

Formal/Informal Employment and Urban Food Security in Sub-Saharan Africa

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Abstract: Sub-Saharan Africa (SSA) is expected to add nearly 800 million urban residents by 2050. Due to this rapid urban population increase there is an urgent need to understand the drivers of urban food security across the region. Understanding food security in an urban environment is difficult due to the complexity of the relationships between urban consumers and food suppliers. Unlike rural communities, urban residents produce little of their own food, and are largely reliant on food suppliers to meet their dietary needs. Identifying urban food insecure households is further complicated by the lack of food security metrics specifically designed for the urban context. We use household-level data from 718 low-income households in Lusaka, Zambia, to assess urban food security through two measures, the Food Consumption Score (FCS) and the Coping Strategies Index (CSI). Our assessment investigates the association between food security and different employment types across the city, with particular attention paid to spatial variance of outcomes and statistical differences between households with majority formal or informal employment. Our study reveals three substantial findings. First, we find statistically significant differences in FCS and CSI of households predominantly engaged with formal employment over households engaged in informal employment. Secondly, we find significant associations between purchasing food from informal and formal food suppliers and the use of coping strategies and consumption of higher calorie foods. Lastly, we identify substantial challenges in using FCS and CSI to evaluate urban food security. Both metrics are predicated on underlying assumptions that may not accurately represent household food consumption and coping strategies in urban areas of SSA.

Keywords: informal employment; urban food security; urban food systems; urbanization; Zambia; Sub-Saharan Africa

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1 Introduction

For urban households in Sub-Saharan Africa (SSA) the path to sustained urban food systems and food security is an ongoing challenge for three reasons. First, recent debates have highlighted the importance of examining food systems as a sum of all parts (Erickson, 2008; Karg et al., 2016). As food security is not solely the result of an ensured availability of food, food systems are not simply the product of producers selling to consumers. Second, the vast majority of previous research on food systems and food security in SSA have focused on rural communities and neglected the phenomenon in urban areas (Crush & Riley, 2018). Third, food systems in urban centers in SSA must rapidly evolve to keep pace with their changing populations. By 2030 nearly 670 million people will live in the urban centers in SSA (United Nations, 2018) and more Africans will live in urban areas than rural areas (Crush et al., 2011).

Urban households in SSA typically purchase the majority of their food (Crush et al. 2010), thus their food security is associated with income derived from employment and urban food systems that feature affordable food suppliers across the entire city. When considering the relationship between urban food systems and household food security, explicit consideration of food accessibility is vital. Urban food accessibility is largely the result of affordability.

Through the use of primary data collected during March and April 2017 in Lusaka, Zambia, we examine how low-income households interact with the food system in Lusaka and the extent to which they are able to attain a consistent supply. We ask two interrelated questions: 1) What is the relationship between low-income urban residents involved in formal, informal, and self-employment and household food security; and 2) How does the measurement of urban food security differ between different employment types? To answer both of these questions, we use the Food Consumption Score (FCS) and Coping Strategies Index (CSI) as indicators of food

security. FCS directly measures food consumption and accessibility, but assumes some level of food unavailability. CSI evaluates the use of coping strategies when food availability and accessibility is limited. But, the index is predicated on the existence of inter-household social safety nets and a predetermined scale of strategy severity. Used on their own, neither metric is wholly correct for assessing urban food security. However, by using these metrics together, we can investigate the relationship between food group consumption and the use of coping strategies.

1.1 Food Security and Food Systems

Urban food systems have the potential to positively or negatively impact the quality of life of residents (Pothukuchi & Kaufman, 1999), including the food security of urban consumers. Much of the previous food security research in SSA, as well as efforts to evaluate and improve food systems in the region, has focused on rural communities through a focus on increased productivity (Crush & Frayne, 2010). Conceptually a focus on rural communities presumes that increases in rural production will increase local food supply. As supply increases the overall prices for food commodities that urban consumers pay to meet their own food needs decreases. The encouragement and pursuit of policies and interventions to improve rural production has made urban food security subordinate to rural food security (Frayne et al., 2010; Maxwell, 1999a). Not until price spikes or food shortages reach critical mass do policymakers think about intervening on the urban front (Maxwell, 1999a). This type approach fails to consider urban food security as a function of the overall food system (Maxwell, 1999b), including the complex human-environment interactions that allow for the growing, processing, dissemination, and consumption of food by individuals (Ericksen, 2008). Researchers, policymakers, and other stakeholders struggle to understand how to best identify and frame issues surrounding food security and food systems.

In SSA, urban food systems are comprised of suppliers that exist at local, regional, and international levels, and operate as nodes in a complex system serving a diverse consumer base (Battersby & Watson, 2018). Within an urban area, food systems can vary considerably through the diversity of suppliers operating across space within the varying residential areas (Blekking et al. 2017). Spatial inconsistency of food supplier availability can lead to variable food security outcomes (Battersby and Haysom, 2018). Understanding the interplay between growing cities and evolving food systems, and how this enables or hinders urban food security, is a considerable challenge made all the more confounding by heterogeneous food security outcomes.

