

Research Article

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Effects of Women Empowerment Group Membership on Household Food Security: Evidence from Vihiga County, Kenya

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ABSTRACT

Background: Women Empowerment Group Membership (WEGM) are widely promoted as instruments for women's financial inclusion and household welfare improvement in rural Kenya. While WEGP may enhance household dietary diversity, evidence on how participation affects food security, and which socio-economic factors drive membership, remains limited particularly in highly vulnerable communities in Luanda Sub-County, Vihiga County.

Objective: This study examined the determinants of women's participation in WEGP and the causal effect of participation on household dietary diversity, accounting for socio-economic and social factors.

Methods: A community-based cross-sectional survey was conducted among 384 households in Luanda Sub-County. Data captured socio-demographic characteristics, WEGP participation and household dietary diversity. Descriptive statistics and t-tests were used to explore differences between members and non-members. Binary logistic regression identified determinants of participation, while an Endogenous Switching Regression (ESR) framework was applied to estimate causal impacts on household dietary diversity (HDDS) correcting for selection bias and generating counterfactual outcomes for non-participants.

Results: Younger age, smaller household size, stronger social networks, longer community tenure and stable income sources significantly increased the likelihood of WEGM participation. ESR results show that membership to WEGP increased HDDS by 1.585 food groups (ATT), while non-members would gain 2.409 food groups if they joined WEGP (ATU) both significant at the 1% level, demonstrating substantial gains in dietary diversity attributable to participation.

Conclusion: WEGP participation enhances household food security by improving dietary diversity through pathways shaped by socio-economic and social factors. Policies aiming to maximize food security impacts should reduce participation barriers, promote social-network engagement and integrate WEGP within broader livelihood and social protection strategies in vulnerable rural communities.

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Received: September 10, 2026; **Accepted:** September 15, 2026; **Published:** September 24, 2026

Introduction

Household food insecurity remains a persistent public health and development challenge in Sub-Saharan Africa, disproportionately affecting rural communities where livelihoods are highly sensitive to climatic, economic and institutional shocks [1,2]. Despite global commitments under the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger) and SDG 5 (Gender Equality), progress in reducing food insecurity has been uneven. Rural women continue to bear a disproportionate burden of food provisioning under conditions of limited access to productive resources and financial services [3,4]. In Kenya, recurrent droughts, declining agricultural productivity and constrained rural incomes have sustained high levels of food insecurity, particularly in arid and semi-arid lands (ASALs) where households rely heavily on subsistence agriculture and informal coping mechanisms [5].

Women play a central role in household food security through food production, income management and intra-household allocation of resources [6]. However, structural barriers such as limited access to formal credit, land ownership constraints and low financial inclusion continue to restrict women's capacity to stabilize household consumption and respond to food shocks [7]. Enhancing financial access through community-based institutions has emerged as a critical pathway to improving food security and household welfare [8]. In response, community-based financial models have gained prominence as locally embedded mechanisms for enhancing women's economic agency. Among these, Women Empowerment Group Membership (WEGM) have emerged as one of the most widespread and accessible forms of informal finance across rural Africa [9,10]. Built on pooled savings, internal lending

and collective governance, WEGM aim to overcome exclusion from formal financial systems while strengthening social capital and resilience among marginalized populations [11].

Empirical evidence suggests that WEGM participation can improve access to savings and credit, smooth consumption, support income-generating activities and enhance women's decision-making power [12]. These pathways are widely assumed to translate into improved household welfare, including food security. Yet, empirical findings remain mixed. While some studies report positive associations between WEGM participation and food availability, others observe limited effects, particularly in highly vulnerable contexts where WEGM function more as coping mechanisms than engines of sustained livelihood transformation [13].

In this context, the relationship between WEGM membership and food security outcomes remains nuanced. While descriptive studies show higher dietary diversity among members, unobserved selection factors may bias these estimates, making causal inference challenging. Women from younger households, smaller family sizes and stronger social networks may self-select into WEGM, creating systematic differences between participants and non-participants [14]. Consequently, rigorous econometric approaches that account for both observable and unobservable determinants of participation are essential to isolate the true impact of WEGM on household food security. Vihiga County exemplifies these dynamics. The county is characterized by high dependence on rain-fed agriculture, recurrent climate shocks and persistent rural poverty [15]. Luanda Sub-County experiences acute food insecurity, driven by erratic rainfall, limited livelihood diversification and constrained access to financial services. Women in Luanda Sub-County shoulder primary responsibility for household food provisioning, yet their economic opportunities remain limited. While WEGM operate widely within the area and are promoted as instruments for women's empowerment and food security, empirical evidence on how women's knowledge and participation in these groups translate into household food security outcomes remains scarce.

