurity by individuals and households (Coates et al., 2015). Multiple studies have used HFIAS to measure urban food access in Sub-Saharan Africa (Crush et al., 2012, 2018; Riley et al., 2018). We opted to use a reduced version after consultation with local research assistants who felt a concise battery of questions

would provide a more culturally appropriate measure, without compromising the basic premise of the metric (Table 1). Responses to rHFIAS are "never (0 times)", "rarely (1-2 times)", "sometimes (3-10 times)", or "often (more than 10 times)". The metric is a composite scores with each answer having an assigned value based on the severity. For example, a response of "never" receives a score of 0, while a response of "often" receives a score of 3. The assigned values are then added together to form the rHFIAS. Lower values represent food access, while higher values represent poor food access. The measure is asked in the context of the past four weeks.

Table 1: Questions included in rHFIAS.

Question 1	In the past 4 weeks, how often did you worry that your household would not have enough food?
Question 2	In the past 4 weeks, how often did any household member have to eat a smaller meal than they felt they needed because there was not enough food?
Question 3	In the past 4 weeks, how often did any household member have to eat fewer meals in a day because there was not enough food?
Question 4	In the past 4 weeks, how often did any household member have to eat foods that they really did not want to eat because of a lack of resources to obtain other types of food?
Question 5	In the past 4 weeks, how often did any household member go through a whole day and night without eating anything because there was no food?

It is important to mention that FANTA developed HFIAS to measure food accessibility and related anxiety in rural areas. No metrics currently exist for the measurement of household urban food security. In the absence of an urban-developed measurement, stakeholders opt to use experience-based metrics, such as HFIAS. These are assessments that attempt to capture the lived experience of household food security (Jones et al., 2013). Specifically, the metrics identify challenges related to food accessibility in the past and what households *did* when accessibility is poor or non-existent. This type of measure is appropriate for urban areas, so long as 1) the metric is well-grounded in the understanding of food insecurity in an area; 2) its performance is consistent with that understanding; 3) it is reliable and accurate across all sampled individuals/households (Gonzalez et al., 2008).

Methods

In order to investigate the food security status of recent migrants and those living in the city for longer, we partitioned the global sample into three groups. Sampled individuals were grouped based on whether they migrated to Mumbwa since 2014, before 2014, or had never migrated. We then used a simple analysis of variance (ANOVA) to examine whether the three migrant groups have significantly different rHFIAS values.

ANOVA provides information on whether statistically significant differences exist between the groups of residents, but does not provide insights into the associations between individual and household

characteristics and rHFIAS. We use a negative binomial regression to model rHFIAS and these associations, similar to that of Tuholske et al. (2018). The reduced HFIAS is treated as a count variable because it is the summation of the frequency of occurrences of categorical answers. While the number of zeros is inflated, we do not assume the zeros are the result of different underlying processes. Therefore, a negative binomial model is appropriate for this analysis.

For independent variables in the model we include a vector of demographic, economic, and social variables. In the vector of economic variables, we include an asset index. The asset index is comprised of variables owned by the household. We use the asset index as a proxy for income, because data on household income is difficult to accurately collect as a result of recall bias or privacy concerns by the respondent (Jones et al., 2013). The asset index is constructed through principal component analysis (PCA) as developed by (Filmer & Pritchett, 2001).

To investigate spatial patterns in the differences of urban food accessibility, we use the fitted values from the negative binomial regression to identify statistically significant spatial clusters of higher (lower) rHFIAS values. We use the Kulldorff spatial scan statistic to conduct cluster analysis. Kulldorff's spatial scan statistic uses a variably sized circular window that moves across the study area to identify statistically significant geographic clusters of higher (lower) than expected outcomes (Kulldorff, 1997).

Results

In Mumbwa, 66 respondents stated they migrated to the city at some point in time. Of this group, 35 migrated from another urban area, while 28 migrated from a rural area. During migration, it was not common for a respondent to move on their own (7 of 66; 11%). Instead, 41 (62%) respondents reported moving with the entire household, 17 (26%) reported moving with some of the household, and 1 (2%) respondent reported not knowing. Of the three migrant group categories, Group 1 (N=70) had a mean rHFIAS value of 5.67 and a standard deviation of 3.99. Group 2 (N=29) had a mean rHFIAS value of 3.69 and a standard deviation of 3.14. Group 3 (N=36) had a mean rHFIAS value of 4.36 and a standard deviation of 3.51 (Figure 2)

