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The effects of remittances on household food nutrition security in the context of multiple shocks in Malawi

David Eddings Zingwe^{1,2*}, Akuzike Ellinah Banda³ and Laston Petro Manja¹

Abstract: The increase in the incidence and intensity of multiple shocks emanating from various fronts has left households vulnerable to various upheavals, case in point, food shortage—a prerequisite of food insecurity and poor nutrition. In analysing the nexus between remittances and food security and nutrition in the context of shocks, the paper adopts and links the household utility framework to the insurance hypothesis from the new economic labour migration theory. Using the coping strategy index, food consumption score, and household dietary diversity, we assess the effects of remittances on food security and nutrition in the context of shocks. The novelty of this paper is the creation of a shock index that captures the intensity of correlated multiple shocks that affect households. We concomitantly capture overall remittances, and disaggregated the remittances based on form and location. By employing integrated household survey round 5 data, and various econometric techniques, the paper finds that remittances are only effective in improving household food and nutrition security for households facing more intense multiple shocks but have no effect on dietary diversity. The paper therefore



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David Eddings Zingwe is a seasoned researcher with almost 7 years of valuable expertise. His research expertise lies in development economics, with a specific emphasis on health economics, agricultural economics, and econometrics. He is dedicated to leveraging research as a powerful instrument for evidence-based policy making. David has collaborated with numerous organizations on baseline, mid-line, and evaluation studies, working with esteemed local research firms and as an independent consultant. Some of the organizations he has collaborated with include WFP, USAID, the World Bank, among others.

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reveals the importance of remittances as a strategy in combating food insecurity and poor nutrition in the context of household shocks.

Subjects: Development Studies; Rural Development; Development Theory; Urban Development; Economics and Development; Economics

Keywords: food security and nutrition; remittances; shock index; Malawi

1. Introduction

Despite recent global efforts to eradicate the food problem—hunger, in sub-Saharan Africa, has worsened since 2014, undernourishment plagued nearly 281 million Africans, and the region accounted for 55% of global rise in the number of undernourished over the 2014 to 2020 period (ECA & AUC, 2021). In Malawi, 37% of children under the age of five are stunted, and in the period between June and September 2022, vulnerability increased, where an estimated 2.6 million people (13% of the country population) experienced high acute food insecurity (Government of Malawi GOM, & IPC, 2022; NSO & Macro, 2016). This was attributed to the influx of various shocks that have had a significant negative impact on household food security and nutrition (Government of Malawi GOM, 2020). Household shocks emanating from various fronts have negatively affected different loci of the food system. For instance, climatic shocks have led to below average crop production; high food inflation leading to high food prices due to the Ukraine-Russia conflict; high agricultural input prices have resulted into high cost of production (Government of Malawi GOM, & IPC, 2022).

On a macro-level, social protection programmes have been adopted as tools to cushion households against shock effects and prevent further catastrophic welfare loss. For instance, traditionally in Malawi, food and non-food items are distributed, in order to reduce the plight of people affected by natural disasters (Kambewa, 2005). Productive safety nets such as subsidies aimed at improving agricultural productivity for resource poor households, and others aimed at providing employment opportunities for labour-abundant but land-constrained poor have also been employed (Kambewa, 2005). There are several empirical studies that have highlighted the positive impacts of these programmes on food security (Asfaw & Davis, 2018; Bhalla et al., 2018); however, inefficiencies and sustainability (deterioration as spending becomes constrained) remain the major bottlenecks (Quartey, 2006). Duchoslav et al. (2023) show that in Malawi, there is political influence in targeting the beneficiaries of humanitarian transfers where electoral votes take precedence over the need to protect the vulnerable. Based on these factors, in this paper, we focus on and examine the effectiveness of household-specific initiatives in coping with shocks. At a household level, dissaving and borrowing, reducing overall consumption, selling productive assets, and working more time—including migration of selected household members—are some of the coping mechanisms that are commonly employed in the occurrence of shocks (Niles et al., 2018). On the one hand, these coping mechanisms are meant for survival (household to get by) and have proven to be regressive in the long term, further plunging households into poverty traps (Niles et al., 2018). On the other hand, insurance and other form of risk pooling mechanisms are a viable option in shielding households against shock effects. However, formal mechanisms like insurance to protect households against the financial consequences of shocks are largely absent in sub-Saharan Africa (Bonfrer & Gustafsson-Wright, 2017). Uninsured shocks can have a persistent impact on consumption levels in developing countries (Davies, 2010). Therefore, in order to minimize risk, households employ migration (where a selected household members migrate and remit to the households of origin) as an adaptation and mitigation strategy (Kangmennang et al., 2017). According to Quartey (2006), remittances tend to have a counter-cyclical nature, as they serve as a major source of consumption smoothing strategies for households. Yang and Choi (2007) show that remittances sent by overseas migrants serve as insurance for recipient households in the occurrence of income shocks. Remittances augment household income and improve the food security and nutrition of the poor who relatively spend a larger proportion of their income on food (Sulemana et al., 2019).

Although several studies acknowledge that migration and remittance are usually prompted by the necessity to insure against shocks or diversify risks by households, only a few selected empirical studies have accounted for shocks in analysing the nexus between remittances and food security and nutrition. These few studies have unearthed different insights about the role of remittance in mitigating shock effects; however, they have failed to depict the multi-faceted nature of shocks, as they have only accounted for single specific types of shocks. For instance, Akim et al. (2022) only controlled for COVID-19 employment shock, and Quartey (2006) only considered food price shocks. In this paper, we argue that shocks are usually correlated and mutually enforcing in affecting household welfare. This implies that failure to capture the multi-faceted nature of shocks can be misleading as it understates the full impact of shocks and overstates the mitigating effect of remittance or other interventions. We therefore account for the intensity of multiple shocks that affect the household by creating a novel shock index. The paper also deviates from other studies by comprehensively capturing remittance, where remittances are further disaggregated based on the form in which they are received, and their origin (the location of where there being sent from). As such we examine the effect of cash, and in-kind remittance, as well as that of international, urban, and rural remittance on food security and nutrition in the context of shocks. The paper addresses an important policy relevant topic and contributes to the wide literature by comprehensively highlighting the effectiveness of remittances as a household strategy in combating shock effects that threaten food and nutrition security. As a preview, we find that remittances ameliorate food security and nutrition (captured by the coping strategy index (CSI)) particularly, for households experiencing intense multiple shocks, otherwise overall remittances are regressive. Similarly for food nutrition proxied by the food consumption score (FCS) and household dietary diversity (HDD), we find that remittance are effective in improving household nutrition (FCS in particular) specifically, for households that experienced multiple intense shocks.