This study addresses these gaps by investigating the determinants of WEGM participation and its causal effect on household dietary diversity in Luanda Sub-County. Using household survey data from 384 women, we first estimate the socio-economic and social factors driving membership using a binary logistic regression. We then assess the impact of participation on food security outcomes through an Endogenous Switching Regression (ESR) framework, which accounts for selection bias and allows estimation of both the effect of membership among participants (ATT) and the potential gains for non-members (ATU). By integrating social, economic and demographic factors, this study provides robust evidence on how WEGM influence household welfare and identifies which households benefit most from participation. The findings contribute to the growing literature on informal financial institutions, food security and women's economic empowerment in rural Africa. They provide policy-relevant insights for targeting and scaling WEGM, informing strategies to improve dietary diversity, resilience and overall household well-being in resource-constrained communities. In doing so, the study offers empirical evidence that is directly relevant to policymakers, development practitioners and public health stakeholders seeking to leverage women-centered financial interventions to address food insecurity in rural Kenya and similar contexts across sub-Saharan Africa.

Methods

Study Design and Area

This study employed a community-based cross-sectional design conducted within Luanda Sub-County of Vihiga County. The area lies within an arid and semi-arid ecological zone characterized by high dependence on rain-fed agriculture and limited livelihood diversification.

Sampling Procedure, Target Population and Sample Size

The study population comprised adult women residing in Luanda Sub-County at the time of data collection. Both women who were members of WEGM and those who were not involved in any WEGM were included to enable comparative analysis. A total sample of 384 women was surveyed. WEGM members were identified through existing savings groups operating in the area, while non-members were identified using snowball sampling within the same communities to ensure socio-economic comparability. Eligibility criteria included residency in the study area and willingness to provide the requisite information.

Data Collection and Instruments

Data were collected using a structured, interviewer-administered questionnaire designed to capture women's socio-demographic characteristics, knowledge of WEGM, participation in WEGM activities and household food security. The questionnaire was developed based on existing literature and adapted to the local context. It was pre-tested to ensure clarity, cultural appropriateness and reliability after which minor adjustments were made.

Ethical Considerations

Ethical approval for the study was obtained from the relevant institutional ethics review board. Authorization to conduct the study was granted by national and county authorities. Participation was voluntary, and written informed consent was obtained from all respondents prior to data collection. Confidentiality and anonymity were ensured by assigning unique identifiers to respondents and restricting access to the dataset to the research team only.

Theoretical Framework

This study is grounded in household utility maximization and collective action theory, which posit that households make participation decisions by comparing expected benefits and costs under existing constraints [16]. In rural settings, participation in WEGM represents an institutional choice through which households seek smooth consumption, relax liquidity constraints and manage risk. A household is expected to join a WEGM when the anticipated gains from improved access to savings, credit and social networks outweigh the associated transaction and opportunity costs. Within this framework, WEGM membership is a non-random, self-selected decision influenced by socio-economic characteristics. These factors shape both the likelihood of participation and households' capacity to translate financial access into improved welfare outcomes. Social learning and peer effects further reinforce participation, as information and trust spread through community networks.

Model Specification

To identify the socio-economic and household factors that influence women's participation WEGM a binary logistic regression (logit) model was employed [17]. This model is appropriate because WEGM membership is a dichotomous outcome (1 = member, 0 = non-member) and allows estimation of the probability that a household participates given observed characteristics, while ensuring predicted probabilities remain between 0 and 1. Using a

logit specification also facilitates interpretation through odds ratios, which quantify the relative change in the likelihood of participation for a unit change in each explanatory variable.

