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Exploring the Impact of Community Development Programs on Livelihoods in Tanzania

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ABSTRACT

Community development programs play a critical role in alleviating poverty and food insecurity among households by improving access to essential services, enhancing income opportunities, and promoting food security. Poverty, food insecurity, and low household income remain persistent challenges in many developing countries, particularly in sub-Saharan Africa, where they present significant obstacles to improving living standards and achieving sustainable development goals. Therefore, the current study examines the determinants of poverty, participation in community development programs, and the impact of such participation on household livelihood in Tanzania using data from the 2022 Tanzania Demographic and Health Survey. The study employs Probit regression to analyze the determinants of poverty and participation. At the same time, Propensity Score Matching (PSM) is used to assess the impact of participation in community development programs on household income and food security. The results show that household size, gender, education level, and access to health services are significant determinants of poverty, while factors such as age, marital status, access to healthcare, and clean water influence participation in community programs. PSM results indicate that participation in community development programs significantly improves both household income and food security. These findings suggest that enhancing access to community development programs, particularly in rural areas, and addressing barriers to participation could have a substantial positive impact on household welfare. The study recommends that policymakers focus on improving access to essential services, providing training, and ensuring that development interventions are more inclusive, particularly for marginalized groups such as women and the rural population.

Keywords: *Poverty, Food Insecurity, Development Projects, Welfare, Impact Evaluation*

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1. INTRODUCTION

Poverty, food insecurity, and low household income remain persistent challenges in many developing countries, particularly in sub-Saharan Africa, where they present significant obstacles to improving living standards and achieving sustainable development goals (FAO, 2023). Despite decades of international efforts aimed at alleviating these issues, the problem persists, with millions of people unable to access necessities such as food, clean water, healthcare, and income-generating opportunities (Ekumah et al., 2020). Recent global events, including the COVID-19 pandemic and geopolitical tensions like the Russia-Ukraine conflict, have exacerbated these challenges, pushing more people into poverty and food insecurity (Ben Hassen & El Bilali, 2022). According to recent estimates, global hunger affected 828 million people in 2020, marking a setback in efforts to eradicate hunger and improve food security worldwide (IFAD, 2020).

In Tanzania, these interconnected problems are particularly acute in rural areas, where most people rely on subsistence agriculture for their livelihoods (Mkonda & He, 2018). Smallholder farmers, who form the backbone of the country's agricultural sector, face numerous challenges, including limited access to markets, inadequate infrastructure, climate shocks, and poor access to health and educational services (Beyene, 2023). These factors contribute to persistent poverty and food insecurity, making it difficult for households to break the cycle of poverty. According to the Integrated Food Security Phase Classification (IPC) report 2023, approximately 964,000 people in Tanzania are experiencing severe acute food insecurity, with many households struggling to meet their basic food and income needs (FAO, 2023).

Food insecurity has direct and far-reaching consequences on household health and well-being, as it impairs nutritional intake and weakens immune systems, leading to higher rates of illness and reduced productivity (Ogada et al., 2020; Encalada-Torres et al., 2022). Malnutrition and poor health outcomes further perpetuate the cycle of poverty, as sick individuals are unable to work or engage in income-generating activities. This highlights the importance of addressing food insecurity as a key strategy in improving household health outcomes and alleviating poverty. Addressing these issues is essential for Tanzania to make progress toward the 2030 Sustainable Development Goals (SDGs), particularly the goals related to poverty reduction, food security, and health improvement.

Recognising the gravity of the situation, the Tanzanian government, in partnership with international organizations such as the World Food Programme (WFP), has launched several initiatives to improve livelihoods, food security, and household income. Among these is the National Multi-Sectoral Nutrition Action Plan (NMNAP), developed in 2015-2016, which consolidates existing policies and strategies to tackle malnutrition and food insecurity more effectively (USAID, 2021). However, while these programs

have made significant strides in improving certain aspects of food security and health, challenges remain, particularly in the form of unequal access to resources and services and a lack of sustained improvements in household income (Yang et al., 2019; Hasell et al., 2023).

One of the key avenues through which these issues can be addressed is through community development programs, which aim to empower local communities by providing them with the tools, resources, and knowledge they need to improve their livelihoods (Khalid et al., 2019). Community development programs often focus on building the capacity of rural households to engage in sustainable agricultural practices, access markets, improve health and nutrition, and participate in income-generating activities. These programs are vital for addressing the root causes of poverty and food insecurity, particularly in rural areas where government interventions may be limited.