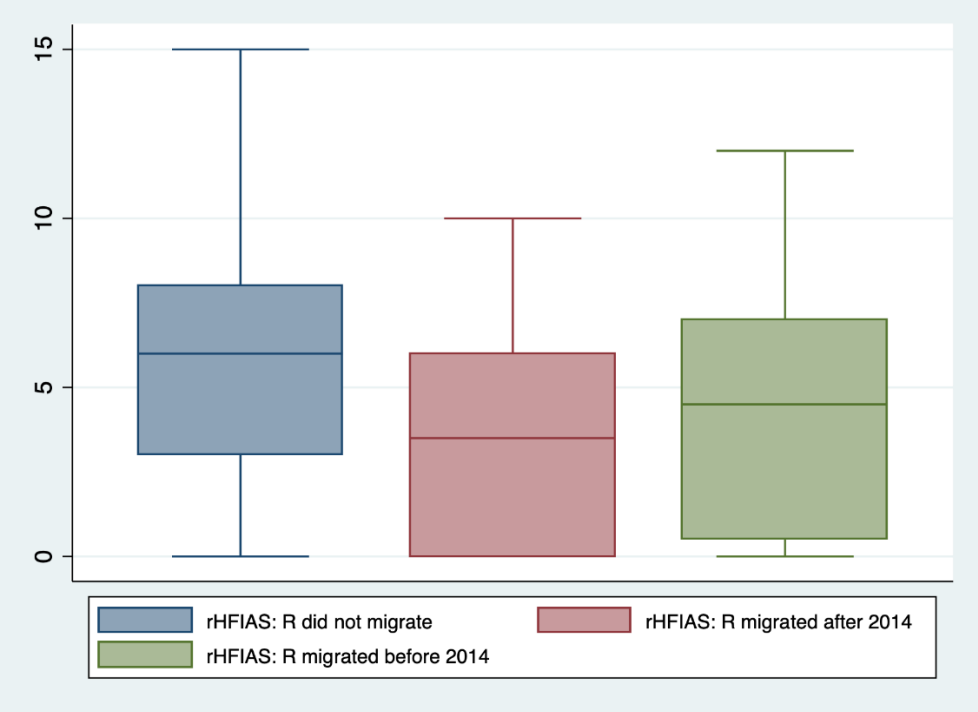

Figure 2: Box plot of rHFIAS values by migration group

Below we report descriptive statistics of household- and individual-level variables by migration group categories of the respondent (Table 1). Non-migrant households (Group 1) have the highest average rHFIAS (5.67) and the lowest asset index score. Those that migrated since 2014 (Group 2) have the highest total number of individuals that have joined the household in the last year, on average. This group also reports the lowest access to a farm. However, this same group has the highest average of total wage earning household members. Group 3, those that migrated before 2014, have the highest average number of household members and the lowest average total number of household members that are casually employed.

Table 2: Descriptive Statistics of Model Variables by Migration Group

Variable	Group 1 Mean	Group 1 SD	Group 2 Mean	Group 2 SD	Group 3 Mean	Group 3 SD
rHFIAS	5.67	3.99	3.69	3.14	4.36	3.51
Asset Index	1.35	1.76	1.74	1.77	1.68	1.34
Farm Access (1=yes)	0.40	0.49	0.17	0.38	0.58	0.50
Total Number of HH Members	5.47	2.49	4.76	1.68	6.22	2.68
Total Number of HH Members that Joined in Last Year	0.29	0.66	0.38	0.82	0.22	0.59
Total HH Members Earning Wages	0.39	0.62	0.59	0.68	0.53	0.70
Total HH Members Employed with Casual Labor	0.16	0.40	0.24	0.51	0.11	0.40
Total Number of HHs Borrowed From that are Family	0.34	0.74	0.14	0.44	0.44	1.23
HH Received Monetary Remittances (1=yes)	0.23	0.42	0.24	0.44	0.33	0.48
Number of Times in Past 14 Days HH Has Purchased from Food Seller on Road	7.21	5.83	4.35	5.20	4.44	5.58
Number of Times in Past 14 Days HH Has Purchased from a Public Market	5.93	5.29	5.72	5.02	4.58	4.73
Number of Times in Past 14 Days HH Has Purchased from a Grocer	5.24	4.98	4.41	4.64	5.25	4.74
Group 1 - Non-migrants (N=70); Group 2 - Migrated Since 2014 (N=29); Group 3 - Migrated Before 2014 (N=36) **Total N: 135**						

ANOVA results show statistically significant variance between the rHFIAS values of the three groups ($F<0.05$). Group 2 and Group 3 have significantly lower rHFIAS values than Group 1, the reference category ($p<0.05$ and $p<0.1$, respectively). After using ANOVA, we used Tukey's Method to validate these results. We find significant differences between the mean differences between Group 1 and Group 2 ($p<0.05$), but not between any combination of the other groups.

