Discussion Papers

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ASSESSING SUPERMARKET PATRONAGE IN MATOLA, MOZAMBIQUE

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Abstract

As an indicator of a broader nutrition transition, the supermarketization of urban food systems in the Global South has become a growing area of research interest. While the rising dominance of supermarkets in urban food systems has been noted in several primate cities in the Global South, there have been few investigations into the spatial and demographic characteristics that may govern the patronage of supermarkets in smaller secondary cities. This paper assesses the supermarketization trend via an investigation of supermarket patronage in a secondary city through a 2014 household survey of Matola, Mozambique. Using a combination of descriptive statistics and decision-tree learning algorithms, the findings suggest a strong geographic pattern to supermarket patronage in Matola. Further analyses comparing frequent and infrequent supermarket patrons confirms the observation that spatial distance may be a more significant determinant of supermarket patronage than household wealth. The findings suggest that the spatial availability of supermarkets may play a greater role in defining the supermarketization of Matola's food system than household entitlements. These findings also have implications for the evolving concept of urban food deserts in secondary cities, recognizing the role of spatial location in determining household access to supermarkets.

Keywords

urban food security, urban food system, supermarkets, Matola

Suggested Citation

Introduction

The proliferation of supermarkets in the Global South and the implications for urban food systems has become a growing research area. Factors contributing to the global spread of supermarkets include increased urbanization, rising incomes, the use of household electronic equipment, and the promotion of ultra-processed food spurred by the globalized media (Traill 2006). Leading retail and supermarket investors proactively focused on these factors as enabling conditions for entry and growth in developing countries while increasing food market efficiency for urban areas (Reardon et al 2007). At the confluence of these processes is the shift from traditional and localized diets to ultra-processed foods resulting in increasing cases of obesity and diet-related non-communicable diseases (NCDs) (Baker and Friel 2016, Popkin 2001, Reardon et al 2019). Globally, making good food choices has become a challenge for the growing middle class with more educated and salaried male and female household heads or households with children in rapidly urbanizing regions including Mozambique (Smart et al 2020). Households have options of obtaining food from both traditional and modern food systems since they coexist and evolve amid urbanization (Baker and Friel 2016). However, there have been tensions between traditional retailers and supermarkets as supermarket chains dominate food markets (Reardon and Hopkins 2006). Additionally, there are questions about the competitive relationship between such food systems and how this affects the accessibility of food for urban poor consumers or manifests in urban food deserts (Battersby and Crush 2014). Examining the spatial and demographic characteristics that may govern the spread and patronage of supermarkets can provide some answers.

Decades ago, large urban agglomerations were only found in the Global North. However, Africa and Asia are becoming home to concentrations of large cities (UN 2014). There are projections that the world's urban population will increase by 2.5 billion people between 2018 to 2050 with about 90% of this growth in Asia and Africa (UN 2018).

While urbanization has the potential to make countries more developed and prosperous, a lack of preparedness combined with the accompanying challenges creates spatial inequalities, poverty, food insecurity, and social exclusion for the urban poor (UN HABITAT 2016). High levels of poverty and food insecurity were once a rural phenomenon but this is changing with rapid urbanization (Frayne et al 2014). This is evident in Maputo, the capital of Mozambique and neighbouring Matola with increasing population, dense urban structures, unplanned settlements, high unemployment levels, and chronic poverty (Andersen et al 2015). The City of Matola west of Maputo has a population of 242,254 households of which about 70% are food insecure and 40% are severely food insecure according to previous studies (McCordic and Abrahamo 2019, McCordic and Raimundo 2019, National Institute of Statistics 2017).