Food insecurity is typically the result of a lack of access to food by individuals, rather than complete unavailability of food (Sen, 1981). Accessibility to food in urban centers is achieved through purchasing power derived from income and ensured through employment. Formal employment is a challenge for low-income residents in SSA to secure. As a result, many rely on the informal labor sector for employment and income (Maxwell et al., 2000; Hart, 1973). The differentiation between the two sectors stems from their interaction with formal regulations (Valodia et al., 2006). One form of employment is not inherently preferable over another (Hart, 1973). It is possible for residents working in the informal employment sector to earn similar wages to those in formal employment. It is also possible for those engaged with informal employment to achieve high food security. However, an association exists between low food security and households with more casually employed members (Crush et al., 2012). This association may be the result of the inherent challenges informally employed residents face as a result of their lack of interaction with formal regulations. For instance, the informal sector

typically does not offer ensured job security, regulated safety nets, or other protections ensured by the state (Sparks and Barnett, 2010). Informally employed individuals also face considerable challenges due to the irregularity of income, compared to self-employed and formally employed individuals (Bargain & Kwenda, 2011; Maxwell et al., 2000).

Two separate branches of employment exist within the informal sector. First, those that operate informally within informal enterprises and those that operate outside of informal enterprises (Valodia et al., 2006). The latter group is comprised of casual laborers, maids, and other forms of labor-intensive employment (ibid), and often relies on cash incomes. Those involved in the latter group may constitute the most at-risk for food insecurity as they face the challenge of inconsistent income that households with members employed in the formal sector, where income is regular, do not (Crush and Frayne, 2010; Mougeot, 1999). The inability of a household to ensure employment that provides a sustained livelihood constitutes the primary challenge in ensuring urban food security (Crush and Frayne, 2010). Inconsistency of income for informally employed households threatens food security as a result of food demand holding relatively constant throughout the year, while income fluctuates. Periods of underemployment, when a person does not have enough paid employment, result in stretches of decreased income and potentially decreased accessibility to food. When this happens, households may use coping strategies as a way to mitigate food insecurity (Barrett, 2002).

Urban households rely on an assortment of food suppliers to meet their dietary needs (Battersby & Watson, 2018). Food suppliers range in scale of operations, spatial distribution, and market share. Supermarkets have the greatest diversity of products, often available at the lowest unit prices (Battersby, 2017), and are growing their market share, as they are able to achieve economies of scale (Battersby & Watson, 2018). Residential areas typically have small shops and grocers that supply assorted processed foods, and a public market for consumers to purchase fresh foods (Blekking et al., 2017). Low-income households most often rely on public markets and the informal sector, particularly street vendors, a sub-group within the informal food sector (Crush et al., 2011). Vendors that sell within public markets governed by the municipality are considered formal food suppliers by the state, while street vendors are considered informal because they sell outside of designated market areas. For low-income urban residents, maybe no food supplier is as important and critical to ensuring accessibility to food than street vendors (Battersby, 2017). Street vendors are ubiquitous throughout the cities of SSA.

Despite prior research focused on the relationship between food purchasing behavior, accessibility, and urban food systems, the role of employment is less understood regarding urban food security in SSA. We investigate the relationship between different types of employment, food suppliers, and household food security. Because employment varies across households as a result of the type and frequency of employment, understanding household employment characteristics is imperative in light of the rapid urbanization occurring throughout SSA.

2 Material and methods

2.1 Study site and sampling design

We present results from household-level analysis in Lusaka, Zambia, to investigate the urban food security of low-income residents in moderate-sized cities of SSA. Lusaka is home to slightly more than 1.8 million people, about one-third of the total urban population in Zambia (CSO, 2012). Lusaka has a mixture of more than 60 formally-designated and informally-established residential areas. Like other moderate-sized African cities, the food system of Lusaka consists of an assortment of supermarket chains, public markets, private grocers, and street

vendors (Blekking et al., 2017; Mason & Jayne, 2009). Residents in cities like Lusaka often visit multiple vendors in a single week to purchase food, with differences in consumption patterns and the types of vendors frequented by the different socioeconomic classes (Battersby and Watson 2018).

2.2 Data

We analyzed data from 718 households collected in March and April 2017 from the Lusaka Household Food Security Survey. Households were selected using a stratified area sampling approach within 18 residential areas (Montello & Sutton, 2006) (left map in Figure 1). Low-income residential areas were selected based on median incomes from a list of residential areas provided by the Lusaka City Council. We focused on low-income residential areas as past research that shows households within these areas are more likely to face food insecurity as a result of low purchasing power (Crush & Frayne, 2010). We sampled both formally-designated and informally-established residential areas. During our survey, one individual over the age of 18 from each household responded to the survey. We interviewed individuals only if they had knowledge of the food purchasing behavior of the household, employment status of working household members, and basic household characteristics. Those that did not have in-depth knowledge of the employment and income of other household members were not interviewed. The respondent was asked a series of questions regarding economic, demographic, and food consumption trends for the household. The respondent was also asked to provide information on the top five wage earners in the household, namely the type and frequency of employment and income earned.

