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PREDICTORS OF HOUSEHOLD FOOD INSECURITY IN MAPUTO AND MATOLA, MOZAMBIQUE

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Abstract

The rapid growth of Maputo and Matola (neighbouring cities in Southern Mozambique) has dramatically changed each city's demographic and food insecurity profile. Previous research in Maputo indicates that household access to infrastructure plays an important role in determining vulnerability to food insecurity. This paper investigates (a) whether this relationship is also true of Matola and (b) whether the demographic composition of households plays a role in defining vulnerability to food insecurity in either city. Using household survey data collected by HCP in 2014 in Maputo and Matola, the paper demonstrates that inconsistent access to water, electricity, medical care, cooking fuel and cash are associated with increased odds of severe household food insecurity in both cities. In addition, nuclear households in the sample have reduced odds of severe food insecurity in both cities (even when taking limited resource access into account). The analysis shows that the surveyed households in both Maputo and Matola share similar predictors of severe household food insecurity and that household structure may influence household vulnerability to food insecurity.

Keywords

food security, household structure, access to services

This is the 22nd discussion paper in a series published by the Hungry Cities Partnership (HCP), an international research project examining food security and inclusive growth in cities in the Global South. The five-year collaborative project aims to understand how cities in the Global South will manage the food security challenges arising from rapid urbanization and the transformation of urban food systems. The Partnership is funded by the Social Sciences and Humanities Research Council of Canada (SSHRC) and the International Development Research Centre (IDRC) through the International Partnerships for Sustainable Societies (IPaSS) Program. Additional support was provided by the Queen Elizabeth Diamond Jubilee Advanced Scholars Program.

Introduction

Despite being a pressing issue, urban food insecurity in rapidly-growing cities in the Global South is relatively under-studied (Crush 2015). Those studies that have been undertaken tend to focus more on food production and availability rather than the other dimensions of food insecurity such as food accessibility, food quality, food stability and food safety (Haysom 2015). In Mozambique, this has been compounded by public policies defined by the government that situate food security within the framework of food production programs. Recent research has suggested that much more research and policy attention should be paid to the drivers and dimensions of urban food insecurity in the country (Raimundo et al 2014, McCordic 2017a, 2017b, Frayne et al 2017). This paper builds on this emerging body of research in taking a broader, non-productionist approach to urban food insecurity. It is also the first study to focus on the adjoining mainland city of Matola and compare it with the capital, Maputo.

The overall objective of the paper is to analyze and compare the levels and predictors of food insecurity in Maputo and Matola to see if there are any significant differences between the two cities. McCordic (2016) has already demonstrated that in Maputo household access to cash, medical care, electricity and water significantly predicts levels of household food security. McCordic and Frayne (2017) also found that household access to cooking fuel was a significant predictor of food security among poor urban households across Southern Africa. The distribution of infrastructure in Maputo and Matola is pertinent to the analysis because of its predictive relationship with food security (McCordic 2017b). Urban infrastructure provides access to the basic resources and services required for urban livelihoods. Interruptions in household access to those resources and services has significant and negative impacts on human security (Scoones 1998, Wisner et al 2004).

There are various reasons why there is a relationship between access to infrastructural resources and food security in urban areas. Food access in cities is primarily negotiated through food retailing rather than food production. The security of urban food access is often determined by a combination of available household assets and food prices (McCordic and Frayne 2017). The accessibility of other resources (like electricity and water) can give an indication of the disposable assets that are in a household's possession (given that these resources are also often purchased rather than produced). Thus, the consistency of household access to basic resources can give an indication of a household's ability to purchase food as well as potential trade-offs in asset expenditures across basic resources. Households are not passive agents of environmental forces (such as infrastructure development and market forces), however. In practice, households often negotiate access to key resources through adaptive coping strategies. These strategies can include remittances from relatives or friends, self-limiting behaviours, and resource allocation strategies within households. The structure of a household can also provide an indication of a household's ability to adapt to threats and hazards by giving an indication of the degree and quality of social support available within the household.

The specific objectives of this paper are (a) to determine and compare the levels of household food insecurity in Maputo and Matola; (b) to determine the predictive relationship between household resource access and severe household food insecurity; (c) to determine the predictive relationship between household structure and severe household food insecurity; and (d) to assess whether the predictive relationship between household structure and severe household food insecurity changes when adjusted for household resource access.