Urbanization creates shifts from farm labour to urban labour, food system changes and a shift from productionist and government-driven policies to market driven frameworks, and corporate and consumer interests including supermarketization (Lang and Barling 2012). The earliest adopters of supermarkets were regions in America and Asia but Africa has recently become a destination for international and South African supermarkets, especially in other countries in Southern Africa (Reardon et al 2004, das Nair 2020). Supermarkets are no longer patronized only by the rich and the middle class. They have spread to secondary and tertiary cities providing modern retail from the middle class to the poor working class (Reardon et al., 2012)

Alongside the supermarketization phenomenon, powerful transnational food and beverage companies like Walmart and Carrefour have infiltrated Sub-Saharan African urban food systems (Baker and Friel 2016, Raimundo et al 2018). Reardon et al (2019) argue that transformations in food systems go through stages: a traditional stage where food supply chain actors are small enterprises dealing in low-processed food, a transitional stage that closely connects rural and urban areas, and lastly a modern stage with the emergence of supermarkets and frequent purchasing of processed food. Most countries

are experiencing these transformations simultaneously with product-specific and location-based variations as consumer behaviour shifts from the traditional stage to frequent purchases from supermarkets at the modern stage (Reardon et al 2021). According to Veeck and Veeck (2000), consumer food purchase behaviours differ based on their demographic and socioeconomic characteristics.

Changes in consumer behaviour are linked to the food environment, which acts as an umbrella for food availability, prices, proximity, affordability, and desirability of processed foods that may differ across demography (Turner et al 2020, Reardon et al 2021, Ruel et al 2020). Previous HCP studies in Nanjing, China, and Maputo, Mozambique, have also underscored the important role of the food environment for dietary diversity. The city of Nanjing exhibited a favourable food environment with a spatially dense food supply network made up of supermarkets, wet markets, and small food stores. The food environment was integrated into residential areas as more than 90% of households purchased fresh food items within easy walking distance or in their neighbourhoods (Zhong et al 2018). Among surveyed households in Nanjing over 56% bought from supermarkets at least once per week while 70% bought from wet markets at least 5 days per week (McCordic et al 2018). In Maputo, local markets and small shops still dominate food sources in the city as over 90% and 70% of households purchased food from these outlets respectively (Raimundo et al 2018). One-third of households purchased food such as milk, sweets and chocolate from supermarkets (Raimundo et al 2018). Both cities are typical of the phenomenon of "selective" adoption where consumers who shop regularly in supermarkets still frequently purchase from traditional markets (Goldman 2000). It also highlights the coexistence of both formal and informal food systems in urban areas.

Factors driving the supermarket revolution across the various geographic regions are the same from both demand and supply perspectives (Reardon et al 2012). The interrelationships between urbanization, employment shifts, growth in incomes, as well as liberalization policies have influenced the demand and supply of ultra-processed foods in Sub-Saharan Africa (Reardon et al 2021). On the one hand, the demand for processed food has increased due to changes in the opportunity cost of time in food preparation as more women work away from home. Also, the adoption of food processing technologies increases leisure time for sedentary activities, such as watching TV, which are linked to obesity (Popkin 2001, Reardon et al 2021). On the supply side, reduced trade barriers, penetration of international supermarket forces, and enhanced use of the media and internet have increased the supply of processed food in response to demand (Popkin 1999, 2004).

An assessment of demand side factors indicates that supermarkets are positioned in areas with projected increases in income and urbanization and hence we see supermarket penetration in rapidly urbanizing middle- to low-income countries (Traill, 2006). This implies that low-income communities will be the least attractive for siting of supermarkets. Food systems are intricately connected to urban systems and undervaluing them on the basis of their low-income status means that the food security of communities will be undermined (Pothukuchi and Kaufman 2000). Food security is sustained by food systems that connect food chain activities with environmental and social contexts (Liverman and Kapadia 2012). Communities in economically disadvantaged areas who are food insecure because of structural inequalities such as the absence of supermarkets have therefore been depicted as "food deserts" (Battersby 2012). However, the food desert phenomenon has primarily been discussed in a Global North context. Also, equating the existence of food deserts in the Global South with the absence or presence of supermarkets is inappropriate as the emergence of supermarkets in the region is more recent (Battersby and Crush 2014). Conceptualizing food deserts in the Global South should include such complexities as transportation, mobility, time, and education as well as the structural drivers of food insecurity beyond the scope of individual households (Battersby and Crush 2014, Wagner et al 2019).