The Model is Formally Specified as follows:

Let $VSLA_i$ denote the WEGM participation status of household i , defined as a binary variable:

$$WEGM_i = \begin{cases} 1 & \text{if household } i \text{ participates in a WEGM} \\ 0 & \text{otherwise} \end{cases} \dots\dots\dots 1$$

The decision to participate in a WEGM is modeled as a latent utility maximization process:

$$WEGM_i^* = Z_i' \gamma + \varepsilon_i \dots\dots\dots 2$$

where:

- $WEGM_i^*$ is an unobserved latent variable representing the net benefit from WEGM participation,
- Z_i is a vector of observed household and respondent characteristics,
- γ is a vector of parameters to be estimated,
- ε_i is a stochastic error term.

Second-Stage Model: Household Food Security (HDDS)

Given that participation in WEGM is not randomly assigned, households that join may differ systematically from those that do not in ways that also affect food security. Simple comparisons of dietary outcomes between members and non-members would therefore be biased. To address this, we employ an Endogenous Switching Regression (ESR) framework, which allows us to estimate the effect of WEGM participation on household dietary diversity while accounting for both observed and unobserved factors that influence participation. The outcome of interest is household dietary diversity ($HDDS_i$).

For WEGM Members:

$$HDDS_{1i} = \beta_{10} + \beta_{11}X_i + \varepsilon_{1i}, \text{if } WEGM_i = 1 \dots\dots\dots 3$$

For non-Members:

$$HDDS_{0i} = \beta_{20} + \beta_{21}X_i + \varepsilon_{0i}, \text{if } WEGM_i = 0 \dots\dots\dots 4$$

Where:

- X_i = vector of household socio-economic characteristics
- $\varepsilon_{1i}, \varepsilon_{0i}$ may be correlated with the selection error ε_i , capturing unobservable factors influencing both participation and HDDS.

Treatment Effect

The Average Treatment Effect on the Treated (ATT) is computed as:

$$ATT = E(FS_{1i} | VSLA_i = 1) - E(FS_{0i} | WEGM_i = 1) \dots\dots\dots 5$$

This measures the impact of WEGM participation on household food security.

Results and Discussion

Table 1 compares socio-demographic characteristics and dietary diversity outcomes between WEGM members and non-members. The results reveal clear and statistically significant differences across several key variables, indicating non-random participation in WEGM. WEGM members are significantly younger than non-members, with an average age of 40 years compared to 54 years among non-participants ($p < 0.001$). Members also live in smaller households and have fewer children, suggesting that lower household dependency burdens are associated with participation. These patterns are consistent with the time, mobility and financial commitments required for sustained engagement in savings groups.

Dietary diversity differs markedly between the two groups. WEGM members record a significantly higher mean Household Dietary Diversity Score (HDDS) than non-members (5.06 versus 4.27; $p = 0.008$), providing preliminary evidence that participation is associated with improved access to a wider range of food groups. Substantial differences also emerge across categorical characteristics. Marital status is strongly associated with WEGM participation ($p < 0.001$), with members more likely to be married, reflecting greater household stability and decision-making autonomy. Land ownership differs significantly between the two groups, with WEGM members more than three times as likely to own land as non-members, highlighting the role of asset endowments in enabling participation. Main income sources vary sharply by participation status ($p < 0.001$). Members are more likely to rely on livestock and diversified income sources while non-members predominantly depend on business activities. In addition, social networks appear to matter: WEGM members are significantly more likely to know neighbours involved in WEGM ($p = 0.011$), underscoring the importance of peer effects and local information flows in shaping participation decisions.

Overall, these descriptive results point to systematic differences between WEGM participants and non-participants in age, household structure, asset ownership, income sources, social exposure and dietary outcomes. The presence of such differences motivates the use of econometric strategies that explicitly account for selection into WEGM participation when estimating its impact on household dietary diversity.