The remainder of the paper is structured as follows. The next section discusses studies on the nexus between remittances and food security and nutrition in the context of shocks. Section 3 presents the data and methodology that the paper employed. Section 4 discusses the results and then the paper is concluded, and policy implications and the limitations of paper are presented.

2. Literature review

2.1. Theoretical literature

Under the new economic labour migration (NELM) theory, migration is explained by three profound hypotheses, that is the relative deprivation hypothesis, the investment hypothesis, and the insurance hypothesis (Taylor, 1999). To begin with, the relative deprivation hypothesis stipulates that a household is motivated to reallocate some of its labour to international migration when it observes that it is income-poor in comparison with other households in its setting (Stark & Taylor, 1989). The relative deprivation therefore assumes that a family member that has migrated will remit income to the household of origin thereby moving the household to higher income rank than other households in the vicinity. However, Fransen and Mazzucato (2014) tested and consequently rejected the relative deprivation hypothesis as they found that remittances are common among wealthier households. The investment hypothesis posits that migration decisions are part of family strategies to raise income, that is intend to be used for investment purposes (Taylor, 1999). This implies that remittances are therefore utilized to remove financial constraints that hinder household investments. Thirdly, the insurance hypothesis states that migration serves as a hedge against various household risks, such as food insecurity, failing of crops, or unemployment (Lucas, 1985; Massey et al., 1993). This paper is therefore hinged on the insurance hypothesis as it

provides a framework by which we are able to understand the role that remittances play in combating shock effects.

Pertaining to the food problem, food security and nutrition rest on four pillars, that is the availability, accessibility, utilization, and sustainability of food (Barrett & Lentz, 2009). Sen (1982) denotes that the food problem has two elements, where one is naturally focused and the other is societal focused. On the one hand, the former emphasizes that food insecurity is mainly as a result of natural factors, that affect the availability of food. On the other hand, the latter stipulates that food insecurity is an inequality issue that results from unequal allocation of food due to unequal access to resources and opportunities (Sen, 1981). According to Sen (1981), food insecurity stems from a lack of “exchange entitlements” that affects household’s command over food.

2.2. Empirical literature

There is no consensus in literature regarding the potential of remittances in tackling food and nutrition insecurity. However, as shown in this review, the inconsistency in these findings is mainly attributed to the capability of remittances to compensate for the loss in family labour that is associated with migration. This implies that the ability of remittances in alleviating household food and nutrition insecurity depends on the magnitude and frequency in the receipt of remittances, the usage of remittances, and the welfare status of remittance-receiving households.

For instance, Atuoye et al. (2017) found that remittances had negative effect on the food security status of households, whereby households that received remittance both in rural and urban areas were more likely to be food insecure than non-remittance receiving households in urban areas. Atuoye et al. (2017) further suggested that remittances on their own are inadequate to improve the perilous food insecurity situation in the Upper West Region of Ghana. Karamba et al. (2011) found that overall migration and remittances did not have substantial effect on food expenditure per capita in Ghana, but in high migration region, migration appeared to increase food expenditure. In sub-Saharan Africa, the interaction of remittances and good governance significantly contributed to food security (Ogunniyi et al., 2019). Good governance implied that the process of sending/receiving remittances is fostered by low transaction costs. Abebaw et al. (2020) found that out-migration in Ethiopia improved the amount of daily calories consumed by adults, particularly for households that had smaller land sizes. In Vietnam, M. C. Nguyen and Winters (2011) unearthed the negative effects of migration and recommended short-term migration as a mechanism for food security improvement. They argued that the difficulty of sending remittances results in households receiving them less frequently in the long term, leading to low remittance levels that have insignificant impact on food and nutrition insecurity. However, Regmi and Paudel (2016) found that in the long-run remittances have significant effect as the income proceeding from remittances is invested in novel agricultural technologies that are less labor-intensive. Mabrouk and Mekni (2018) found that remittances have a positive effect on the accessibility of food in African countries; however, remittances had a negative effect on food availability. This was attributed to the loss in labour, a key factor in food production. Similarly, Quisumbing and McNiven (2009) found that, in rural Philippines, migration led to the transition from agriculture, where remittances were invested in nonland assets and negatively affected consumption. Kaiser and Dewey (1991) found that households that rely on remittances did not allocate their income to food in comparison with other household types.

In order to better understand the dynamics surrounding remittances, other studies disaggregated remittances into different categories based on the form and the spatial variations (places from which the remittances are being sent from/to). For instance, in terms of the spatial variations, there is a consensus showing heterogeneities between households that