Research on the effectiveness of community development programs has shown that these initiatives can significantly improve household welfare, particularly in terms of food security and income generation (Doustmohammadian et al., 2022; Clief et al., 2021; Durao et al., 2020). For instance, studies have demonstrated that community development programs that focus on improving agricultural productivity, access to markets, and the provision of health services can lead to substantial increases in household income and reductions in food insecurity (Kandeepan et al., 2016; Gallegos et al., 2021; Uddin, 2019). However, most of the existing literature focuses on the relationship between two factors, such as poverty and food insecurity (Kandeepan et al., 2016; Gallegos et al., 2021; Uddin, 2019) or food insecurity and health (Ogada et al., 2020; Encalada-Torres et al., 2022), without fully exploring the complex interplay between poverty, food insecurity, and household income within the context of community development programs. This interplay is very important; that is why this study seeks to fill this gap by examining the impact of community development programs on Tanzania's household livelihoods, focusing on how these programs influence income and food security. By utilising a quantitative approach, this research aims to comprehensively analyse the factors that drive household participation in community development programs and their subsequent effects on household welfare. The study uses data from the 2022 Tanzania Demographic and Health Survey (DHS) to evaluate the effectiveness of community development programs in improving livelihoods and alleviating poverty in rural Tanzania.

Moreover, this study is particularly relevant given the growing recognition that sustainable development requires a multi-faceted approach that addresses not only economic factors but also social and environmental dimensions. This research contributes to the broader discourse on achieving sustainable development goals in resource-constrained settings by focusing on community-driven initiatives that seek to empower households at the grassroots level. Ultimately, the findings of this study are expected to provide valuable insights for policymakers and development practitioners in

designing and implementing more effective strategies for poverty alleviation, food security improvement, and income generation in rural Tanzania. Through this investigation, the study assesses the current state of community development programs and offers recommendations on how these programs can be scaled and improved to ensure more equitable and sustainable outcomes for households in rural Tanzania.

2. METHODOLOGY

This study adopts a quantitative approach to analyse the intricate relationships between Tanzania's food insecurity, poverty, and income. Therefore, a non-experimental research design was utilised to assess these dynamics at the household level, allowing for an in-depth examination of socio-economic and institutional variables affecting Tanzanian households. A sample of 4,782 households was selected, drawn from the Demographic and Health Survey (DHS) data of 2022 conducted by the National Bureau of Statistics (NBS) (URT, 2022). The survey provided comprehensive data on household characteristics, including income levels, food access, and poverty prevalences, alongside socio-economic and institutional factors. This large, nationally representative dataset enabled the study to generate broad insights into the extent of malaria across different regions of Tanzania.

Regression technique

The Propensity Score Matching (PSM) model is employed in this study to evaluate the impact of community development program participation on household welfare, focusing specifically on income and food security. PSM is an effective method because it compares households that participate in community development programs with those that do not, while controlling for potential selection bias. One of the key advantages of PSM is that it does not rely on strict assumptions regarding the functional form or distribution of the variables, which makes it a flexible and robust technique for impact evaluation.

The propensity score, denoted as $P(X)$, represents the probability that a household participates in community development programs based on a set of observable characteristics X. By matching households with similar propensity scores, PSM allows for a more accurate estimation of the causal effect of program participation on household welfare outcomes, such as income levels and food security. This ensures that households in the treatment group (those participating in community development programs) are compared with similar households in the control group (non-participants), thereby isolating the effect of community development programs from other confounding factors. The matching process enhances the study’s ability to estimate the impact of community development program participation on household welfare.

The propensity score $P(X)$ can be expressed mathematically as:

$$P(X) = P(D = 1 \mid X = x)$$

This D represents participation in community development programs, and X denotes the observable characteristics of households. The propensity score $P(x_i)$, which calculates the probability of households benefiting from these programs, is defined as:

$$P(x_i) = \frac{exp\,(\delta x_i)}{1 + exp\,(\delta x_i)}$$

After estimating the propensity scores, the study derives the Average Treatment Effect on the Treated (ATT) using both kernel-based matching (KBM) and nearest-neighbor matching (NNM) techniques. This follows the methodologies outlined by Heckman and Todd (1998, 1997). The ATT is calculated as:

$$ATT = \frac{1}{n^1}\sum_{1} \quad \left[\left(Y_{1i} \mid D_i = 1\right) - \sum_{j} \quad r_{1,0}\left(Y_{0i} \mid D_i = 0\right)\right]$$

