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Article

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Coping with food and nutrition insecurity in Zimbabwe: does household head gender matter?

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Abstract

On the basis of a large-scale nationally representative sample of household data from five pooled cross-section surveys conducted by the Zimbabwe Vulnerability Assessment Committee (ZimVAC), this study assesses the existence of gender differences in the vulnerability to food and nutrition insecurity, usage of consumption-based and livelihoods-based coping strategies, and the existence of gender heterogeneity in the correlation of usage of such coping strategies when confronted by food and nutrition insecurity. The study offers three main findings. Firstly, female-headed households are more susceptible to food and nutrition insecurity than those headed by males. Secondly, female-headed households are more likely to employ consumption-based coping strategies than their male counterparts, but there is no statistically significant difference in the usage of livelihoods-based coping strategies. Finally, whilst there is little evidence of gender heterogeneity in the correlation of the usage consumption-based coping strategies, there is overwhelming evidence that female-headed household heads are less likely to adopt livelihoods-based coping strategies when confronted with food and nutrition insecurity. The sum total of these findings is that whilst female-headed households are more prone to food insecurity than their male counterparts, they are less able to use livelihoods-based coping strategies to weather household food and nutrition insecurity than their male counterparts.

Keywords: Gender differences, Food security

JEL classification: J16, Q18

Introduction

Idiosyncratic and systemic shocks such as climate change (FAO 2010; Tirado et al. 2010), food price hikes (Christian 2010; FAO 2008; Quisumbing, et al. 2008), or global economic crises (Ivanic and Will 2008; Ivanic et al. 2012) impose gender-heterogenic consequences on food and nutrition security of households (Klasen et al. 2015). Vis-à-vis male-headed households, female-headed households have different demographic and socio-economic conditions, resource utilization patterns, and social network patterns (Croson and Gneezy 2009; Fletschner and Carter 2008; Fletschner et al. 2010; Gneezy and Rustichini 2004; Kairiza et al. 2017; Powell and Ansic 1997; Reevy and Maslach 2001) which renders them more susceptible to food and nutrition insecurity than their male counterparts (Horrell and Krishnan 2007; King-Dejardin and Owens

2009; Klasen et al. 2015; Peterman et al. 2010; Quisumbing 1996; Quisumbing and McClafferty 2006; Quisumbing and Pandolfelli 2009). Concomitant to the aforementioned gender heterogeneity in vulnerability to food and nutrition insecurity, are gender differences in the strategies employed by households to subsist when confronted with food and nutrition insecurity which are termed consumption-based and livelihoods-based coping strategies (Dercon and Krishnan 1999; Fafchamps et al. 1998; Gupta et al. 2015).

This study expands on the body of literature focusing on gender and food and nutrition insecurity on the basis of a pool of five nationally representative cross-section surveys, comprising both rural and urban households in Zimbabwe. The annual household surveys employed in this study span from 2013 to 2017 and were conducted by the Zimbabwe Vulnerability Assessment Committee (ZimVAC). Specifically, on the basis of the gender of the household head, this study appraises the existence of the gender gap in food and nutrition insecurity in Zimbabwe. Secondly, it assesses the existence of gender differentials in the usage of consumption-based and livelihoods-based coping strategies in Zimbabwe. Finally, it evaluates gender heterogeneity in the correlation of the household usage of coping strategies when confronted with food and nutrition insecurity. The study measures food and nutrition insecurity on the basis of five proxies which are the household hunger score, poor food consumption score, and household consumption of vitamins, proteins, and iron.

The study offers three major findings. Firstly, female-headed households in Zimbabwe are more prone to food and nutrition insecurity after controlling for major confounding variables. Secondly, in light of the high vulnerability to food and nutrition insecurity, vis-à-vis male-headed households, female-headed households are more likely to use consumption-based coping strategies, but not livelihoods-based coping strategies. Finally, in terms of gender heterogeneity in the correlation of household usage of coping strategies when confronted with food and nutrition insecurity, female-headed households are less likely to employ livelihoods-based coping strategies but not in respect of consumption-based coping strategies than their male counterparts.

The next section of this paper reviews the relevant literature and outlines hypotheses to be examined in this study. The 'Methods' section details the methods employed in the study, whilst the 'Discussion' section provides a discussion of the results. Finally, the 'Conclusion and policy recommendations' section concludes.

