

Full Length Research Paper

Coping strategies for AIDS-affected households facing food security problems in Malawi: Evidence from integrated household surveys

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Accepted 15 October, 2010

This study examines the coping strategies used by AIDS-affected households facing food security problems. The results from the multinomial logistic model showed that, during 2004/05 and 2006/07, the most dominant coping strategy used by AIDS-affected households facing food security problems, was buying food from the market. This is followed by casual labour, obtaining food from relatives and friends, eating unripe maize before harvest and irrigation farming. The results from logistic discriminant analysis function indicate that, for all households, ordinary coping strategies are dominant among food-insecure households with a total score of close to 80%, much higher than survival strategies at around 20% during 2004/05.

Key words: Morbidity, mortality, coping strategies, farm households, Malawi.

INTRODUCTION

The small size and fragmented nature of land holdings among farm households, has been one of the constraints in achieving food security at household level in Malawi (Chirwa, 2007) and this has been exacerbated by the effects of HIV/AIDS. A decline in available household labour results in a decline in the cultivated land area and a drop in the range of crops that can be grown. It also leads to loss of potential cash income due to illness and death of household members (Haslwimmer, 1996). In times of food crisis, most households in Malawi engage in casual labour, working in other farmers' fields for cash or payment in kind and/or reducing food consumption.

As a result of the impact of HIV/AIDS, more households face food security problems during times of famine, regardless of whether the households were previously food-secure or not. In general, the majority of the AIDS-affected smallholder households do not produce enough food to take them throughout the whole year, even in food-secure years (Blackie and Conroy, 2007). Alumira et al. (2005) found that in Zomba District, in 2002, 92%

of AIDS-affected households were found to be food-insecure compared with 47.3% of non-AIDS affected households. This confirms the findings of other studies e.g. SADC FANR, 2003 and Arrehag et al. (2006).

In recent years, the Malawi government implemented initiatives to ensure that people with HIV/AIDS can gain access to anti-retroviral drugs (ARVs). However, the success of these initiatives partly depends on the food security and nutritional status of their beneficiaries, as medical research shows that ARVs can be dangerous when taken on an empty stomach (Castleman et al., 2003). Good nutrition makes the drugs more effective (FAO, 2002). Faced with the HIV virus, the immune system works hard to fight the virus. Thus people carrying HIV and those suffering from AIDS require higher nutritional levels (FAO, 2002; Epstein, 1995).

The empirical literature indicates that the affected households use various strategies to cope¹ with HIV/AIDS consequences. The most common coping strategies include selling livestock and assets, borrowing

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¹ Coping is an effort taken to manage specific external and/or internal demands that are deemed as exceeding the resources of the person. A strategy is a plan that is meant to achieve something over a period of time.

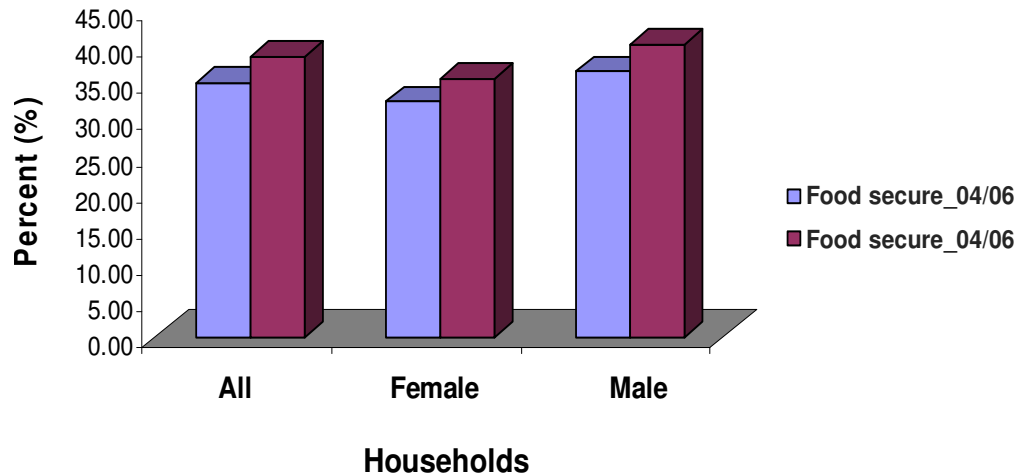


Figure 1. AIDS-affected households and food security. Source: Integrated household survey data, 2004/05 and 2006/07 (NSO, 2005, 2008).

funds, hiring out labour, receiving social grants, food handouts, reducing consumption, withdrawing children from school and reducing household size (Akinboade 2008; Nguthi and Niohoff, 2008; Bukusuba et al., 2007; Chamunika, 2006; Chapoto and Jayne, 2005; Naidu and Harris, 2006; Yamano and Jayne, 2004; Manther, 2004; Lundberg and Over, 2000).