From a supply perspective, supermarket diffusion happens in stages from bigger cities with wealthier consumer groups towards the urban poor and rural towns (Reardon and Hopkins, 2006). The spatial availability of supermarkets and proximity to living areas (accessible within 10 minutes by biking or walking) have been key for the increased patronage of supermarkets (Goldman 2000). Reardon et al (2021) argue that traditional and transitional retail still dominates Sub-Saharan food purchasing and consumption with supermarkets catering for only 10-20% of total processed food retail. This is the case in Maputo close to Matola, where the main food sources consist of traditional markets, small shops, informal street traders, and backyard vendors. According to Raimundo et al (2018), 91% of households purchased food from markets and small shops at least twice weekly, while only 37% patronized supermarkets at least once a week or less. Informal food systems play an important role in providing food access among residents in deprived areas who cannot access supermarkets, as well as providing jobs and income for the urban population (McCordic and Raimundo 2019, Raimundo et al 2020).

Reardon and Hopkins (2006) suggest that tensions in price, convenience, quality, and safety between traditional informal retailers and supermarkets increase as supermarkets gain dominance and traditional retail declines. Despite attempts by modern supermarkets to replace traditional food outlets, local markets remain a very common food retail source for urban households, as in Nanjing and Maputo (McCordic et al 2018; Raimundo et al 2018). This provides more options for poor urban households, which can increase the stability of food access by using a range of sources and taking advantage of price differences (Battersby and Haysom 2018). Reducing spatial inaccessibility by localizing food systems to create more options can provide greater access to nutritious food and reduce the incidence of NCDs (Seyfang 2009).

The connections between urbanization, supermarketization, the nutrition transition, food insecurity, poverty, and rising inequalities in Global South cities have been described as complex and unsustainable (UN HABITAT, 2016). Complex sustainability challenges become more pronounced when there is a failure to identify systemic connections between problems, which only creates more problems (Starik and Kanashiro 2013). A suitable approach to addressing these interrelated problems is by applying a sustainability lens (Gladwin et al 1995). In 2015, members of the United Nations signed Agenda 2030 with 17 integrated Sustainable Development Goals (SDGs) designed to address the world's most pressing challenges related to environmental protection, economic growth, and social inclusion (UN 2015). The SDGs are designed to be interdependent with mutually reinforcing actions leading to "wins" while minimizing the counteracting effects of other goals (Nilsson et al. (2016). Theoretically, connecting SDG 1 (No Poverty), SDG 2 (Zero Hunger), and SDG 11 (Sustainable Cities and Communities) in conceptualizing supermarketization can support investigations into the spatial and demographic characteristics that may govern the patronage of supermarkets in smaller secondary cities such as Matola.

Methodology

The research in Matola for this paper had two main objectives: (a) identify the household market base for supermarkets in Matola using key spatial and demographic indicators; and (b) compare attitudes to supermarkets among frequent and infrequent supermarket patrons in Matola. The sample for this study was drawn from a household survey of Matola conducted in 2014 by the Hungry Cities Partnership. The survey was administered by enumerators from Eduardo Mondlane University in Maputo in 10 randomly selected wards in the city of Matola and was completed by 507 households. The total survey sample was then distributed across the 10 selected wards using approximate proportional allocation based on the most recently available census data for Matola. Within the 10 selected wards, the enumerators followed a systematic sampling pattern to select households for the survey. The survey was then administered to adult household members who were able to respond on behalf of their household.

The HCP survey instrument administered in this household survey of Matola collected data on household food security, consumption, demographic, and poverty indicators. Table 1 shows the variables used to assess the market base for supermarkets in Matola. The dependent variable in the analysis was supermarket access. This variable measured whether or not the respondent household sourced any of their food from supermarkets. The variable was formatted in a broader food sourcing matrix (similar to Crush and McCordic 2017). In this variable, a "yes" indicated that the respondent, or any member of the respondent's household, had obtained food from a supermarket within the previous year. A "no" indicated that the respondent, or any household member, had not obtained food from a supermarket within the previous year.

With respect to the independent variables, the spatial variable was the ward location of each sampled household (Table 2). The household type variable categorized each sampled household into one of

the following: (a) female-centred (no husband/male partner in the household, but may include relatives, children, friends); (b) male-centred (no wife/female partner in household, but may include relatives, children, friends); (c) nuclear (husband/male partner and wife/female partner with or without children); (d) extended (husband/male partner and wife/female partner and children and relatives) and other (usually single-person households).