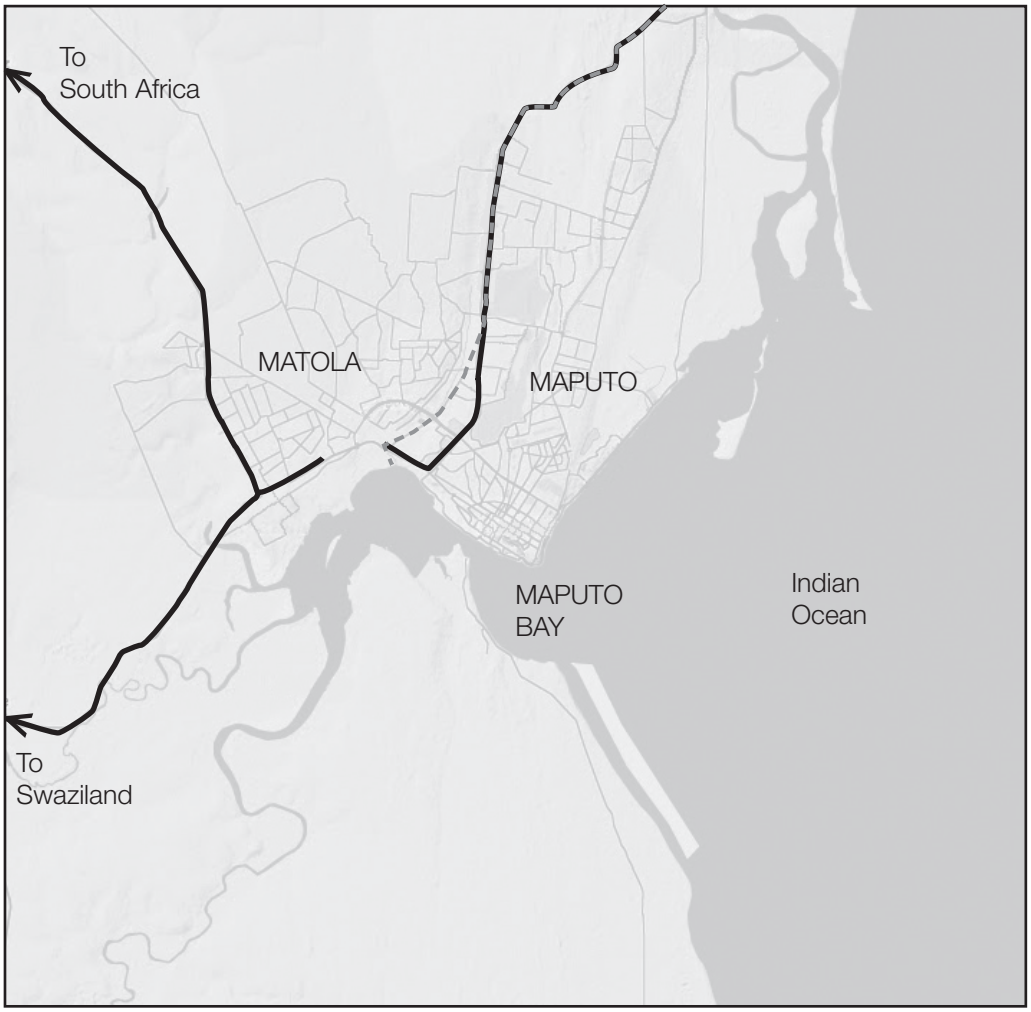
Background

Urban development in Mozambique has historically been centralized in Maputo. However, the country has experienced more diffuse urban development in recent decades (World Bank 2014). Maputo is the capital of Mozambique and is located in the south of the country on the western shore of Maputo Bay

(Figure 1). It was first established as a settlement in the sixteenth century and was the capital of the Portuguese colony from 1898 until independence in 1975. Maputo grew rapidly during the civil war of the 1980s as refugees from the countryside poured into unplanned informal settlements on the periphery. Since the end of the war, Maputo has continued to grow through natural increase and in-migration, though at a slower rate. Matola was originally an industrial satellite town developed in the 1960s and 1970s by Portugal. As land became scarcer and more expensive, it became increasingly popular with new arrivals from the countryside. Its growth was further fuelled by people relocating from the crowded neighbourhoods of Maputo (Paulo et al 2007). Since 1987, Maputo and Matola have had separate administrations and Matola is the capital of the province.