OBJECTIVES OF THE STUDY

This study analyses the coping strategies of AIDS-affected households. Specifically, the study intends to (i) examine coping and surviving strategies among AIDS-affected households facing food security problems in Malawi²; (ii) investigate whether the coping and survival strategies of households with mortality differ from those with morbidity; (iii) bearing in mind the gender differences in land holdings and access to inputs of production, to distinguish whether coping and survival strategies differ according to the gender of the household head and finally, (iv) to explain the choice of coping strategies by households.

The term 'coping', it can be noted, implies success rather than failure. However, some of the so-called coping strategies in fact represent a failure to cope and a desperate struggle to survive. To say that households are coping suggests that the households are managing well or at least persevering, so some strategies are better considered as survival strategies (Rugalema, 2000). Thus we distinguish between coping strategies and survival strategies.

Morbidity, mortality and food security in Malawi

Among AIDS-affected households, Figure 1 indicates that 38.5% of the affected households were food-secure during the 2006/07. This is a slight improvement from the 2004/05 when 34.9% of the affected households were food-secure and may be attributed to the fertilizer subsidy programme which the Malawi government began

implementing since 2004. However, the 38.5% is far lower than the national average of 51%, a finding in line with the findings from empirical literature (e.g. Musita et al., 2009; Adenegan and Adewusi, 2007) where non-affected households were more food secure compared to affected households.

An analysis of food security in the affected households by gender shows that the proportion of female headed households that are food-secure rose from 32.3% during 2004/05 to 35.4% in 2006/07 percent. On the other hand, the proportion of food-secure male headed households increased from 36.4 percent to 40.2 percent. In general, male headed households were relatively more food-secure than their female headed counterparts, in line with maize production levels for female and male headed households during 2006/07. These results are in line with findings from Gill (2010) and Mikael (2004), but differ with Adenegan and Adewusi (2007) who indicated that HIV/AIDS affected female headed households, have higher food security than male headed households.

Figure 2 show food security among affected households with mortality. AIDS-affected households that were food secure increased from 34.5% in 2004/05 to 39.6% in 2006/07. By gender, female headed and male headed households that were food secure rose from 30.3 and 36.0% to 42.5 and 38.0%, respectively.

Food security affected households with morbidity which increased from 35.2 in 2004/05 to 37.6% in 2006/07. Affected female headed households that are food secure dropped slightly from 33.4 to 32.5% (Figure 3). On the other hand, food security affected male headed households, rose from 36.8 during 2005/06 to 41.5%, during 2006/07 season. Thus although on average, male headed households are more food secure than female headed households, disaggregated data give mixed outcomes for households with mortality and morbidity.

We now turn to examine the coping strategies adopted by AIDS-affected and non-affected smallholder.

Coping strategies of food-insecure households

Figure 4 shows coping strategies for food insecure households during the 2004/05. The results show that the dominant coping strategy during 2004/05 was casual labour (labour) at 35.4%, followed by buying of food from the market (market) at 33.3%. The other strategies are obtaining food from relatives and friends (relatives) at 11.3%, eating unripe maize before harvest (eat

² We are examining coping and survival strategies of the AIDS-affected households facing food security problems (AIDS-affected households with prime-age adult mortality and morbidity)



Figure 2. AIDS-affected households with mortality and food security. Source: Integrated household survey data, 2004/05 and 2006/07 (NSO, 2005, 2008).

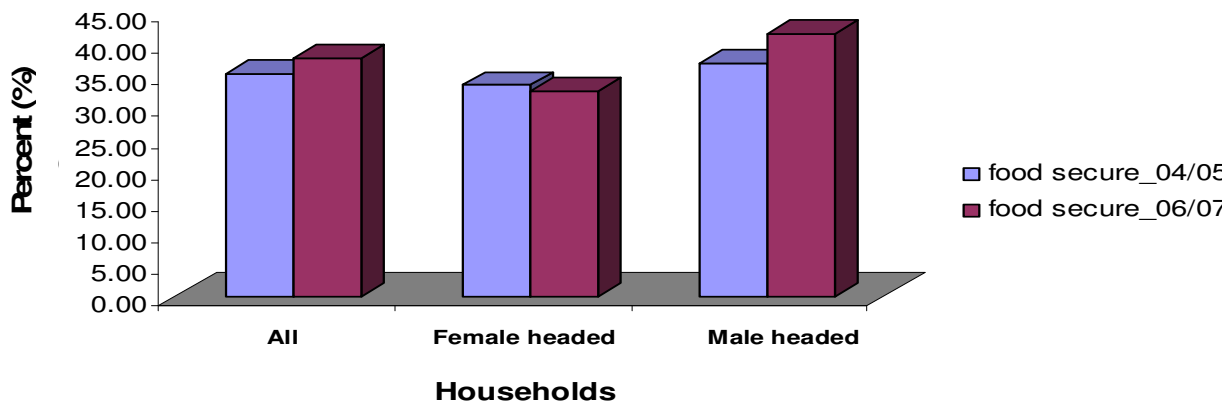


Figure 3. Affected households with morbidity and food security. Source: Integrated household survey data, 2004/05 and 2006/07 (NSO, 2005, 2008).