Household food security was measured using the Household Food Insecure Access Scale (HFIAS) (Coates et al 2007). This scale measures food security according to the frequency with which households experienced food access challenges in the previous month. The dimensions of food access challenges covered by the scale are described in the following HFIAS questions:

- In the past four weeks, did you worry that your household would not have enough food?

- In the past four weeks, were you or any household

TABLE 1: Demographic Indicators Used to Identify the Market Base for Supermarkets

Dependent variable	Categories				
Supermarket access	No	Yes			
Independent variables	Categories				
Ward	Sampled wards				
Household structure	Female-centred	Male-centred	Nuclear	Extended	Other
Lived Poverty Index	<=1.00	1.01–2.00	2.01–3.00	>=3.01	
Household Food Security (HFIAP)	Food secure	Mildly food insecure	Moderately food insecure	Severely food insecure	

TABLE 2: Distribution of Sampled Households in Matola

Ward	No.	%
Accordo de Lusaka	22	4.3
Fomento	50	9.9
Infulene	24	4.7
Liberdade	66	13.0
Matola A	94	18.5
Matola Gare	18	3.6
Ndlavela	99	19.5
Nkobe	16	3.2
São damaso	47	9.3
Zona verde	71	14.0
Total	507	100.0

member not able to eat the kinds of foods you preferred because of a lack of resources?

- In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?

- In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?

- In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?

- In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?

- In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?

- In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?

- In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?

- In the past four weeks, did you or any household member eat a cooked meal less than once a day?

In response to these questions, household respondents were provided with the following ranked answers (on a scale from 0-3): 0=No, 1=Rarely (once or twice), 2=Sometimes (3 to 10 times), and 4=Often (more than 10 times). To calculate the final categorical score from the HFIAS scores that ranged from 1 to 27, a scoring algorithm was applied to identify four HFIAP categories: food secure, mildly food insecure, moderately food insecure, or severely food insecure.

Household poverty was measured using the Lived Poverty Index (LPI), which measures the frequency with which households had gone without basic resources and services in the previous year. The

resources and services included in this index are:

- Over the past year, how often, if ever, have you or your household gone without enough food to eat?

- Over the past year, how often, if ever, have you or your household gone without enough clean water for home use?

- Over the past year, how often, if ever, have you or your household gone without medicine or medical treatment?

- Over the past year, how often, if ever, have you or your household gone without electricity in your home?

- Over the past year, how often, if ever, have you or your household gone without enough fuel to cook your food?

- Over the past year, how often, if ever, have you or your household gone without a cash income?

In response to these questions, respondents were provided with the following ranked answers (on a scale from 0-4): 0=Never, 1=Just once or twice, 2=Several times, 3=Many times, 4=Always. The numeric responses to each of these answers were then averaged across the six questions. The average score for each question was then categorized as: <=1.00, 1.01–2.00, 2.01–3.00, >3.01 (where higher scores represent greater degrees of poverty as measured by frequency of access to the resources included in the scale questions).

In addition to these spatial and socio-economic variables, the survey included a series of attitudinal measures meant to assess opinions about supermarkets among frequent and infrequent patrons. For the purposes of this analysis, a frequent supermarket patron was defined as a household that accessed supermarkets on a monthly basis. An infrequent patron was a household that accessed supermarkets less than once a month. The frequent patrons were provided with a series of statements about reasons for shopping at a supermarket. The infrequent patrons were provided with a series of statements about reasons for not shopping at a supermarket.

Respondents were given the option of agreeing, neither agreeing or disagreeing, or disagreeing with the statement (Table 3).

All analysis was carried out using IBM SPSS version 27. For the first research objective (identification of the sampled household market base for supermarkets in Matola using key spatial and demographic indicators), a CHAID (Chi-Square Automatic Interaction Detection) decision tree was used. The CHAID decision tree was built using a learning algorithm that iteratively segments the sample through a chi-square analysis of the independent variables (ward of residence, household structure, LPI, and HFIAP) against the dependent variable (supermarket access). The chi square analysis is applied to the splits in the independent variable categories associated with the highest chi-square value (by merging and splitting categories within each variable). The variable with the highest chi-square value is then used to segment the sample (according to the splits identified for that variable). The process is then repeated within the sample sub-segments defined by the categories of the split variable (identifying the variable, and variable splits, associated with the highest chi-square value).