Table 1 shows the growth of the two cities over time and their combined growth (as Greater Maputo). Maputo's greatest period of growth was between 1970 and 1997, from 380,000 to 970,000. Between 1997 and 2007, its population expanded more slowly and estimates from the 2017 Census suggest that its population remained virtually static between 2007 and 2017. While Matola also grew quickly between 1970 and 1997 (from 48,000 to 425,000), its most rapid increase has been since 1997. By 2017, the population of Matola exceeded that of Maputo by 500,000 and it is now the largest city in Mozambique. Much of the growth

FIGURE 1: Location of Maputo and Matola



of both Maputo and Matola was unplanned and the majority of the population in both cities live in informal settlements. Both cities also have a gender imbalance with more women than men (Figure 2).

Much of the vulnerability to food insecurity experienced by households in Maputo and Matola is an outcome of their separate and combined historical development. The distribution of infrastructure and resources across Maputo and Matola tends to fall along broad lines of formality and informality (Jenkins 2004). Access to these key resources has been hampered by land tenure policies that have tended to regard rural-urban migrants as temporary residents (Newitt 1995, Jenkins 2000, Raimundo et al 2018).

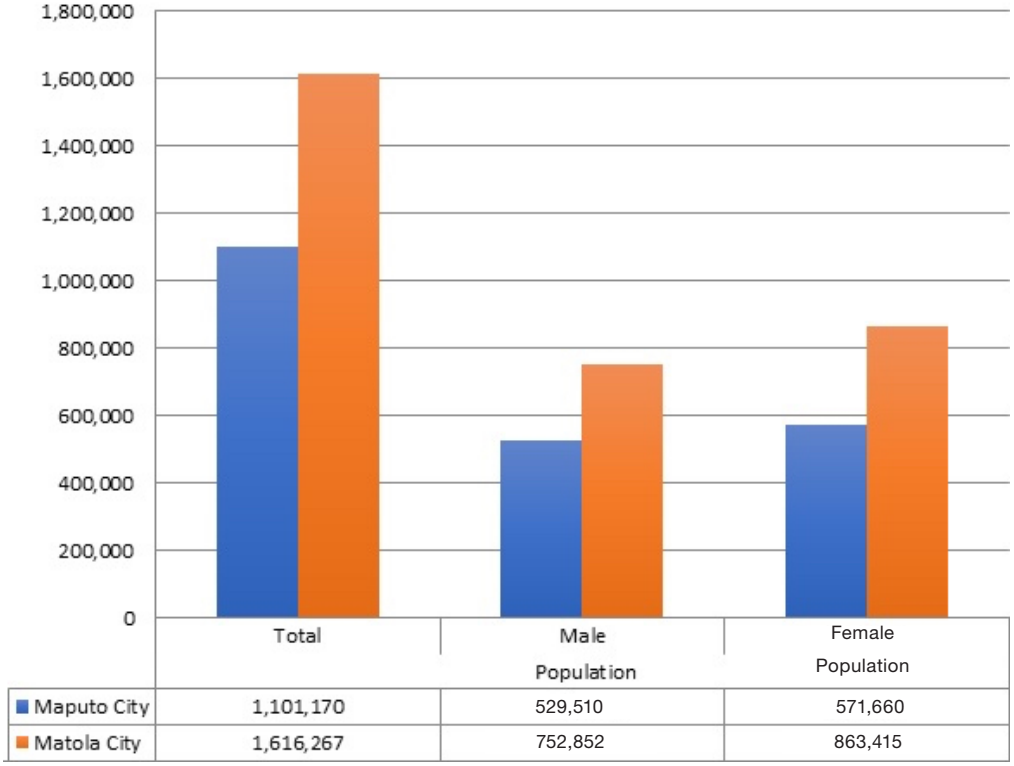
Methodology

The data is drawn from city-wide household food security surveys of Maputo and Matola by the Hungry Cities Partnership in collaboration with the Centre for Policy Analysis at Eduardo Mondlane University (EMU) in Maputo. The survey

TABLE 1: Growth of Maputo and Matola

	Maputo	Matola	Greater Maputo
1940	74,000		74,000
1950	93,265		93,265
1960	178,565	48,446	227,011
1970	378,348	86,979	465,327
1980			739,077
1997	966,837	424,661	1,773,016
2007	1,120,360	687,150	2,353,503
2017	1,101,170	1,616,267	
Source: Andersen et al (2015: 336).			