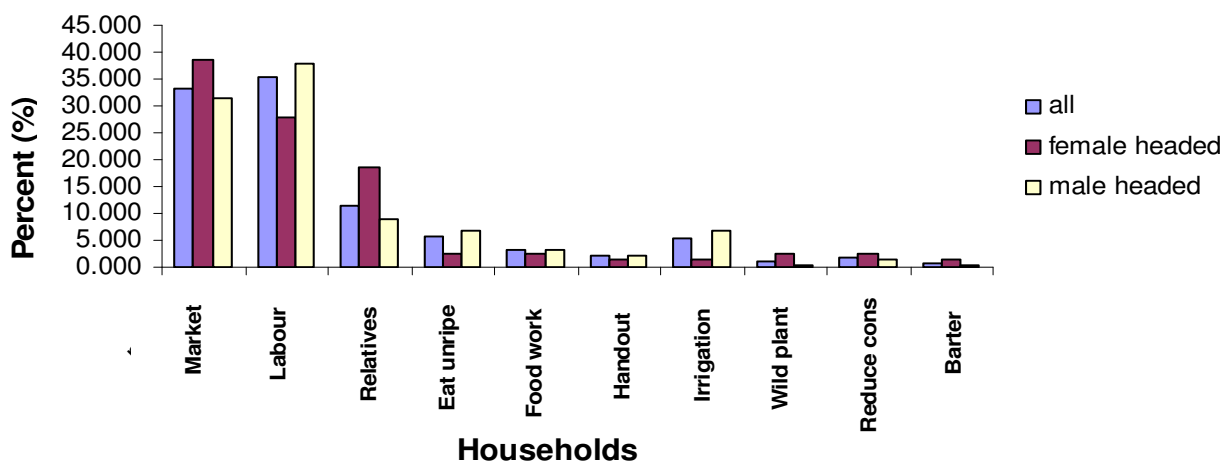


Figure 4. Coping strategies for food-insecure households during 2004/05. Source: Integrated household survey data, 2004/05 and 2006/07 (NSO, 2005, 2008).

unripe), food for work (food work), obtaining food handouts (handout), irrigation farming (irrigation), eating wild plants (wild

plants), reducing food consumption (reduce cons), and barter trade (barter).

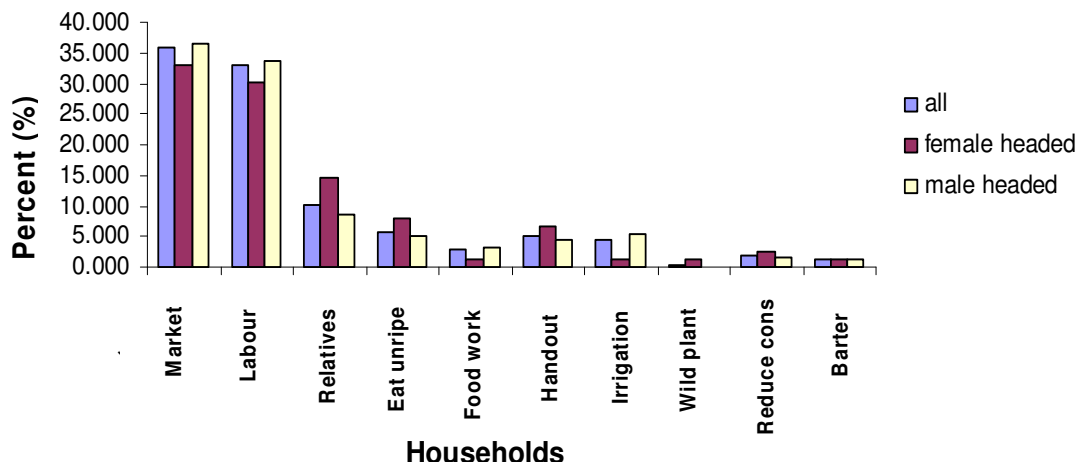


Figure 5. Coping strategies for food-insecure households during 2006/07 season. Source: Integrated household survey data, 2004/05 and 2006/07 (NSO, 2005, 2008).