As a result, the learning algorithm can efficiently segment a sample based on responses to a dependent variable (in this case, supermarket access). To avoid over-fitting, the model was pruned so that each parent node had a minimum of 50 households and each child node had a minimum of 25 households. This method of analysis can also be used to identify the variables that can most efficiently categorize the sample (based on the independent variable used in the first split of the decision tree). The analysis also relied on descriptive statistics and cross-tabulations to better understand the attitudinal factors involved in supermarket food sourcing among frequent and infrequent supermarket patrons.

The limited unavailability of list frames or area frames to inform the random selection of respondents means that the household sample may not be completely representative. However, the analysis does provide important insights into some of the factors driving supermarket patronage among the sample itself. Furthermore, the results of the analysis are reliant on the accuracy of recall among survey respondents. The chosen methodology also does not allow causal inferences to be made, but does permit robust conclusions about the association between variables and trends in supermarket patronage. Finally, the analysis is based on a cross-sectional case study design and the findings are therefore specific to the sampled households in Matola at the time of data collection. Further research would be needed to identify trends in other areas or time periods in this area.

Household Market Base for Supermarkets

The CHAID decision tree identified some important features among the sampled households (Figure 1). The model indicated that the best initial split for predicting household supermarket access would be the ward of residence. This finding indicated that

TABLE 3: Attitudes Regarding Supermarkets Among Frequent and Infrequent Supermarket Patrons

Frequent Supermarket Patron Attitudes	Categories		
Food is cheaper at supermarkets	Agree	Neither	Disagree
Food is better quality at supermarkets	Agree	Neither	Disagree
Supermarkets have a greater variety of foods	Agree	Neither	Disagree
We can buy in bulk at supermarkets	Agree	Neither	Disagree
Supermarkets are where we get social pay-outs so we shop there	Agree	Neither	Disagree
Infrequent Supermarket Patron Attitudes	Categories		
Supermarkets are too expensive	Agree	Neither	Disagree
Supermarkets do not provide credit	Agree	Neither	Disagree
Supermarkets are only for the wealthy	Agree	Neither	Disagree
Supermarkets do not sell the food that we need	Agree	Neither	Disagree

the spatial location characteristics of the sampled households were more important than the demographic characteristics in predicting supermarket access. Within the Matola A and Fomento wards, the household sample was further segmented by food security status before the learning algorithm stopped due to insufficient sample size in either the parent or child nodes.

Figure 1 shows that the highest levels of supermarket access were among the sampled households in the Matola A and Fomento wards, where about 60% had accessed supermarkets as a food source in the previous year. In these wards, 80% of food secure or mildly food insecure households accessed supermarkets as a food source, while only 30% of moderately or severely food insecure households did so. The lowest levels of supermarket access were observed among the sampled households in Ndlavela, Liberdade, and Sao Damaso wards, where about 12% of the sampled households had accessed supermarkets as a food source in the previous year.

The distribution of the demographic characteristics of the sampled households in each of the wards provides further clarity to the supermarket access features observed in the CHAID decision tree (Table 4). For example, Matola A and Fomento both had some of the highest rates of household food security (according to the HFIAP) when compared to the other wards in Matola. Rates of lived poverty (as measured by the LPI) appeared to be relatively low in these wards, but were not exclusively low compared to the other sampled wards.

Furthermore, there was no clear difference in the structure of the households in these wards when compared to the other sampled wards. If these demographic variables better explained the association between ward of residence and supermarket access, then those variables would probably have been selected over the ward of residence as the first split in the decision tree by the CHAID learning algorithm.