Literature review and hypotheses

In comparison to their male counterparts, female household heads and women, in general, have different observable and unobservable demographic and socio-economic conditions (Croson and Gneezy 2009; Fletschner and Carter 2008; Fletschner et al. 2010; Gneezy and Rustichini 2004; Kairiza et al. 2017; Powell and Ansic 1997; Reevy and Maslach 2001). Concomitant to differences in observable and unobservable demographic and socio-economic conditions are gender differences in agricultural productivity and food and nutrition insecurity vulnerability (Horrell and Krishnan 2007; King-Dejardin and Owens 2009; Klasen et al. 2015; Peterman et al. 2010; Quisumbing 1996; Quisumbing and McClafferty 2006; Quisumbing and Pandolfelli 2009). The reports by FAO (2010, 2011) note that women and girls are overrepresented amongst the population of people who food and nutrition insecure worldwide. In this background, the

following hypothesis linking the food and nutrition insecurity status of the household and the gender of the household head is proposed:

Hypothesis 1

Female-headed households are more likely to be food and nutrition insecure than male-headed households.

When confronted by food and nutrition insecurity, households employ strategies to weather the insecurity (Dercon and Krishnan 1999; Fafchamps et al. 1998; Gupta et al. 2015). There are two types of strategies engaged by households to cope with food insecurity which are consumption-based and livelihoods-based coping strategies. Consumption-based coping strategies involve short-term adjustments of food consumption patterns, whereas livelihoods-based coping strategies involve long-term adjustments of income earning or food production patterns, as well one-off responses such as sale of durable assets (Christiaensen and Boisvert 2000; Coates et al. 2006; Maxwell and Caldwell 2008; Maxwell et al. 1999).

The role of food preparation and distribution is largely carried out by women in Zimbabwe. In light of food and nutrition insecurity, it is therefore easier for women and female household heads to engage in short-term adjustments of consumption patterns such as controlling the food portion size and food rationing or consumption of less preferred foods (Günther and Harttgen 2009; Skoufias and Quisumbing 2005). In view of the mentioned higher propensity to use short-term consumption-based coping strategies, the following hypothesis connecting the gender of the household head and the adoption of consumption-based coping strategies is suggested.

Hypothesis 2.1

Female-headed households are more likely to employ consumption-based coping strategies than male-headed households.

Extant studies note that men are more able to employ livelihoods-based coping strategies than women (Günther and Harttgen 2009; Skoufias and Quisumbing 2005). Men are more concerned with long-term livelihood security and, to this end, tend to control market-based coping such as the sale of assets or labour and loan arrangements with patrons and moneylenders. They also negotiate inter-household exchanges involving more substantial transfers of food, labour, or cash (Günther and Harttgen 2009; Skoufias and Quisumbing 2005). In that matrix, notwithstanding their higher likelihood to face food and nutrition insecurity, female household heads are more likely to be constrained by unobserved societal and cultural restrictions as well as prior endowments in income and capital which limits their ability to employ livelihoods-based coping strategies. The following hypothesis linking the adoption of livelihoods-based coping strategies and the gender of the household head is therefore proposed.

Hypothesis 2.2

Female-headed households are no more likely to employ livelihoods-based coping strategies than male-headed households.

The aforementioned household head gender differentiation in the ability to implement consumption-based coping strategies and livelihoods-based coping strategies is likely to result in gender heterogeneity in the correlation of household usage of coping strategies and the incidence of food and nutrition insecurity. Notwithstanding, the fact that female household heads are hypothesized to employ more consumption-based coping strategies than their male counterparts, there is likely to be a female who is responsible for those activities in male-headed households to the extent that there is not so much gender heterogeneity in the usage of such consumption-based coping strategies in households headed by females and those headed by males. In light of this, the following hypothesis linking the gender of the household head and the usage of consumption-based coping strategies when confronted by food and food and nutrition insecurity is proposed.

Hypothesis 3.1

There is no gender difference in the likelihood the household implementation of consumption-based coping strategies when confronted with food and nutrition insecurity.

The usage of livelihoods-based coping strategies when confronted with food and nutrition insecurity is likely to be influenced by the ease with which one can implement the livelihoods-based coping strategies. As already noted, female household heads are likely to be more constrained in their usage of livelihoods-based coping strategies than their male counterparts. In this background, the following hypothesis linking the usage of livelihoods-based coping strategies when confronted by food and nutrition insecurity and the gender of the household head is suggested.

Hypothesis 3.2

Female-headed households are less likely to implement livelihoods-based coping strategies when confronted by food and nutrition insecurity than their male counterparts

Methods

Data

This paper employs nationally representative household data on rural and urban livelihoods from five annual pooled cross-section surveys conducted by the Zimbabwe Vulnerability Assessment Committee (ZimVAC) which is a consortium comprising of the Zimbabwean government, UN agencies, and non-governmental organizations. The household assessment surveys span from 2013 to 2017 totaling 67,857 households as

Table 1 Distribution of observations by year

	Female [F]	Male [M]	Total [F + M]
2013	3664	7034	10,698
2014	3788	6910	10,698
2015	3787	6866	10,653
2016	7622	16,355	23,977
2017	4221	7610	11,831
Total	23,082	44,775	67,857

Notes: The 2016 survey also includes both urban and rural households with 14,434 and 9,543 observations, respectively

shown in Table 1. Save for the 2016 data which comprises both rural and urban households, the surveys focused on rural households. Table 1 shows that the 2013 and 2014 surveys covered 10,698 observations each, whereas the 2015, 2016, and 2017 surveys had 10,653, 23,977, and 11,831 observations, respectively. In terms of the gender distribution of the household heads, there are a total of 23,082 female-headed and 44,775 male-headed households.

