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NO. 15

THE FOOD SECURITY
IMPLICATIONS OF
GENDERED ACCESS
TO EDUCATION AND
EMPLOYMENT IN
MAPUTO

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Abstract

The multiple linkages between gender and household food security in cities have been observed in diverse settings, at multiple scales, and through a variety of disciplinary lenses. The Hungry Cities Partnership is rooted in the importance of *inclusive* growth of cities, which includes a fundamental concern with gender-based injustices that reduce inclusivity, sustainability and food security by underpinning structural poverty. This discussion paper is motivated by the gap in policy-ready quantitative data needed to identify the ways in which gender inequality, food insecurity, and public policy are interconnected. Analysis of the 2014 survey of household food security in Maputo identified female headship as a household attribute closely associated with food insecurity and yet the employment and education status of the head largely mitigated the effect of female headship on food security. Using household survey data, this investigation defines the extent to which the relationship between the sex of the household head and food insecurity appears to be conditionally dependent upon employment and education. The findings provide further impetus to urban policy makers to operationalize gender-equality goals. For Hungry Cities researchers, it provides a model for gender-based analysis of household food security in other cities.

Keywords

gender, food security, Maputo, urban poverty, urban inequality

This is the 15th 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.

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Introduction

The Hungry Cities Partnership draws inspiration from Carolyn Steel's book *Hungry City*, which notes that "food and cities are so fundamental to our everyday lives that they are almost too big to see. Yet, if you put them together, a remarkable relationship emerges" (Steel 2013: ix). This observation can easily be extended to include gender, which fundamentally shapes everyday experiences of food provisioning, consumption, trading, and production, while also playing a core role in the functioning of food systems, policymaking, and economies across scales (Dodson et al 2012, Riley and Hovorka 2015). Gender has long been recognized as the "key to food security" (Quisumbing 1995), and yet policy researchers continue to strive to understand the exact dimensions of the link between cities, food, and gender, and to devise ways to strategically "mainstream" gender into city-scale food security policies. The Hungry Cities Partnership aims to make a contribution to understanding these linkages and supporting evidence-based policymaking by mobilizing new empirical data to reveal the ways in which food, gender, and poverty are inter-related in cities of the Global South.

This discussion paper addresses this gap in city-scale household food security analysis using data on 2,071 households in Maputo, Mozambique, gathered in 2014 by the Hungry Cities Partnership and the Centre for Policy Analysis (CPA) of the Faculty of Arts and Social Sciences (FASC) of Eduardo Mondlane University. Unsurprisingly, the data shows that the sex of the household head is a strong predictor of household food insecurity. However, the data goes further in demonstrating that factoring in the education and employment status of the household head reduces the food security gap between male- and female-headed households. This finding adds weight to the central importance of gender equality as a development goal by suggesting that the provision of better educational and employment opportunities to women is an important factor in addressing household food insecurity.

The next section of the paper provides information about the research context of Maputo. Section

three outlines the methods employed in data collection and analysis. Section four presents the research findings and is followed in section five by a discussion of the implications of these findings for policy development.

Research Context

Gender politics in Mozambique are unique in the region because of the influence of the Frente de Libertação de Moçambique (Mozambique Front Liberation) or FRELIMO policies directed at realizing an ideal of gender equality through its revolutionary period in the 1970s and 1980s. Urdang (1983: 9), for example, quotes a woman at a party rally in the late 1970s, observing that "FRELIMO says that all of us, women and men, can develop our minds, all of us can work. FRELIMO knows that women can think very well, that women are as capable of making decisions." Raimundo (2010: 32) explains that the enactment of the women's emancipation policies following the liberation war (1964-1975) allowed women to break from cultural proscriptions that inhibited their role as decision-makers. The emancipation of women was a key pillar in the distinction between colonial and postcolonial societies, fitting well with the three ideological goals of modernism, nationalism and socialism (Pitcher 2002). These goals resonated most profoundly in urban Mozambique which housed one of Africa's most industrialized economies at independence.