Where n^1 represents the number of treated cases and r denotes the weight representing the gap between the treated and control groups. The ATT is estimated by averaging the differences in outcomes between the treated and control groups that are matched based on the same propensity score. This can be further expressed as:

$$E\left(Y_1 - Y_0 \mid D = 1\right) = E\left[E\left(E(Y_1 - Y_0) \mid D = 1, P(X)\right)\right]$$
$$= E\left[E\left(D = 1, P(X)\right) - E\left(Y_0 \mid D = 0, \right), P(X)\right]$$

In the regression analysis, a two-stage model estimates the relationship between the variables. The first stage equation predicts household participation in community development programs based on a set of covariates:

$$Y_i = \beta_0 + \beta_1 Z_i + \gamma X_i$$

In the second stage, the predicted values X_i from the first stage are used to estimate the effect of participation on household welfare outcomes:

$$Y_i = \beta_0 + \beta_1 \widehat{X}_i + \varphi X_i$$

Where $\widehat{X}_i$ are the predicted values of X_i from the first-stage regression. The variables used in the regression analysis are presented in Table 1. This comprehensive approach ensures that the study effectively captures the true impact of community development program participation on household income and food security.

Table 1: Definition and Variable Measurements

Variables	**Description**
Malnutrition	Presence of at least one of the children in a household with malnutrition
Food Security	Household access to food (Food secured=1, Food insecure=0)
Sex	Sex of the head of household (Male=1, Female=0)
Age	Age of the head of household in years
Household size	Total number of members in a household
Marital status	Marital status of head of household (Married =1, Unmarried = 0)
Distance to healthcare services	Distance from household to healthcare service in Km
Distance to water source	Distance to a water source in Km
Years of schooling	Number of years one has completed or ended his/her education
Distance to market	Distance from the household to the market in Km
Access to health services	Healthcare access (Good Access=1, Poor access=0
Residence	Place of residence (Rural=1, Urban=0)
Household income	Monthly total household income
Access to clean water	Access to clean water (Yes=1, No=0)

Source: Study Findings (2024)

3. **RESULTS**

The results in Table 2 provide valuable insights into the household characteristics that influence participation in community development programs. Age appears to be a significant factor, with participants being younger (35.06 years) compared to non-participants (45.09 years). This suggests that younger individuals may be more inclined to engage in these programs due to their greater flexibility or motivation to improve their household welfare. This finding is reinforced by the significant p-value (0.047) indicating a meaningful difference in age between the two groups.

Gender plays an important role in participation, as male-headed households are more likely to engage in community development programs than female-headed ones. With 43.2% of participants being male, compared to 68.4% of non-participants, the significant p-value (0.015) highlights that gender is a determining factor. This could reflect gender dynamics where men have more access to resources or decision-making power, leading them to participate more in community initiatives. On the other hand, household size is another factor influencing participation, with larger households more likely to engage in community programs. The results show that participants have an average household size of 4.955 members, compared to 3.884 for non-participants. This

suggests that larger households may see the benefits of participation as a way to support their numerous dependents, and the significant p-value (0.032) underscores this relationship.

Education plays a key role in determining participation, as participants tend to have more years of schooling (6.077 years) than non-participants (5.772 years). The significant p-value (0.016) indicates that education increases the likelihood of participation, perhaps because more educated individuals can better understand these programs' benefits and navigate the participation requirements. Education empowers individuals to make informed decisions, which may explain why those with more schooling are more likely to participate in community initiatives. Additionally, residence also significantly affects participation, with a higher proportion of participants living in rural areas (60.4%) than non-participants (32.8%). The significant p-value (0.015) suggests that rural households are more likely to participate because community development programs are more prevalent or necessary in rural settings where access to resources is limited. Rural households may see these programs as crucial for improving their welfare, particularly in areas where government support is less accessible.

Table 2: Description of household characteristics based on participation in Community Development Programs

Variable	All Means	Participants	Non-Participants	P-Value
Age	43.092	35.06	45.09	0.047
Sex (Male=1, Female=0)	0.364	0.432	0.684	0.015
Household size	5.042	4.955	3.884	0.032
Years of schooling	7.084	6.077	5.772	0.016
Marital status (Married=1, Unmarried=0)	0.512	0.495	0.178	0.321
Residence (Rural=1, Urban=0)	0.649	0.604	0.328	0.015
Access to health facilities (Good Access=1, Poor access=0	0.694	0.488	0.453	0.004
Distance to health facilities	6.872	3.884	5.087	0.065
Access to market (Yes=1, No=0)	0.673	0.598	0.388	0.254
Distance to marketplace (km)	5.187	2.085	4.118	0.000
Access to clean water (Yes=1, No=0)	0.355	0.276	0.017	0.015
Distance to water source (km)	7.063	3.174	6.763	0.154
Household poverty status (Poor=1, Non poor=0)	0.397	0.318	0.592	0.231

Source: Study Findings (2024)

Access to health facilities and distance to health services are essential factors influencing participation. Participants have better access to health services (48.8%) than non-participants (45.3%), with a highly significant p-value of 0.004. Participants live closer to health facilities (3.884 km) than non-participants (5.087 km), although this difference is only marginally significant. These findings suggest that households with better access to health services are more likely to participate in community programs because they have more opportunities to engage with external services and resources.