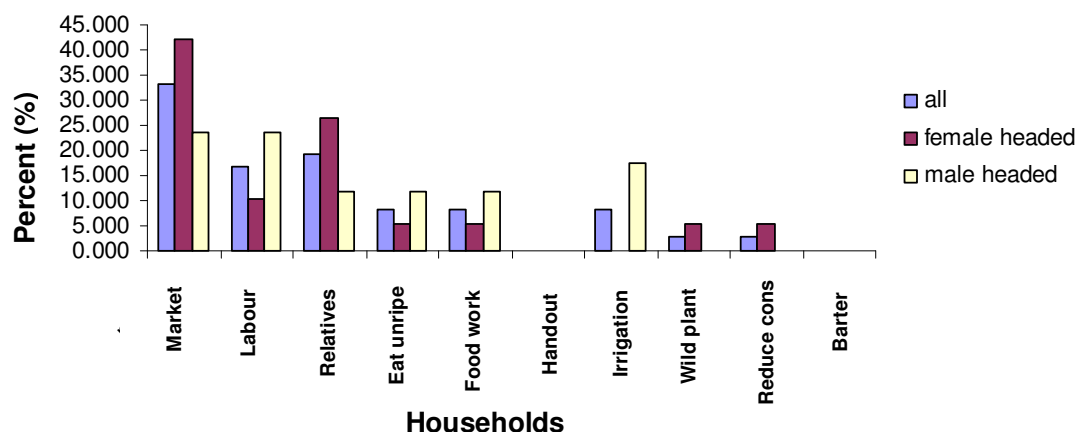


Figure 6. Coping strategies for households with prime-age adult mortality during 2004/05. Source: Integrated household survey data, 2004/05 and 2006/07 (NSO, 2005, 2008).

Figure 5 shows coping strategies for food insecure households during 2006/07. The results show that buying food from the market (market) is the dominant strategy at 35.7%, followed by casual labour (labour)³ at 32.9%. The other strategies are obtaining food from relatives (relatives) at 10.0%, eating unripe maize before harvest (eat unripe), food for work (food work), obtaining food handouts (handout), irrigation farming (irrigation), eating wild plants (wild plants), reducing food consumption (reduce cons) and barter trade (barter)

Data analysis on coping strategies of food insecure households, with mortality during 2004/05 reveal that, the most dominant coping strategy is buying food from the market (market) at 33.3%, followed by obtaining food from relatives and friends (relatives) at 19.4%, casual labour (labour) at 16.7%, eating unripe maize before harvest (unripe), food for work (food work), irrigation farming (irrigation), reducing consumption (reduce cons), eating wild plants (wild plants)

³ Although one could argue that both buying from market and labour are part of the same strategy as wages from labour are used to buy food from the market, in the context of rural farm households, which is the context of our study, most labour activities are paid for in kind (for instance with food)

(Figure 6).

On the other hand, the dominant coping strategy for food insecure households with morbidity during 2004/05 is casual labour (labour) at 38.0%, followed by buying food from the market (market) at 33.3%, obtaining food from relatives (relatives) at 10.2%, eating unripe maize before harvest (unripe), food for work (food work), irrigation farming (irrigation), food handouts (handout), reducing consumption (reduce cons), barter trade (barter) and eating wild plants (wild plant) (Figure 7).

Figures 8 and 9 provide corresponding results of coping strategies for food insecure households with mortality and morbidity during 2006/07. For households with prime-age adult mortality, the dominant coping strategy during 2006/07 was buying food from the market (market) at 39.0%, and unlike in 2004/05, this was followed by casual labour (labour), obtaining food from relatives (relatives), eating unripe maize before harvest (eat unripe), food for work (food work), obtaining food handouts (handout), irrigation farming (irrigation), and reducing consumption (reduce cons).

On the other hand, unlike during 2004/05, the dominant strategy for food insecure households with morbidity during 2006/07 was buying food from market (market) at 35.3%, followed by casual

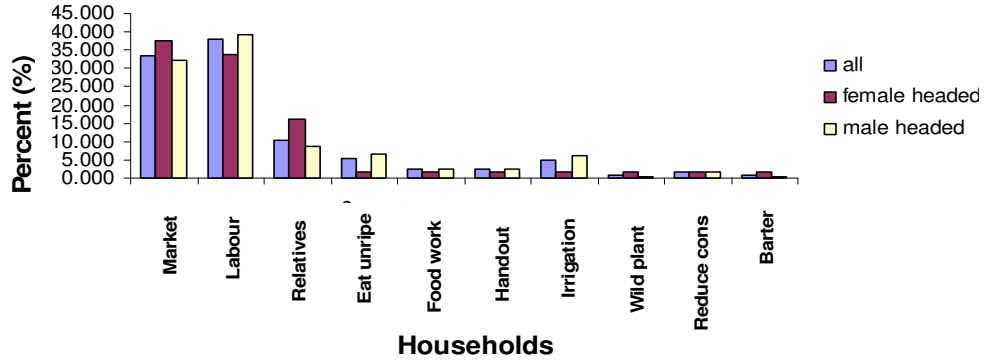


Figure 7. Coping strategies for households with prime-age adult morbidity during the 2004/05. Source: Integrated household survey data, 2004/05 and 2006/07 (NSO, 2005, 2008).

