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Household headship, resource ownership and food security: New evidence from Southeast Nigerian cities

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ABSTRACT

In cities with deeply entrenched sociocultural/patriarchal norms, female-headed households (FHHs) and male-headed households (MHHs) often have unequal access to economic resources and opportunities, which can lead to gender gaps in food security. Male control of economic resources means that women and FHHs are frequently less able to invest in and achieve food security goals. Using an estimated food security line constructed from a set of household food expenditure data retrieved from the 2018/19 Nigeria Living Standards Survey (to delineate households as food secure and food insecure), as well as a nonlinear Blinder-Oaxaca decomposition model, this study investigates how household headship and resource ownership contribute to gendered food (in)security gaps in Nigerian cities. The study offers two main findings. First, there are significant food security inequalities between MHHs and FHHs. Second, the differences in the level of use of household resources/assets explain 56 % of the observed gendered food security inequalities. In sum, the study suggests that: (i) if FHHs are supported to acquire the same level of economic resources as MHHs, their food security status can improve significantly; and (ii) considering household headship and resource ownership as crucial gender equality issues in food security policies can help advance the wellbeing of FHHs in cities. This study's findings are important for the design of policies promoting equal rights to economic resources and the achievement of food security for both men and women.

Introduction

This study examines whether and how household headship and resource ownership contribute to gendered food (in)security gaps. The study is motivated by three assumptions popularised by past studies investigating the role of household heads (HHs) and gender differences in access to socio-economic resources. The first assumption presents HHs as the main decision-makers and income earners who are responsible for the economic wellbeing of their households [1,2]. The second assumption posits that female-headed households (FHHs) relative to male-headed households (MHHs) are disadvantaged in accessing economic resources and opportunities and are often seen as vulnerable to food insecurity [3,4]. This vulnerability is usually linked to unjust patriarchal structures (e.g. in many developing countries) that undermine the capacity of women and FHHs to access the resources required to meet food security needs [5]. Van Averbeke [6] found that FHHs tend to access/receive smaller plots of land, lower credit facilities, insufficient support from

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agricultural extension agencies and limited access to innovative farming tools compared to their male counterparts. In combination, these two assumptions indicate that although the HH (irrespective of his/her gender) strive to meet and sustain the economic welfare of the household, the resources available to do these are not gender-neutral. The third assumption indicates that household headship influences how resources within the household are allocated and utilised amongst household members, including how multiple households build social networks with one another for exchange of resources [7].

In viewing household headship from a gender lens and by focusing on male- and female-headed households in the context of household food security, this study seeks to advance better understandings of the gendered aspect of household food security. Household food security here refers to a state where "all people (households), at all times, have physical, social, and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" ([8], p. 2). Four well-known dimensions of food security arising from this definition are food availability (e.g. the quantity of food available in a household); food accessibility (capturing household economic access to sufficient, safe, and nutritious food); food stability (relating to steady food supplies in a household); and food utilisation (encompassing how food is utilised/prepared to meet family dietary needs). Food insecurity, in contrast, implies limited ability to secure and consume sufficient and quality food, often leading to adverse effects on household well-being [9].

In this study, we assess household food security using the 'food access' dimension, drawing on past studies that used Household Food Expenditure Surveys (HFES) covering household economic access to food, including vulnerability to food deprivation. The validity, reliability and applicability of HFES in food security studies in developing countries have been confirmed by past studies (e.g. [10,11]). These studies note that data on expenditure do not solely comprise household monetary expenditure on food, they also cover the monetary value of food consumed within the household that is obtained from family farms and food received as gifts.