Additionally, access to clean water shows a significant difference between participants and non-participants. Only 27.6% of participants have access to clean water compared to 1.7% of non-participants, with a significant p-value of 0.015. This indicates that households without clean water are more likely to participate in community programs, possibly searching for better resources or infrastructure. Participation in these programs is a pathway to improving living conditions.

Interestingly, while factors like access to markets and poverty status might be expected to influence participation, the results show that these variables do not have significant differences between participants and non-participants. This suggests that participation in community development programs may be more influenced by direct access to essential services like health facilities and clean water rather than broader economic indicators like poverty status or market access. Therefore, these results highlight key household characteristics influencing participation in community development programs, such as age, gender, household size, education, rural residence, and access to health facilities and clean water. These findings underline the importance of targeting community programs in rural areas and improving access to essential services to encourage greater participation and improve household welfare.

Determinants for the household participation in the community development programs

The probit regression results in Table 3 provide insights into the factors influencing household participation in community development health programs. Age is negatively associated with participation, as indicated by the significant negative coefficient (-0.125, $p<0.05$), suggesting that older individuals are less likely to participate in these programs. This may be due to older individuals being less mobile or less motivated to engage in community development programs. On the other hand, sex also plays a role in participation, with male-headed households being less likely to participate compared to female-headed households, as reflected by the negative coefficient (-0.206, $p<0.05$). This may suggest that women, who often bear the responsibility for family and domestic activities, may be more inclined to engage in community development programs.

Marital status emerges as a significant determinant of participation, with married individuals more likely to participate (0.201). This indicates that marital stability may encourage greater involvement in community development initiatives, perhaps because families see a collective benefit from participating in programs that enhance household welfare. Additionally, living in rural areas significantly reduces the likelihood of participating in community development programs, as shown by the strong negative coefficient (-0.216, $p<0.01$). This may be attributed to limited access to information, resources, or engagement opportunities in rural regions' community programs. Similarly, increased distance to the marketplace also discourages participation, as

demonstrated by the significant negative coefficient (-0.179, p<0.01), which highlights the role of physical access to key community centers in influencing participation.

Table 3: Probit results on the determinants for participation in the Community Development programs

Participation in Community Development programs	Coefficient	t-value	P-value
Age	-0.125**	-4.18	0.019
Sex (Male=1, Female=0)#	-0.206*	-2.02	0.013
Household size	-0.095	-1.43	0.284
Years of schooling	0.421	1.18	0.210
Marital status (Married=1, Unmarried=0)#	0.201***	6.01	0.001
Residence (Rural=1, Urban=0)#	-0.216***	-7.09	0.009
Access to health facilities (Good Access=1, Poor access=0)#	0.271**	2.14	0.014
Distance to health facilities	0.268***	3.02	0.001
Access to market (Yes=1, No=0)#	0.138	1.01	0.162
Distance to marketplace	-0.179***	-3.10	0.002
Access to clean water (Yes=1, No=0)#	0.215***	7.05	0.001
Distance to water source	0.028	0.16	0.149
Household poverty status (Poor=1, Non poor=0)#	-0.213**	-4.16	0.021
Constant	0.134***	3.14	0.005
Mean dependent var	0.572		
Pseudo r-squared	0.369		
Chi-square	109.165		
Akaike crit. (AIC)	2503.07		
SD dependent var	0.2388		
Number of observations	4,782		
Prob > chi2	0.000		
Bayesian crit. (BIC)	3622.18		

Dependent Variable: Participation in Community Development Program
 # dy/dx is for discrete change of dummy variable from 0 to 1.
**** p<0.01, ** p<0.05, * p<0.1*
Source: Study Findings (2024)

Conversely, households with better access to health facilities and clean water are more likely to participate in community development programs, as indicated by the positive and significant coefficients for access to health facilities (0.271, p<0.05) and access to clean water (0.215, p<0.01). This suggests that households with access to essential services may be more health-conscious and willing to engage in community development programs such as health initiatives. However, greater distance to health facilities also significantly increases participation (0.268, p<0.01), potentially reflecting the importance of outreach programs or the motivation of households in remote areas to engage in initiatives that bring healthcare closer to them. Furthermore, household poverty status significantly negatively impacts participation (-0.213, p<0.01), indicating that poorer households are less likely to engage in community development programs.