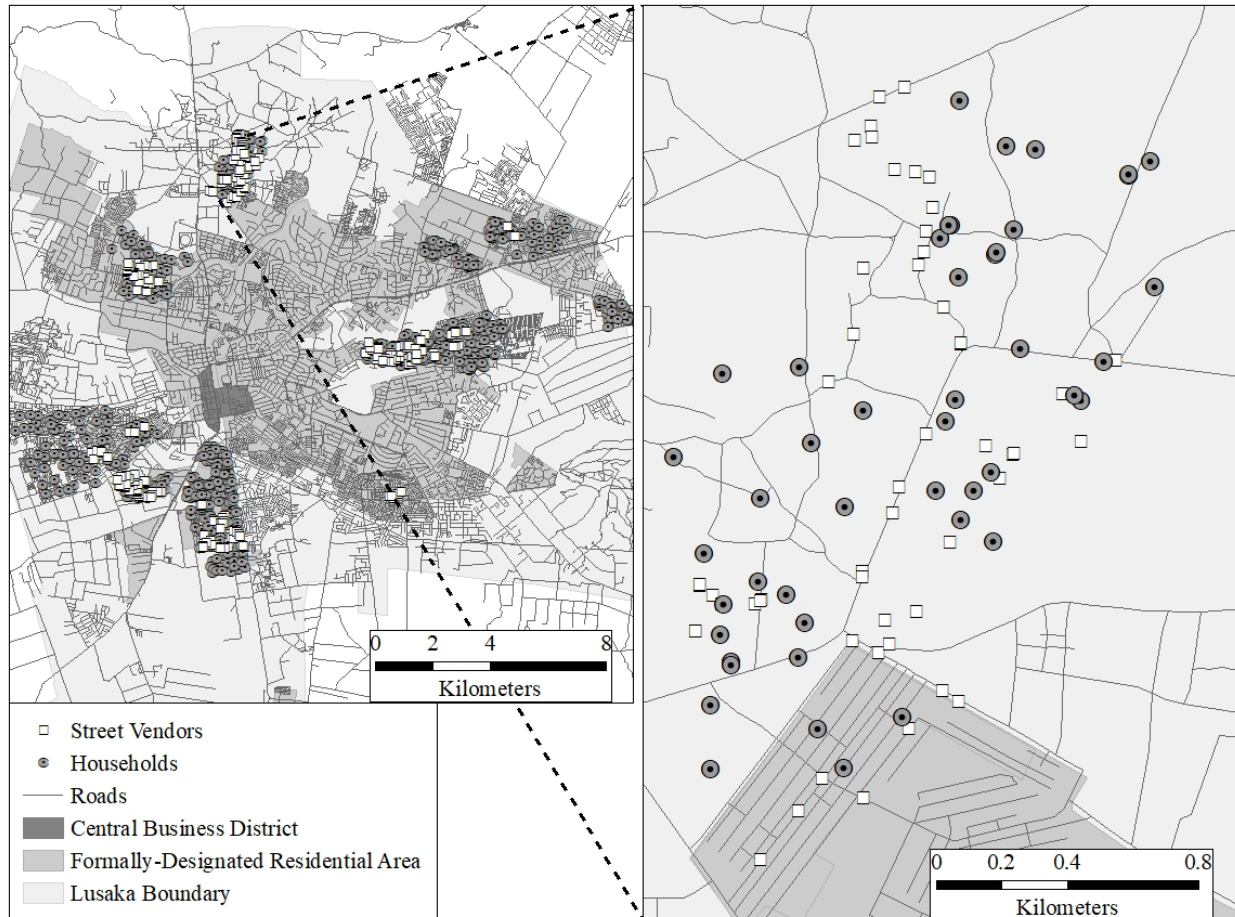


Figure 1: Households and street vendors surveyed during March and April 2017 data collection in Lusaka, Zambia (at left), as well as a subset of respondents from the Kabanana residential area (at right).
 Source: 2017 Lusaka Household Food Security Survey

No single indicator or measure of food security is perfect for understanding or contextualizing all that encompasses food security in either rural or urban settings. Rather, multiple measures of food security are used to understand slightly different aspects of the issue (Barrett, 2010; Vaitla et al., 2017). For this reason, we use two food security measures: the Food Consumption Score (FCS) and the Coping Strategies Index (CSI). Food security is a complex concept that requires a foundational understanding of basic consumption levels before more nuanced metrics may be used (World Food Programme, 2008). We use FCS as a dependent variable in order to create a baseline at which all households within this study may be examined from. FCS provides a means to capture dietary diversity, the frequency of food consumption, and the nutritional quality of food consumed (Cafiero et al., 2014).

When households fail to meet their food needs, they may use coping strategies in an effort to supplement their typical consumption behaviors. We then regress the same household characteristics to predict CSI, in order to identify the level of coping for households. By predicting the relationship between household characteristics and these two metrics we are able to understand how two related aspects of urban food security differ between households of varying socioeconomic and sociodemographic characteristics.

The United Nations World Food Programme (WFP) created the FCS in 1996 in order to rapidly assess rates of rural household food consumption in Southern Africa (World Food

Programme, 2008). The FCS is a composite score based on the frequency of consumption of a diverse group of foods (World Food Programme, 2008). The metric measures how many days out of the previous seven a household consumed a particular food item, providing a score of 0 to 7. Foods items are then grouped into categories (e.g tubers, vegetables, meats). Food groups consumed more than 7 times in a week are recoded as 7. Each food group is weighted based on caloric density. Weighted scores are added together to formulate a final FCS for each household. The minimum score possible is 0 and the maximum score possible is 112. Households with composite scores below a threshold of 21 are defined as having “poor” food consumption, between 21 and 35 is “borderline” food consumption, and households in excess of 35 have “acceptable” food security (World Food Programme, 2008).

The CSI was created in the early 2000s to rapidly assess food security by measuring behavior of individuals that are unable to access sufficient food (Maxwell & Caldwell, 2008). CSI is the summation of the number of days a series of coping strategies were used during a seven-day period, then a weight representing the severity of the strategy used is added to the number of days each coping strategy is used. Weights range from one to four, with four representing the most severe coping strategies. For example, the question, “In the past 7 days, has your household had to rely on less preferred and less expensive food?” receives a weight of one, while the question, “In the last 7 days, has your household had to skip entire days with eating?”, receives a weight of four. A lower composite score thus indicates less use of coping strategies. Because recall under the most favorable circumstances can be challenging to respondents, we modified CSI, by considering only whether the household used a strategy in the past week and multiply that answer by the weight, without consideration of the number of times used. The minimum score possible in our modified CSI is 0 and the maximum score possible is 20. A score of 0 represents a household used no coping strategies during the past 7 days, while a score of 20 means that the household used every coping strategy included in the index during the past 7 days.