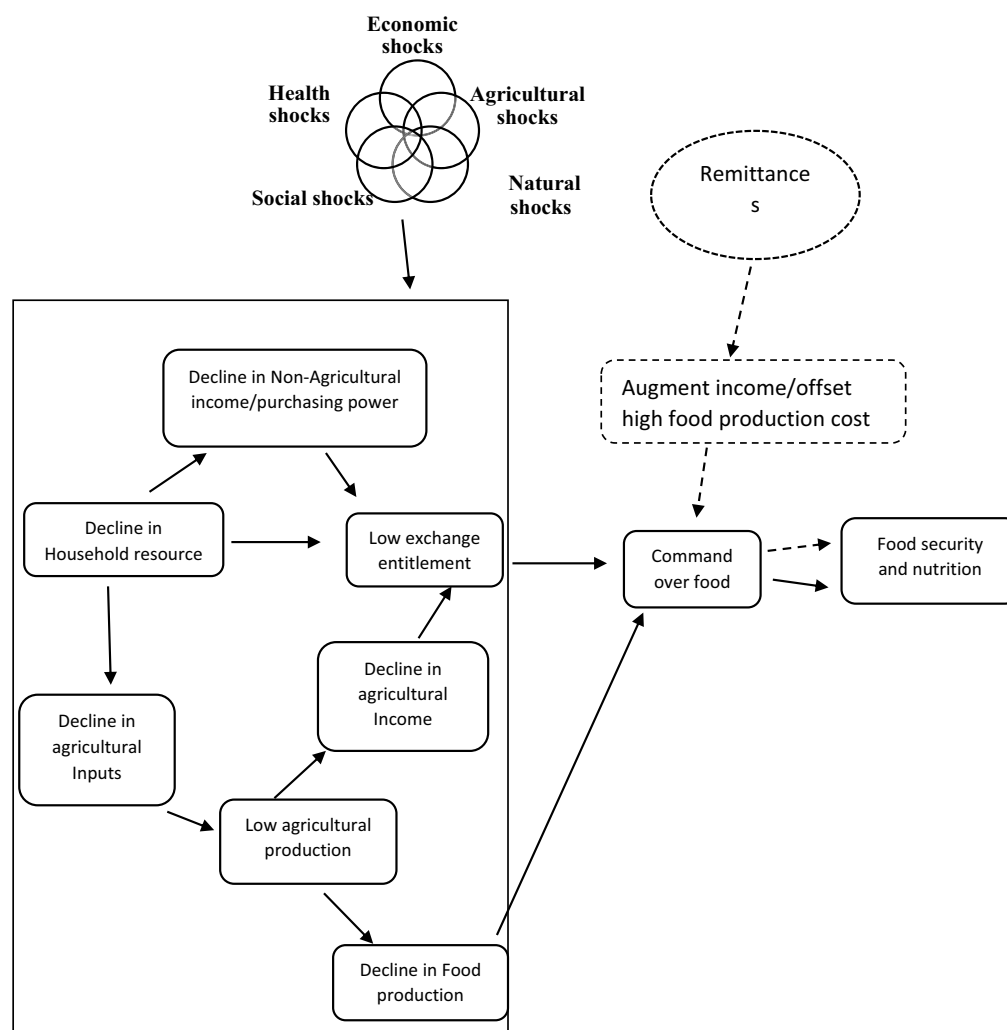
received international remittances and those that received domestic remittances, where international remittances had a greater cushioning effect (Akim et al., 2022; Smith & Floro, 2021). Sulemana et al. (2019) found that international remittances were positively associated with food security and that the frequency by which household received remittance matters. Precisely, there was no significant difference in food security status between households that received remittances less frequently to those that did not receive remittance (Sulemana et al., 2019). Ebadi et al. (2020) found that domestic remittance had adverse effect on food security while international remittance improved food security in sub-Saharan Africa. Ebadi et al. (2020) suggest that households that send out domestic migrants tend to be poorer than those send out international migrants. Conversely, Baah-Kumi and Lee (2021) found that domestic remittances significantly improved HDD, particularly for rural households. Similarly, Vo (2023) found that domestic remittances play a significant role in alleviating food and nutrition insecurity in Vietnam.

In terms of the forms of remittances, Crush and Caesar (2018) provided evidence of the different spatial flows of both cash and in-kind remittances, even though empirical studies have focused more on the former. Baako-Amponsah et al. (2022) found that both cash and in-kind remittances had a significant impact on food security, specifically, in-kind remittances only improved food security for people in rural areas in Ghana. Similarly, Kuuire et al. (2013) found that rural households used food remittance as a strategy for coping with chronic household food insecurity amidst poverty and other natural shocks. In Malawi, Andersson (2011) explored the role of in-kind remittances of maize and suggested that in-kind remittances may hold important food security implications for households constrained by land, income, or other productive resources.

As suggested by the theoretical literature, migration is used as a strategy by households to insure against risks or shocks. Empirically, Quartey (2006) examined the interaction effect of remittance and economic shocks on household consumption per adult equivalent and found that remittance only mitigate shocks on household welfare for food crop farmers. This indicated that remittance are particularly beneficial for the poorest of poor (Quartey, 2006). Akim et al. (2022) found that COVID-19 shock increases food insecurity scores, but the adverse effects are abated by remittances of any origin. Beuermann et al. (2016) found that 100% of health shocks in Jamaica is absorbed by remittances; Yang and Choi (2007) found that remittances offset 60% of the decline in household income resulting from a rainfall shocks in the Philippines. Perakis (2011) found that heterogeneity of the role of remittance among households. On the one hand, remittance and out-migration were able to smoothen consumption, acting as an insurance, and on the other hand, it had a negative effect on consumption. It was inferred that village-level insurance crowded out remittances as the possible insurance option. Fransen and Mazzucato (2014) analysed the effect of remittances on household welfare and wealth in the post-conflict Burundi and found that households that received remittances scored high on non-productive assets, such as living conditions, food security, and subjective wealth in comparison with non-remittance receiving households. Combes et al. (2014) found that remittances have a dampening effect on food price shocks and food price instability on household consumption in vulnerable countries. The implication of these studies is that remittance essentially acts as insurance for households particularly, the poor in the midst of shocks. In much as these studies reveal the role of remittances in combating various shock effects, they, however, do not capture the multi-faceted nature of shocks. This implies that the mitigation effect of remittances is not accurately captured. As such we further explore this nexus by accounting for the effect and intensity of multiple shocks that affect food security and household nutrition.

Figure 1. Conceptual framework presenting the nexus between remittances and food security in the midst of shocks.

Source: author's compilation adapted from the literature reviewed. Note: The dotted, and solid arrows represent positive, and negative effects, respectively.



3. Data and methodology

3.1. Data

This paper uses secondary survey data from the recent round 5 integrated household survey (IHS5) fielded from April 2019 to March 2020. The survey sampled 11,434 households that were statistically selected to be representative at national, district, urban, and rural levels, and is designed to provide information on the various aspects of household welfare in Malawi. The IHS5 used a stratified sampling design, where 719 census enumeration areas (EAs) were selected as primary sampling units (PSUs) with an average of about 16 households each. For the sampled communities and households, four types of questionnaires were administered during the survey, in terms of the Household, Agricultural, Fisheries and Community Questionnaires. The main variables of interest in this study (remittances, household shocks, food security and nutrition) are sourced from the household questionnaire, which includes demographic information and the household welfare aspects. Due to missing response for the variables used, we obtained usable sample of 7723 households.

3.2. Conceptual framework

Figure 1 is the conceptual framework depicting the role of remittances in absorbing the shock effects on food security and nutrition. As illustrated, five main correlated shocks from different

Table 1. Shock types and examples

SHOCK TYPE	EXAMPLES OF SHOCKS
Natural shocks	<ul style="list-style-type: none"> • Weather shocks (droughts and erratic rains) • Other natural disasters as floods, earthquakes, and landslides
Economic shocks	<ul style="list-style-type: none"> • High prices of food • End of regular financial assistance • Reduction in the earnings from household business • Business failure • Reduction in the earnings of currently salaried household members • Loss of employment of previously salaried household members
Agricultural shocks	<ul style="list-style-type: none"> • An unusually high level of crop pests or diseases or livestock diseases • Unusually low prices of agricultural output • High costs of agricultural inputs
Health shocks	<ul style="list-style-type: none"> • Serious illness or accident of household member(s) • Birth in the household • Death of the household member • Death of income earner(s)
Social shocks	<ul style="list-style-type: none"> • Break-up of household • Theft (crime) • Conflict or violence

fronts clog the pathways of food security and nutrition, consequently, reducing households' command over food. The five broad categories of shocks, namely, natural, agricultural, economic, social, and health shocks were formulated by consolidating 21 different single shocks that affect households. The shocks are presented in Table 1 showing the shock types and their corresponding examples. For instance, we categorise a household experiencing an agricultural shock if the household experienced an unusual high level of crop pests, or low prices of agricultural or high cost of agricultural. The innovation in creating the shock index lies in its flexibility to incorporate households affected by either a specific type of shock or various combinations of shocks. Remittances are, therefore, assumed to offset the shock effects on food security and nutrition if the net effect of remittances on a household's command over food is positive.