Food access/expenditure data derived from the Living Standards Measurement Survey (LSMS) enable estimation of context-specific national food security lines and categorisation of households into food secure and food insecure groups [12]. The 2018/19 Nigeria LSMS captures data on the population of rural and urban households in Nigeria, as well as data on household food and non-food expenditures. We use the LSMS data to estimate a national food security line of ₦4, 821.4 (i.e., approximately US$13) per person/-month (computed by dividing the national monthly household food expenditure by total household size). This approach trumps alternative approaches involving the use of a sample-dependent food security line (i.e. a food security line based on data generated from sub-national household surveys). Using this estimate, we classified households into two food security groups: households are considered food secure if their per capita monthly food expenditure is above or equal to the national food security line, and food insecure if their food expenditure is below the line. Here, food secure households are those whose per capita monthly food expenditure is above or equal to the national food security line (estimated at N4, 821.4 ≈ US$13, at the time of the study).

This study employs a general nonlinear Blinder-Oaxaca decomposition model (in which FHHs and MHHs are considered as separate variables) to investigate gendered food (in)security. Unlike past studies that used a pooled regression analysis involving gender 'dummy' indicators (such as the nominal male versus female variables) typical of ordinary regression analysis [1,13], the nonlinear Blinder-Oaxaca decomposition model generates information on how differential ownership/use of resources fosters gender gap in food (in)security.

By using the approaches outlined above, this study addresses the following set of unique objectives unexplored in previous studies – these are to (i) unpack the differences in socio-economic characteristics and resource ownership between MHHs and FHHs; (ii) determine whether MHHs and FHHs share similar food security status in an urban context; (iii) understand the differences in the determinants of food (in)security between MHHs and FHHs; and (iv) investigate how gender gap in resource ownership contributes to gendered (household) food (in)security. The study contributes to the broader household food security and gender equality literature by offering empirical insights on the forces that engender dissimilar gendered food (in)security in cities characterised by agriculture and food production activities and where relatively less rigorous empirical food security research has been conducted.

Methodology

Study area description

Household participants for this study were recruited from urban areas in southeast Nigeria. This region comprises Enugu, Imo, Anambra, Abia and Ebonyi States (Fig. 1). The region's total land area is approximately 78,612 km^2, located between longitudes 7° 54′ 26″E and 8° 27′ 10″E and latitudes 4° 47′ 35″N and 7° 7′ 44″N in the tropical rain forest zone of Nigeria, and has a mean maximum temperature of 27 °C, and total annual rainfall exceeding 2500 mm [14]. The region is mainly agrarian, and the majority of the inhabitants depend on land resources for their livelihoods. The population density is approximately 1000 people/Km^2; the estimated total population is 22.3 million [15].

The proportion of male-headed versus female-headed households[1] in southeast Nigeria stands at 78.2 % and 21.8 % respectively [16]. Southeast Nigerian cities are considered a unique testbed for investigating gendered household food security because of the persistent problem of food insecurity that characterises households in the cities [17]; as well as the protracted challenges of social inequality and lingering gender gaps in economic resource ownership that shape household headship [18].

[1] Male-headed or female-headed households refers to households headed by an adult man or woman (respectively) - with children and with or without a spouse.