Determinants for the prevalence of poverty among households

The results from the probit regression analysis provide a comprehensive understanding of the factors influencing household poverty. One of the key findings is the positive and significant relationship between household size and poverty. The larger the household, the more likely it is to experience poverty (0.172, $p<0.05$). This can be explained by the economic strain larger families often face, with more dependents to support and fewer resources to spread across household members. This suggests that policymakers should consider interventions to support larger households with resources and services that can alleviate the financial pressure they face.

Gender also plays a significant role in determining household poverty. The positive coefficient for male-headed households (0.108, $p<0.01$) indicates that they are more likely to be poor compared to female-headed households. This could be attributed to gender roles and expectations limiting male household heads' access to diversified income streams or social support systems. This highlights the need for more gender-sensitive policies addressing the specific challenges male-headed households face in improving their economic well-being.

Table 4: Probit regression results on determinants for household poverty

Poverty Status	**Coefficient**	**t-value**	**p-value**
Household Size	0.172**	2.01	0.016
Sex (Male=1, Female=0)	0.108***	2.22	0.004
Age	0.153	0.73	0.168
Marital status (Married=1, Unmarried=0)	-0.175**	3.08	0.022
Years of schooling	-0.150**	4.03	0.011
Access to health facilities (Good Access=1, Poor access=0)	0.103**	2.87	0.014
Distance to Health Care	0.169	0.58	0.235
Access to market (Yes=1, No=0)	0.217	0.33	0.327
Distance to Market	-0.163	0.75	0.892
Distance to water Source	0.076	0.69	0.632
Residence (Rural=1, Urban=0)	0.105***	4.11	0.001
Constant	0.175	0.04	0.183
Mean dependent var		0.591	
Pseudo r-squared		0.317	
Chi-square		258.014	
Akaike crit. (AIC)		1585.01	
SD dependent var		0.3955	
Number of observations		4,782	
Prob > chi2		0.000	
Bayesian crit. (BIC)		2775.09	

Dependent Variable: Poverty Status
 # dy/dx is for discrete change of dummy variable from 0 to 1.
**** p<0.01, ** p<0.05, * p<0.1*
Source: Study Findings (2024)

Interestingly, age is not a significant factor in determining poverty status. This suggests that while factors such as education and household essentials are important, the age of

the household head may substantially have a strong direct influence on the likelihood of experiencing poverty. This could imply that poverty affects households across all reasonably evenly, though age-specific interventions, such as those targeting older people or youth, might still be necessary in some contexts.

Marital status emerges as another significant determinant, with married households less likely to fall into poverty (-0.175, $p<0.05$). This could be due to the economic stability that marriage often brings, such as the possibility of dual income or shared financial responsibilities. Policies that strengthen family structures and provide support to married couples could help reduce poverty rates further. On the other hand, education is the most decisive factor influencing poverty, with households where the head has more years of schooling being less likely to be poor (-0.150, $p<0.05$). This reinforces the critical role of education in poverty alleviation, as better-educated individuals are likely to access higher-paying jobs and better employment opportunities. Thus, expanding access to education, particularly in rural and underserved areas, is essential for breaking the cycle of poverty.

Access to health services, although typically seen as a positive factor, is shown to have a positive and significant association with poverty in this analysis (0.103, $p<0.05$). This suggests that while access to healthcare is vital, the cost burden associated with accessing these services may contribute to poverty, particularly if households incur significant out-of-pocket expenses for medical care. Therefore, health policies that reduce the financial burden of healthcare services, such as subsidies or insurance schemes, could mitigate this effect and improve household welfare. Other factors, such as distance to healthcare and market access, do not significantly impact poverty status, suggesting that while these factors are essential, they may not directly contribute to poverty in this context. However, living in a rural area significantly increases the likelihood of being poor (0.105, $p<0.01$). This finding emphasises the rural-urban divide in poverty rates and the need for rural development policies to improve infrastructure, access to markets, and income-generating opportunities in rural areas.