Table 1: Descriptive Statistics of Respondents by WEGM Participation Status

Variable	Non-members (n = 220)	Members (n = 164)	Test statistic	p-value
Continuous variables				
Age (years)	54.20 (13.15)	40.65 (14.48)	t = 10.57	<0.001
Household size	2.74 (0.73)	2.50 (0.71)	t = 3.58	0.0004
HDDS	4.27 (1.88)	5.06 (2.11)	0.79	0.008
Number of children	3.86 (2.16)	2.49 (1.93)	1.38	<0.001
Categorical variables (%)				
Education level			$\chi^2(3) = 6.46$	0.091
Primary	52.03	41.28		
Secondary	34.55	40.83		
Tertiary	9.35	14.22		
Other	4.07	3.67		
Marital status			$\chi^2(2) = 26.93$	<0.001
Single	26.83	13.76		
Married	62.60	59.17		
Other	10.57	27.06		
Land ownership			$\chi^2(1) = 24.67$	<0.001
Yes	7.32	23.85		
No	92.68	76.15		
Main income source			$\chi^2(3) = 52.78$	<0.001
Crop farming	12.20	11.47		
Livestock	13.41	22.94		
Business	61.79	31.19		
Other	12.60	34.40		
Neighbour involved in WEGM			$\chi^2(1) = 6.54$	0.011
Yes	82.11	90.37		
No	17.89	9.63		

Source: Field Survey, 2023

Determinants of WEGM Participation

To identify the socio-economic factors associated with women's participation in women empowerment group membership (WEGM), a binary logistic regression model was employed. The logit specification is appropriate in this context as it accommodates a nonlinear probability structure and ensures predicted values lie within the unit interval. Moreover, logistic regression is widely used in studies of participation in collective action and financial inclusion allowing for straightforward interpretation of odds ratios while controlling for confounding household and community characteristics. The model performs well statistically, with the joint significance test strongly rejecting the null hypothesis of no explanatory power (Wald $\chi^2 = 102.80$, $p < 0.001$). The relatively high pseudo R^2 of 52.27% indicates that the included covariates capture a substantial share of the variation in WEGM participation, suggesting that observable socio-economic and social network factors play an important role in shaping membership decisions.

Age emerges as a strong and robust determinant of participation. The negative and highly significant coefficient implies that older women are substantially less likely to participate in WEGM. The

odds ratio indicates that each additional year of age reduces the likelihood of membership by about 8%, holding other factors constant. This result is consistent with life-cycle considerations: younger women may have greater incentives to accumulate savings, invest in household welfare and engage in group-based financial activities while older women may face higher opportunity costs or lower perceived returns to participation. This study corroborates with another study conducted in Uganda where age was found to significantly influence WEGM membership [18].

Household size also exerts a significant negative influence on WEGM membership. Women from larger households are less likely to participate, reflecting the competing demands on time and resources in households with higher dependency burdens. Larger households may struggle to meet the regular savings contributions required by WEGM making participation more difficult despite potential long-term benefits. Similarly, study by found that joining a WEGM is positively and significantly determined by household size [19].

Social networks play a central role in participation decisions. Knowing neighbours who are already involved in WEGM

significantly increases the likelihood of membership. This finding highlights the importance of peer effects, trust and information diffusion in the adoption of informal financial institutions. In settings where formal financial literacy and outreach are limited, social proximity lowers uncertainty and reduces perceived risks associated with group-based saving and lending.

Community attachment further reinforces participation. Women who have lived longer in the community are more likely to be WEGM members, reflecting the role of social embeddedness and reputation in sustaining collective financial arrangements. Longer residence strengthens social ties and mutual trust, which are critical for the functioning of savings groups that rely on

repeated interaction and informal enforcement mechanisms. This study agrees with the findings of that social network positively influences WEGM membership [18,20].

Income characteristics also matter. Women engaged in more stable and diversified income-generating activities are significantly more likely to participate in WEGM. The positive effect of main income source suggests that predictable cash flows ease liquidity constraints and enable consistent savings contributions, which are essential for sustained participation. This study is in line with study that found that income is a key determinant to WEGM membership among Cocoa farmers in Ghana [21].

Table 2: Determinants of WEGM Participation (Logit Model, Odds Ratios)

Variable	Odds ratio	Robust SE	p-value
Age (years)	0.923***	0.010	0.001
Education level	1.165	0.166	0.285
Household size	0.560***	0.095	0.001
Land ownership	0.529*	0.187	0.072
Neighbour involved in WEGM	0.349***	0.120	0.002
Number of children	0.982	0.065	0.780
Years in community	1.008**	0.004	0.036
Main income source	1.511***	0.187	0.001
Constant	343.617***	388.614	<.001

*** p<0.01, ** p<0.05

Effect of WEGM Membership on Household Food Security

The effect of participation in WEGM on household dietary diversity was examined using an Endogenous Switching Regression (ESR) to account for self-selection into membership. Predicted and counterfactual outcomes reveal substantial gains in dietary diversity for both current members and non-members. Among WEGM members, the predicted mean Household Dietary Diversity Score (HDDS) was 7.74, while the counterfactual HDDS was 6.16 had they not been members; yielding an Average Treatment Effect on the Treated (ATT) of 1.59 food groups, significant at the 1% level. This indicates that households actively engaged in WEGM enjoy a meaningful improvement in diet diversity attributable to their participation. Econometrically, this result demonstrates that WEGM membership causally enhances household food security, even after accounting for observable and unobservable factors that influence both participation and dietary outcomes.