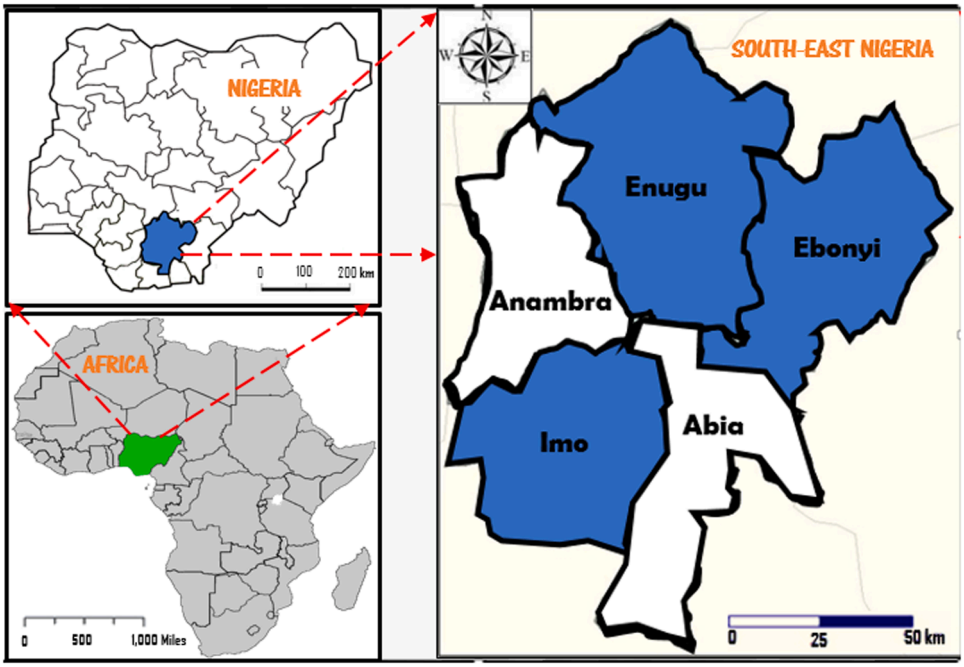

Fig. 1. Map of Nigeria showing the southeast region and the three states (highlighted in blue) where this study was conducted. Source: Olumba and Alimba [4].

Sampling and data collection

We used a three-stage sampling method to select the sample households for the study. First, purposive sampling was used to select three states (i.e. Ebonyi, Enugu and Imo) from the five states in the region based on the predominance of urban agricultural activities and gendered food security gaps. Second, we sampled urban farming households across the three selected states. A sampling frame containing a total of 931 urban farming households (Ebonyi: 202; Enugu: 192; and Imo: 537) was retrieved from the Agricultural Development Programme and Fadama III offices in each state. Using the Yamane [19] method of sampling from a population (Eq. 1), we estimated a minimum representative sample size of 280 urban households based on a 5 % error margin and a 95 % confidence interval.

$$n = \frac{N}{1 + N\,(e^2)} = \frac{931}{1 + 931\,(0.05^2)} = 280 \tag{1}$$

Where: n = sample size, N = total sampling frame of urban households, and e = tolerable error level of 0.05.

Third, to account for the difference in the number of households across the three selected states, we employed a proportionate sampling technique ($n_h = \mathrm{n} * \frac{m_i}{N}$, *where* n_h = sample size selected from each state, n=sample size of the study [280], m_i=total households for each state, and N = total households [931]) which enabled us to select a total of 280 households (Table 1).

Data were collected from 280 urban households (164 MHHs and 116 FHHs). Urban households in this context are households in areas located within the state capital territory that engage in growing food to meet household food requirements and boost household income. Questionnaires captured information on household characteristics such as the gender, dependency ratio, primary occupation, farming experience, household size, membership in cooperative societies; key variables relating to household resource ownership such as educational qualification, access to credits, farm income, off-farm income, market access and size of land owned; and households' monthly food expenditure. To collate household monthly food expenditure data, we followed FAO's recommendation to include 12 major food groups that make up the human diet (see [20]). Based on these food groups, we asked households to indicate how much they spent on food items purchased, as well as the cost of food items received as gifts or obtained from their farms and consumed by household members in the last month.

Data analysis and approaches employed in addressing the study objectives

A t-test (of significance) on (a) the equality of means for continuous variables, and (b) the equality of proportions for binary variables was carried out to assess differences in the socio-economic characteristics and resource levels of the MHHs and FHHs. To assess the food security differences between MHHs and FHHs, we adopted a combination of approaches. First, household food expenditure assessment methods enabled objective measures of household average monetary expenditures on food in the last one

Table 1
Sample size of the study (± 5 % precision level where the confidence level is 95 %)

Region	Sampled state	Number of households	Selected sample size
Southeast	Ebonyi	202	61
	Enugu	192	58
	Imo	537	161
	Total	931	280

month (including food from farms and food received as gifts). Second, using a national food security line[2] that captures two-third mean per capita monthly household food expenditure [21,22], the surveyed households were classified into food secure and food insecure groups. Third, we employed a t-test of significance to detect food expenditure differences between MHHs and FHHs.