Measurement of key variables

Food and nutrition insecurity

This study uses five proxies to measure the food and nutrition insecurity status of the household. Firstly, the study uses the Household Hunger Score (HHS). The household hunger score is a weighted index created from the summation of the questions to which the household responds affirmatively to questions of having experienced a day with no food of any kind in the household, went to sleep at night hungry because there was no food, or go a whole day and night without anything to eat at all because there was not enough food to eat in the household. This therefore implies that for household i :

$$\text{HHS}_i = \#\{\text{Questions answered affirmatively by household } i\}$$

HHS _{i} takes values from 0, up to and including 3. The higher the household hunger score, the more food and nutrition insecure the household is.

The second measure is the poor food consumption score. The household food consumption score is a measure of dietary diversity, food frequency, and the relative nutritional importance of the food consumed. A high food consumption score increases the possibility that a household achieves nutrient adequacy. The food consumption score is used to classify households into three groups: poor, borderline, or acceptable food consumption. One is taken to have a poor food consumption score if that household has a food consumption score that is less than 21. The poor food consumption score variable therefore takes the value of one if the household food consumption score is less than 21 and 0 otherwise.

The final three measures take the value of 1 if the household has not consumed foods that contain minerals, proteins, or iron. If the household has not consumed minerals, vitamins, or iron, the household is taken to be food and nutrition insecure.

Measures of consumption and livelihoods based coping strategies

The CSI of a household is calculated by multiplying the frequency of consumption coping strategies used in the last 30 days with their respective severity weights. The coping strategies and their weights are shown Table 8 in Appendix 1 of this study. Similarly, the livelihoods-based coping strategies index is acquired by multiplying the use of the livelihoods strategies by their severity weights as shown Table 9 in Appendix 2 of this study.

Statistical estimation

To understand the impact of gender on, the household propensity to be food and nutrition insecure as stipulated in Hypothesis 1, the adoption of consumption-based coping strategies as stipulated in Hypothesis 2.1, or the adoption of livelihoods-based coping

strategies, as stipulated in Hypothesis 2.2, the following OLS regression model is proposed:

$$Y_i = \alpha + \gamma X_i + \varepsilon_i \quad (1)$$

Y_i takes the value of the household food and nutrition insecurity status or the level of adoption of consumption-based or livelihoods-based coping strategies. As previously noted, the household food and nutrition insecurity status is proxied by five measures which are the household hunger scale, poor food consumption score, never consuming vitamins, never consuming minerals, or never consuming iron. The higher the value of the food and nutrition insecurity proxies, the higher the food and nutrition insecurity of the household. X_i is a vector of the background characteristics of the household head, the household characteristics, provincial dummies, as well as year dummies since the data used was collected in five annual surveys. X_i also captures the gender of the household head. The gender variable takes the value of 1 if the household head is female and 0 otherwise. The study is interested in the coefficient of the gender variable as an answer to Hypotheses 1, 2.1 and 2.2 of this study. Results of the OLS estimation of Eq. (1) are presented in Tables 5 and 6 of this study.

Hypotheses 3.1 and 3.2 pays heed to the gender heterogeneity in the usage of consumption-based coping strategies and livelihoods-based coping strategies when confronted by food and nutrition insecurity. To capture the gender heterogeneity, the following regression model is proposed:

$$Y_i = \alpha + \beta \text{Coping}_i \times \text{Gender} + \rho \text{Gender}_i + \phi \text{Coping}_i + \gamma X_i + \varepsilon_i \quad (2)$$

In the case of Eq. (2), Y_i is the household food and nutrition insecurity status. The variable *Coping* represents consumption-based or livelihoods-based coping strategies, whereas the variable *Gender* represents the gender of the household head which takes the value of 1 if the household is female and 0 otherwise. The results of the OLS regression estimation of Eq. (2) are presented in Table 7 of this study.