Despite the implementation of progressive policies and the availability of opportunities for urban employment, the ideal of gender equality has been divorced from the ground-level reality for most women. While the reality falls short of the ideal, there is some evidence of female-headed households escaping poverty at a more rapid rate than male-headed households (Tvedten et al 2013). This is partly due to the growing proportion of female headship across all economic classes in Maputo and the growing diversity of female-headed households. The rising number of female-headed households can also be read in many cases as an expression of

women's agency in configuring their households. As Raimundo et al (2014: 6) note: "women are taking increasing control over their own lives by forming female-headed households and establishing close female-focused social networks."

The household experience of food insecurity is an important lens for understanding economic marginalization. Previous research has indicated that the sex of household heads in Maputo predicts household experiences of poverty and food insecurity. Using the 2008 AFSUN (African Food Security Urban Network) household survey of poor areas in eleven Southern African cities, Dodson et al (2012) demonstrate that female-centred households were generally more food insecure than nuclear households. Yet, low-income female-centred households (which are, by definition, headed by women) appeared to have better food security outcomes than low-income nuclear households (usually headed by a male or heterosexual partnership). This observation fits with the understanding that investments directed toward women will have a greater net benefit to households, and especially vulnerable household members, than investments directed to men (Haddad et al 1997, Ruel et al 1998). In the case of Maputo, Sahn and Alderman (1997) suggested that the education of mothers in Maputo significantly predicted infant stunting while the level of overall household income indicated a statistically significant relationship with the nutritional status of older children in the household.

Based on a national demographic and expenditure survey of Mozambique, Garrett and Ruel (1999) suggested that height-for age stunting of children was significantly associated with both household income and the education level of household heads. They argue that that this may also explain urban and rural differences in nutrition (with females having a much greater chance of being educated in urban areas). While the analysis included the gender of the household head, this variable was not a significant predictor of stunting when other demographic variables (like education) were controlled for. Using the AFSUN household survey of Maputo, McCordic (2016, 2017) also found that the relationship between the sex of the household

head (as well as their marital status) and household food insecurity was statistically insignificant when the influence of household infrastructure access was controlled for. The Hungry Cities Partnership data thus provides an opportunity to revive the research discussion on the instrumental role of investing in women's education and employment opportunities as a pre-condition of progress on other goals such as urban food security.

Methodology

This study was guided by the following research questions: (a) is there a predictive relationship between the sex, education and employment status of the household head and the food security status of the household? and (b) is the relationship between the sex of the household head and household food security status conditionally dependent upon the education and employment of the household head?

The HCP survey instrument administered to the 2,071 households included scales on food insecurity, poverty, food sources, food purchasing patterns, as well as demographic data collection. The sampling strategy used in the fieldwork relied on a two-stage design. In the first stage, 19 wards were randomly selected within the city. Within each of these wards, an enumerator team used systematic sampling to select households for interview (Raimundo et al 2018). The total household sample size was also distributed across the selected wards using approximate proportionate allocation based on the most recently available census data (from 2007).

The variables used in this paper include one food security scale and three demographic variables characterizing the heads of the households included in the survey (Table 1). The Household Food Insecure Access Prevalence (HFIAP) scale is a food security measure based on the frequency and severity of food access challenges faced by households over the previous four weeks (Coates et al 2007). These food access challenges are determined by nine Likert scale questions which assess multiple dimensions of food access challenges at varying degrees of severity.

Using a scoring algorithm, the answers to these questions are then used to categorize the sampled households according to their ranked food security status. For the purposes of this paper, the ranked score was then dichotomized as a binary variable indicating whether a household was judged to be food secure (a score of 1 on the HFIAP) or food insecure (a score of 2-4 on the HFIAP). This variable binning allowed for more direct comparisons of adjusted and unadjusted odds ratios.

The investigation also included three demographic variables: the sex of the household head, the education level of the household head, and the employment status of the household head. The education level of the household head demonstrates whether the household head has had any formal education. The employment status of the household head demonstrates whether the household head is employed (formally or informally, full-time or part-time) or unemployed (including pensioners, homekeepers, and individuals medically unable to work).

