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DETERMINANTS OF FOOD INSUFFICIENCY COPING STRATEGIES IN SUB-SAHARAN AFRICA: A CASE OF MALAWI

DETERMINANTY STRATEGII POSTĘPOWANIA W PRZYPADKU NIEDOBORÓW ŻYWNOŚCI W AFRYCE SUBSAHARYJSKIEJ: PRZYPADEK MALAWI

Abstract

This paper examined the determinants of household food insufficiency coping strategies based on secondary data collected from 12,480 randomly selected households in Malawi. In response to food insufficiency, households employed the following coping strategies: relying on less preferred food options, reducing the proportion of meals, reducing the number of meals per day, restricting adult consumption for small children to eat, and borrowing food from family or friends. To assess the determinants of food insufficiency coping strategies, a multivariate probit model was employed. Education level, household size, livestock ownership and place of residence were some of the important factors that affected the choice of the coping strategies. The paper recommends policies that aim at strengthening the education system of the rural communities to equip them with skills they can use diversify their livelihood sources.

Keywords: *food insufficiency, coping, multivariate probit, households, Malawi*

Streszczenie

W niniejszym artykule przeanalizowano determinanty strategii radzenia sobie z niedoborem żywności w gospodarstwach domowych w oparciu o dane zebrane w 12 480 losowo wybranych gospodarstwach domowych w Malawi. W reakcji na niedobory żywności gospodarstwa domowe stosowały następujące strategie radzenia sobie z problemem: wybór mniej preferowanych opcji żywieniowych, zmniejszanie proporcji posiłków, zmniejszanie liczby posiłków dziennie, ograniczanie spożycia przez dorosłych na rzecz małych dzieci i pożyczanie żywności od rodziny lub przyjaciół. Do oceny czynników warunkujących strategie radzenia sobie z niedoborem żywności zastosowano wielowymiarowy model probitowy. Poziom wykształcenia, wielkość gospodarstwa domowego, posiadanie zwierząt gospodarskich i miejsce zamieszkania to niektóre z ważnych czynników, które wpłynęły na

wybór strategii postępowania. W dokumencie zaleca się strategie mające na celu wzmocnienie systemu edukacji społeczności wiejskich, aby wyposażyć je w umiejętności, z których mogą korzystać, różnicując źródła utrzymania.
***Słowa kluczowe**: niedobór żywności, radzenie sobie, wielozmienny probit, gospodarstwa domowe, Malawi*

Statement of the problem in general outlook and its connection with important scientific and practical tasks.

Africa has been experiencing slow growth in agriculture which subsequently leads to food insufficiency. Food insufficiency is experienced when a household does not have enough food for consumption (Tefera & Tefere, 2014; Dunga & Dunga, 2017).

A food insufficient household's level of a vulnerability is reflected in the range of coping strategies they employ. Households employ food or non-food based coping strategies, or a combination of both and coping strategies can vary due to socioeconomic, institutional and demographic factors Some households would smooth consumption by tapping into different resources at their disposal such as accessing credit, tapping into their financial reserves and the erosive behavior of selling of productive assets which is the general tendency of households with lower asset status (Mjonono, Ngidi, & Hendriks, 2009; Farzana, et al., 2017). Households which do not have such resources to tap into, fail to smoothen consumption and hence change their consumption patterns which include: relying on less preferred food options, limiting portion sizes at mealtimes, reducing the number of meals consumed per day, and restricting consumption by adults in order for small children to eat. Most of the strategies tend to be used in a sequential manner, with more irreversible strategies only being used after more reversible strategies have been shown to be insufficient in allowing the household to cope with the food insufficiency it faces (Corbett, 1988). This paper complements the current understanding of the determinants of household food insufficiency.

Analysis of latest research where the solution of the problem was initiated.

Data Description

The study used the Fourth Integrated Household Survey (IHS-4) which was conducted by the National Statistical Office (NSO) of Malawi from April 2016 to April 2017. A stratified two-stage sample design was used for the HIS-4. The primary sampling units (PSUs) selected at the first sampling stage were the census enumerations areas (EAs) A total of 779 EAs were selected across the country with an average of about 235 households each per EA.

The survey collected information on specific conditions, experiences, and behaviors characteristic of a wide range of severity of household food insufficiency of 12,480 households statistically designed to be representative at both national, district, urban

and rural levels enabling the provision of reliable estimates for these levels. A household was categorized as food insufficient if it reported food shortages in the month preceding the survey, and so 7,434 households were categorized as food insufficient.

Definition of Variables
Table 1 shows a list of independent variables which were included in the model.

Table 1. Definition of variables.