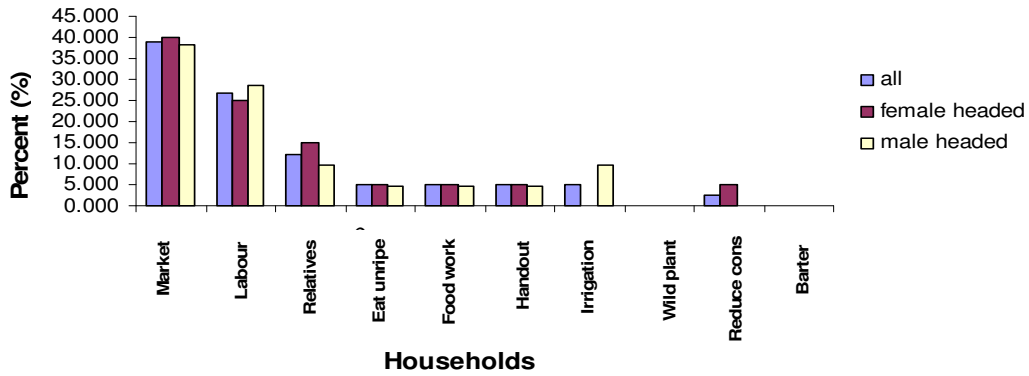


Figure 8. Coping strategies for food-insecure households with mortality during the 2006/07 agricultural season. Source: Integrated household survey data, 2004/05 and 2006/07 (NSO, 2005, 2008).

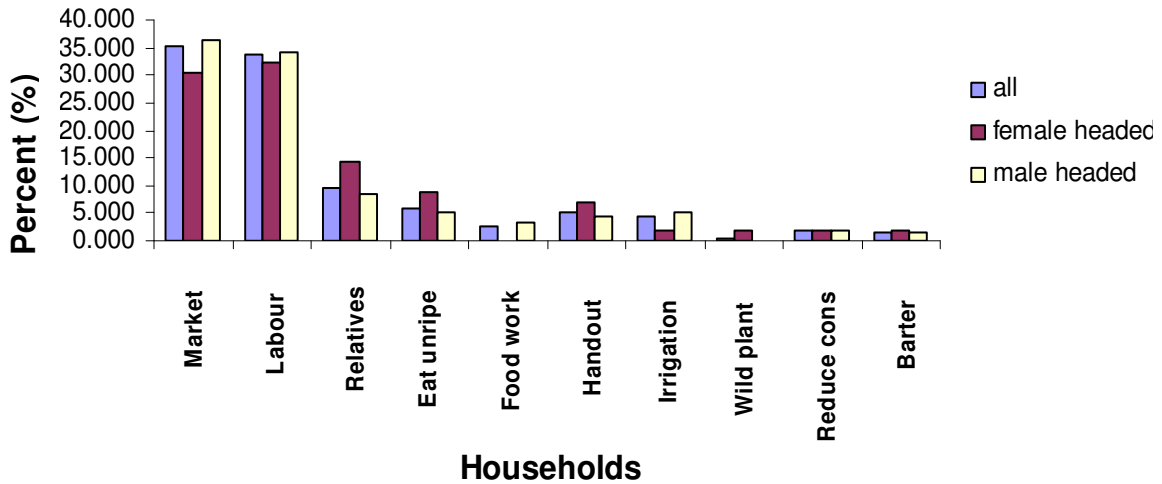


Figure 9. Coping strategies for food-insecure households with morbidity during the 2006/07 season. Source: Integrated household survey data, 2004/05 and 2006/07 (NSO, 2005, 2008)

labour (labour) at 33.8%, obtaining food from relatives and friends (relatives), eating unripe maize before harvest (eat unripe),

obtaining food handouts (handout), irrigation farming (irrigation), food for work (food work), reducing consumption (reduce cons),

barter trade (barter), and eating wild plants (wild plants).

It is worth noting that some households resort to bizarre strategies such as, eating wild plants and reducing consumption; reinforcing the notion that these strategies are not just coping strategies - they are in fact survival strategies. It should also be noted that descriptive statistics on coping strategies do not reveal much information. In our sample, there are some households that use more than one coping strategy which can be properly analyzed using choice modelling techniques, such as the multinomial probit model.