Discussion

Descriptive analysis

Background characteristics of the household heads

Table 2 shows the background characteristics of the household heads by the gender of the household head. According to the table, female household heads tend to be older than the male household heads by 4.4 years. The age difference is statistically significant at the 1% level of significance. Table 2 also reveals that of the female household heads, only 18.5% reported that they were married and living together with their spouse. This number is a far cry from the male household heads who reported that 89.7% of them were married and living together with their spouse. The difference in the proportion of female and male household heads who were married and living together with their spouse is 71.2% and it is statistically significant at the 1% level of significance. The large gender difference in the marital status of the household heads is however not surprising given the cultural and societal setting of Zimbabwe which preserves the household head status for the husband in the marriage setting. The female heads of the household heads are more likely to found in settings where they are widowed (51.8%), married but living apart (14.2%), or divorced or separated (11.9%).

Table 2 Background characteristics of the household heads by gender

Variable	Female [F]	Male [M]	Difference [F – M]
Age [Years]	51.078	46.725	4.353***
Marital status			
Married living together	0.185	0.897	– 0.712***
Married living apart	0.142	0.035	0.107***
Divorced/separated	0.119	0.014	0.105***
Widowed/widower	0.518	0.030	0.488***
Never married	0.035	0.023	0.012***
Level of education			
No education	0.197	0.093	0.104***
Primary level	0.369	0.274	0.095***
ZJC	0.193	0.200	– 0.007**
O' level	0.173	0.289	– 0.116***
A' level	0.049	0.101	– 0.053***
Diploma/certificate after primary	0.005	0.011	– 0.005***
Diploma/certificate after secondary	0.011	0.023	– 0.012***
Graduate/post-graduate	0.003	0.009	– 0.006***

Notes: The fourth column shows the results of two-tailed t-test for the difference in the means
 ***, **, and * indicate the 1, 5, and 10% levels of significance

The respective proportions for these marital statuses for male household heads are 3%, 3.5%, and 1.4%.

In terms of the average level of education, Table 2 reveals that the proportion of female household heads that had no education is 19.7% versus the 9.3% for male household heads. Furthermore, only 17.3% of the female household heads had completed O' level education versus 28.9% of the male household heads.

The major take is that female household heads are older, more likely to be found in settings where they do not have a spouse and are less educated than their male counterparts. This finding is consistent with the earlier findings that find that female household heads have different observable and unobservable background characteristics from their male counterparts (Croson and Gneezy 2009; Fletschner and Carter 2008; Fletschner et al. 2010; Gneezy and Rustichini 2004; Kairiza et al. 2017; Powell and Ansic 1997; Reevy and Maslach 2001).

Gender differences in the characteristics of households

Table 3 shows the gender heterogeneity in the characteristics of the households headed by females and males, respectively. According to Table 3, female-headed households tend to be statistically smaller than those headed by males. The households headed by females average 4.83 members whereas those headed by males tend to average 5.3 members. The difference of 0.47 members is statistically significant at the 1% level of significance. *Ceteris paribus*, the observed gender difference in household size, is logical given that the majority of female household heads tend to be widowed as Table 2 previously intimated. Unlike male-headed households, the majority of the female-headed households are short of one member who constitutes the spouse of the household head.

Table 3 also reveals that female-headed households tend to have smaller average monthly income versus those headed by their male counterparts. Female-headed

Table 3 Background of households

Variable	Female [F]	Male [M]	Difference [F – M]
Household size	4.828	5.295	– 0.467***
Proportion of female members to household size	0.606	0.467	0.139***
Number of mentally ill household members	0.089	0.085	0.004
Number of chronically ill household members	0.077	0.074	0.003
Household income [USD]	128.521	190.687	– 62.167***
Province			
Bulawayo	0.011	0.010	0.001
Manicaland	0.131	0.101	0.030***
Mashonaland Central	0.093	0.140	– 0.047***
Mashonaland East	0.141	0.143	– 0.002
Mashonaland West	0.095	0.139	– 0.044***
Matabeleland North	0.114	0.109	0.005**
Matabeleland South	0.139	0.095	0.044***
Midlands	0.127	0.140	– 0.013***
Masvingo	0.125	0.103	0.022***
Harare	0.023	0.019	0.004***
The household is located in rural areas [1 if yes]	0.867	0.855	0.012***

Notes: The fifth column shows the results of two-tailed *t* test for the difference in the means
 ***, **, and * indicate the 1, 5, and 10% levels of significance

households had on average a monthly income of USD128.52 versus USD190.69 for the male-headed households. Furthermore, female-headed households are more likely to be located in rural areas by a proportion of 1.2% than their male counterparts.

The findings presented in Table 3 further corroborate the findings in Table 2 and reaffirms the notion that female households have different socio-economic characteristics from those of male households (Croson and Gneezy 2009; Fletschner and Carter 2008; Fletschner et al. 2010; Gneezy and Rustichini 2004; Kairiza et al. 2017; Powell and Ansic 1997; Reevy and Maslach 2001). The differences in the socio-economic characteristics are likely to give rise to gender differences in the household propensity to food and nutrition insecurity and the coping strategies employed by the household when they are not controlled for.