Both indicators were developed to measure particular dimensions of food security in rural communities. Numerous articles address the shortcomings of food security metrics (Barrett, 2010; Jones et al., 2013), and the shortfalls of using rural-developed indicators within the urban context (Barrett, 2010; Haysom & Tawodzera, 2018; Tuholske et al., 2018). However, no metric has been developed specifically for use in an urban context. To fill this gap, we use indicators developed for rural food security measurement, but contextualize them through descriptive analysis of the households and food systems in which food suppliers and consumers interact. We then examine the determinants of the two food security measures in order to understand how household employment characteristics and household composition relate to the two food security outcomes. In our sample, FCS ranges from 16.5 to 102.5 with a mean score of 61.109, while the CSI ranges from 0 to 20, with an average of 1.174. We include a mixture of categorical and continuous variables in our model (Table 1 in Appendix A). During data collection, the exchange rate between the Zambian Kwacha and United States Dollar was K 9.3 to 1 USD.

To understand how employment is related to food security scores, we ask a series of questions about the top five income earners in the household. We categorize these household members in terms of employment categories that include formal, informal, and self-employed. Formally employed household member are employed by a formal entity and have an ensured paycheck. Informal employment is defined as household members in this category work periodically and the period is short-term, and the labor is often physical. Self-employed household members do not work for a formal entity, and the regularity of work ranges in scale

and frequency. For example, this group includes small business owners, street vendors, and landlords. In both models we estimate, we use the percentage of self-employed household members as the reference or base category.

Reliable household income is often difficult to capture. We use a household asset index to serve as a proxy for income. The index is calculated by evaluating the ownership of particular assets owned by more than 5% or less than 95% of all households. This index provides the first principal component for use in principal component analysis (PCA) (Filmer and Pritchett, 2001). A factor score is generated through PCA, which provides a continuous range of asset ownership. The factor score is then ranked from high to low and divided into quintiles. The average asset quintile is 2.97. For households with a majority formal employment, the mean asset index is 3.14. Households with a majority informal employment have the lowest mean asset index of 1.89. Households with a majority of self-employed individuals and a mixture of employment types have mean asset indices of 2.99 and 3.11, respectively.

Seventy-five percent of households are male headed. Household food expenditures are approximately K850 (\$91.40) per month and average food expenditures per capita are K43.92 (\$4.72). Households are, on average, composed of 5.54 individuals of which 1.59 members are employed. Households sampled contain about 0.9 dependents per working individual.

Households throughout Lusaka have a wide range of food suppliers to choose from. Food suppliers differ in their spatial distribution (Blekking et al., 2017), and in the quantities and prices of foods they offer to urban consumers (Battersby and Watson, 2018). Supermarkets offer the greatest diversity of products, but are fewer in number. Informal street vendors have the largest spatial coverage, but offer the fewest products. Shops or small grocers are in the middle in terms of distribution and diversity of products. On average, households visited street vendors about 4.2 times during a 14-day period, small shops and grocers about 5.2 times, and supermarkets 1.4 times in the same period.

We estimate two models using FCS and CSI. We estimate an ordinary least squares regression (OLS) to examine the relationship between household socioeconomic characteristics and the two food security metrics. Through OLS analysis we improve our understanding of the hindrances and opportunities faced by households in obtaining urban food security. Because we sampled only select residential areas during data collection, sampled households are clustered by residential areas throughout the city. In our analysis, we cluster model standard errors by residential area. This method allows observations between residential areas to remain independent but allows observations within the same residential areas to violate the assumption of independence.

Then, we conduct a simple analysis of variance (ANOVA) to examine differences in FCS and CSI by groups of majority employment type. We grouped households based on the predominant employment type: households with the majority of employed members in formal, informal, self-employed, and mixed employment (Table 1). Groups were determined through categorizing the percentage of employed household members in a given type of employment out of total working household members. The latter group is represented by households that have split employment. For example, a household of four working members with two members in informal employment and two members with jobs of formal employment. We validate ANOVA by using Tukey's test.

Table 1: Selected Descriptive Statistics of Employment Groups Used in ANOVA Regression

Employment Group	Freq.	Mean Household Members	Food Cost per Capita (Kwacha)	Mean Asset Index	Times Street Vendors Visited	Times Shop in Residential Area Visited	Times Supermarket Visited
Majority Formal	230	5.33	45.96	3.14	4.46	5.36	1.85
Majority Informal	61	4.57	47.55	1.89	3.87	5.54	0.64
Majority Self-employed	254	5.68	45.24	2.99	4.09	5.12	1.18
Mixed Employment	173	6.18	38.41	3.11	4.20	5.05	1.42

Source: 2017 Lusaka Household Food Security Survey

3 Results

Using the FCS thresholds designed by WFP, our sample contains 654 households (91.6%) with scores greater than 35, indicating they have “acceptable food consumption”. Within our sample, 57 households (7.98%) had borderline food consumption at the time of the survey with scores between 21 and 35. From our sample, only 3 households (0.42%) have an FCS below 21, indicating poor food security as based on the amount of food consumed. Through a dietary recall exercise, we find households most frequently consume cereals, vegetables, and cooking oil, with cereal having the smallest standard deviation of consumption (Figure 2).