From our analysis using the negative binomial model we find statistically significant associations between rHFIAS and the household asset index, household access to a farm, which migrant group the respondent is associated with, the total number of wage workers in the household, and the number of times in the past 14 days the household has purchased from a food supplier on the road. We report only the marginal effects and standard errors of our analysis using the negative binomial model (Table 3).

Table 3: Negative Binomial Regression Results

	Marginal Effect		SE
Asset Index	-1.122	***	0.265
Farm Access (1=yes)	-1.319	***	0.560
Total Number of HH Members	0.171		0.117
Total Number of HH Members that Joined in Last Year	0.632	*	0.359
Total HH Members Earning Wages			
Total HH Members Employed with Casual Labor	-1.216		0.663
Total Number of HHs Borrowed From that are Family	-0.565		0.648
HH Received Monetary Remittances (1=yes)	-1.692	***	0.531
Number of Times in Past 14 Days HH Has Purchased from Food Seller on Road	-0.484		0.687
Number of Times in Past 14 Days HH Has Purchased from a Public Market	-0.148		0.411
Number of Times in Past 14 Days HH Has Purchased from a Grocer	0.687		0.764
Asset Index	0.081	*	0.047
Farm Access (1=yes)	-0.061		0.056
Total Number of HH Members	0.060		0.058
N = 135			
Chi2 <0.001			

Note: *p<0.1, **p<0.05, ***p<0.001
[t]Non-migrants used as the reference category

We find household food access is significantly associated with household assets. An increase of 1 on the household asset index significantly lowers rHFIAS by more than one point ($p<0.01$), holding all else equal. A reduction in rHFIAS values represents improved food access, a critical aspect of food security. Although we do not measure purchasing power or income directly, our use of an asset index as a proxy measure corroborates past research that finds urban food security is closely associated with purchasing power.

Our analysis finds that possessing access to a farm or plot of land for the production of food significantly lowers rHFIAS by approximately 1.3 points, or nearly 9% ($p<0.01$), holding all else equal. This finding suggests rural-to-urban linkages, both physical and social, may contribute substantive improvements to the urban food security of individuals and households.

The future of these types of links and their marginal effects may be reduced as a result of urban area expansion. Our analysis does not differentiate between the proximity of the rural farm to the urban households, but the results are substantial given that as secondary cities increase in their spatial extent more agricultural land will be converted to urban areas. This type of expansion may dispossess some urban residents from important resources for food provision.

Considering household composition, we find an increase of one additional household member in the last year is significantly associated with a marginal increase of rHFIAS by six tenths of a point ($p<0.1$), holding all else equal. The phenomenon of multi-sited households involves the location of individuals across separate locations but within the same overall household (Padoch et al. 2008). Multi-sited households also provide important nodes of opportunities for people, and important social safety nets in terms of food and money reallocation between sites. Like the variable for access to a farm, our survey does not differentiate between whether recent household members come from inside or outside of Mumbwa. However, the results are substantively important to our overall understanding of migration patterns and their association with urban food security.

The total number of wage workers in the household is significantly associated with a lower rHFIAS score. The addition of one wage worker in the household is associated with a 1.7 reduction in HFIAS ($p<0.01$). A two point reduction in HFIAS equates to a reduction of about 11% of the total possible rHFIAS score. Urban areas throughout SSA must contend with growing populations and chronically high unemployment rates. Our findings illustrate the importance and value of wage employment in the attainment of food access and food security in urban areas. Although out analysis does not illustrate the negative association between (r)HFIAS and casual labor that past research has found, the large magnitude of wage employment illustrates that above all else, frequent, steady employment is strongly associated with increased food security.