Variable	Definition	Measurement	Expected sign
Age	Age of household head measured in years	Years	+
Education level	Highest level of education reached	Primary School = 1 Junior Secondary = 2 Senior Secondary = 3 Tertiary = 4 None = 5	+/-
Expenditure	Amount of money spent in the month preceding the survey	Malawi Kwacha (MK)	-
Fishing	Whether the household is involved in fishing	Yes = 1 No = 0	-
Household size	Number of people living under the same abode and eating from the pot	Number	+
Land size	The total amount of land the household cultivates	Acres	+/-
Livestock ownership	Whether the household owns any livestock or not	Yes = 1 No = 0	-
Marital status	Whether the household head is married or not	No = 0, Yes = 1	-
Place of residence	Whether the household is located in rural or urban area	Urban = 1 Rural = 0	-
Sex of household head	Whether the household head is male or female	Female = 0 Male = 1	-

Source: Generated by the author based on The Fourth Malawi Integrated Household Survey Data

Aims of paper. Methods

Methodology
Theoretical Framework
A multivariate probit model was used to determine factors that influence the choice of food insufficiency coping strategies. The model is a multi-response variable model which specifies the relationship between The structural form of the model is as follows (Capellari & Jenkins, 2003; Chib & Greenberg, 1998):

coping options and a set of independent variables. The model allows error terms to be freely correlated and works where heteroskedasticity is present (Ben-Akiva & Bolduc, 1996; Greene, 2005). The model's latent variables are expressed as discrete variables through a threshold specification.

$$y_{im}^* = \beta'_m x_{im} + \varepsilon_{im}, m = 1, \dots, M$$
$$y_{im} = 1 \; if \; y_{im}^* > 0 \text{ and } 0 \text{ otherwise}$$

ε_m, m = 1,…, M are error terms distributed as multivariate normal, each with a mean of zero, is a vector of parameters and x_{im} is a vector of explanatory variables, is a vector of dependent variables. The dependent variable represents outcomes for different choices among the following coping strategies which are observed if the corresponding underlying utility exceeds a set threshold of zero: relying on less expensive or preferred foods, limiting portion size at mealtimes, reducing the number of meals consumed in a day, restricting consumption by adults in order for small children to eat, and borrowing food from a friend or relative. The model is estimated through maximum likelihood through the Geweke–Hajivassiliou–Keane (GHK) smooth recursive conditioning simulator (Cappellari & Jenkins, 2003; Chib & Greenberg, 1998).

Exposition of main material of research with complete substantiation of obtained scientific results. Discussion.

Summary Statistics
The average age of household heads was 44 years. Only 9% of the household heads had attained some education; 4% had attained primary education, 2% attained had attained secondary education and 3% had attained tertiary education. The average household size was four. Most (68%) of the household heads were married. Over half (68%) of the households were male-headed. Only 13% of the households were located in urban areas. The average cultivated land of the sampled households was one acre. Less than half (39%) of the households owned livestock while 3% were involved in fishing.

Empirical Results
Discussion of the results is based on marginal effects because they provide a meaningful way of quantifying changes in the dependent variable due to changes in independent variables. For dummy variables, the marginal effects represent the discrete change from 0 to 1. Interpretation of the marginal effects assumes a ceteris paribus condition for the other independent and dependent variables.

Table 2 below shows estimates from the multivariate probit analysis. The study hypothesized that socioeconomic, institutional, and demographic factors do not affect food insufficiency coping strategies. With a Prob>χ2 = 0.0000, the null hypothesis that socioeconomic, institutional, and demographic factors do not affect food insufficiency coping strategies was rejected. The likelihood ratio test was also significant (Prob> χ2 = 0.0000) implying that there was a correlation between the coping strategies which was corrected using the Geweke–Hajivassiliou–Keane (GHK) smooth recursive conditioning simulator, and that it was correct to use the multivariate probit model (Capellari and Jenkins, 2003). Robust standard errors are used to correct for heteroskedasticity (Greene, 2005).

Table 2. Marginal effects from multivariate probit estimation.