3.3. Analytical framework

3.3.1. Modelling food security and nutrition in the state of uncertainty

Based on the objective of the paper, our interest is to model household behaviour in the state of uncertainty. In this regard, we assume that the household unit has two main linked objectives, that is firstly, to maximise the joint utility function comprising of the food requirements for each household member, food and non-food purchases, food from own production, and leisure or labour supplied to the market. Following Chirwa and Ngalawa (2008) and Zingwe et al. (2023), we express the utility maximisation model as follows:

$$U_h = f_h(N, F, C, L; X_h, \varepsilon) \quad (1)$$

where U_h is the collective household utility for household h ; N is the food requirement outcome of the households; F is food consumption; C is non-food consumption; L is leisure; X_h is the exogenous household-specific characteristics; and ε is a stochastic term representing unobservable heterogeneity in preferences. Secondly, we assume that the household seek to minimise (insure against) risk that has a bearing on household utility by sending out some of its labour (migration of selected members). Based on this, we model household food security and nutrition as follows:

$$FSN_j = g_j(x(h, r), z, \varepsilon) \quad (2)$$

where FSN is the food security status of j household, x represents household-specific factors comprising of demographic and socio-economic factors h and remittances r . z represents household shocks, and ε is the error term.

3.4. Specification of economic models

Following equation (2), we capture the dependent variable FSN_j using three different but related indicators. Firstly, we adopted the CSI that captures food security by aggregating the number of coping strategies that households use in mitigating the food problem, with the index ranging from 0 to 56 (Maxwell et al., 2008). For nuanced interpretation, in the analysis, we further normalize the CSI, and it ranges from 0 to 1. The coping strategies that make the CSI include the frequency at which households relied on less preferred or less expensive foods, limit portion size of food at meal times, reduce the number of meals eaten in a day, restrict consumption by adults for children should eat, and borrow or rely on help food from a friend or relative. The severity of food insecurity is determined by the number of strategies that households employ (Maxwell et al., 2008). Since the dependent variable CSI ranges from 0 to 1 an indication of fractional response, we therefore adopt the fractional logit model which is presented as follows:

$$CSI_i = \alpha_0 + \sum_i \beta_i X_i + \sum_i \tau_i R_i + \gamma_i S_i + \sum_i \omega_i R_i S_i + \varepsilon_i \quad (3)$$

The fractional logit regression model is a quasi-likelihood method which is fully robust and relatively efficient for fractional response-dependent variables (Papke & Wooldridge, 1996).

In order to capture food nutrition, we use the FCS and HDD, where the former is a composite score based on dietary diversity, food frequency, and relative nutritional importance of different food groups consumed during seven days (WFP, 2008). The FCS can, therefore, measure both food security and nutrition, hence being an ideal indicator to bridge the CSI and HDD. The HDD encompasses the number of food groups required, with the highest being 12 (Zingwe et al., 2023). This implies that a household with an HDD score that is lower than 12 is short of a food group component, while a household that has 12 is taking in all required food groups. In studying household nutrition, other studies—such as Chirwa and Ngilawa (2008)—use anthropometry measures, which are direct measures of an individual's nutrition. However, this study used the FCS and HDD indicators due to data limitations, as anthropometric measures were only specified for children in the data. In terms of the econometric models, after conducting some diagnostic and robustness checks (model specification tests, VIF, heteroskedasticity), we fit the OLS and Poisson regression models for the FCS, and HDD, respectively. The HDD is count variable as such, it required count-data regression models. We therefore selected the Poisson regression model after conducting overdispersion test (Wooldridge, 2010). The models are, therefore, presented as follows:

$$FCS_i = \alpha_0 + \sum_i \beta_i X_i + \sum_i \tau_i R_i + \gamma_i S_i + \sum_i \omega_i R_i S_i + \varepsilon_i \quad (4)$$

$$HDD_i = \alpha_0 + \sum_i \beta_i X_i + \sum_i \tau_i R_i + \gamma_i S_i + \sum_i \omega_i R_i S_i + \varepsilon_i \quad (5)$$

Where the right-hand side of the equations (3), (4), and (5) consists of the independent variables and their respective parameters. Specifically, α_0 is the constant term, X_i is a vector of household-specific variables R_i is remittances, and S_i is the shock index that captures five shocks; β_i , τ_i , γ_i , and

Table 2. Definition of the variables used in the model

Variable	Definition
Remittances	A dummy variable where 1 indicate that the household is a recipient of remittances
Cash remittances	A dummy variable where 1 indicate that the household is a recipient of cash remittances
In-kind remittances	A dummy variable where 1 indicate that the household is a recipient of in-kind remittances
Rural remittances	A dummy variable where 1 indicate that the household is a recipient of remittances from the rural area
Urban remittances	A dummy variable where 1 indicate that the household is a recipient of remittances from the urban area
International remittances	A dummy variable where 1 indicate that the household is a recipient of international remittances
Shock index	An index that is formulated by aggregating the 5 shock types with their corresponding intensities, obtained from the Principal Component Analysis (PCA).
Wage employment	A dummy variable where 1 indicates that household head's main occupation is wage employment
Farming	A dummy variable where 1 indicates that household head's occupation is farming
Non-farm business	A dummy variable where 1 indicates that household head's main occupation is non-farm business
Household size	The number of household members in a household
Male headed household	A dummy variable where 1 indicates that the sex of household head is male
Marital status	A dummy variable where 1 indicates that the household head is married
Years of education	The number of schooling years of the household head
Urban	A dummy variable where 1 indicates that the household is located in the urban setting
Credit access	A dummy variable where 1 indicates that the household had access to credit
Age of the household head	The age of the household head in years
Land owned	The land owned by a household in acres

Table 3. Pairwise correlation for testing validity of instruments (P-values reported)

Instrumental Variables	Outcome Variable			The Independent Variable
	CSI	FCS	HDD	Remittances
Household members in the economically active age group	0.00	0.59	0.17	0.00
Village bank	0.88	0.23	0.00	0.00

ω_i are vectors of parameters for X_i , R_i , S_i , and the interaction of R_i and S_i , respectively. ε_i is the error term. We are interested in the estimator ω_i , as it tests the main hypothesis of whether remittances mitigate shocks. The details of the exogenous variables are presented in the Table 2.