For households not currently participating or members in WEGM, the ESR model predicts a mean HDDS of 5.80. However, the counterfactual scenario where these non-participating households were assumed to join a WEGM, indicates a potential mean HDDS of 8.20, resulting in an Average Treatment Effect on the Untreated (ATU) of 2.41 food groups, also statistically significant at the 1% level. This finding highlights that non-members, who are often more food-insecure, stand to gain substantially from participation, suggesting a considerable untapped potential for improving dietary diversity through program expansion. The magnitude of these effects is meaningful within the HDDS scale (1-12 food groups), reflecting real improvements in access to diverse foods, which is closely associated with improved nutrient intake and overall household food security. The larger ATU compared to ATT suggests that households currently excluded from WEGM are more food insecure and may benefit even more from membership than those already participating.

These results are consistent with existing literature showing that access to community-based savings and credit programs improves household welfare by enabling greater flexibility in household resource allocation, reducing vulnerability to shocks and facilitating the purchase of a wider variety of foods [22-24].

Table 3: WEGM Participation Causal Effect on Household Food Security

HDDS	Mean outcome		
Decision stage			
	Being member	Being non-member	ATE
Members	7.742	6.157	1.585*** (ATT)
Non- member	5.795	8.204	2.409*** (ATU)

*** denotes significance at the 1% level.

Conclusion

From a public health perspective, this study provides robust evidence that participation in WEGM is positively and causally associated with improved household dietary diversity in Luanda Sub-County, a highly vulnerable rural setting. WEGM membership is non-random and shaped by age, household structure, income stability, community embeddedness and social networks, reflecting broader social determinants that influence access to nutrition-supportive resources. After correcting for selection bias using an endogenous switching regression framework, the findings show that WEGM participation leads to meaningful improvements in dietary diversity, a key determinant of nutritional adequacy and population health. Members consume a wider range of food groups than they would have in the absence of participation, while non-members would experience even larger dietary gains if they were to join. These effects indicate that WEGM primarily function as consumption-smoothing and risk-management mechanisms that help protect diets against economic and food access shocks, rather than as direct income-enhancing interventions. Overall, the study underscores the relevance of community-based financial institutions as nutrition-sensitive public health tools. Strengthening access to and participation in WEGM can contribute to preventive public health strategies aimed at improving diet quality, reducing vulnerability to food insecurity, and enhancing household resilience in resource-constrained settings.

Policy Recommendations

From a public health standpoint, WEGM programming should explicitly be inclusion-oriented. Group design rules must accommodate households with limited liquidity through flexible contribution schedules and staggered entry, ensuring that nutritionally vulnerable populations are not excluded from mechanisms that stabilize food access and dietary quality. Second, community-based diffusion mechanisms should be institutionalized as part of public health outreach. Leveraging existing social networks through peer mobilization, local champions and inter-group mentoring can reduce information barriers and expand coverage of nutrition-supportive financial platforms, particularly among hard-to-reach populations. Third, WEGM should be formally integrated into county and national public health and food security strategies. Savings groups can function as effective entry points for complementary interventions such as nutrition education, maternal and child health messaging, livelihood diversification and shock-responsive social protection, thereby amplifying their preventive health impact. Finally, policy frameworks should recognize WEGM as resilience-building public health assets. Their primary contribution lies in stabilizing household consumption and protecting diets during periods of economic or food system stress. Sustained support through light-touch regulation, technical assistance and linkage with health, nutrition and extension services is therefore essential to maximize their population-level health benefits.

Conflict of Interest

The authors reported no potential conflict of interest.

Funding

This research work was not funded.

Acknowledgments

The authors thank women groups in the area of study who aided us with essential information during the data collection exercise.

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