A statistically significant association exists between rHFIAS and the number of times the household visits food sellers along the road during the past 14 days. An increase of one visit during that time period increases rHFIAS values at the margins by about one tenth of one point ($p<0.1$), holding all else equal. These findings are similar to those of Riley et al. (Riley et al., 2018), which state food insecure household most often visit roadside food suppliers and other smaller or informal food suppliers, as compared to food secure households. This finding strengthens the importance of ensuring equity within the local food system, in order to ensure that all residents are able to procure necessary food. Limiting the ability of roadside vendors to operate will likely create a food system that excludes the more food insecure.

The negative binomial model confirms the results of our ANOVA analysis. We find the period during which the respondent interviewed migrated to Mumbwa has mixed associations with rHFIAS. We use respondents that have not migrated to Mumbwa as the reference category. Respondents that migrated to Mumbwa since 2014 are associated with significantly lower rHFIAS values, in comparison to non-migrant respondents ($p<0.05$). There is no statistically significant difference in rHFIAS values between non-migrants and those that migrated before 2014, holding all else equal.

Our spatial analysis indicates two statistically significant clusters of households (Figure 3). The largest cluster contains 32 households that have higher than average rHFIAS values. The mean rHFIAS values inside the cluster is 7.531, while outside the cluster the mean rHFIAS is 4.078 ($p<0.01$). The cluster to the east is smaller with 30 total households. This cluster has an in-cluster rHFIAS mean of 2.433 and an out-cluster rHFIAS mean of 5.60 ($p<0.05$). Neither cluster is located close to or contains the central public market or the central business district. The cluster to the west is located in an unplanned informally settled area, while the cluster to the east is located partially in a formally settled area.

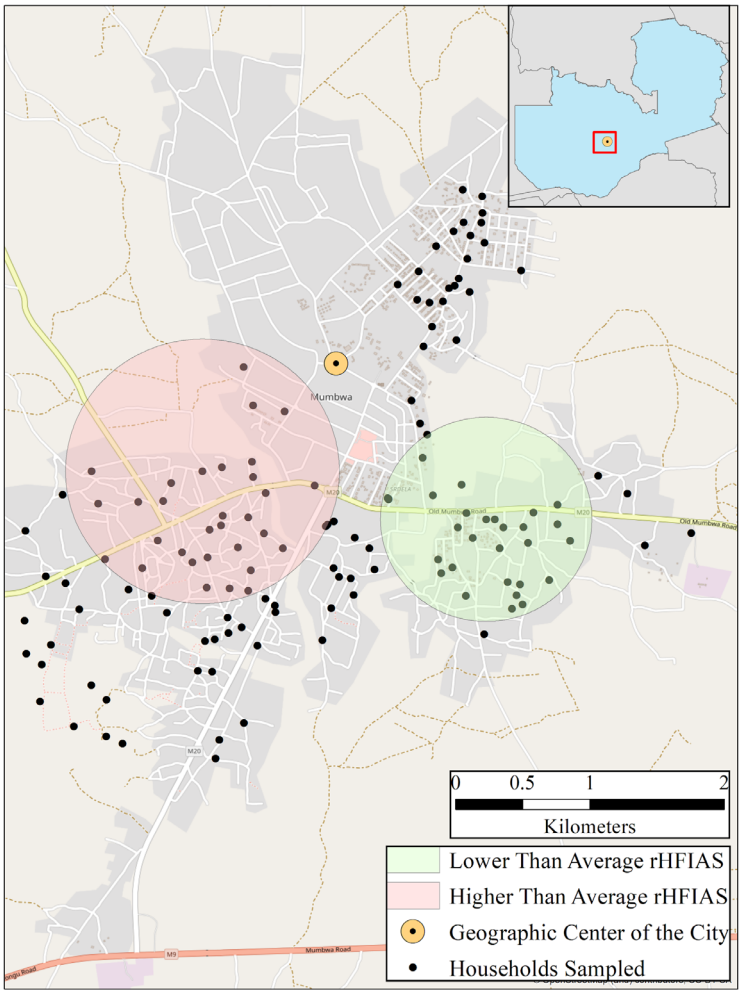

Figure 3: Clusters of lower than average rHFIAS values (at left) and higher than average rHFIAS values (at right).

Discussion

Our findings highlight the association between migration patterns, urbanization, and access to food in secondary cities. As rapid urbanization continues throughout SSA, an increased understanding of urban food security and its relation to other pertinent phenomenon is important. These findings provide important contributions to the literature on urban food security in secondary cities, and the relationship between migration and food security.