Variable	Relying on less expensive or preferred foods dy/dx (std. error)	Limit portion size at mealtimes dy/dx (std. error)	Reducing the number of meals consumed in a day dy/dx (std. error)	Restrict consumption by adults in order for small children to eat dy/dx (std. error)	Borrow food, or rely on help from a friend or relative dy/dx (std. error)
Age of household head (linear)	0.001 (0.001)	-0.00 (0.002)*	-0.002 (0.002)	-0.003 (0.002)	-0.010 (0.002)***
Age of household head (squared)	-0.000 (0.000)	0.000 (0.000)**	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)***
Expenditure	-0.005 (0.003)	-0.151 (0.004)***	0.000 (0.004)	0.004 (0.004)	-0.003 (0.004)
Education Level					
Primary	-0.021 (0.022)	0.013 (0.027)	0.005 (0.028)	-0.010 (0.027)	-0.053 (0.029)*
Junior Secondary	-0.047 (0.033)	-0.107 (0.042)**	-0.111 (0.043)**	-0.100 (0.034)***	-0.144 (0.039)***
Senior Secondary	-0.063 (0.029)**	0.032 (0.032)	-0.039 (0.035)	-0.008 (0.033)	-0.038 (0.036)
Tertiary	-0.117 (0.058)**	-0.017 (0.064)	-0.171 (0.069)**	-0.034 (0.058)	-0.050 (0.067)
Fishing	-0.047 (0.021)**	-0.031 (0.031)	-0.019 (0.031)	-0.013 (0.029)	0.009 (0.031)
Household size	0.002 (0.002)	0.025 (0.003)***	0.020 (0.003)***	0.051 (0.003)***	0.007 (0.003)**
Land Size	0.000 (0.004)	-0.001 (0.005)	-0.003 (0.005)	-0.006 (0.005)	-0.012 (0.005)**
Livestock ownership	-0.027 (0.008)***	-0.019 (0.011)*	-0.032 (0.011)***	-0.011 (0.011)	-0.034 (0.012)***
Marital status	-0.010 (0.014)	-0.045 (0.018)**	-0.051 (0.019)**	0.038 (0.018)**	-0.030 (0.019)
Place of residence	-0.077 (0.011)***	-0.086 (0.016)***	-0.141 (0.016)***	-0.054 (0.016)***	-0.129 (0.018)***
Sex of household head	-0.011 (0.013)	-0.024 (0.017)	-0.025 (0.018)	-0.071 (0.017)***	-0.063 (0.018)***

* = Significant ($p<0.01$); ** = Significant ($p<0.05$) *** = Significant ($p<0.1$);
Robust standard errors in parenthesis

Source: Generated by the author based on The Fourth Malawi Integrated Household Survey Data

Relying on less expensive or preferred foods

Some households cope with food insufficiency by adjusting their food intake through reducing the quality, the variety, or the desirability of their diet. This strategy was widely adopted, by 85% of the food insufficient households.

The following four factors had a significant effect on reliance on less expensive or preferred foods: education level, fishing, owning livestock and place of residence. Households whose head had obtained senior secondary and tertiary education were significantly (p<0.05) less likely to cope by relying on less expensive or preferred foods 6.3 and 11.7 percentage points respectively than households whose head had not attained any education. Households involved in fishing were also less likely to cope by relying on less expensive or preferred foods by 4.7 percentage points than their non-fishing counterparts significant at p<0.05. The probability of relying on less expensive or preferred foods was significantly (p<0.01) lower by 7.7 percentage points for urban dwellers than for rural dwellers. Households which owned livestock were significantly (p<0.01) less likely to cope by relying on less expensive or preferred foods by 2.7 percentage points than households which do not own livestock.

Limiting portion sizes at mealtimes

Some households respond to food insufficiency by managing the remaining food in their home. This often includes consuming smaller amounts of food at mealtimes than they would otherwise consume. This coping strategy was adopted by 66% of the food insufficient households.

The following seven factors had a significant effect on limiting portion sizes at mealtimes: age of household head, expenditure, education level of household head, household size, livestock ownership, marital status of household head, and place of residence. Below the age of 40, a unit increase in the age of the household head corresponded to a significant (p<0.01) decrease in the probability of the household coping by limiting portion sizes by 0.3 percentage points while each additional year after the age of 40 corresponded to a significant (p<0.01) increase in the probability of the household coping by limiting portion sizes by an infinitesimal amount. Expenditure was used as a proxy for income and it was found significant at p<0.01. A unit increase in income corresponded to a lower probability of coping by limiting portion sizes by 15.1. Households whose head had obtained junior secondary school education were significantly (p<0.05) less likely to cope to food insufficiency by limiting portion sizes by 10.7 percentage points than households whose head had not attained any education. An increase in household size by one more member significantly (p<0.01) increased the probability that the household would cope by limiting portion sizes by 2.5 percentage points. This might be explained by the notion that with limited resources, additional family members contribute more to consumption than to production (Tsegaye, et al., 2018). The probability that a household would cope by limiting portion size was significantly (p<0.1) lower by 1.9 percentage points for households with some livestock than households without. Households led by a married individual were less likely to cope by limiting portion sizes by 4.5 percentage points than households led by an unmarried, separated, or divorced individual. The likelihood of limiting portion sizes significantly (p<0.01) lower by 8.6 percentage points among urban dwellers than their rural counterparts.

Reducing the number of meals consumed in a day

Consumption of three meals or more per day is customary in many households, however, in the face of food shortages some households reduce the number of meals taken per day to mitigate or scale down food hardships. This coping strategy was adopted by 64% of the food insufficient households.