To answer the first research question, odds ratios and chi-square tests of independence were used. Odds ratios allow for an assessment of the distribution of households in cross-tabulations of the variables. In this analysis, an odds ratio value greater than one indicates an increase in the odds of food insecurity given a change in the demographic variables (e.g. a change from male to female in the sex of the household head). The p-values for these odds ratios were calculated using Pearson's chi-square tests of independence. These p-values were calculated using boot-strapping techniques.

The second research question was addressed by using adjusted odds ratios, Bayesian Network analysis, and Chi-square Automatic Interaction Detector (CHAID) decision tree analysis. The adjusted odds ratio calculations were calculated using binary

logistic regression analysis. These binary logistic regression models included all the variables used. In other words, this modelling calculated the odds ratio value describing the sex of the household head with the HFIAP variable while controlling for the education and employment status of the household head (based on Maximum Likelihood Estimation). The analysis also included a Bayesian Network which, using a Markov Blanket, determined any conditionally dependent relationships between the variables (as determined by a Pearson's Chi-Square test of independence at an alpha of 0.01 using a maximal conditioning set size of 5).

The Bayesian Network determined whether any statistically significant relationships between the variables (based on chi-square analysis) remained significant given sub-sets of the other variables. Using this method, the statistically significant relationships in the Bayesian Network are indicated by an edge between the variables. The question was further addressed using a CHAID decision tree to determine the categorization of female- and male-headed households using the employment status and education level of the household head as categorizing variables. The CHAID decision tree was built using an exhaustive CHAID learning algorithm which used Pearson's chi-square tests of independence to determine what variables to split upon and used stopping rules to avoid over-fitting (a minimum of 2% of the sample was allowed for any parent branches and a minimum of 1% of the sample was allowed for any child branches). The exhaustive CHAID learning algorithm operates by identifying the independent variable with the highest chi-square value against the dependent variable as a splitting variable. The algorithm then repeated the process within each category in this variable (and repeats the process again within each sub-set of those variables) until the stopping rules are triggered.

TABLE 1: Investigation Variables

Variable	Level	Values	
HFIAP	Binary	Food secure	Food insecure
Household head sex	Binary	Male	Female
Household head education	Binary	Formally educated	Not formally educated
Household head employment	Binary	Employed	Unemployed

The thresholds that were set when binning the variables were meant to aid the odds ratio calculations and potentially assist with interpretability. In terms of potential limitations of the analysis, the way in which the variables were binned might mask other more significant thresholds when categorizing households according to their food security status. Given the limited availability of relevant census information (and the lack of list-frames and area-frames), the city-wide household survey of Maputo might not be fully representative. It is also important to note that no causal interpretations of the findings can be made based on the methods used. There was a slight imbalance in the dependent variables used for the logistic regression analysis, Bayesian Network, and CHAID decision tree built in this investigation. However, this imbalance was not significant enough to benefit from misclassification costs and resampling had the potential to change probabilities of household inclusion.

Other questions might relate to the application of quantitative methods to the broader issue of gender and development. This is partly due to the obscurity of emic explanations for the configuration of households in Maputo and the gendered meanings associated with the sex of individuals recorded in the survey instrument. The scope of the paper is thus limited to the questions that can be addressed with the data available. Other research on gender and urban food security in Southern Africa has demonstrated the potential for complementary qualitative research to shine light on the complex interaction of identities, individual agency, economic and environmental conditions, and social trends in shaping the relationship between gender and urban household food security (Riley and Legwegoh 2018). For

example, this analysis does not address the distinction between female-headed households with multiple women sharing caregiving and income-generating roles, and single women dividing their time and energy among multiple responsibilities. The male-headed/female-headed binary might therefore overstate the association of women with food insecurity since the female-headed household category includes a higher proportion of households relying on one person to earn income and provide care.

Predicting Food Security Using Gender, Education and Employment

The frequency distribution of the independent variables against the HFIAP variable revealed important findings (Table 2). Most of the sampled households (regardless of household head sex, education and employment status) were food insecure according to this scale. That said, male, formally educated, or employed household heads are more likely to be from food secure households than heads who are female, not formally educated, or unemployed. This frequency distribution indicates the overall food insecurity vulnerability faced by households in Maputo and gives an early indication of the predictive importance of each independent variable in defining the food security status of those households.