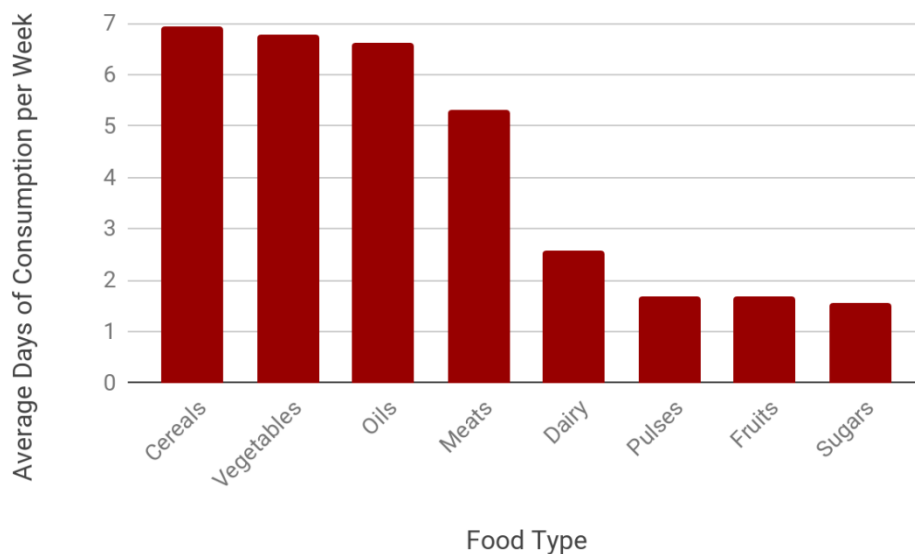


Figure 2: Average number of days an item in each food category was consumed

Source: 2017 Lusaka Household Food Security Survey

From the questions used to create an aggregate CSI score, 233 households (32.63% of all sampled households) generally worry about having enough food for home consumption. The most common coping strategies used were altering their dietary consumption toward less preferred foods (148 households, 20.73%) and reducing the number of meals per day (146 households, 20.45%). The more frequent use of these coping strategies is consistent with the *Coping Strategies Index: Field Methods Manual* (Maxwell & Caldwell, 2008), which finds that a change of diet and reducing the number of meals are all common coping strategies for food insecure households. At the other end of the spectrum of responses, 40 households (5.6%) reported sending children to eat with neighbors, and five (0.70%) sampled households asked for money as a coping strategy (Figure 3).

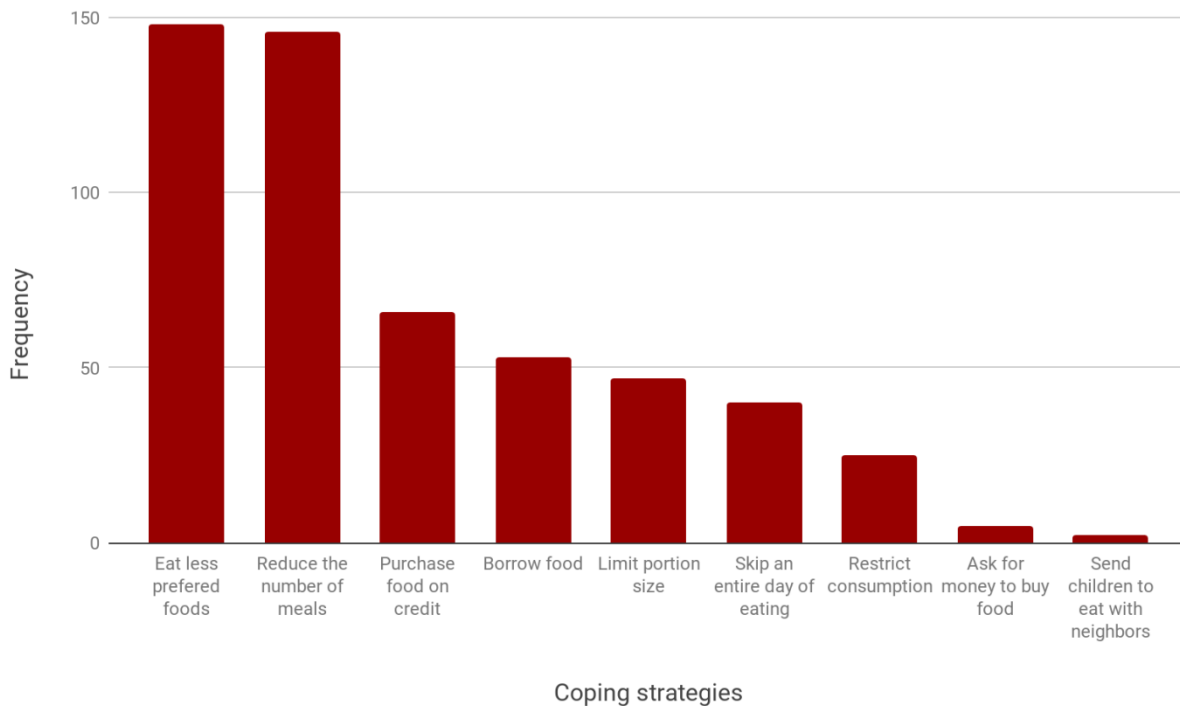


Figure 3: Frequency of responses for coping strategies used

Source: 2017 Lusaka Household Food Security Survey

FCS and CSI are negatively correlated with one another (-0.387) ($p < 0.001$). Greater food consumption (FCS) is associated with less need for food coping strategies (CSI). As a result, a positive coefficient on FCS or CSI will typically coincide in an inverse effect on the other metric. For instance, the model coefficients for the educational attainment of the household head increases FCS by 1.470 points ($p < 0.001$) for each additional level of educational attainment and an additional level of educational attainment decreases CSI by -0.113 ($p < 0.05$) for each. More education thus indicates greater food consumption and a decrease in the use of coping strategies at the household level.