FIGURE 2: Population of Maputo and Matola, 2017



Source: National Institute of Statistics (INE), preliminary data from the 4th Census, 2017.

instrument measured food security, food access, and household economic and social demographic characteristics, and was administered using tablet technology by researchers and students from EMU. In Maputo, 19 wards were randomly selected (from the total 63 wards in the city) and the total sample size was stratified across these wards using approximate proportionate allocation and the most recent census records. A systematic sampling strategy was used to select households for interview. The primary purpose of the HCP survey was to sample households in Maputo. However, to provide insights into the food security situation in Matola, 507 households in 10 wards were randomly selected in that city. These differing sample sizes were the result of logistical constraints on transportation in the field. That said, each survey sample size was calculated to approximate at least a 5% confidence interval 19 times out of 20. It should be noted, however, that this calculation assumes simple random sampling while systematic sampling was used in the field.

In order to operationalize the variables used for the collection of data, to make them measurable to facilitate the analysis, and to ensure comparability and evaluation in the same statistical model, scalar indicators were used. As recommended by Bickel et al (2000) and Coates (2007), the HFIAS and HFIAP indicators are very important and useful for identifying the prevalence and severity of food security in a given population. Although the information obtained from the HFIAS indicator can be used at the level of individuals and/or population groups, depending on the specificities and objectives of a given study, it is important to acknowledge that the questions about food insecurity that underpin the HFIAS and HFIAP have a certain degree of subjectivity.

This research approach has some limitations. First, given the challenges in developing an accurate sampling frame (due to the limited availability of recent, accurate and relevant maps and census data), it is difficult to establish the generalizability of the household survey to all households in either Maputo or Matola. Second, the thresholds used to bin variables in this investigation may mask variations in the variable measurements and therefore may miss more important thresholds for predicting household food security. Third, with the observational nature of this data, the lack of a control group, and limitations on the statistical ability to control all significant variables, it is not possible to make causal arguments. Instead, this research approach can highlight predictive relationships and changes in the quality of those relationships when other factors are controlled.

Levels of Food Insecurity

Both Maputo and Matola experience similar, and severe, degrees of food insecurity. The HFIAS is based on 9 Likert scale questions about the frequency with which households experienced different forms of food insecurity in the previous four weeks. The answers are calculated as scaled scores from 0 to 27 (where 0 represents complete food security and 27 complete food insecurity). The average HFIAS was 6.5 in Matola and 6.1 in Maputo, suggesting marginally better food security in Maputo. However, when the households were grouped into the four categories in the HFIAP typology, around 30% of the sampled households in both cities were categorized as food secure (Table 2). At the same time, almost 40% of the households in both were severely food insecure.

TABLE 2: Household Food Insecurity in Maputo and Matola

	Maputo		Matola	
	No.	%	No.	%
Food secure	589	28.6	166	32.9
Mildly food insecure	227	11.0	53	10.5
Moderately food insecure	453	22.0	98	19.4
Severely food insecure	787	38.3	187	37.1
Total	2,056	100.0	504	100.0

Thus, about 70% of the households in both cities experience some degree of food insecurity.

The HDDS measures what food groups were consumed in the household in the 24 hours prior to the survey with a minimum of 0 and a maximum of 12. The mean HDDS score was again very similar in both cities: 4.1 in Maputo and 4.3 in Matola, indicating that households consumed foods from fewer than five food groups on average. The generally low dietary diversity in both cities is confirmed by the distribution of households across the HDDS scale (Figure 3). However, there is a slight difference with more households in Maputo likely to consume food from three or fewer food groups.

Food Insecurity and Infrastructure Access

This paper draws on three sets of variables from the household surveys (Table 3). Household food security was measured using the HFIAP typology. The HFIAP categories are binned into a binary variable representing whether a household is severely food insecure or not. The analysis also used two sets of independent variables: (a) household structure; and (b) household resource access.

The household structure variable reflects the internal social arrangements of the household and is divided into four categories: male-centred, female-centred, nuclear and extended. Male-centred households contain a single male head without a partner/spouse; female-centred households contain a single female head without a partner spouse; nuclear households contain a married or common law couple with or without children; and extended households contain a married or common law couple with immediate and extended relatives or non-relatives living in the household. This variable was binned into four dummy variables which indicate whether a given household is categorized in one of these household structures or not.