From the models specified, we expected remittances to be endogenous to the dependent variables, as such, we used the control function (CF) approach to remedy for it. The CF approach requires the inclusion of instrumental variables (IVs) in the first stage that correlate with remittances but not the dependent variables (in our case CSI, FCS, and HDD). In order to select valid IVs, we conducted the falsification test using the pairwise correlation test presented in Table 3. Based on the table, the number of household members in the active age group, and belonging to a village bank, are valid instruments for FCS. On the one hand, the number of household members in the active age group is the only instrument valid for HDD, and on the other hand belonging to a village is the valid instrument for CSI.

Using logistic regression model, we, therefore, proceeded with the first-stage analysis of the CF, specified as follows:

$$R_i = \alpha_0 + \sum_i \beta_i X_i + \sum_i \tau_i Z_i + \gamma_i S_i + \sum_i \omega_i R_i S_i + \varepsilon_i \quad (6)$$

where Z_i is IVs represented in Table 3, precisely, we use both IVs to obtain residuals that are used in the FCS OLS regression model, and for the CSI fractional logit model and HDD Poisson model, we include residuals that we obtain from the first stage using the respective valid instruments.

4. Discussion of results

4.1. Descriptive results

Table 4 presents descriptive statistics of the variables that are used in the econometric models. To begin with, the average CSI is 0.12, an indication that food insecurity is visible but not severe. On average, households consume 8 of the 12 food groups, evidenced by the HDD score and the average FCS is 48.82, indicating that it is acceptable as it is above 35, this is slightly higher in comparison with the findings of Khan et al. (2012), who found the average FCS to be 42.12. In terms of employment, the table shows that 19% of household heads have a wage employment, 74% are farmers, and 24% are involved in non-farm businesses. The average years that the

Table 4. Summary statistics of the variables used in the model

Variable	Mean	SD
CSI	0.122	0.145
HHDD	7.903	1.960
FCS	48.823	17.976
Land owned	1.213	2.892
Wage employment	0.186	0.388
Farming	0.743	0.436
Non-farm business	0.242	0.429
Household size	4.584	2.120
Male-headed household	0.734	0.442
Marital status	0.744	0.436
Years of education	6.677	4.554
Wealth Index	0.025	0.144
Urban	0.180	0.384
Credit access	0.301	0.458
Age of the household head	44.326	15.826

Table 5. Averages of the shock prevalence and corresponding intensities

Variable	Mean	Intensity
Shocks		
Natural shocks	0.46	0.5474
Agricultural shocks	0.63	0.5870
Economic shocks	0.63	0.5531
Health shocks	0.26	0.1569
Social shocks	0.10	0.1591
Shock index	0.51	

Notes: NB: The intensities are computed using PCA.

household head stays in school is 7 years. On average, households consist of five members, 73% of the households are male-headed, 74% of the household have household heads who are married, and the average age of the household head is 44 years. The average land owned by households is 1.2 acres, and 30% of the households have access to credit. On average 18% of the households reside in urban areas.

Table 5 presents the five types of household shocks with their corresponding intensities. The results indicate that agricultural and economic shocks affect more people followed by natural, health, and social shocks in that particular order. In terms of intensity, agricultural shocks are the most intense, followed by economic, natural, social, and health shocks in that particular order. The shock index indicates 0.51 average score, in a range of 0 to 1, indicating that household experiences intense multiple shocks.

Table 6 presents the differences in the remittances received between urban and rural areas. To begin with, there are significant differences between rural and urban areas, in terms of the percentage of recipients of rural, urban, and international remittances. The results show that more rural households receive remittances in the form of in-kind, and from rural areas, than urban dwellers, evidenced by 3% in-kind remittances and 14% rural remittance significant difference. This is in line with Andersson (2011) who found that 52% of remitters reported that maize was being sent or collected by relatives in neighbouring villages. There is a 14% and 4% difference between urban and rural dwellers, where more urban dwellers receive remittances from urban areas, and other countries (international remittances), respectively. The results also show that more urban dwellers receive remittances in cash than rural households (5% difference). For the households that received remittances, urban dwellers receive more remittances than rural households in Malawi Kwacha (MK). For instance, urban dwellers receive more remittances in cash from both rural and urban areas, and receive more in-kind remittances from urban areas than rural households. There are no significant spatial differences with regard to the international remittances received.

4.2. Econometric results

Table 7 presents the econometric results of the first and second stages of the CF, where the first stage (1) presents the results of a logit model, and the second stages (2)-(4) are results of the fractional logit. To begin with, in (1), on the one hand, the results show that the shock index, years of education of the household head, residing in an urban area, and credit access are positively significant. This indicates that an increase in the intensity of household shocks increases the likelihood of receiving remittances. According to Duda et al. (2018) households experiencing environmental shocks are likely to migrate. An increase in the schooling years of the household head increases the likelihood of receiving remittances; urban dwellers are more likely to receive remittances than rural households. This finding is contrary to Ali et al. (2019) who found that rural households receive more remittances than urban households. In terms of education, the results

Table 6. Spatial variations in remittances

	Overall mean	Urban	Rural	Difference
Remittances recipients (%)	0.41	0.43	0.41	0.02
Rural remittances recipients (%)	0.30	0.18	0.32	−0.14***
Urban remittances recipients (%)	0.14	0.26	0.12	0.14***
International remittances recipients (%)	0.05	0.08	0.04	0.04***
In-kind remittances recipients (%)	0.30	0.27	0.30	−0.03*
Cash remittances recipients (%)	0.25	0.29	0.24	0.05***
Remittances recipients (MK)	41219.29	74334.82	33557.74	40777.08***
Rural remittances recipients (MK)	12592.16	20833.39	11605.58	9227.81***
Urban remittances recipients (MK)	43203.55	55744.75	37198.11	18546.64***
International remittances recipients (MK)	150212.90	173099.30	140300.30	32798.95
In-kind remittances recipients (MK)	13352.89	19385.73	12156.16	7229.57***
In-kind rural remittances recipients (MK)	9911.29	15131.90	9312.29	5819.61***
In-kind urban remittances recipients (MK)	14355.49	16501.25	13278.76	3222.49
In-kind International remittances recipients (MK)	4983.92	6666.67	4357.24	2309.43
Cash remittances recipients (MK)	60399.32	101752.30	49450.86	53301.41***
Cash rural remittances recipients (MK)	12080.16	19133.22	11172.40	7960.82***
Cash urban remittances recipients (MK)	46766.09	68590.10	38133.36	30456.74***
Cash international remittances recipients (MK)	153437.20	176655.30	143421.60	33233.73

Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

are in line with Arun and Ulku (2011) who found that education had a positive effect on remittances. Households that accessed credit are more likely to receive remittance than those that did not access credit. This finding is in line with Hagen-Zanker and Siegel (2007) who explained that migrants send remittances because of indebtedness (loan repayment). According to Brown (1997), migrants who received financial assistance from relatives at home to migrate had a greater likelihood of sending remittances. On the other hand, household size, farming as the main occupation of the household head, male-headed households, and age of the household head are negatively significant. This indicates that an increase in the household size reduces the

Table 7. The effect of remittances on coping strategy index

	(1) Remittance	(2) CSI	(3) CSI	(4) CSI
Shock index	0.280*** (0.038)	0.333* (0.145)	0.326* (0.145)	0.330* (0.145)
Safety nets	0.287*** (0.048)	0.072 (0.067)	0.074 (0.067)	0.086 (0.067)
Land owned	−0.008 (0.009)	−0.090** (0.030)	−0.091** (0.031)	−0.091** (0.030)
Wage employment	−0.073 (0.066)	−0.284*** (0.058)	−0.278*** (0.058)	−0.279*** (0.058)
Farming	−0.145* (0.062)	−0.074 (0.077)	−0.067 (0.077)	−0.071 (0.077)
Non-farm business	−0.077 (0.056)	−0.271*** (0.055)	−0.267*** (0.055)	−0.273*** (0.055)
Household size	−0.060*** (0.012)	0.083*** (0.025)	0.086*** (0.025)	0.085*** (0.025)
Male	−0.508*** (0.069)	−0.025 (0.253)	0.017 (0.253)	0.020 (0.253)
Married	0.044 (0.073)	−0.091 (0.047)	−0.111* (0.047)	−0.118* (0.047)
Years of education	0.017** (0.006)	−0.046*** (0.009)	−0.048*** (0.009)	−0.049*** (0.009)
Wealth index	0.148 (0.166)	−1.495*** (0.211)	−1.507*** (0.211)	−1.507*** (0.211)
Urban	0.140* (0.070)	−0.004 (0.083)	−0.048 (0.083)	−0.053 (0.083)
Credit	0.594*** (0.059)	−0.077 (0.273)	−0.108 (0.273)	−0.089 (0.272)
Age of HH	−0.058*** (0.008)	0.001 (0.029)	0.004 (0.029)	0.002 (0.029)
Age squared	0.001*** (0.000)	−0.000 (0.000)	−0.000 (0.000)	−0.000 (0.000)
Village bank	−0.077 (0.080)			
Safety nets*shock index		−0.055 (0.049)	−0.052 (0.049)	−0.060 (0.049)
Rural remittance		0.329*** (0.068)		
Rural remittances*shock index		−0.124* (0.049)		
Urban remittances		−0.019 (0.090)		
Urban remittances*shock index		−0.001 (0.069)		
International remittances		−0.243 (0.162)		
International remittances*shock index		−0.044 (0.132)		
Residual		0.764 (2.013)	0.964 (2.015)	0.892 (2.012)
Cash remittances			−0.013 (0.075)	

(Continued)

Table 7. (Continued)

	(1) Remittance	(2) CSI	(3) CSI	(4) CSI
Cash remittances*shock index			−0.064 (0.056)	
In-kind remittances			0.341*** (0.069)	
In-kind remittances*shock index			−0.111* (0.051)	
Remittances				0.198** (0.064)
Remittances*shock index				−0.093* (0.047)
_cons	1.152*** (0.196)	−2.378 (1.565)	−2.551 (1.568)	−2.447 (1.564)
N	7724	7723	7723	7723
LR/Wald chi2	453.88***	1070.05***	1082.26***	1036.65***

Notes: Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

likelihood of receiving remittance. Duda et al. (2018), however, found that household size had a positive impact on out-migration. This indicates that out-migration of household members from a large household does not translate to them remitting to their households. Farming households are less likely to receive remittances as they rely on their household members for family labour. Male-headed household are less likely to receive remittances in comparison with female-headed households; an increase in the age of the household head reduces the likelihood of receiving remittances; however, the chances of receiving remittances start to increase when the household head reaches a certain age (age squared is positively significant).

In the second stage models, the residuals are insignificant, indicating that endogeneity would not have been a problem even if it was not controlled for. Our variables of interest include the shock index, remittances, and their interaction. The results show that the relationship between the CSI and the shock index is positively significant at 5% level in all three models. This indicates that an increase in the intensity of household shocks increases the likelihood of being food insecure. The findings support various studies that found the negative effects of different types of shocks such as climatic, economic, and health shocks on household food security in Malawi (Davies, 2010, Niles & Asfaw and Davis, 2018; Asfaw & Maggio, 2017). Shocks negatively affect the pillars that incline household food security and nutrition. For instance, climatic shocks lead to the damage of agricultural produce, livestock, and infrastructure, thereby exacerbating food shortages (Niles et al., 2018); economic shocks such as a decline in house income or purchasing power due to food inflation reduce household food accessibility (Ecker & Qaim, 2011); agricultural shocks such as high input prices halt production of food (Wiggins & Brooks, 2010); health shocks forces households to prioritise health expenditure over food expenditure (Somi et al., 2009).

Overall, the relationship between remittances and the CSI is positively significant, indicating that household that receives remittances is likely to experience food insecurity. This signals that remittances are unable to offset the reduction in food production due to the loss of family labour. However, the interaction of the shock index and remittance is negatively significant showing that remittances reduce food insecurity for households that experienced intense shocks. Moniruzzaman (2020) asserts that remittances offset the food-related shocks

and also reduce the need for severe coping strategies such as rationing. We infer that remittances are more effective as an insurance mechanism against shocks, than they are as a reliable livelihood option that combat food deprivation—food insecurity. Similarly, Obi et al. (2019) established that remittance are veritable instruments for meeting food security during food crises. Our findings are also in line with Atuoye et al. (2017) who found that remittances are inadequate to resolve the food problem. Similarly, the disaggregated remittances, particularly remittances from rural areas, and in-kind remittances are positively significant at all levels, showing the likelihood of a higher CSI for the recipients of rural remittances or those that receive in-kind remittances. The interactions of the shock index and rural remittances and that of the shock index and in-kind remittances are both negatively significant. This implies that rural remittances or in-kind remittances reduce the likelihood of experiencing food insecurity, only, for households facing multiple intense shocks.