Gender differences in food insecurity and coping strategies

Table 4 displays the gender differences in food and nutrition insecurity and the coping strategies indices of the households in Zimbabwe. Consistent with prior studies such as Horrell and Krishnan (2007), King-Dejardin and Owens (2009), Klasen et al. (2015), Peterman et al. (2010), Quisumbing (1996), and Quisumbing and McClafferty (2006) amongst others, this study finds that female-headed households are more likely to be food insecure than their male counterparts. Table 4 shows that female-headed households have higher household hunger scores than their male counterparts. Female-headed households have average household hunger score of 0.53 versus the average household hunger score of male-headed of 0.47. Furthermore, female-headed households have higher probability of never consuming foods with minerals, proteins or iron with the respective difference in proportions vis-à-vis male-headed households being

Table 4 Food security by gender of the household head

Variable	Female [F]	Male [M]	Difference [F – M]
Hunger score	0.525	0.474	0.051***
Poor food consumption score	0.202	0.169	0.033***
Never consumes minerals	0.357	0.343	0.015***
Never consumes proteins	0.198	0.154	0.044***
Never consumes iron	0.445	0.376	0.068***
Consumption coping strategy index	22.066	20.558	1.508***
Livelihoods coping strategy index	0.521	0.578	– 0.057***

Notes: The fourth column shows the results of two-tailed *t*-test for the difference in the means
 ***, **, and * indicate the 1, 5, and 10% levels of significance

0.02, 0.04, and 0.07. These differences are all statistically valid at the 1% level of significance.

Table 4 also shows the differences in consumption and livelihoods-based coping strategies indices. Consistent with studies such as Cappellini et al. (2014), Günther and Harttgen (2009), and Skoufias and Quisumbing (2005), amongst others, Table 4 displays that female-headed households are more likely to employ consumption-based coping strategies than male-headed households before controlling for background characteristics. Female-headed households have higher consumption-based coping strategies index of 22.07 versus 20.56 for males. The difference of 1.51 is statistically significant at the 1% level of significance. This finding confirms that females as the preparers of food in the households are more able to reorganize consumption patterns in the household when faced with food insecurity.

Table 4 also shows that when one considers the livelihoods-based coping strategies female-headed households are less likely to employ livelihoods-based coping strategies than their male counterparts before controlling for background characteristics. Indeed, female-headed households have a livelihoods-based coping strategy index of 0.52 versus the 0.58 for male-headed households, giving rise to a difference of 0.06 which is statistically significant at the 1% level of significance. This table confirms the earlier findings of Günther and Harttgen (2009) and Skoufias and Quisumbing (2005), amongst others, who show that female-headed households are more restricted in the usage of livelihoods-based coping strategies than their male counterparts. Female household heads are less likely to be able to employ livelihoods-based coping strategies such as selling a house when confronted by food and nutrition insecurity than their male counterparts.

Regression results

The impact of gender impact on food and nutrition insecurity

Table 5 shows the impact of gender on food insecurity. According to column II of the table, if the household head is female, the probability of having a poor food consumption score increases by 1.56%. Furthermore, columns IV and V of Table 5 shows that the probabilities of never consuming proteins or iron increases by 2.13% and 2.84%, respectively. The findings presented in Table 5 confirm Hypothesis 1 of this study that female-headed households are more prone to food insecurity than their male counterparts even after controlling for the demographic characteristics of the households. The