The household resource access variables measure whether households have consistent or inconsistent (including no) access to water, medical care, electricity, cooking fuel, and cash over the previous year. These variables are based on the Afrobarometer Lived Poverty Index (LPI) and represent basic resources needed to support urban life and overall household security (McCordic 2016). Given the importance of food access to the concept and

FIGURE 3: Household Dietary Diversity in Maputo and Matola

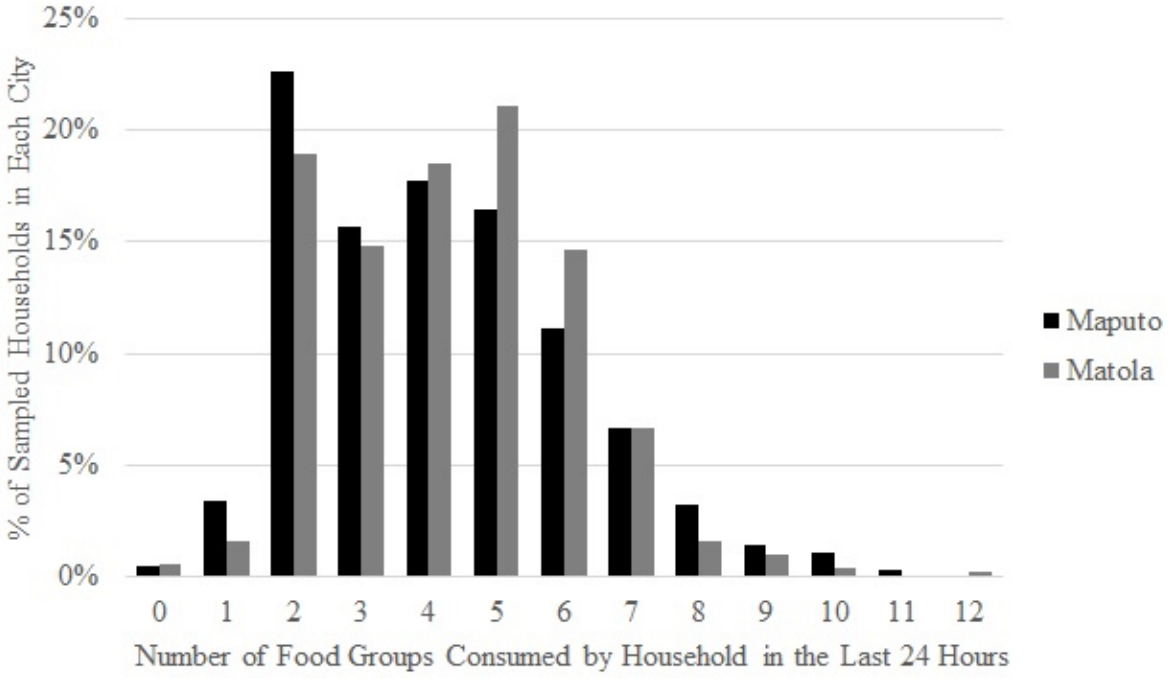


TABLE 3: Analysis Variables

Variable	Level	Values	
Dependent variable			
HFIAP	Binary	Not severe	Severe food insecurity
Household structure			
Female-centred	Binary	No	Yes
Male-centred	Binary	No	Yes
Nuclear	Binary	No	Yes
Extended	Binary	No	Yes
Resource access			
Water access	Binary	Consistent	Inconsistent/no access
Medical access	Binary	Consistent	Inconsistent/no access
Electricity access	Binary	Consistent	Inconsistent/no access
Fuel access	Binary	Consistent	Inconsistent/no access
Cash access	Binary	Consistent	Inconsistent/no access

measurement of food security, it is likely that these variables play an important role in creating severe household food insecurity.

To assess whether these independent variables have a predictive relationship with severe household food insecurity in both Maputo and Matola, odds ratios are used to assess whether a change in the value of any of the independent variables is associated with a change in the odds of the dependent variable (severe food insecurity). These calculations were paired with Pearson's chi-square tests and Fisher's exact tests to assign a p-value to assess the statistical significance of the relationships. The odds ratios are calculated independently of the influence of any other variable. In other words, it is difficult to assess whether the relationship is mediated or moderated by other variables in the data set. In order to assess this aspect of the relationship, the analysis relies on binary logistic regression to control for the influence of the resource access variables while assessing the relationship between household structure and severe food insecurity.