Impacts of participation in community development programs on household welfare

The Propensity Score Matching (PSM) results in Table 5 examine the effects of household participation in Community Development Programs on household income and food security using both Nearest Neighbor Matching (NNM) and Kernel-Based Matching (KBM) techniques. For household income under the NNM approach, the unmatched results show that treated households (those participating in community development programs) have significantly higher incomes (101,926.22 TSH) compared to control households (85,333.75 TSH). However, the difference of 1,879.55 TSH is not statistically significant. After matching (ATT), the difference becomes more pronounced with a substantial increase in income of 61,274.06 TSH among treated

households. The T-statistic of 3.217 confirms the statistical significance of this result, indicating that participation in community development programs positively impacts household income.

Regarding food security under the NNM approach, unmatched results reveal that treated households have higher food security scores (0.907) than control households (0.712), a difference of 0.135. After matching, the ATT results show a significant improvement in food security of 0.259 for the treated households, supported by a T-statistic of 5.173. This demonstrates the positive effect of community development programs on food security.

Table 5: The PSM Results on the Impact of Household Participation in Community Development Programs on Household Income and Food Security

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Household Income (NNM)						
Unmatched	101926220	85333.75	1879.55	83454.2	0.213	0.310
ATT	89,330.591	63305.17	2,031.11	61,274.06	1.179	3.217
Food Security (NNM)						
Unmatched	0.907	0.712	0.135	0.577	1.150	4.084
ATT	0.907	0.698	0.259	0.439	0.185	5.173
Household Income (KBM)						
Unmatched	101926220	85333.75	1879.55	83454.2	0.213	0.310
ATT	89,330.591	63305.17	2,031.11	61,274.06	1.179	3.217
Food Security (KBM)						
Unmatched	0.588	0.310	0.107	0.203	1.336	5.083
ATT	0.588	0.556	0.211	0.345	0.875	5.081

Source: Study Findings (2024)

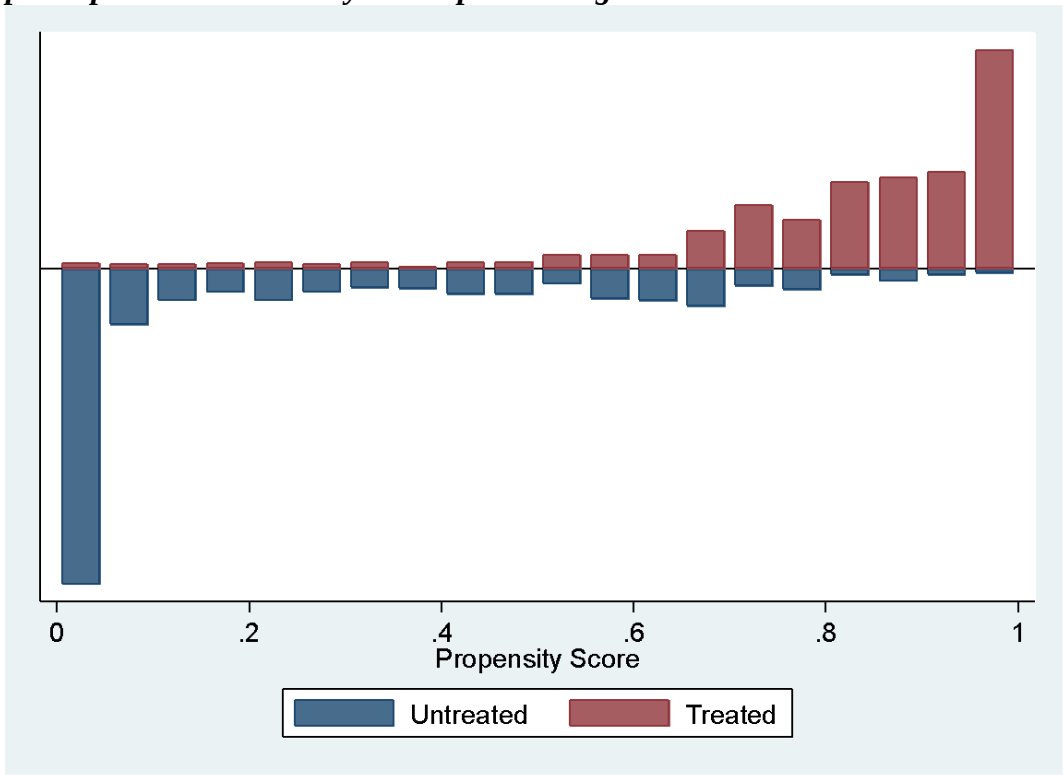
The KBM results for household income show a similar pattern to the NNM results. Unmatched results indicate higher income for treated households, although the difference is not statistically significant. After matching, the ATT results substantial significant revenues in income of 61,274.06 TSH for the treated group, with a T-statistic of 3.217, further affirming the positive impact of program participation on household income. For food security under the KBM approach, unmatched results show a difference of 0.107 between treated and control households, with treated households having higher food security. After matching, the ATT results show a significant increase in food security of 0.211 for treated households, with a T-statistic of 5.081, confirming that participation in community development programs leads to better food security outcomes. Overall, the PSM results indicate that household participation in

community development programs substantially and positively affects household income and food security. These findings highlight the effectiveness of community development programs in improving the economic well-being and food security of participating households.