Analytical framework

We analyse the choice of coping strategies by food-insecure households using a multinomial logit model, a multinomial probit model and discriminant analysis. It is not obvious which is the most suitable choice model to use and recent studies which have used these models have not clarified the matter. We thus compare results using each estimation method.

In most cases, the most statistical method is the one that matches the stochastic process, generating the observed data and is able to inform theoretical questions of interest. This implies that, one must be able to differentiate multinomial probit model (MNP) and multinomial logit model, (MNL) as models of data processes. The IIA, the main argument from theory for choosing MNP over the simpler MNL, is rarely relevant. If IIA does not hold, the parameter estimates and predictions of both models are inconsistent. As a result, more flexible models such as multinomial probit, have therefore been suggested (Cameron and Trivedi, 2005; Woodridge, 2002).

Multinomial logistic and multinomial probit models

A multinomial logit model is not usually appropriate, as it assumes zero correlation in unobserved factors over alternatives (McFadden, 2000), which implies that alternatives can be substituted. However, it is not possible to always have this in reality. This assumption on substitution is usually called the Independent of Irrelevant Alternatives (IIA) property. Multinomial probit models, on the other hand, allow correlation in unobserved factors among alternatives (McFadden, 2000).

In this essay, we estimate a model choice of coping strategies using different statistical specifications. After estimating the widely used multinomial logit model, we estimate an independent multinomial probit model. The multinomial probit model does not suffer from the well-known independence of irrelevant alternatives (IIA), which is the main problem in using the multinomial logit model. In our estimation, we compared the elasticities estimated with these different statistical specifications. We assessed the importance of the IIA assumption, by comparing the predictions of three different models -the multinomial logit model, the independent multinomial probit model and multinomial probit model.

Let individuals n, face a set of J, mutually exclusive alternatives coping strategies, each associated with an unobserved utility.

$$U_{ij} = x'_{ij}\beta_i + \epsilon_{nj} \tag{1.1}$$

where X_{ij} is an m-dimensional row set of individual characteristics, n, and alternative, j, β_i is a set of constant parameters, ϵ_{ij} is a random disturbance term (Cameron and Trivedi, 2005; Woodridge, 2002).

Specification of multinomial logit model (MNL)

Following Cameron and Trivedi (2005) and Woodridge (2002), we specify the probabilities to be estimated under multinomial logit model as follows:

$$prob(y_i = j | x_i) = \frac{e^{\beta_j' x_i}}{1 + \sum_{k=1}^J e^{k' x_i}} \text{ for } j=0, 2, \dots, J, \tag{1.2}$$

where x_i represents explanatory variables, that is, household characteristics such as age, education level and gender (all of household head). The ratio of choice probabilities for alternative j and k (the odd-ratio of alternatives j and l) is:

$$\ln \left[\frac{P_{ij}}{P_{ik}} \right] y_i = x'_i (\beta_j - \beta_k) = x'_i \beta_j \text{ if } k=0 \tag{1.3}$$

The odd-ratio, P_j/P_k , is not dependent on other choices other than j and k, which follows from the independence of disturbances in the original model.

For each i, one and only one of the $d_{ij} ' s$ is 1 (Cameron and Trivedi, 2005; Woodridge, 2002). The log-likelihood is a simplification of the binomial logit model:

$$\ln L = \sum_{i=1}^n \sum_{j=0}^J d_{ij} \ln prob(y_i = j) \tag{1.4}$$

The derivatives take the following form:

$$\frac{\partial \ln L}{\partial \beta_j} = \sum_i (d_{ij} - P_{ij}) x_i, \text{ for } j = 1 \dots, J \tag{1.5}$$

Specification of multinomial probit model (MNP)

As already stated, the model has an advantage, in that; it allows correlations among all alternatives or choices. The probability "that an individual n chooses alternative j" is:

$$p_{ij} = Pr[U_{ij} > U_{ik} \text{ for all } k \neq j] \tag{1.6}$$

In the MNP, this probability can be calculated analytically to obtain

p_{ij} , is given by:

$$p_{i1} = Pr[j=1] = \int_{-\infty}^{*1,12} \int_{-\infty}^{*1,13} f_1(\epsilon_{i,2}^*, \epsilon_{i,3}^*) d\epsilon_{i,2}^* d\epsilon_{i,3}^* \tag{1.7}$$

The explanatory variables include household characteristics such as age of the household head, education level of household head and gender (sex) of the household head. The log likelihood for multinomial probit model is specified as follows;

$$\ln L(\psi^*) = \sum_{i=1}^N \sum_{j=1}^J D_{ij} \ln(p_{ij} | \psi^*, V_{i,kj}^*)$$

$$\forall j, j \neq k \quad (1.8)$$

where $(p_{ij} | \psi^*, V_{i,kj}^*) = pr(\varepsilon_{ij}^* < \varepsilon_{ik}^*)$
 $\forall k | \psi^*, V_{ik} - V_{ij}^*), \psi^*$ is a vector of parameters and k
 represents the chosen alternative. The error terms $\varepsilon_{i,21}^*$ and $\varepsilon_{i,31}^*$
 are assumed to have a density $f_1(\varepsilon_{i,21}^*, \varepsilon_{i,31}^*)$ derived from the
 density function $f(\varepsilon_i)$ and are bivariate normal with mean vectors
 zero (0).