The distribution of households across the independent and dependent variables reveal some important features (Table 4). For example, about 28% of severely food insecure households in both Maputo and Matola were able to maintain consistent access to medical care in the previous year. Similarly, only 25% of severely food insecure households were able to maintain consistent access to cash or cooking fuel in the previous year. Among the different household structures, over 40% of female-centred and extended households were severely food insecure in Maputo and Matola. Nuclear households were the least food insecure in both cities.

Odds Ratios

All the resource access variables were associated with a statistically significant increase in the odds of severe household food insecurity (Table 5). Households with inconsistent access to medical care, cooking fuel and cash over the past year had five times the odds or more of being severely food insecure in Maputo and Matola. Among the household structure types, only nuclear households shared a statistically significant relationship with severe food insecurity. In this case, nuclear households in Maputo had 30% lower odds of being severely food insecure, while in Matola they had 50% lower odds of being severely food insecure. In Maputo, female-centred households also had 26% higher odds of being severely food insecure compared to other household types. However, this relationship has limited statistical significance and the sampled households in Matola did not show the same relationship. In sum, with the exception of female-centred households, similar relationships are observed between severe food insecurity, household structure and resources access in both cities.

TABLE 4: Household Food Insecurity, Household Structure and Resource Access

		Maputo				Matola			
		Not severe		Severe		Not severe		Severe	
		N	%	N	%	N	%	N	%
Female-centred	Female-centred	365	57.8	266	42.2	76	58.5	54	41.5
	Not female-centred	893	63.4	516	36.6	239	64.6	131	35.4
Male-centred	Male-centred	177	61.2	112	38.8	30	53.6	26	46.4
	Not male-centred	1,081	61.7	670	38.3	285	64.2	159	35.8
Nuclear	Nuclear	401	68.2	187	31.8	128	75.3	42	24.7
	Not nuclear	857	59.0	595	41.0	187	56.7	143	43.3
Extended	Extended	267	58.4	190	41.6	75	56.8	57	43.2
	Not extended	991	62.6	592	37.4	240	65.2	128	34.8
Water access	Consistent	927	69.0	416	31.0	237	72.5	90	27.5
	Inconsistent	329	47.8	360	52.2	76	43.9	97	56.1
Medical access	Consistent	1,105	71.8	435	28.2	279	72.8	104	27.2
	Inconsistent	154	30.9	345	69.1	31	27.7	81	72.3
Electricity access	Consistent	711	73.4	258	26.6	169	71.6	67	28.4
	Inconsistent	542	51.2	516	48.8	143	54.4	120	45.6
Fuel access	Consistent	1,023	75.0	341	25.0	259	73.4	94	26.6
	Inconsistent	236	35.1	436	64.9	54	37.0	92	63.0
Cash access	Consistent	1,031	75.9	327	24.1	253	74.2	88	25.8
	Inconsistent	225	33.2	452	66.8	59	37.6	98	62.4

TABLE 5: Odds Ratios of Food Insecurity, Household Structure and Resource Access

	Maputo				Matola			
Variables	O.R.	Lower	Upper	N	O.R.	Lower	Upper	N
Female-centred	1.261*	1.041	1.528	2040	1.296	0.861	1.951	500
Male-centred	1.021	0.791	1.318	2040	1.553	0.887	2.719	500
Nuclear	0.672**	0.548	0.823	2040	0.429**	0.284	0.647	500
Extended	1.191	0.964	1.473	2040	1.425	0.950	2.138	500
Water access	2.438**	2.018	2.946	2040	3.361**	2.285	4.945	500
Medical access	5.691**	4.567	7.091	2039	7.01**	4.376	11.229	500
Electricity access	2.624**	2.177	3.162	2027	2.117**	1.458	3.073	499
Fuel access	5.542**	4.536	6.771	2036	4.694**	3.113	7.078	499
Cash access	6.334**	5.172	7.756	2035	4.775**	3.189	7.152	498

*(p<.05 on Chi-Square and Fisher's Exact Test)
**(p<.01 on Chi-Square and Fisher's Exact Test)

Adjusted Odds Ratios

All the binary logistic regression models of severe household food insecurity in this analysis had insignificant Hosmer and Lemeshow tests with Nagelkerge R^2 values over 0.25. In addition, multicollinearity was ruled out as a confound for any of these models via Pearson's r correlation matrices of the independent variables in the models. In addition, all models indicated an increase in predictive accuracy by at least 7 percentage points over the null models.