The odds ratio calculations of the independent variables against the HFIAP dependent variable confirmed that female-headed households had greater odds of being food insecure compared to

TABLE 2: Household Head Characteristics and Household Food Security

		HFIAP			
		Food secure		Food insecure	
		No.	%	No.	%
Household head sex	Male	404	30.8	909	69.2
	Female	147	23.8	470	76.2
Household head education	Formally educated	467	30.9	1,046	69.1
	Not formally educated	36	13.7	226	86.3
Household head employment	Employed	468	31.5	1,020	68.5
	Unemployed	78	18.7	340	81.3

male-headed households. The same was true of households with heads without formal education or employment. Households with heads without formal education had 2.8 times the odds of being food insecure (compared to formally educated household heads) and unemployed household heads had twice the odds of being food insecure (compared with employed household heads). These odds ratio calculations demonstrated a statistically significant relationship according to the Pearson’s chi-square tests of independence (at an alpha of 0.01).

Separating Gender from Education and Employment Status in Predicting Household Food Security

When the odds ratios calculated in Table 3 are adjusted for the influence of all independent variables (using maximum likelihood estimation via binary logistic regression), the relationship between the sex of the household head and the food security status of the household changes (Table 4). When controlling for the education level and employment status of the household head, the predictive relationship between the sex of the household head and the food security status of the household becomes

statistically insignificant (at an alpha of 0.05). That said, even while controlling for the influence of all independent variables, the predictive relationship between the education level and employment status of the household remains statistically significant (again at an alpha of 0.05).

The relationships indicated in Table 4 are confirmed graphically by the Bayesian Network in Figure 1. This Bayesian Network demonstrates that the relationship between the sex of the household head and the food security status of the household is conditionally dependent on the education level of the household head. Furthermore, the relationship between the sex of the household head and the employment status of the household head is also conditionally dependent upon the education level of the household head. These relationships were established using an alpha of 0.05 on Pearson’s chi-square tests of independence.

The CHAID decision tree depicted in Figure 2 provides insights into why these conditionally dependent relationships might exist. The CHAID decision tree shows the gendered distribution of households based on education and employment among the surveyed households. It indicates that among the independent variables included in this investigation, household head employment status had the greatest chi-square value when related to household food security. The decision tree also

TABLE 3: Odds Ratio Calculations of Household Head Characteristics and Household Food Security

Independent variables	Odds ratio	95% Confidence interval					
		Lower	Upper	Pearson’s chi-square	Df	P-Value (2-sided)	No.
Household head sex**	1.421	1.141	1.769	9.923	1	0.002	1,930
Household head education**	2.803	1.939	4.051	32.253	1	<.001	1,775
Household head employment**	2.000	1.528	2.618	26.122	1	<.001	1,906

* p<.05; ** p<.01

TABLE 4: Adjusted Odds Ratio Calculations using Binary Logistic Regression Analysis

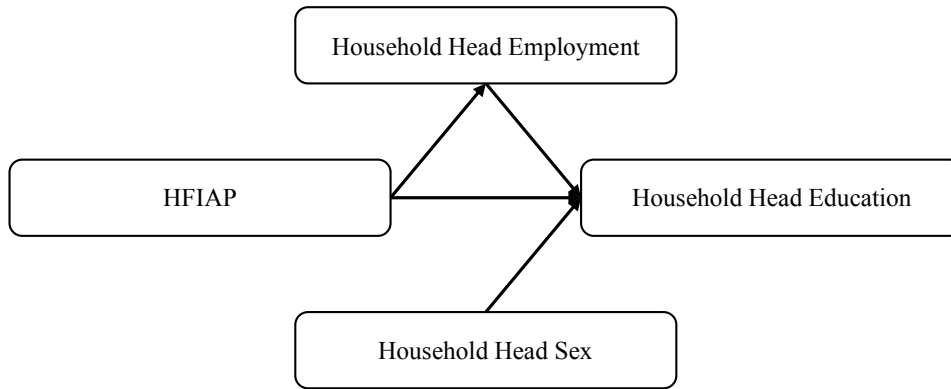
Independent variables	Adjusted odds ratio	95% Confidence interval		
		Lower	Upper	P-value (2-sided)
Household head sex	1.152	0.900	1.473	0.261
Household head education**	2.396	1.632	3.516	<.001
Household head employment**	1.792	1.328	2.418	<.001