Table 5 OLS estimates of the impact of gender on food security

Variables	Hunger score (I)	Poor food consumption score (II)	Never consumes minerals (IV)	Never consumes proteins (V)	Never consumes iron (IV)
Household head is female	- 0.00889 (0.0115)	0.0156*** (0.00477)	- 0.00518 (0.00476)	0.0213*** (0.00467)	0.0284*** (0.00584)
Age of household head [years]	- 0.00381*** (0.000267)	- 0.00166*** (0.000111)	- 0.000820*** (0.000108)	- 0.000980*** (0.000109)	- 0.000810*** (0.000135)
Married living together	- 0.0197 (0.0233)	0.0173* (0.00885)	- 0.0122 (0.00905)	0.00916 (0.00868)	- 0.000982 (0.0112)
Married living apart	- 0.0982*** (0.0255)	- 0.0103 (0.00994)	- 0.0103 (0.0103)	- 0.00985 (0.00979)	- 0.0250** (0.0126)
Divorced/separated	0.0841*** (0.0286)	0.0287*** (0.0110)	- 0.00539 (0.0108)	0.0183* (0.0107)	0.00491 (0.0135)
Widowed/widower	0.0490* (0.0258)	0.0187* (0.00980)	- 0.0165* (0.00986)	0.0110 (0.00960)	0.00937 (0.0122)
Primary	- 0.0820*** (0.0135)	- 0.0425*** (0.00551)	- 0.0136*** (0.00463)	- 0.0398*** (0.00548)	- 0.0411*** (0.00650)
ZJC	- 0.195*** (0.0154)	- 0.0957*** (0.00629)	- 0.0403*** (0.00562)	- 0.0847*** (0.00619)	- 0.0894*** (0.00759)
O' level	- 0.264*** (0.0146)	- 0.117*** (0.00593)	- 0.0608*** (0.00521)	- 0.104*** (0.00583)	- 0.129*** (0.00723)
A' level	- 0.352*** (0.0191)	- 0.159*** (0.00799)	- 0.0898*** (0.00841)	- 0.134*** (0.00777)	- 0.169*** (0.00989)
Diploma/certificate after primary	- 0.367*** (0.0297)	- 0.139*** (0.0107)	- 0.0910*** (0.0141)	- 0.119*** (0.0109)	- 0.178*** (0.0160)
Diploma/certificate after secondary	- 0.371*** (0.0213)	- 0.141*** (0.00765)	- 0.0948*** (0.0105)	- 0.131*** (0.00753)	- 0.199*** (0.0114)
Graduate/post-graduate	- 0.324*** (0.0290)	- 0.0900*** (0.0103)	- 0.0530*** (0.0126)	- 0.0879*** (0.0103)	- 0.148*** (0.0150)
Household size	0.0230*** (0.00173)	0.00196*** (0.000691)	- 0.000422 (0.000672)	0.00137** (0.000676)	0.00636*** (0.000847)
Proportion of female household members	- 0.0224 (0.0173)	0.00222 (0.00712)	0.00243 (0.00708)	0.0151** (0.00700)	0.0187** (0.00878)
Number of mentally ill household members	0.0217* (0.0128)	0.00184 (0.00482)	0.00596 (0.00438)	0.00561 (0.00464)	0.0110* (0.00571)
Number of chronically ill household members	0.126*** (0.0141)	0.0244*** (0.00531)	0.000663 (0.00470)	0.0105** (0.00502)	0.0123** (0.00623)
Household income [USD]	- 0.000225*** (9.42e-06)	- 8.88e-05*** (3.50e-06)	- 5.53e-05*** (4.31e-06)	- 7.67e-05*** (3.25e-06)	- 0.000146*** (5.60e-06)
The household is located in rural areas [1 if yes]	0.214***	0.138***	0.0190***	0.113***	0.316***

Table 5 OLS estimates of the impact of gender on food security (*Continued*)

Variables	Hunger score (I)	Poor food consumption score (II)	Never consumes minerals (IV)	Never consumes proteins (V)	Never consumes iron (IV)
	(0.0134)	(0.00431)	(0.00373)	(0.00430)	(0.00570)
	(0.0133)	(0.00587)	(0.00556)	(0.00568)	(0.00713)
Constant	0.882*** (0.0502)	0.294*** (0.0152)	0.778*** (0.0139)	0.244*** (0.0154)	0.317*** (0.0208)
Observations	64,779	65,950	65,950	65,950	65,950
R-squared	0.063	0.065	0.405	0.051	0.119

Notes: Regression results control for province as well as survey year dummies. Robust standard errors in parentheses
***, **, and * indicate the 1, 5, and 10% levels of significance

results are also consistent with previous studies that find that female head households are more prone to food insecurity such as Horrell and Krishnan (2007), King-Dejardin and Owens (2009), Klasen et al. (2015), Peterman et al. (2010), Quisumbing (1996), Quisumbing and McClafferty (2006), and Quisumbing and Pandolfelli (2009) amongst others.

The results in Table 5 also show that education decreases the food insecurity of the household. Indeed, columns I to column V of the table show that as the level of education increases all measures of food insecurity decrease. This finding is consistent with earlier studies such as Garrett and Ruel (1999). Expectedly, columns I to V show that household size, having a chronically or mentally ill household member increase the household food and nutrition insecurity by all proxies.

The impact of gender on the adoption of coping strategies

Column I of Table 6 shows the impact of gender on the usage of consumption-based coping strategies. According to column I of the table, if the household head is female, the usage of consumption-based coping strategies increases by 0.95 points. This finding therefore confirms Hypothesis 2.1 of this study and affirms the findings of earlier studies such as Cappellini et al. (2014), Günther and Harttgen (2009), and Skoufias and Quisumbing (2005), amongst others. This finding is intuitive since as already noted, the role of food preparation and distribution is usually carried out by females in the Zimbabwean setting. Even if they are the household heads, women are still likely to be involved in the food preparation patterns at home, rather than if the household head is male who is less likely to have a direct role in the preparation of food at home. It therefore follows that females are likely to be more able to change consumption patterns at home without difficulty.