To investigate differences in the determinants of food security between the MHHs and FHHs, we used individual logit models for each of the MHHs and FHHs to identify the determinants of household food (in)security. Here the dependent variable took the value of one if MHHs or FHHs is food secure and zero if otherwise - the models controlled for variables commonly used in food security analysis [1,22,13].

To investigate how differences in resource ownership contribute to gender gap in food security, we employed the nonlinear Blinder-Oaxaca decomposition model. This decomposition model is a modification of the general Blinder-Oaxaca decomposition technique proposed by Fairlie [23]. This technique has gained wider applications because it overcomes the problem of generating predictions outside of the (0,1) interval or misleading estimates such as in the linear Blinder-Oaxaca decomposition when group differences are very large for an influential explanatory variable [24]. In this study, we used the nonlinear Blinder-Oaxaca decomposition technique to decompose gender inequalities in food security status of MHHs and FHHs and to examine the extent to which gendered food security inequalities can be explained by differences in the levels of observed covariates such as socio-economic characteristics and resource ownership and those due to unobserved covariates. Unobserved covariates constitute the residual part of any model that cannot be accounted for by observed differences in a set of covariates [25,23]. To conduct this nonlinear decomposition analysis, we employed the '*fairlie*' package in Stata-15, which supports decomposition for binary dependent variables, as in our case [26]. The estimation procedures of the nonlinear Blinder-Oaxaca decomposition analysis are presented in the Appendix.

Results and discussion

Differences in the socio-economic characteristics and resource ownership

Table 2 presents the summary statistics of the socio-economic characteristics and resource levels of MHHs and FHHs.

The table shows significant differences in farm sizes ($P < 0.1$), per capita monthly food expenditure ($P < 0.05$), per capita monthly off-farm income ($P < 0.05$), educational status ($P < 0.1$) and membership in cooperative societies ($P < 0.1$) between MHHs and FHHs. Specifically, the FHHs have lower farmland holdings, lower per capita monthly food expenditure and off-farm income, lower cooperative membership and less educational qualifications compared to the MHHs. This finding corroborates the results of Olumba and Alimba [4] and Debela [5] suggesting that FHHs are largely disadvantaged in terms of their demographics and access to and ownership of productive/economic resources. The disadvantaged position of the FHHs has negative consequences on their efforts towards attaining food security [2].

Food security differences across MHHs and FHHs

Table 3 provides results on the food security status of the MHHs and FHHs. Approximately 63 % of the MHHs are food secure, compared to 48 % of the FHHs. The t-test statistics show that this difference is significant at 5 % level.

This finding is consistent with other studies reporting the prevalence of food security gaps between FHHs and MHHs and highlighting the FHHs as having lower food security status [27,28].

Differences in the determinants of food security between the MHHs and FHHs

First, we examine the determinants of food security, and second, we identify the differences in the determinants. Table 4 presents results from a logit regression analysis of the factors influencing food security in MHHs and FHHs. In terms of the differences in the determinant factors for food security across HHs, the results show that household size significantly determines food security in the FHHs but not in the MHHs. Also, the dependency ratio is significant in the MHHs model but not in the FHHs. Nevertheless, there are pieces of evidence of similar factors influencing the food security status of both the FHHs and MHHs, with differences only observed in the magnitude, i.e., the size of the coefficient and level of significance.

Across FHHs, household size (average of 6) undermines food security (significant and negative relationship ($P < 0.1$)). As the number of people living in FHHs increases, the number of individuals to feed also increases – this places pressure on income and

[2] Derived from LSMS data.