Our model indicates a significant and negative effect of the household asset index on FCS for the three lowest asset owning household quintiles (Table 2). The asset index is statistically significant with a positive effect on household CSI for quintiles 1 and 2. These results indicate

households with the lowest levels of asset ownership own fewer assets. As such, these households face increased hindrances in purchasing higher-calorie foods and meeting their daily food needs, which increases the need to use coping strategies.

Table 2: OLS Regression Results

	Model 1 - FCS			Model 2 - CSI		
	Coefficients		Robust SE	Coefficients		Robust SE
Educational Attainment of HH Head	1.470	***	0.374	-0.113	**	0.045
Gender of HH Head	0.203		1.527	-0.084		0.156
Age of HH Head	-0.188	**	0.040	0.007		0.008
Percentage of HH Members Informally Employed	-0.054	*	0.028	0.004		0.003
Percentage of HH Members Self-Employed	-0.017		0.015	0.000		0.002
Number of HH Members	0.872	**	0.259	-0.009		0.033
Dependents Ratio	0.432		0.759	0.322	**	0.137
Asset Index Quintile 1	-8.888	***	3.000	1.433	***	0.295
Asset Index Quintile 2	-6.041	**	2.440	1.065	***	0.254
Asset Index Quintile 3	-5.491	**	2.250	0.311		0.180
Asset Index Quintile 4	-0.096		2.512	0.286		0.250
Food Cost per Capita	0.154	***	0.035	-0.015	***	0.002
Times Street Vendors Visited	0.082		0.164	0.037		0.013
Times Shop in Residential Area Visited	0.342	*	0.171	-0.025		0.011
Times Supermarket Visited	0.947	***	0.338	-0.031		0.023
Control for Residential Area	Yes			Yes		
Constant	56.907	***	5.094	2.180	***	0.430
N	718			718		
R2	0.272			0.236		
* <0.05, ** <0.01, *** <0.001						

Source: 2017 Lusaka Household Food Security Survey

Note: FCS can range from 0 to 112. A 0 means a household has consumed no food of any category during a 7-day period, while 112 means a household consumes each category during the same time period. CSI can range from 0 to 20 with 0 indicating no coping strategies have been used during a 7-day period, and a score of 20 indicates the household used every coping strategy during the same timeframe. The model clusters standard errors by residential areas.

The effect of employment on predicting FCS and CSI differs. In our models we use the percentage of working household members in a given category – informal, self, and formal – out of the total number of working household members. Coefficients represent a 1% increase. An

increase of 1% in the percentage of household members engaged with informal labor opportunities, decreases household FCS by five one-hundredths of a point ($p < 0.05$), holding all else equal. This is more substantive when a family of four is considered. In this scenario, the transition of one household member from self-employment to informal employment would increase the percentage of household members informally employed. This transition represents 25% of the household labor force informally employed. This substantively equates to a decrease in FCS by 1.35 points, holding all else equal.

Household composition has significant effects on both models. The total number of household members significantly increases FCS by about nine tenths of one point ($p < 0.01$). This is not surprising since FCS is a direct measure of consumption. The findings related to food cost per capita may indicate that households able to spend more money on food per household member consume more high-calorie foods ($p < 0.001$). The use of coping strategies by a household, as measured through CSI, is a direct response to a lack of available and accessible food. For households capable of achieving a higher food cost per capita, it is unsurprising a significant, negative association exists ($p < 0.001$). We also find a high ratio between dependents and working age individuals increases household CSI by three tenths of one point ($p < 0.001$). As the ratio increases, working age household members face increased difficulty in ensuring the food needs of those unable to contribute to household income or the procurement of food.

Finally, the frequency at which households purchase from food suppliers has significant effects on FCS and CSI. Each additional visit by the household to a street vendor during a 14-day period increases CSI by about four tenths of one point ($p < 0.05$). This indicates households that rely more frequently on street vendors for their food are more likely to use coping strategies. For visits to a shop in the residential area of the household there exists a significant and positive effect on FCS ($p < 0.01$). An additional trip to purchase food from this type of supplier increases FCS, and ultimately caloric intake, by four tenths of a point. Similarly, an additional trip to purchase food from a supermarket significantly increases FCS by more than a full point ($p < 0.001$).

Table 3: ANOVA Regression Results

	Sum of Squares	df	Mean Square	F	Significance
Between Groups	8858.42	3	2952.81	10.26	<0.001
Within Groups	205522.95	714	287.85		
Total	214381.37	717			

Source: 2017 Lusaka Household Food Security Survey

With ANOVA we examine mean FCS of households within four employment groups: majority formal, informal, self, and mixed (Table 3). We use the group that has majority formal employment as the base category. There is a significant effect of employment group on FCS at the $p < 0.01$ level [$F(3, 714) = 10.26$]. There is also a significant effect of employment groups on CSI at the $p < 0.01$ level [$F(3, 714) = 5.14$]. Post hoc comparisons of the ANOVA results were completed using the Tukey HSD test. We find the mean CSI score differences for majority formal employment households are significantly lower than those of the majority informally employed households ($p < 0.01$), the majority mixed employment households ($p < 0.05$), and the majority of self-employed households ($p < 0.05$). We find the mean CSI score difference for majority self-employed and majority mixed employment households are both significantly higher than the mean CSI scores of majority informally employed households ($p < 0.05$). Tukey HSD test

results for FCS show majority formal employed households are significantly higher than those of majority informally employed households ($p < 0.01$) and majority mixed employment households ($p < 0.1$). Majority self-employed households have significantly lower FCS than majority informally employed households ($p < 0.1$). Taken together, these results suggest that aggregated individual employment types have a substantial effect on CSI and FCS at the household level. Specifically, our results suggest households comprised mostly of formally employed individuals have higher FCS and lower CSI, indicating better food security. Alternatively, households with primarily of informally employed individuals have lower FCS and higher CSI than the other employment groups. This indicates worse household food security.