Column II of Table 6 shows the impact of gender on the livelihoods-based coping strategies. The table shows that there is no statistically significant gender differences in the ability to use livelihoods-based coping strategies which is in line with Hypothesis 2.2 of this study. This finding is in line with prior studies such as Günther and Harttgen (2009) and Skoufias and Quisumbing (2005), amongst others, who conclude that female household heads are less likely to be able to engage in long-term measures such as selling a house in the light of hunger than their male counterparts.

Table 6 OLS estimates of the impact gender on coping strategies

Variables	Consumption-based coping strategies index	Livelihoods-based coping strategies index
	(I)	(II)
Household head is female	0.950** (0.379)	– 0.0263 (0.0170)
Age of household head [years]	– 0.171*** (0.00865)	– 0.00571*** (0.000380)
Married living together	1.984*** (0.738)	0.101*** (0.0320)
Married living apart	– 2.247*** (0.797)	0.00648 (0.0351)
Divorced/separated	3.380*** (0.885)	0.0958** (0.0386)
Widowed/widower	3.192*** (0.809)	0.145*** (0.0347)
Primary	– 1.348*** (0.406)	– 0.00715 (0.0151)
ZJC	– 3.247*** (0.474)	0.0157 (0.0207)
O' level	– 6.372*** (0.451)	– 0.0473*** (0.0182)
A' level	– 9.235*** (0.603)	– 0.0733 (0.0450)
Diploma/certificate after primary	– 8.230*** (0.970)	– 0.0901* (0.0516)
Diploma/certificate after secondary	– 10.77*** (0.617)	– 0.116*** (0.0398)
Graduate/post-graduate	– 8.761*** (0.795)	– 0.177*** (0.0441)
Household size	1.082*** (0.0531)	0.0407*** (0.00253)
Proportion of female household members	– 0.0721 (0.537)	0.00630 (0.0245)
Number of mentally ill household members	0.762* (0.401)	– 0.0135 (0.0156)
Number of chronically ill household members	3.468*** (0.460)	0.106*** (0.0184)
Household income [USD]	– 0.00885*** (0.000332)	– 0.000185*** (1.32e–05)
The household is located in rural areas [1 if yes]	11.49*** (0.378)	0.262*** (0.0180)
Constant	26.39*** (1.444)	– 0.0686 (0.0588)

Table 6 OLS estimates of the impact gender on coping strategies (Continued)

Variables	Consumption-based coping strategies index (I)	Livelihoods-based coping strategies index (II)
Observations	65,950	45,663
R-squared	0.083	0.087

Notes: Regression results control for province as well as survey year dummies. Robust standard errors in parentheses
***, **, and * indicate the 1, 5, and 10% levels of significance

Gender heterogeneity in the usage of coping strategies when confronted by food and nutrition insecurity

Panel A of Table 7 shows the gender heterogeneity in the household usage of consumption-based coping strategies when confronted by food and nutrition insecurity. According to columns I to V of panel A, there is positive and statistically significant correlation in the usage of consumption-based coping strategies and household food and nutrition insecurity. Households that are food insecure are more likely to engage in consumption-based coping strategies. In terms of gender heterogeneity in the usage of consumption strategies in the presence of food insecurity, it is only observed in column IV of panel A where female household heads are more likely to use consumption-based coping strategies in the presence of lacking proteins but not in any other measure of household food and nutrition insecurity.

Panel B of Table 7 shows the gender heterogeneity in the usage of livelihoods-based coping strategies in the presence of household food and nutrition insecurity. According to columns I to V of panel A, there is positive and statistically significant correlation in the usage of livelihoods-based coping strategies and household food and nutrition

Table 7 OLS estimates of gender heterogeneity in the usage of coping strategies when confronted with food and nutrition insecurity

Variables	Hunger score (I)	Poor food consumption score (II)	Never consumes minerals (IV)	Never consumes proteins (V)	Never consumes iron (IV)
Panel A					
Household head is female × Consumption-based coping strategy index	– 0.000212 (0.000338)	7.69e–05 (0.000128)	8.64e–05 (0.000134)	0.000337*** (0.000124)	– 0.000197 (0.000137)
Household head is female	0.0353*** (0.00726)	0.0254*** (0.00344)	0.00988** (0.00462)	0.0326*** (0.00347)	0.0664*** (0.00473)
Consumption-based coping strategy index	0.0149*** (0.000203)	0.00355*** (7.83e–05)	0.00195*** (8.25e–05)	0.00262*** (7.40e–05)	0.00405*** (8.63e–05)
Panel B					
Household head is female × Livelihoods-based coping strategy index	– 0.0329*** (0.0114)	– 0.0110*** (0.00374)	0.000742 (0.00390)	– 0.00511 (0.00356)	– 0.0164*** (0.00436)
Household head is female	0.0763*** (0.00966)	0.0379*** (0.00399)	0.0186*** (0.00431)	0.0458*** (0.00401)	0.0741*** (0.00531)
Livelihoods-based coping strategy index	0.222*** (0.00635)	0.0344*** (0.00212)	0.0260*** (0.00216)	0.0211*** (0.00195)	0.0312*** (0.00247)