Table 2
MHHs and FHHs socio-economic characteristics and resource ownership

Household characteristics	Description of variable	MHHs (Mean A)	FHHs (Mean B)	Differences (A – B)
Monthly per capita food expenditure	Total household expenditure on food divided by number of persons in household	₦10 799.84 (i.e. $28.4)[1]	₦9 558.54 (i.e. $25.2)	2.46**
Monthly per capita farm income	Total household farm income earned divided by number of persons in household	₦67 953.12 (i.e. $178.8)	₦64 868.45 (i.e. $170.7)	0.30
Monthly per capita off-farm income	Total household off-farm income earned divided by number of persons in household	₦53 489.23 (i.e. $140.8)	₦29 366.22 (i.e. $77.3)	2.41**
Age	Average age of household head	48	47.28	0.58
Education level	Education level of household head (years of schooling)	13.07	11.89	1.87*
Farm experience	Number of years of farming	12.41	11.21	1.14
Household size	Number of persons in household	6	6	0.44
Market access	Distance to the nearest output market (kilometre)	2.16	2.47	-1.56
Farm size	Size of farmland used in the last cropping season (hectare)	2.52	2.24	1.86*
Dependency ratio	Number of non-working members divided by number of working household members	1.97	2.10	-0.62
Membership in cooperatives	If Household head belongs to a cooperative (1 = yes; 0 = no)	0.48	0.37	1.85*
Access to credit	If Household head has access to credit (1 = yes; 0 = no)	0.30	0.22	1.56
Observations		164	116	

Notes: ** and * statistically significant at 5 % and 10 % respectively. Mean is shown for continuous and dummy variables.
[1] Exchange rate at the time this research was conducted was ₦380 to US$1.

Table 3
Summary food security indices of the households

Variable	Description of variables	MHHs (Mean A)	FHHs (Mean B)	Differences (A – B)
Food security	Household food security status	0.63	0.48	2.54**

Note: ** statistically significant at 5 %.

Table 4
Bivariate logistic regression of factors influencing food security of MHHs and FHHs (n=280)

Variables	MHHs Odds ratio	*t*-value	FHHs Odds ratio	*t*-value
Age of head of household (years)	1.05	0.85	1.03	1.12
Education level of head of household (years)	1.04	0.38	1.07	0.74
Primary Occupation	1.29	0.51	0.92	-0.24
Access to credit	0.65	-0.62	2.85	1.20
Distance from farm to market (km)	1.01	0.04	1.02	0.23
Member of cooperatives	0.41	-1.24	1.17	0.17
Household size	0.50	-1.56	0.68	-1.70*
Farm income (₦)	1.00	3.20***	1.00	2.06**
Distance from farm to residence (km)	1.33	1.08	0.71	-1.55
Off-farm income (₦)	0.99	-0.80	1.00	1.17
Farm size (ha)	10.23	4.45***	2.68	2.89***
Dependency ratio	0.54	-2.78***	0.79	-0.82
Constant	0.13	-0.63	0.01	-2.54
R^2	0.73		0.54	
Observations	164		116	

Notes: ***, ** and * statistically significant at 1 %, 5 % and 10 %, respectively. Abbreviations: Naira (₦), Kilometre (km), Hectare (ha)

available household food resources. Previous studies (e.g. [29]) suggest that FHHs with large household sizes (e.g. > 5) are likely to be vulnerable to food insecurity. Kassie et al. [27] found the probability of food insecurity increasing with increases in family size in both MHHs and FHHs.

In the MHHs, the dependency ratio decreases the probability of being food secure. MHHs with several dependants (e.g. > 5) that are non-income earners usually have limited income to sufficiently cater for the food needs of all household members. Sisha [13] suggests that a high dependency ratio is negatively associated with the probability of households being food secure. The effect of a high dependency ratio can be reduced by creating multiple income streams – this can help to extend access to food and in turn reduce household food insecurity.