For the other controls, land owned, wage employment, non-farm business, years of education, and household wealth are negatively significant in all the three model specifications, indicating that these variables reduce food insecurity. The level of education reduces food insecurity, and this is in line with Bulawayo et al. (2019) who asserted that an increase in an individual's education level enhances their wage-earning capacity, which may translate into a higher ability to afford basic household food requirements. Similarly, wage employment or non-farm business is essential in tackling household food insecurity as it enhances exchange entitlement by households (Sen, 1981). Land owned and household wealth also improve food security, an indication that household assets are significant in ensuring food security. For instance, households can use land for food production or gain rentals that can be used to purchase food. This is in line with Zingwe et al. (2023) who found plot size and wealth index to have a negative effect on CSI. Household size is positively significant, an indication that an additional member to the household increases the likelihood of household food insecurity. This is in line with Mota et al. (2019) who asserted that additional household member exerts more pressure on consumption than they contribute to production.

Table 8 presents the results of the logit and OLS regression models. The logit model is also the first stage of the CF and has been used to obtain the residuals that are used in the OLS regression models. The results in (1) are similar to those in Table 6, as such we only interpret the IV which is positively significant showing that an increase in the number of economically active household members increases the likelihood of receiving remittances.

The OLS regression models present the nexus between remittances and FCS, among other controls. Overall, the results show that remittances have no significant effect on FCS, however, when interacted with the shock index, the relationship between FCS and remittances is positively significant at 5% level. This indicates that remittances have a positive effect particularly, on households that face intense multiple shocks, evidenced by a 1.47 higher FCS score than other households. This is in line with Akim et al. (2022) who found that remittances from any origin had significant positive effect on COVID-19 shock-induced food insecurity. The disaggregated remittances indicate that remittances in form of cash or in-kind are insignificant. However, the interaction of cash remittances and the shock index is positively significant at all levels, indicating a 1.93 higher FCS for recipients of cash remittances that face intense shocks in comparison with other households. On the one hand, households that receive remittances from rural areas unexpectedly have a 1.77 significant lower FCS than those that did not receive remittances. This can be explained by the fact that the loss in family labour due to out-migration outweighs gains from remittances. In Malawi, particularly, in rural settings, households depend on own-food production that is labour-intensive, hence losing labour to migration has adverse ramification on food and nutrition security. However, when interacted with the shock index, rural remittances have a significant positive effect, signalling that households that experienced intense shocks benefited more (1.44 higher FCS) from rural remittances than other households. On the other hand, households that receive international remittances have a 5.14 higher FCS score than other households.

Table 8. The effect of remittances on household food consumption score

	(1) Remittance	(2) FCS	(3) FCS	(4) FCS
Shock index	0.318*** (0.041)	−3.303** (1.065)	−3.257** (1.070)	−3.411** (1.076)
Safety net	0.289*** (0.051)	−0.879 (0.808)	−0.991 (0.806)	−1.019 (0.807)
Land owned	−0.016 (0.013)	0.287*** (0.048)	0.308*** (0.046)	0.305*** (0.046)
Wage employment	−0.057 (0.072)	5.383*** (0.611)	5.412*** (0.613)	5.438*** (0.613)
Farming	−0.194** (0.071)	2.433** (0.748)	2.584*** (0.750)	2.738*** (0.753)
Non-farm business	−0.087 (0.060)	3.966*** (0.535)	4.050*** (0.537)	4.123*** (0.538)
Household size	−0.076*** (0.018)	0.147 (0.183)	0.161 (0.184)	0.177 (0.184)
Male	−0.473*** (0.084)	1.311 (1.609)	1.128 (1.610)	1.198 (1.614)
Married	−0.006 (0.090)	1.603* (0.648)	1.945** (0.643)	2.026** (0.643)
Years of education	0.015* (0.007)	0.956*** (0.071)	0.975*** (0.071)	0.982*** (0.071)
Wealth index	0.211 (0.188)	15.588*** (1.830)	15.647*** (1.832)	15.601*** (1.825)
Urban	0.150 (0.080)	6.097*** (0.810)	6.509*** (0.809)	6.523*** (0.811)
Credit	0.552*** (0.063)	−1.387 (1.787)	−1.506 (1.794)	−1.800 (1.799)
Age of HH	−0.054*** (0.009)	0.424* (0.174)	0.443* (0.175)	0.473** (0.175)
Age squared	0.000*** (0.000)	−0.004* (0.002)	−0.004* (0.002)	−0.004* (0.002)
No. active members	0.058* (0.026)			
Village bank	−0.020 (0.084)			
Safe nets*shock index		0.424 (0.607)	0.454 (0.606)	0.539 (0.608)
Rural remittance		−1.773* (0.832)		
Rural remittances*shock index		1.444* (0.627)		
Urban remittances		0.258 (1.142)		
Urban remittances*shock index		3.116*** (0.893)		
International remittances		5.140** (1.709)		
International remittances*shock index		1.473 (1.385)		
Residual		13.729 (13.564)	14.971 (13.622)	17.532 (13.661)

(Continued)

	(1) Remittance	(2) FCS	(3) FCS	(4) FCS
Cash remittances			1.170 (0.934)	
Cash remittances*shock index			1.932** (0.717)	
In-kind remittances			-0.997 (0.874)	
In-kind remittances*shock index			0.716 (0.658)	
Remittances				-0.015 (0.778)
Remittances*shock index				1.469* (0.595)
_cons	1.102*** (0.230)	20.198* (10.037)	18.611 (10.074)	16.648 (10.108)
N	7724	7723	7723	7723
LR chi2/F-stat	356.13***	107.73***	116.27***	126.40***

This is in line with Smith and Floro (2021) who found that international remittances have greater impact in reducing food insecurity than domestic remittances. Urban remittances are only positively significant when interacted with shocks. Households that concomitantly experienced intense shocks and received remittances from urban areas had a 3.12 higher FCS score than other households. Again, this signals the importance of urban remittances in combating food insecurity and poor nutrition in the occurrence of shocks. The shock index is another variable of interest, and has a consistent negative and significant relationship at all levels with FCS in all three models. The results show that an increase in the intensity of household shocks reduce FCS by at least 3 scores. Generally, shocks have negative ramifications on food security and nutrition, as they halt the entire food system.