* p<.05; ** p<.01; N = 1,754

indicates the best means of splitting household head education and employment status to categorize households according to food security status. Among those household heads who were unemployed and had no formal education, 74% were

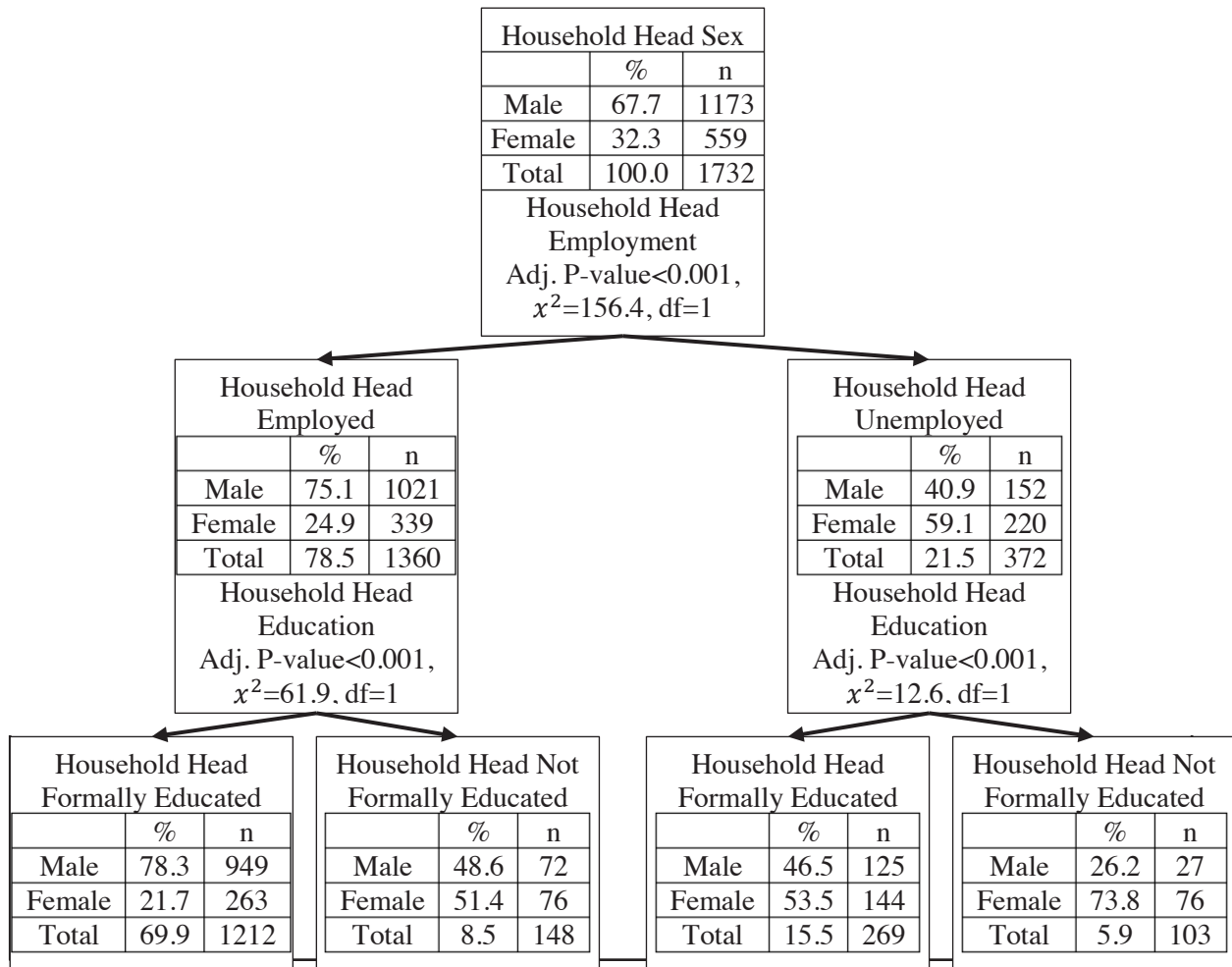
female. At the same time, the opposite trend also existed. Among those household heads who were employed and had a formal education, 78% were male.