Furthermore, Table 4 shows that across both the MHHs and FHHs, the probability of food security increases with farm size ($P < 0.01$) and farm income ($P < 0.05$). With respect to farm size, the positive and significant relationship observed between farm size and household food security status suggests that making farmlands physically and economically accessible to households can facilitate food security. This is particularly the case in agrarian societies where urban farming provides food to the household, as well as farm income to purchase food not produced by households [30]. Our study finding echoes Kassie et al. [27] study suggesting that farm size has an increasing marginal effect on the probability of household food security in both MHHs and FHHs in agrarian societies.

Linking differences in resource ownership to gender gap in food security

In this section, we explore how gender differences in resource ownership - farm income, off-farm income, employment status, educational attainment, and social networks contribute to gender gaps in food security. Using a nonlinear Blinder-Oaxaca decomposition, the differences in food security of the MHHs and FHHs were statistically decomposed into two parts: (i) a part attributed to gender-related differences in the observed distributions of household characteristics (explained effect); and (ii) a part due to differences in the unobserved characteristics (unexplained effect). Table 5 presents the result from the nonlinear decomposition of gender inequalities in household food security and the extent to which observable differences in the level of resource use/ownership contribute to gendered food security differences.

Rows (1) to (12) report the contribution of individual variables to gendered food security inequalities. The 13th row reports the extent to which the differences in observed characteristics/ resources (explained) in MHHs and FHHs contribute to gender differences in food security. That is, how much of the gender food security gap would be reduced if FHHs had the same resources as MHHs. Row (14) reports the extent to which the differences in the unobserved characteristics (unexplained) in MHHs and FHHs contribute to gender differences in food security. That is the unobserved differences in their returns from using resources that are not accounted for in the model. The last row reports the estimated gender inequality in the food security status between the male- and female-headed urban farming households.

The MHHs were the reference group because the interest was in measuring discrimination towards FHHs. As shown in Table 5, gender differences in the included variables accounted for 15 % of the gender inequalities in food security. However, this would have been reduced to 9 % if the FHHs had the same level of resources as the MHHs and 7 % if the FHHs had the same returns as MHHs resources. Specifically, the decomposition suggests that the gender food security gap would decrease if FHHs had the same resource endowment as the MHHs.

Furthermore, about 56.1 % and 43.9 % of the gendered food security inequality result from differences in the observed distribution of the included variables and differences in the unobserved characteristics respectively. Within the 56.1 % component of the inequality due to differences in observed households' characteristics, the inequalities attributed to farm sizes between the MHHs and FHHs contributed the most (33.6 %).

Gender differences in farm sizes contributed the most (33.6 %) and significantly ($P < 0.01$) to the gender gap in food security. By implication, lower farmland resource among FHHs relative to MHHs contributes the most to the gender gap in food security. Lower farm areas in use by FHHs (as observed in Table 2) is often linked to the patriarchal structures in Nigeria that limit female ownership, control and access to economic resources such as land [31]. The same situation has been noted in previous urban studies, where women urban farmers operate on small farm areas while the male cultivates on larger farm areas [32,33]. For example, Olumba et al. [33] found that access to land for women in urban agriculture in southeast Nigeria remains a challenge, with the majority of women farmers

Table 5
Results from the nonlinear decomposition of gender inequalities in household food security (n=280)

Independent variables	Estimate	Standard error	% contribution[a]
Age of head of household (Years)	0.00	0.00	2.25
Education level of head of household (Years)	0.01	0.01	6.21
Primary occupation	-0.00	0.01	-2.31
Access to credit	-0.00	0.01	-4.29
Distance from farm to the market (km)	0.00	0.01	2.18
Member of cooperative	0.00	0.01	1.25
Household size	-0.01	0.01	-3.30
Farm income (₦)	0.02	0.05	14.60
Distance from farm to the residence (km)	0.00	0.01	2.58
Off-farm income (₦)	-0.00	0.01	-0.40
Farm size (Ha)	0.05***	0.02	33.62
Dependency ratio	0.01	0.01	3.76
Explained effect: due to gender differences in observed distributions	0.09		56.14
Unexplained effect: due to gender differences in unobserved characteristics	0.07		43.86
Gender inequality	0.15		100