Distribution of estimated propensity scores for participants and non-participants in health care programs

Figure 1 below illustrates the distribution of estimated propensity scores for participants and non-participants in Community Development Programs. There is a reasonable overlap between treated (participants) and untreated (non-participants) groups, particularly in the mid-range of propensity scores (0.2 to 0.8), indicating that many households across both groups share similar characteristics, making them suitable for matching. However, at the extremes—low propensity scores close to 0 and high scores close to 1—there are noticeable gaps, with non-participants dominating at lower scores and participants dominating at higher scores. This pattern suggests that households with very low or very high likelihoods of participating in the programs are primarily concentrated in one group, potentially limiting the comparability at these ends. Nonetheless, the overlap in the middle range provides sufficient support for reliable matching between the two groups.

Figure 1: Distribution of estimated propensity scores for participants and non-participants in Community Development Programs



Source: Study Findings (2024)

Covariate balancing tests before and after matching

The results in Table 6 present the covariate balancing tests before and after matching for two matching algorithms: nearest neighbor matching (NNM) and kernel-based matching (KBM). Before matching, both algorithms show high pseudo-R^2 values (0.394 for NNM and 0.402 for KBM), which indicate a significant difference in covariates between participants and non-participants. Additionally, the LR χ^2 tests before matching are statistically significant ($p<0.01$), showing that the covariates are not well balanced. However, after matching, the pseudo-R^2 values drop significantly (0.018 for NNM and 0.095 for KBM), suggesting improved balance between the treated and untreated groups. The LR χ^2 test after matching for both algorithms is no longer statistically significant ($p>0.1$), indicating good covariate balance.

Table 6: Covariate balancing tests before and after matching

Matching algorithm	Pseudo-R2		LR χ^2 (P-value)		Mean standardized bias		Total bias reduction %
	Before	After	Before	After	Before	After	
MNM	0.394	0.018	2433.1 (0.000)	101.87 (0.108)	33.84	6.86	62
KBM	0.402	0.095	2309.2 (0.000)	118.09 (0.154)	27.45	5.43	53

Source: Study Findings (2024)

Moreover, the mean standardised bias also reduces after matching, from 33.84 to 6.86 for NNM and from 27.45 to 5.43 for KBM, reflecting a considerable reduction in bias between the two groups. The total bias reduction percentages are 62% for NNM and 53% for KBM, signifying that both matching algorithms successfully improve the balance of covariates, with NNM showing a slightly higher bias reduction. These results indicate that both matching methods effectively balance the covariates between participants and non-participants, making comparing groups more reliable.

4. DISCUSSION

The discussion of this study addresses three critical areas: the determinants of household poverty, the factors influencing participation in community development programs, and the participation in these programs on household welfare, particularly food security and income, using Propensity Score Matching (PSM). These analyses provide essential insights into the dynamics of poverty and welfare improvement in Tanzania, emphasising the role of community interventions in alleviating poverty and improving household livelihoods.

The first analysis focuses on the determinants of household poverty, identifying several socio-economic factors that contribute to household poverty status. The probit regression results revealed that household size, gender, access to health services, years of schooling, and rural residence are significant determinants of poverty. Households with larger sizes were more likely to be in poverty, consistent with findings from other studies highlighting how the economic burden increases with household size, reducing per capita income and contributing to poverty (Encalada-Torres et al., 2022). Gender also played a significant role, with male-headed households being less likely to be poor, aligning with research by Zhang et al. (2024), which found that female-headed households often face higher poverty rates due to limited access to resources, employment, and social networks. Additionally, access to health services was a critical factor in reducing poverty. This echoes findings from a study by Gassara and Chen (2021), indicating that access to quality healthcare contributes to human capital development and, thus, poverty reduction. On the other hand, rural households were more likely to be in poverty, which is consistent with existing literature that underscores the higher prevalence of poverty in rural areas due to limited infrastructure, markets, and access to services (Gesesew et al., 2022).