Regarding other controls, case in point household head characteristics such as marital status, type of employment, years of education, and age are positively significant. The results show that households whose household head was married had a higher FCS than other households. Similarly, Ragasa et al. (2019) found households that were dual headed by male and females were food secure than those with only male or female adults. An increase in the age household head led to the increase of FCS, but up to a certain point, beyond that FCS declined. This is in line with Beyene and Muche (2010) who asserted that older household heads devote their time in food production than younger household heads. Households with head in the wage employment, farming, and non-farm business had a higher FCS than other households, an increase in the schooling years of the household head increase FCS. Khan et al. (2012) also found that adult literacy played a role in improving access to food security. Other household specific factors such as land ownership and household wealth index, were also statistically significant. The results show that an increase in wealth index increases FCS by 16 points, and an increase in land owned by households increases FCS by 3 points. This is in line with Harris-Fry et al. (2015) and Mbwana et al. (2016) who found land owned, and wealth status had a significant positive impact on food security. Households in urban areas have also a higher FCS than those in rural areas.

Table 9. The effect of remittances on household dietary diversity

	(1) Remittance	(2) HDD	(3) HDD	(4) HDD
Shock index	0.294*** (0.041)	−0.075** (0.025)	−0.075** (0.025)	−0.078** (0.025)
Safety nets	0.288*** (0.051)	−0.010 (0.018)	−0.011 (0.018)	−0.011 (0.018)
Land owned	−0.015 (0.013)	0.003* (0.001)	0.004** (0.001)	0.004** (0.001)
Wage employment	−0.056 (0.072)	0.067*** (0.012)	0.067*** (0.012)	0.067*** (0.012)
Farming	−0.195** (0.071)	0.042* (0.017)	0.044** (0.017)	0.046** (0.017)
Non-farm business	−0.087 (0.060)	0.080*** (0.012)	0.080*** (0.012)	0.082*** (0.012)
Household size	−0.076*** (0.012)	0.005 (0.004)	0.005 (0.004)	0.005 (0.004)
Male	−0.473*** (0.084)	0.068 (0.037)	0.068 (0.037)	0.068 (0.037)
Married	−0.006 (0.090)	0.017 (0.016)	0.020 (0.016)	0.021 (0.016)
Years of education	0.015* (0.007)	0.011*** (0.002)	0.012*** (0.002)	0.012*** (0.002)
Wealth index	0.211 (0.188)	0.093** (0.032)	0.092** (0.032)	0.091** (0.032)
Urban	0.150 (0.080)	0.065*** (0.016)	0.071*** (0.016)	0.071*** (0.016)
Credit	0.543*** (0.051)	−0.051 (0.041)	−0.053 (0.041)	−0.057 (0.041)
Age of HH	−0.054*** (0.009)	0.008* (0.004)	0.009* (0.004)	0.009* (0.004)
Age squared	0.000*** (0.000)	−0.000* (0.000)	−0.000* (0.000)	−0.000* (0.000)
No. active members	0.061* (0.026)			
Safety nets*shock index		0.017 (0.014)	0.017 (0.014)	0.018 (0.014)
Rural remittance		−0.024 (0.019)		
Rural remittances*shock index		0.014 (0.015)		
Urban remittances		0.007 (0.023)		
Urban remittances*shock index		0.035 (0.019)		
International remittances		0.050 (0.034)		
International remittances*shock index		0.014 (0.030)		
Residual		0.531 (0.308)	0.548 (0.308)	0.580 (0.308)
Cash remittances			0.024 (0.020)	

(Continued)

	(1) Remittance	(2) HDD	(3) HDD	(4) HDD
Cash remittances*shock index			0.016 (0.016)	
In-kind remittances			-0.020 (0.019)	
In-kind remittances*shock index			0.011 (0.015)	
Remittances				-0.004 (0.017)
Remittances*shock index				0.019 (0.013)
_cons	1.102*** (0.230)	1.478*** (0.228)	1.456*** (0.228)	1.433*** (0.228)
N	7724	7723	7723	7723
F-stat/LR chi2	356.13***	864.47***	853.00***	840.11***

Notes: Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 9 presents the results of the logit and Poisson regression models, the results of logit are similar to those in Tables 6 and 7, as such we focus on the interpretation and discussion on Poisson models only. The results indicate that remittances (both the whole and disaggregated) have no effect on HDD. This reflects that remittances are not enough to make substantial changes to HDD. The shock index is negatively significant at all levels of statistical significance in all 3 models, indicating that an increase in the intensity of household shocks reduces HDD. This is in line with Kundu et al. (2021) who found that COVID-19 induced shocks such as loss of employment reduced HDD. According to Ecker and Qaim (2011), household shocks forces households to switch to less expensive foods, and cease to eat meat products, and fruits.

For the other controls, household head occupation, particularly for households whose household head primary occupation is farming, wage employment, and non-farm business had a higher HDD score than other households. Socio-economic factors, such as years of education of the household head, credit access, wealth index, and residing in urban areas, were positively significant at all levels of statistical significance. Huluka et al. (2019) also found that wealth status of the household improves HDD; Zingwe et al. (2023) found that households that had access to credit had better HDD scores than those that did not access credit.

5. Conclusion and policy implications

The influx of multiple shocks from various fronts has exacerbated food insecurity and poor nutrition, affecting approximately 13% of the population. This is in light of various interventions both on the global and national level aimed at alleviating food poverty. This paper sought to investigate household-led initiatives, case in point- remittances in combating the effects of multiple shocks on household food security and nutrition. The paper establishes that, firstly, on average households face intense multiple correlated shocks. Secondly, there are spatial variations in terms of recipients of remittances, where on one hand, more rural households receive in-kind remittances from the rural areas than urban dwellers. On the other hand, more households from urban areas receive cash remittances from urban areas than rural households. Nonetheless, urban households receive more remittances than rural households, regardless of the form or origin.

Thirdly, remittances are an important tool in improving food security and nutrition for households facing intense shocks, however, without the consideration of shocks, remittances are detrimental as a livelihood strategy for the alleviation of food poverty. This is so because remittances are inadequate to compensate for the loss in family labour that is as a result of migration. Although remittances are not panacea, they are, however, crucial in combating food and nutrition insecurity in the current operating environment that is characterized by a myriad of shocks. Policywise, this implies the removal of barriers, and the reduction in transaction costs associated with the process of sending or receiving remittances. Additionally, in the long-haul remittances on their own are unable to combat food and nutrition insecurity, this means that they need to be accompanied by other direct interventions designed to tackle food and nutrition insecurity.

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