FIGURE 1: Bayesian Network of Conditionally Independent Relationships



N = 2,071

FIGURE 2: CHAID Decision Tree Categorizing Household Head Sex Using Employment and Education Status



N = 2,071

Conclusion

The findings presented in this paper demonstrate that there is a statistically significant and predictive relationship between the sex of the household head and the food security status of the household in Maputo. However, this relationship appears to be conditionally dependent upon the education level and employment status of the household head. The distribution of education and employment across the household heads also appears to be strongly gendered. Together, these findings suggest that the food insecurity of female-headed households may be partially explained by education and employment across both male and female-headed households in Maputo.

The findings provide new quantitative evidence of the strong association between gender and food security in Maputo. For urban food security researchers and policymakers, this paper contributes to the understanding of the demographic predictors of food insecurity in Maputo and potentially further afield. A similar analysis in other Hungry Cities Partnership cities, for example, would confirm whether this is a more generalizable finding or is specific to Maputo. The data provides evidence of the extent to which other growing urban challenges (like food insecurity) may be dependent upon the distribution of these opportunities.

In sum, these findings help to explain the gendered effects underlying food insecurity suggested by a diverse literature including statistical models, historical research, and ethnographic observation. However, they should be interpreted in light of both the limitations and strengths of the methods used. The remaining discussion highlights the policy dimensions of the issues raised, drawing attention first to legislation toward gender equity in education, and second to policies aimed at gender equity in employment.

Article 88 of the Constitution of the Republic of Mozambique stipulates the right to education for all Mozambican citizens and Article 122 promotes the development of women in social, cultural, political

and economic spheres of activity (Mario and Nandja 2005, Tvedten et al 2008). The government of Mozambique has also implemented the 2001–2005 Action Plan for the Reduction of Absolute Poverty (PARPA, and later the 2006–2009 PARPA II), Law 6/92, and the 2000–2004 programme aimed at bolstering access to education as a means of combating poverty and reinforcing the political and economic model presented in the 1990 constitution (Mario and Nandja 2005, Tvedten et al 2008). These significant legislative instruments, which work in concert with global efforts to promote education for women and girls, have been slow to transform the gender-based inequalities observed in this study. While public education is centrally planned and managed (Roby et al 2009, Tvedten et al 2008), a sensitized municipal leadership could help to facilitate access to formal education by improving public transportation, utilities at schools (with sanitation services especially important for adolescent girls), and public safety in and around schools.

Gender roles also shape engagement in sectors of employment. At the national level, women have greater participation in agriculture and a growing representation in the informal sector in Maputo (Agadjanian 2002, MEF 2016, Tvedten et al 2008). The gender distribution across these employment sectors continues to place women in less profitable work and may hamper entry into more lucrative occupations. Nonetheless, the findings suggest that even part-time, informal, and low-paid employment is associated with improved household food security for female-headed households. While the long term strategic vision for gender equality with food security hinges on investments in education and public awareness of the need for cultural change, in the short term the municipality should be supporting female entrepreneurship in Maputo's informal economy with an aim to improving household food security. Examples of policy measures include providing greater access to credit and protection from harassment during business hours.

Gender relations have been defined as power relations. Changing these relations can take a long time due to the ingrained societal presuppositions underlying gender roles. The structural causes of

gender inequalities (both within households and the broader society) define who has access to what and how they get that access. Furthermore, the will to engage these structural causes ultimately relies on multi-sector stakeholders: government, academia, private sector, civil society and the broader public. This investigation highlights the importance of linking gender-based food security initiatives to policies supporting women's access to education and employment. By adopting a gendered food security perspective, public policies and initiatives can optimize the National Strategic Plan for Food Security and Nutrition of Mozambique adopted in 2016.

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