FIGURE 1: CHAID Decision Tree Model of Household Supermarket Patron Segmentation (n=507)
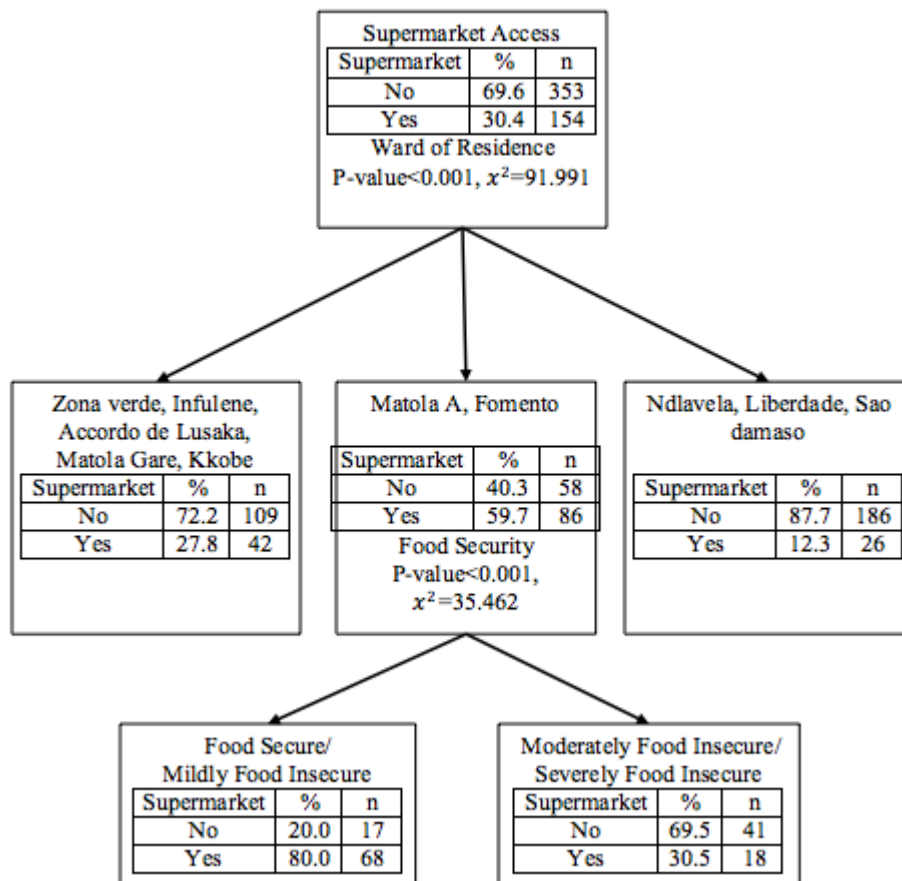
TABLE 4: Cross-Tabulation of Market Segregation Variables by Sampled Ward

Variable	Category	Accordo de Lusaka (n=22)	Fomento (n=50)	Infulene (n=24)	Liber-dade (n=66)	Matola A (n=94)	Matola Gare (n=18)	Ndlavela (n=99)	Nkobe (n=16)	São damaso (n=47)	Zona verde (n=71)
Supermarket patron last month	No	63.6%	30.0%	70.8%	86.4%	45.7%	61.1%	85.9%	81.3%	93.6%	76.1%
	Yes	36.4%	70.0%	29.2%	13.6%	54.3%	38.9%	14.1%	18.8%	6.4%	23.9%
Household structure	Female-centred	22.7%	20.0%	37.5%	21.2%	24.7%	16.7%	23.5%	33.3%	17.4%	42.3%
	Male-centred	9.1%	16.0%	8.3%	10.6%	14.0%	0.0%	6.1%	6.7%	30.4%	4.2%
	Nuclear	18.2%	50.0%	16.7%	24.2%	31.2%	77.8%	38.8%	46.7%	30.4%	29.6%
	Extended	50.0%	8.0%	37.5%	40.9%	28.0%	5.6%	29.6%	13.3%	17.4%	22.5%
	Other	0.0%	6.0%	0.0%	3.0%	2.2%	0.0%	2.0%	0.0%	4.3%	1.4%
Household Food Insecure Access Prevalence	Food secure	4.5%	74.0%	25.0%	38.5%	40.4%	11.1%	32.0%	18.8%	25.5%	15.5%
	Mildly food insecure	4.5%	4.0%	12.5%	7.7%	8.5%	0.0%	7.2%	12.5%	6.4%	31.0%
	Moderately food insecure	9.1%	8.0%	0.0%	21.5%	10.6%	44.4%	21.6%	18.8%	21.3%	36.6%
	Severely food insecure	81.8%	14.0%	62.5%	32.3%	40.4%	44.4%	39.2%	50.0%	46.8%	16.9%
Lived Poverty Index Categories	<= 1.00	94.7%	94.0%	100%	92.2%	85.9%	76.5%	76.5%	57.1%	89.1%	84.3%
	1.01 - 2.00	0.0%	4.0%	0.0%	7.8%	12.0%	23.5%	21.4%	42.9%	8.7%	12.9%
	2.01 - 3.00	5.3%	2.0%	0.0%	0.0%	2.2%	0.0%	2.0%	0.0%	2.2%	2.9%
	3.01+	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Attitudes to Supermarkets