The second analysis examined the determinants of participation in community development programs, which are crucial in enhancing household welfare. The results indicated that age, sex, marital status, access to health facilities, and rural residence significantly influence participation in these programs. Younger individuals were less likely to participate, reflecting a lack of awareness or engagement in development programs typically aimed at older populations. This finding is consistent with studies like Truninger and Díaz-Méndez (2017), which found that older individuals are more likely to engage in community-driven development initiatives. Marital status was another significant factor, with married individuals more likely to participate, likely due to their greater responsibilities and motivation to improve household welfare. Rural households were less likely to participate in development programs, potentially due to geographical barriers and limited access to information, a finding supported by Alston et al. (2022), who argue that remoteness and lack of access to services hinder rural populations from participating in development initiatives. Access to health facilities and clean water also played a significant role in participation, as households with better access were more likely to engage in community programs, which aligns with studies that emphasise the role of essential service provision in enabling participation in development interventions (Seligman & Berkowitz, 2019).

The third analysis, using the Propensity Score Matching (PSM) method, assessed the impact of participation in community development programs on household income and food security. The results revealed a substantial positive effect of program participation on income and food security. Households participating in these programs experienced

significantly higher income levels and improved food security than non-participants. This finding is consistent with the work of Kilewo and Frumence (2015), which demonstrated that participation in community and development programs enhances household welfare by providing better access to markets, resources, and skills. The positive effect on food security is particularly noteworthy, given the chronic food insecurity in rural Tanzania, as community programs help households improve agricultural productivity and diversify income sources, thereby enhancing food availability and stability. Studies by Seligman and Berkowitz (2019) also show that development programs focusing on farming and livelihood improvement have effectively reduced food insecurity by equipping households with the necessary tools and knowledge to increase food production.

Additionally, the PSM results highlighted that participation in these programs significantly impacted food security more than household income. This suggests that while community development programs effectively improve immediate welfare outcomes such as food security, their long-term impact on income generation may require sustained efforts, training, and investment. These findings align with previous studies, such as those by Mabli and Ohls (2015), which highlight the challenges rural households face in translating increased productivity into long-term income gains due to market access barriers, fluctuating prices, and limited financial literacy.

The gender disparity in the impact of participation is also an important issue highlighted by this study. Although benefiting from these programs, female-headed households still lag behind male-headed households in terms of income gains. This result aligns with the findings of Maereka et al. (2023), who emphasise the structural barriers women face in rural areas, such as limited access to credit, land ownership issues, and traditional gender roles, which hinder their full participation and ability to benefit from development programs. The study underscores the need for more gender-sensitive policies that address these disparities by ensuring women's equal access to resources, training, and opportunities to enhance their welfare outcomes.

5. **CONCLUSION**

The findings of this study underscore the critical role of community development programs in improving household welfare, particularly in poverty reduction, food security, and income levels in rural Tanzania. The analysis reveals significant determinants for household poverty, including household size, gender, education level, and access to services, which all play crucial roles in determining poverty status. Furthermore, the study highlights the key factors influencing participation in community development programs, such as age, marital status, access to health and water facilities, and rural residence. The participation in these programs, as revealed through Propensity Score Matching (PSM) analysis, has a substantial positive impact on

household income and food security, thus validating the importance of these interventions in addressing the challenges faced by vulnerable populations.

The results point to several areas that require targeted policy interventions to maximise the impact of community development programs. First, the significant effect of household size on poverty suggests that family planning and social protection initiatives should be integrated into community programs to manage household dependency ratios effectively. Additionally, efforts to improve access to health services and education for rural households, particularly women and female-headed households, are essential to reducing poverty and enabling more equitable participation in development programs. The study also emphasises the importance of improving infrastructure, particularly access to markets and clean water, which significantly influence poverty and program participation.

To enhance the effectiveness of community development programs, the government and stakeholders should prioritise expanding access to them, particularly in rural and underserved areas. This includes investing in outreach efforts to ensure more inclusive participation, especially for women and younger individuals who may be underrepresented in such programs. Moreover, the study shows the need for continuous training and capacity-building initiatives that empower households to maximise the benefits of their participation in community programs, particularly in terms of enhancing agricultural productivity and income generation.

Lastly, while community development programs have positively affected household welfare, significant gaps in access and participation still need to be addressed. Policymakers should focus on creating more inclusive, equitable, and sustainable development interventions that cater to the specific needs of rural and marginalised populations. Additionally, a concerted effort to integrate these programs with broader poverty alleviation strategies, such as improving access to education, healthcare, and infrastructure, is critical to ensuring long-term success in reducing poverty and enhancing household welfare across Tanzania.

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