Discriminant analysis

We use discriminant analysis to distinguish between coping strategies and survival strategies. This is premised on the fact that some households facing food security problems fail to cope as they struggle to survive. In this case, their strategies would rather be specified as survival strategies rather than coping strategies. We specify the logistic discriminant function as follows:

$$D_i = \alpha_1 X_1 + \alpha_2 X_2 + \dots + \alpha_n X_n \quad (1.9)$$

D_i represents i -th respondent discriminant score on the function, $X_1 \dots X_n$, represent explanatory variables such as years of age, education, gender of household head; $\alpha_1 \dots \alpha_n$ are standardized coefficients estimated from the data

Empirical results

As a preliminary, we estimated multinomial logistic and multinomial probit models, to compare the estimates and marginal effects. The results from both models are identical. This is due to the similarities in the shapes of the logit and probit probability distributions. Major differences would arise only if there were considerable differences in the estimated coefficients, relative to their respective distributions. Still, the smaller MNL confidence bands suggest that the corresponding high and low ranges for the estimated marginal effects are far smaller than for the corresponding ranges for the MNP estimates. We then proceeded to estimate multinomial logistic models with social economic characteristics of farm households. We also have results under discriminant analysis, to investigate whether adopted strategies represent ability to cope or rather failure to cope (that is, survive).

The coefficients in any limited dependent variable can be misleading. Since the multinomial logit and multinomial probit models are probability models, the absolute

level of a coefficient can represent a wrong picture of the impact of the regressor on the dependent variable. To deal with this problem, we compute marginal effects on the conditional mean functions. The marginal effects are derivatives of the conditional mean.

Coping strategies used by food-insecure households

Tables 1 and 2 show estimation results of choice probabilities predicted by multinomial logistic model. The results indicate that during 2004/05 and 2006/07, buying of food from the market (mkt) was the dominant coping strategy for households facing food security problems, with the highest choice probability of 0.379, followed by casual labour (labour), obtaining food from relatives and friends (relative), eating unripe maize before harvest (unripe), and irrigation farming (irrig). The other coping strategies include food for work (fwork), obtaining food handouts (fhand), reducing consumption (reduce) and barter/exchange. Some coping strategies are similar to the findings of previous studies. For instance, Akinboade (2008), Chamunika (2006) and Mikael (2004) show that, affected households received handouts; Akinboade (2008), Bukusuba et al. (2007), Mikael (2004) showed that affected households reduced consumption while Mikael (2004) indicated that affected households received assistance from relatives and friends. By gender, buying food from the market (mkt) is the most dominant coping strategy among female headed households during 2004/05 and 2006/07, with choice probability of 0.455 and 0.367, respectively.

This is followed by casual labour (labour) and obtaining food from relatives, respectively (relative). For male headed households, the most dominant coping strategy was casual labour (labour) in 2004/05 and buying food from the market (mkt) in 2006/07, with choice probabilities of 0.386 and 0.395, respectively. This was followed by buying food from the market (mkt) and casual labour (labour), respectively. The main coping strategy for food-insecure households with mortality during 2004/05 and 2006/07 is buying food from the market (mkt), followed by casual labour (labour). On the other hand, the main coping strategy of food-insecure households with morbidity during 2004/05 and 2006/07 is casual labour (labour) and buying food from the market (mkt), respectively. This is followed by buying food from the market (mkt) and casual labour (labour), respectively. The least ranked coping strategies are eating wild plants (wplant) and barter trade (barter).

Coping and survival of food-insecure households

Using discriminant analysis, we divide the coping strategies into coping (ordinary) strategies and survival (serious) strategies. This is premised on the understanding

Table 1. Probabilities on coping strategies for 2004/05 season.