Notes: Regression results control for province as well as survey year dummies. Robust standard errors in parentheses
***, **, and * indicate the 1, 5, and 10% levels of significance

insecurity. According to columns I to V of panel B, there is statistically significant negative correlation in the usage of livelihoods-based coping strategies and being female in the presence of household food and nutrition insecurity. Indeed, column I shows that being female reduces the propensity to use household livelihoods-based coping strategies as the household hunger score increases. The pattern in column I is observed in column II to IV of panel B of Table 7. These findings therefore strongly corroborate Hypothesis 3.2 of this study. Furthermore, the findings presented in panel B of the Table 7 also affirm the earlier findings of studies such as Günther and Harttgen (2009) and Skoufias and Quisumbing (2005), amongst others, who find that females are less able to use livelihoods-based coping strategies in the presence of household food and nutrition insecurity.

Conclusion and policy recommendations

On the basis of a large-scale nationally representative household data from four pooled cross-section surveys conducted by ZimVAC from 2013 to 2017 comprising 67,857 households in Zimbabwe, this study assessed the existence of gender heterogeneity in the vulnerability to food insecurity, usage of coping strategies, and the household usage of such coping strategies when confronted by food and nutrition insecurity.

The study offers three major findings. Firstly, consistent with prior studies, the study finds that female-headed households are more prone to food insecurity than those that are male-headed. The study finds that female-headed households are *ceteris paribus*, more likely to have higher household hunger scores, poor food consumption scores as well as likely to go without consuming vitamins, minerals or foods rich in iron.

Secondly, the study finds that female-headed households are more likely to be able to use consumption-based coping strategies but not livelihoods-based coping strategies more than their male counterparts. This finding is intuitive given that consumption-based coping strategies are short-term and are more likely to be within the realm of decisions that are preserved for women specifically the preparation and distribution of food within the traditional household in the Zimbabwean setting. Women however even though they might be household heads might be encumbered by societal conventions in engaging in more long-term livelihoods-based coping strategies than their male counterparts. In that regards, the study therefore finds no statistically significant gender heterogeneity in the usage of livelihoods-based coping strategies.

Finally, the study finds that there is little evidence in the gender heterogeneity in the household usage of consumption-based coping strategies when confronted by food and nutrition insecurity. The little evidence of gender heterogeneity in the usage of consumption-based coping strategies is likely to be because even in the households where they are headed by males the implementation of consumption-based coping strategies is still done by women in the household. On the other hand, when one looks at the longer-term livelihoods-based coping strategies, female-headed households are less likely to employ livelihoods-based coping strategies when confronted by food and nutrition insecurity than their male counterparts. Their lesser ability is likely to stem from the socio-cultural constraints that they are likely to encounter in the implementation of livelihoods-based coping strategies when confronted by food and nutrition insecurity.

In summary, whilst female-headed households are more prone to food insecurity than male-headed households, they are more encumbered in the use of long-term coping strategies than their male counterparts.

Appendix

Table 8 Measurement of consumption coping strategy index

During the last 7 days, were there days (and, if so, how many) when your household had to employ one of the following strategies (to cope with a lack of food or money to buy it)?	Frequency (number of days from 0 to 7)	Weight
Relied on less preferred, less expensive food		1
Borrowed food or relied on help from friends or relatives		1
Reduced the number of meals eaten per day		1
Reduced portion size of meals		2
Reduction in the quantities consumed by adults/mothers for young children		3

Table 9 Measurement of livelihoods based coping strategies index

During the past 30 days, did anyone in your household have to engage in any of the following activities because there was not enough food or money to buy food?	Weight
Sold household assets/goods (radio, furniture, refrigerator, television, jewellery, clothes, etc.)	2
Purchased food on credit or borrowed food	2
Spent savings	0
Borrowed money	2
Sold productive assets or means of transport (sewing machine, wheelbarrow, bicycle, car, etc.)	3
Consumed seed stocks that were to be held/saved for the next season	0
Withdrew children from school	0
Sold house or land	0
Begged	0
Sold last female animals	4

Abbreviations

ZimVAC: Zimbabwe Vulnerability Assessment Committee

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Ethical approval and consent to participate is not applicable for our study.

Competing interests

The authors declare that they have no competing interests.

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