Among the sampled household respondents who patronized supermarkets on a frequent basis (at least once a month), over 80% agreed that supermarkets provided a greater variety of food, over 75% that supermarkets provided better quality food and just under two-thirds (63%) that bulk purchasing was possible at supermarkets. Only a few respondents said they accessed supermarkets because they receive social grant pay-outs there (24%) and around half thought that food was cheaper at supermarkets.

Among the sampled households that did not frequently access supermarkets, over 65% agreed that supermarkets were too far away while 40% thought that they were too expensive. Only 20% agreed that supermarkets were only for the wealthy and less than 20% that supermarkets did not sell the food that the household wanted.

Conclusions

This paper set out to assess the role of spatial and demographic factors in segmenting the supermarket market base in the secondary city of Matola, Mozambique. The findings indicate a strong spatial pattern to supermarket patronage in the city. The wards with the highest rates of supermarket

TABLE 5: Supermarket Attitudes among Frequent (Monthly) Supermarket Patrons

Attitudes	Agree		Neither agree nor disagree		Disagree	
	No.	%	No.	%	No.	%
Food is cheaper at supermarkets	78	56.1	34	24.5	27	19.4
Food is better quality at supermarkets	105	75.5	21	15.1	13	9.4
Supermarkets have greater variety of foods	113	81.9	17	12.3	8	5.8
We can buy in bulk at supermarkets	86	62.8	25	18.2	26	19.0
Supermarkets are where we get our social grants so we shop there	31	23.8	30	23.1	69	53.1

TABLE 6: Supermarket Attitudes among Infrequent (Less than Monthly) Supermarket Patrons

Attitudes	Agree		Neither agree nor disagree		Disagree	
	No.	%	No.	%	No.	%
Supermarkets are too far away	233	64.9	37	10.3	89	24.8
Supermarkets are too expensive	127	38.0	103	30.8	104	31.1
Supermarkets do not provide credit	93	31.3	123	41.4	81	27.3
Supermarkets are only for the wealthy	72	20.9	93	27.0	179	52.0
Supermarkets do not sell the food we need	58	17.5	62	18.7	211	63.7

patronage also reported the high levels of food security. However, the CHAID decision tree analysis did not indicate that food security status performed better than the spatial indicator (ward of residence) in segmenting supermarket patrons in the sample. Further analysis of attitudinal statements from frequent and infrequent supermarket patrons appeared to indicate that spatial distance, rather than wealth, was a common motivating factor for limited supermarket patronage. Taken together, these findings seem to indicate a strong spatial dimension to supermarket patronage in Matola. Although wealthier wards are more likely to be food secure due to increased financial and food access, the spatial location of supermarkets was identified as a challenge rather than the price or choice of products. Location of a supermarket near communities generally influences consumer behaviour as they shift from purchasing local food to frequent supermarket purchases of ultra-processed food. Future research on Matola should focus on determining other, spatially disaggregated, reasons that may explain the patterns observed. For example, it may be that supermarkets are more prevalent in some wards than in others. The distribution of housing and infrastructure in the city may also attract households of different socio-economic status to different areas of the city, which may shape the spatial spread of supermarket patronage. Furthermore, given the close proximity of Matola to Maputo, it is likely that the residents of Matola may also access food derived from Maputo's food system. More research will be needed to clarify the boundaries of each respective city's food system and any potential spillover effects for nearby cities.

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