The following five factors had a significant effect on reducing the number of meals consumed in a day as a coping strategy: education level, household size, livestock ownership, marital status and place of residence. Households whose head had obtained junior secondary and tertiary education were less likely to cope to food insufficiency by reducing the number of meals consumed in a day by 11.1 and 17.1 percentage points respectively than households whose head had not attained any education both significant at p<0.05. An additional of one more household member significantly (p<0.01) increased the probability that the household would cope with food insufficiency by reducing the number of meals consumed in a day by 2.0 percentage points. Households which owned livestock was less likely to cope by reducing the number of meals consumed in a day by 3.2 percentage points than households which did not own any livestock significant at p<0.01. The probability of coping by reducing the number of meals consumed in a day was significantly (p<0.01) lower by 5.1 percentage points for households led by a married individual than for households led by an unmarried, divorced or separated individual. Lastly, the probability of coping by reducing the number of meals consumed in a day was significantly (p<0.01) lower by 14.1 percentage points for urban dwellers than their rural counterparts.

Restricting consumption by adults in order for small children to eat

Children are usually protected from disrupted consumption patterns and reduced food intake during times of food insufficiency. Mostly it is in households with severe food insufficiency that even children under 5 years of age get affected by food insufficiency. This strategy was least adopted, by 31% of the food insufficient households.

The following five factors had a significant effect on restricting consumption by adults in order for small children to eat as a food insufficiency coping strategy: education level, household size, marital status of household head, place of residence, and sex of household head. Households whose head had obtained junior secondary education were significantly (p<0.01) less likely to cope by restricting consumption by adults in order for small children to eat by 10.0 percentage points than households whose head had not attained any education. An addition of one more household member increased the probability that the household would cope by restricting consumption by adults in order for small children to eat by 5.1 percentage points significant at p<0.01. A household led by a married person was significantly (p<0.05) more likely to cope to food insufficiency by restricting consumption by adults in order for small children to eat by 3.8 percentage points than households led by an unmarried, separated or divorced individual. Urban residents were significantly (p<0.01) less likely to cope by restricting consumption by adults in order for small children to eat by 5.4 percentage points than rural residents. Male headed households were less significantly (p<0.01) less likely to cope by restricting consumption by 7.1 percentage points than female-headed households.

Borrowing food from others (41%)

Some households may also seek assistance or increase reliance on borrowed food from relatives or friends in times of food shortages. Borrowing food, or relying on help from others was adopted as a food insufficiency coping strategy by 41% of the food insufficient households.

There was a significant relationship between coping to food insufficiency by borrowing food from others and the following seven factors: age of household head, education level of household head, household size, size of cultivated land, livestock ownership, place of residence, and sex of household head. Below the age of 55, a unit increase in the age of the household head corresponded to a decrease in the probability of the household coping by borrowing food by 1.0 percentage point. After the household head attains the age of 55, each additional year corresponded to an increase in the probability of the household coping by borrowing food by an infinitesimal amount significant at $p<0.01$. Households whose head had obtained primary and junior secondary education were significantly ($p<0.01$) less likely to cope to food insufficiency by borrowing food by 5.3 and 14.4 percentage points respectively than households whose head had not attained any education. An increase of one more household member significantly ($p<0.05$) increased the probability that the household would cope by borrowing food by 0.7 percentage points. A unit increase in acres of cultivated land corresponded to a decrease in the probability of the household coping by borrowing food by 1.2 percentage points significant $p<0.05$. Households which owned livestock were significantly ($p<0.01$) less likely to cope by borrowing food by 3.4 percentage points than households which did not own any livestock. The probability of urban residents coping to food insufficiency by borrowing food was significant ($p<0.01$) and lower by 12.9 percentage points than a rural resident. Lastly, male-headed households were significantly ($p<0.01$) less likely to cope with food insufficiency by borrowing food by 6.3 percentage points than female-headed households. This might be because male tend to have more access to productive resources like land which translates into a little bit more food than their female counterparts (Dube, Haji, & Zemedu, 2018).

Conclusions.

Food insufficient households employed a wide range of coping mechanisms intended to lessen the impacts of the same. In response to food insufficiency, households reported using various coping strategies which included relying on less preferred food options, limiting portions at meals times, reducing the number of meals per day, restricting adult consumption for small children to eat, and borrowing food from family or friends. Factors such as the age of household head, education level of household head, household size, size of cultivated land, livestock ownership, place of residence, and sex of household head had different effects on each of the coping strategies.

The paper recommends policies that strengthen the education system of the rural communities to equip them with skills they can use to diversify their livelihood source and improve the access and control of strategic resources such as land and livestock more especially among female-headed households.

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