Note: *** statistically significant at 1 %.
Notes: The decompositions are based on the regression result reported in Table 4 as well as the coefficient estimates from both genders. Estimates are mean values of the decomposition using 1000 random subsamples.
[a] The 'percent contribution' column gives the contribution of each variable to the gender inequality in food security status between male- and female-headed urban farming households. This is computed by dividing the estimate by gender inequality (0.15).

producing on small plots. Farming on large farm areas has been shown in the literature to spur household food security [34].

To check for sensitivity and robustness, the analyses were rerun using pooled samples from both groups. The proportions/results were consistent with those found when MHHs were the reference group. The relative proportions due to the observed distribution of included variables and unobserved characteristics were 56.1 % and 43.9 % respectively under the pooled model. The extent to which inequality is attributed to the observed distribution of the included variables and unobserved characteristics will depend upon the choice of a reference group.

Conclusion and policy implications

Despite growing enquiries into the role(s) of household headship and gender equality in food security relatively less attention has been given to understanding these issues in urban food security contexts. Using a case study of urban farmers in southeast Nigeria, this study employs the nonlinear Blinder-Oaxaca decomposition model to investigate how male versus female household headship and resource ownership contribute to gender gap in the attainment of food security in urban farming settings. Consistent with previous studies, preliminary results of this study show significant gender-specific differences in terms of ownership of resources and food access/security between MHHs and FHHs - with the FHHs disadvantaged relative to male-headed households. Furthermore, this study noted gender-specific differences (e.g., farm size, income from farm activities, number of unemployed household members) in the determinants of food security between male- and female-headed households. This suggests the need to frame food security policies in ways that account for gender gap/inequality across households.

The result of the nonlinear Blinder-Oaxaca decomposition model makes important addition to the gender and food security literature by providing insights into the contributing factors of the observed gendered inequalities in food security in the context of urban households. Specifically, the result shows that the differences in the level of household resources/assets between MHHs and FHHs account for more than half (56 %) of the observed gendered food security inequalities, with gender biases in the farm sizes being the most influential factor. This finding suggests that if FHHs are supported to acquire the same level of economic resources (e.g., large farm size) as MHHs, their food security status can improve significantly. An important policy implication here is that improving FHHs' access to land for urban agriculture might offer an important pathway for addressing food insecurity. Therefore, to improve household security for women and FHHs, this study recommends that explicit policy interventions banning discrimination in land access for women and FHHs are required in the study area. The findings of this study are important for the design of policies promoting equal rights to economic resources and the achievement of food security for men and women, thereby enabling the achievements of target 2.1 of the United Nations Sustainable Development Goal (SDG) 2 on zero hunger and target 5A of SDG 5 on gender equality.

In terms of future research suggestions, this study proposes the following. First, further studies examining the nexus of gender, resource ownership and food security can disaggregate household headship structures to reflect two distinct categories: *dejure* FHHs and *defacto* FHHs. This distinction can help to provide valuable information on the heterogeneity that may exist within these categories of FHHs. Second, a panel dataset can be employed to advance insights on unobserved (specific) heterogeneity (e.g., socio-cultural barriers, political instabilities, and time-specific heterogeneity), which may not be adequately captured in cross-sectional survey data.

CRediT authorship contribution statement

Chukwudi Charles Olumba: Conceptualization, Methodology, Formal analysis, Investigation, Project administration, Resources, Validation, Writing – original draft, Writing – review & editing. **Cynthia Nneka Olumba:** Investigation, Writing – review & editing. **Uche Okpara:** Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.sciaf.2023.e01974.

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