4 Discussion

Our results clearly demonstrate that household employment is intractably linked to household food consumption and the use of coping strategies in low-income areas of large African cities. However, FCS and CSI as indicators of urban food security only partially illustrate the food security of the sampled households. This is due to shortcomings prevalent within the indicators, especially when used in the urban context. This result compliments similar findings on the poor applicability of rural-centric food security metrics in the urban context (Tuholske et al., 2018; Haysom and Tawodzera, 2018). For instance, FCS as a food security metric assumes some level of food unavailability. Unavailability of food in urban areas is less of a contributing factor to urban food insecurity due to the complexity of the urban food system (Battersby, 2012). Large cities like Lusaka contain a range of spatially distributed and diverse food suppliers. The breadth and extent of these food suppliers ensures food availability. In the urban context, food insecurity is likely the result of limited purchasing power and prohibitive costs.

FCS as a food security metric captures accessibility to a food group through whether the respondent consumed a food group or not. There is no consideration of the portion size. Understanding the portion size of a particular food group would provide a range of consumption. Respondents that consume vastly different quantities of food would receive the same score since they consumed the same type of food. Furthermore, FCS makes no consideration of the nutritional contribution of food beyond calories. Fruits and vegetables receive low weights because they are low calorie foods, even though they provide important micronutrients. Alternatively, high-calorie foods like meat and dairy receive high weights. This is problematic as the region is going through a nutrition and diet transition in which SSA residents consume more high-calorie foods (Cohen and Garrett, 2010; Haysom and Tawodzera, 2018). As SSA continues to urbanize the region will become more pressed to deal with the triple burden of malnutrition: undernourishment, obesity, micronutrient deficiency (Battersby and Watson 2018). Using metrics like FCS that put a strong emphasis on high-calorie foods above all else and are premised on the assumption of a lack of available food will create a skewed understanding of household food security and the food systems relied on by urban residents.

Using CSI to measure urban food security is also not without challenges. CSI is used to measure how a household or individual deals with unavailability and inaccessibility to food. The index contains three questions which assume some level of inter-household social relationship. First, "In the past seven days, have there been times when you borrowed food, or relied on help from a friend or relative?" Second, "In the past seven days, have there been times when you purchased food on credit?" Third, "In the past seven days, have there been times when you have sent household members to eat elsewhere?" Households that answer "no" to these questions may

not have used the coping strategies because it was not needed. Alternatively, households that answer “no” may not have used the coping strategies because they were unable to leverage social networks. This latter scenario is problematic in the creation of CSI. These households lack informal social safety nets capable of providing resources and assistance in times of need. In the calculation of CSI households lacking available social safety nets receive the same value as households that did not need to use the coping strategies. This leads to misidentification of households and their use of coping strategies as a means to mitigate food insecurity.

However, in the urban context social safety nets may not exist for all urban households. Cohen and Garrett (2010) state informal safety nets may exist less often for new migrants to a city. The social relationships required to ensure these types of safety nets take time to develop and maintain. For those new to a city, that process may still be undergoing, leading migrant households to lack the necessary social relationship. A lack of social relationships to leverage may mean households are unable to use particular coping strategies like obtaining credit, borrowing food or money, or sending children to eat with relatives or friends. In light of the high rates of urbanization taking place in SSA, understanding how urban food security and its drivers are related to inter-household social ties will grow in importance.

Neither metric used in this analysis considers the importance of space as a contributing factor to urban food security. Excluding spatial nuance obscures the full complexity of urban food systems. Instead, explicitly including spatial features into an analysis allows for a more nuanced understanding of urban food security and avoids making widespread assumptions about urban areas and whole populations (Battersby 2012). Urban food security analysis that considers spatial characteristics encourages a more contextualized understanding of the phenomenon. In this analysis, we considered urban food security at the residential level, but future studies may consider food security at multiple scales. This would provide greater contextualization in understanding how the relationship between urban residents and their immediate and distant food suppliers relates to household food security.

Understanding how urban consumers interact with their local food system stands as an important next step in our understanding of urban food security in SSA. For instance, supermarkets have changed urban food systems across SSA and will likely continue to increase as their market share increases into the future. Researchers have already noted spatial transformations of food systems due to supermarket expansion (Battersby, 2017; Skinner and Haysom, 2016; Abrahams, 2010). Our finding that a visit to a supermarket has a significant and substantive effect on food consumption in the household is important. Despite being less spatially ubiquitous throughout Lusaka, supermarkets play an important role in food consumption at the household level. This level of consumption is not possible if household are unable to afford the cost and time associated with travel to their locations. How the relationship between supermarkets and household food security will transform over time remains to be seen. Similarly, how the relationship between supermarkets and other smaller food suppliers changes over the same period is also unknown. The extent to which the growth of supermarkets helps or hurts other suppliers will be specific to the local context (Skinner and Haysom 2016).

Abrahams (2010) states that as supermarkets increase their role within the urban food systems of SSA, these food systems will likely integrate further into global and regional supply chains. Greater reliance on supermarkets for food consumption may improve food security through cheaper foods available to consumers, but greater dependence on longer food supply chains may also increase the vulnerabilities of urban food systems. Vulnerabilities in the urban food system that increase food prices will affect low-income urban consumers more heavily as a

result of their low purchasing power (Tacoli 2017). For urban residents with low purchasing power the informal food sector will continue to play a vital role in ensuring food security.