These models indicate that when other resource access variables are controlled, the consistency of household access to water and electricity no longer shares a statistically significant relationship with severe household food insecurity in Maputo. In Matola, however, access to water remains a

statistically significant predictor of severe food insecurity, while electricity access does not. In addition, controlling for the resource access variables, male-centred households demonstrate a statistically significant increase in the odds of severe food insecurity in both Maputo and Matola. Nuclear households in both cities demonstrate a statistically significant reduction in the odds of severe household food insecurity (Table 6).

Conclusion

While the importance of resource access for household food security in Maputo has been demonstrated previously (McCordic 2016), this paper demonstrates the importance of these variables as predictors of severe food insecurity in Matola as well. In addition, electricity (and water in the case of Maputo) become insignificant predictors of severe food insecurity when other resource access variables are controlled. Nuclear households in the sample are associated with significantly better household food security outcomes in both Maputo and Matola. At the same time, male-centred households (those households with an unmarried male head) in the sample have significantly greater odds of being severely food insecure in both cities. This suggests that household structure may be either a protective or vulnerability factor with regard to household food insecurity in these cities. Male-centred households in the sample also have significantly increased odds, and nuclear households significantly reduced odds, of severe food insecurity when access to water, electricity, medical care, cooking fuel and cash are controlled in both cities.

Despite their differing histories and development, Maputo and Matola appear to share similar levels

TABLE 6: Binary Logistic Regression Models of Severe Household Food Insecurity.

Maputo								
Variables	O.R.	Sig.	O.R.	Sig.	O.R.	Sig.	O.R.	Sig.
Female-centred	1.198	0.11						
Male-centred			1.457	0.013				
Nuclear					0.608	<.001		
Extended							1.125	0.348
Water access	1.194	0.158	1.223	0.11	1.176	0.2	1.211	0.126
Medical access	2.445	<.001	2.418	<.001	2.459	<.001	2.394	<.001
Electricity access	1.07	0.587	1.107	0.416	1.123	0.357	1.087	0.505
Fuel access	2.139	<.001	2.181	<.001	2.151	<.001	2.179	<.001
Cash access	3.099	<.001	3.123	<.001	3.089	<.001	3.066	<.001
Nagelkerke R^2	0.291		0.292		0.298		0.29	
HL P-value	0.49		0.134		0.721		0.641	
Matola								
Variables	O.R.	Sig.	O.R.	Sig.	O.R.	Sig.	O.R.	Sig.
Female-centred	1.064	0.798						
Male-centred			2.356	0.009				
Nuclear					0.51	0.004		
Extended							1.223	0.398
Water access	2.027	0.004	2.098	0.002	1.989	0.005	2.032	0.004
Medical access	3.471	<.001	3.353	<.001	3.459	<.001	3.465	<.001
Electricity access	0.869	0.573	0.973	0.914	0.903	0.681	0.878	0.601
Fuel access	1.718	0.05	1.687	0.06	1.675	0.063	1.69	0.058
Cash access	2.211	0.003	2.369	0.001	2.09	0.006	2.18	0.003
Nagelkerke R^2	0.268		0.283		0.286		0.269	
HL P-value	0.454		0.297		0.084		0.054	

of food insecurity and predictive relationships between food security, household structure and resource access. This finding indicates that the relationships between these variables extend beyond Maputo and may be applicable to other cities. The predictive relationship between resource poverty, household structure and severe food insecurity in Maputo and Matola supports more targeted vulnerability assessments. In other words, characteristics of households that experience severe food insecurity can be used to identify households in danger of falling into this form of insecurity. This insight enhances efficiencies in public policy interventions by highlighting the characteristics of the vulnerable sectors of the population in each city. If household structure plays a role in shaping household food security outcomes, there may be policy efficiencies in programs aimed at bolstering familial relationships. By bolstering programs targeting remittances of food and goods, there may be additional supports provided to households that are vulnerable to food insecurity. Community support programs may also be able to provide support networks that limit the shocks suffered by households experiencing resource deprivation.

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