We acknowledge our use of a single case study cannot begin to parse out all of the spatial complexity inherent within urban food security. However, the presence of two distinct clusters of food security is substantive. These findings suggest poor food security outcomes in more recent, unplanned areas of the city. The clusters are located near the periphery of Mumbwa, but large areas of the city periphery are not included in these clusters. This finding highlights the spatial complexity of urban food

security. As cities grow, local food systems must grow in parallel in order to meet the food security needs of residents. Unfortunately, urban food systems are not explicitly planned for in SSA (Battersby, 2017). Lack of food systems planning can lead to a number of food security-related problems, such as obesity and micronutrient deficiency (Battersby & Watson, 2018). However, planning for food systems can negate these challenges. Planning for food systems can increase access to a variety of food suppliers that operate at varying scale and levels (Blekking et al., 2017), which is needed to meet the needs of urban residents across the socio-economic spectrum.

Accessibility to different food suppliers depends on income, social status, and spatial characteristics (Battersby, 2012; Demmler et al., 2017). The absence of food system planning disproportionately affects low-income urban residents, as this group relies more heavily on broad, diverse food systems to meet their food security needs (Battersby & Watson, 2018). In unplanned, rapidly settled areas on the periphery of cities, the local food system often meets local demand through informal food suppliers (Blekking et al., 2017). Low-income residents are especially reliant on the informal sector for food needs (Skinner and Haysom 2016). Stakeholders could address urban food security by bringing food security to regional and planning initiatives (Crush & Riley, 2018).

Policymakers and other stakeholders could mitigate the challenges associated with food security through direct planning of food systems. Currently, governance of food systems typically focuses on production and ensuring availability (Delaney et al., 2018). Less exists on the governance of food distribution and consumption within food systems (Delaney et al., 2018). Not considering the governance of food distribution and consumption may create spatial gradients of food insecurity across the city.

For recent migrants to cities, settling in unplanned residential areas far from the city center creates unique challenges attaining food security. Like other low-income urban households, recent migrants must contend with poor economic conditions and maintaining social support structures. In lieu of few economic opportunities urban residents may leverage social ties to ensure their food needs are met and economic hardship alleviated (Crush, 2013; Tacoli et al., 2015). Urban households in the Global South are often a part of a complex web of interconnected households that maintain social ties in order to provide and receive support to one another (Frayne, 2005; Padoch et al., 2008). Support to urban households can take multiple forms and can provide vital social safety nets for ensuring food security.

Maintaining social ties to rural areas allows for the movement of resources and individuals from rural areas to urban centers for multiple purposes, such as educational or employment opportunities (Eloy et al., 2015; Tacoli, 2017). However, the same social ties that improve food security can also hinder livelihoods. Joining a household may provide more opportunities for the recent migrant, yet at the bare minimum this action can strain the ability of those receiving the additional individual to meet their own

food needs. This finding is related to previous literature that states urban households can often deplete their resources through efforts to maintain urban to rural linkages (Tacoli et al., 2015).

Into the future it is possible trans-household resource circulation behaviors may be affected by climate change. Climate change is expected to negatively affect growing conditions throughout much of SSA (Cline, 2008; Funk et al., 2008; Jones & Thornton, 2003). Specifically, climate change is expected to increase temperatures and decrease rainfall (Battisti & Naylor, 2009; Funk et al., 2008). Decreased rainfall patterns can significantly increase urbanization trends in SSA (Barrios et al., 2006). The effects of climate change on local growing conditions around cities like Mumbwa may increase local food prices. Increases to food prices disproportionately affects low-income urban consumers (Tacoli, 2017). Additionally, decreases in rural growing conditions may spur more temporary or permanent migration from rural-to-urban areas. These changes may also reduce the association between maintaining connections to a farm and food accessibility.

Conclusion

Migration patterns in the region have contributed to the spatial expansion of cities in SSA, which has created multiple food security-related challenges. One of the challenges deals with the rapid expansion of cities and strain on local food systems to meet the food needs of all urban consumers, including low-income urban residents and recent migrants. These groups often face employment challenges and feature lower purchasing power, which is necessary for ensuring urban food security. However, these groups also maintain substantial rural-to-urban links that can help to mitigate food insecurity.

Our study also highlights the spatial complexity that underlies the phenomenon of urban food security and the local food system. Urban food security is s spatially heterogeneous phenomenon, with residents throughout a city facing variable food security outcomes. These results illustrate the complex challenge policymakers face in addressing urban food security, due to the spatial, economic, and social complexity of the phenomenon.

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