Coming to the forefront of this research is the importance of the informal economy for household food security in SSA. The informal economy provides necessary employment and food for urban residents. “The informal economy operates where the market-based strategies of formal institutions and organizations are incapable of meeting consumer demand due to incompatibilities between formalized systems and households facing poverty” (Peyton et al. 2015, p. 46). Our findings reveal that households more heavily involved in informal employment have lower food consumption and higher coping scores. In contrast, households with a larger proportion of members involved in formal employment have higher food consumption and lower coping scores. Urbanization and the rapid population growth of urban SSA is creating a difficult challenge for policymakers. More people in cities are faced with the difficulties of finding employment that provides steady income. Those in informal employment often operate within the cash-based economy. Declines in income, the devaluation of currency, or increases in food prices substantially affect this group (Tacoli 2017).

During periods of low income, weak currency, or high food prices households face the daunting challenge of how to spend what little money is available. Money available must be used to meet an assortment of expenditures beyond food, such as school fees, medical bills, and transportation costs amongst others. When purchasing power is restricted, households may begin to use coping strategies as a way to improve food security. Our findings of a statistically significant difference between the food consumption and the use of coping strategies between informally employed households and formally employed households is not entirely unexpected.

We readily acknowledge that the informal economy is broad and employment within this sector is not inherently preferable to formal employment. However, the general characteristics of informal employment highlight the challenge of ensuring steady income and tenure (Sparks and Barnett, 2010). Our analysis suggests these challenges may also be associated with low food security, as compared to formal employment. Poor economic conditions and limited available income are the daily reality of many low-income urban residents in SSA. This daily reality often manifests itself through food insecurity. How to mitigate these challenges is a considerable task. Policymakers could mitigate the challenges associated with informal employment and urban food security through explicitly considering urban food systems planning at the local level. This type of planning would require policymakers to actively include both informal food suppliers and informal employment in urban development initiatives. Improving on the paucity of informal employment through training related to small business development or economic incentives that increase employment frequency may substantively improve the livelihoods of low-income urban residents. Although costly to local and national governments in the short-term, the long-term benefits will affect not only food security, but other aspects of urban livelihoods like education and public health.

5 Conclusion

It is not surprising that income is related to household food security. But there are particular implications for variability in urban food security given the large portion of households that rely on low-wage, variable employment opportunities. Our use of two metrics to measure separate aspects of food security in an urban setting highlights the challenges faced by households that engage more with informal employment opportunities. Although a wide range of informal employment opportunities exist, our findings highlight a general negative relationship

between households with predominantly informal employment and household urban food security, as compared to the food security of households engaged in formal employment. We find a relationship between the increased use of street vendors and more frequent use of coping strategies, while more frequent visits to formal food shops and supermarkets is associated with greater consumption of higher calorie foods.

As the urbanization of Sub-Saharan Africa continues, there is a need for policymakers to directly address urban food security with policies capable of mitigating food system shocks and improving employment conditions. Not doing so is likely to create scenarios like those witnessed in 2007-2008 when low-income residents were disproportionately affected by food price spikes. Going forward, policymakers should consider the direct effects informal employment has on the sourcing of food and food security within the cities and towns of SSA. Failing to implement policies that address the challenges associated with variable, infrequent employment and challenges related to food accessibility will not mitigate the relationship between food insecurity and stresses related to rapid urbanization.

Appendix A

Table 4: Descriptive Statistics of Variables Included in Model

Variable Name	Mean	Stand. Dev.	Min.	Max.	Variable Description
Age of Household Head	42.70	12.50	19	92	The age of the household head (in years).
Gender of Household Head (1 = male)	0.76	0.43			The gender of the household head. Female is used as a reference category.
Educational Attainment of HH Head	Some Secondary		No Education	Completed Post-Secondary	The highest educational attainment of the household head.
Percentage of HH Members Self-Employed	26.94	39.02	0	100%	The percentage of household members employed through self-employment opportunities. This category is used as a reference category.
Percentage of HH Members Informally Employed	13.31	29.45	0	100%	The percentage of household members informed through informal employment opportunities
Percentage of HH Members Formally Employed	40.79%	42.91	0	100%	The percentage of household members informed through formal employment opportunities
Household Asset Index	2.97	1.43	1	5	Asset index for the household placed into one of five categories
People per Sleeping Room	3.84	1.83	0.5	11	The number of individuals living in the household, regardless of age.
Household Dependent Ratio	0.89	0.71	0	1	Dependents per working age individuals.
Household Food Expenditure per Capita per Week	43.92 K	26.40	2.27	275	Amount spent on food per person per week in the household.
Times Street Vendors Visited (per 14 days)	4.23	4.56	0	14	Number of times the household purchased food from a street vendor in a two week period.
Times Shop in Residential Area Visited (per 14 days)	5.20	4.19	0	14	The number of times the household purchased food from a grocer / shop within their residential area in a two week period.
Times Supermarket Visited (per 14 days)	1.41	2.28	0	14	The number of times the household purchased food from a supermarket in a two week period.

Coping Strategies Index (CSI)	1.17	2.10	0	203	A composite score used to measure coping strategies by individuals or households. Categories are weighted by guidelines set forth by WFP and CARE.
Food Consumption Score (FCS)	61.11	16.98	16.5	102.5	A composite score used to measure food security through consumption of different food categories. Categories are weighted by amount of calories.
N = 718 households					

Source: 2017 Lusaka Household Food Security Survey

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