Households	Mkt	Labour	Relative	Unripe	Fwork	Fhand	Irrig.	Wplant	Reduce	Barter
All households	0.379	0.372	0.087	0.051	0.023	0.022	0.039	0.000	0.026	0.000
Female headed	0.455	0.310	0.176	0.000	0.008	0.012	0.000	0.000	0.029	0.008
Male headed	0.351	0.386	0.059	0.069	0.027	0.025	0.053	0.000	0.023	0.006
Mortality	0.548	0.128	0.188	0.071	0.065	...	0.000	0.000	0.000	...
Female headed	0.551	0.072	0.325	0.000	0.000	...	...	....	0.052	...
Male headed	0.412	0.305	0.048	0.043	0.022	....	.....	...	0.000	...
Morbidity	0.373	0.402	0.079	0.039	0.018	0.026	0.039	0.000	0.000	0.000
Female headed	0.446	0.338	0.138	0.000	0.000	0.017	0.000	0.000	0.000	0.010
Male headed	0.354	0.400	0.059	0.054	0.024	0.027	0.049	0.000	0.025	0.007

Source: Author's estimation results; = not available

Table 2. Probabilities on coping strategies for 2006/07 season.

Households	Mkt	Labour	Relative	Unripe	Fwork	Fhand	Irrig	Wplant	Reduce	Barter
All households	0.386	0.351	0.074	0.054	0.021	0.035	0.035	0.000	0.014	0.029
Female headed	0.367	0.327	0.115	0.082	0.000	0.043	0.000	0.000	0.045	0.019
Male headed	0.395	0.359	0.065	0.046	0.023	0.033	0.045	....	0.000	0.033
Mortality	0.435	0.297	0.130	0.033	0.053	0.054	0.000	0.000	0.000	...
Female headed	0.510	0.257	0.144	0.000	0.000	0.042	0.047	....	0.047	...
Male headed	0.371	0.245	0.128	0.000	0.002	0.000	0.000	...	.....	...
Morbidity	0.389	0.371	0.069	0.057	0.000	0.032	0.034	0.000	0.011	0.037
Female headed	0.364	0.385	0.0781	0.093	...	0.042	0.000	0.000	0.038	0.028
Male headed	0.399	0.367	0.061	0.045	0.018	0.029	0.042	....	0.000	0.038

Source: Author's estimation results; = not available

Table 3. Discriminant analysis results for 2004/05 season – coping strategies.

Households	Mkt	Labour	Food for work	Irrigation	Barter	Total
All households	35.02	34.63	2.72	428	1.56	78.21
Female headed	39.73	28.77	2.74	1.37	1.37	73.98
Male headed	33.15	36.96	2.72	5.43	1.63	79.89
Mortality	39.39	15.15	6.06	6.06	0.00	66.66
Female headed	44.44	11.11	5.56	0.00	0.00	61.10
Male headed	33.33	20.00	6.67	13.33	0.00	73.33
Morbidity	34.38	37.50	2.23	4.02	1.79	79.92
Female headed	38.18	34.55	1.82	1.82	1.82	78.19
Male headed	33.14	38.46	2.37	4.73	1.78	80.48

Source: Author's estimation results; means not available

that, some strategies adopted by households represent non-coping, that is survival, including obtaining food from relatives/friends, eating unripe maize before harvest, food handouts, eating wild plants and reducing consumption.

The results show that for all households, ordinary coping strategies have a total score of 78.21%, much higher than survival strategies at 21.79% during 2004/05, an indication of much greater involvement in coping

strategies than survival strategies. During 2006/07, the score for coping strategies dropped very slightly to 78.09%.

The drop emanated from female headed households, especially among morbidity affected households. (Tables 3 to 6). In general, male headed households have higher scores for coping strategies, compared to female headed households over the 2004/05 and 2006/07 period. This

Table 4. Discriminant analysis results for 2006/07 season – coping strategies.

Households	Mkt	Labour	Food for work	Irrigation	Barter	Total
All households	35.69	32.86	2.12	3.89	3.53	78.09
Female headed	30.77	30.77	1.28	1.28	3.85	67.95
Male headed	37.56	33.56	2.44	4.88	3.41	81.95
Mortality	39.02	26.83	4.88	4.88	0.00	75.60
Female headed	40.00	25.00	5.00	0.00	0.00	70.00
Male headed	38.10	28.57	4.76	9.52	0.00	80.95
Morbidity	35.12	33.88	1.65	3.72	4.13	78.50
Female headed	27.59	32.76	0.00	1.72	5.17	67.24
Male headed	37.50	34.24	2.17	4.35	3.80	82.06

Source: Author's estimation results; = not available.

Table 5. Discriminant analysis results for 2004/05 season – survival strategies.

Households	Obtain from relatives/friends	Eat unripe	Food handouts	Eat wild plants	Reduce consumption	Total
All households	10.12	6.23	2.23	0.78	2.33	21.79
Female headed	17.81	2.71	1.37	1.37	2.74	26.03
Male headed	7.07	7.61	2.72	0.54	2.17	20.17
Mortality	18.18	12.12	0.00	0.00	3.04	33.34
Female headed	27.78	5.56	0.00	0.00	5.56	38.90
Male headed	6.67	20.00	0.00	0.00	0.00	26.67
Morbidity	8.93	5.35	2.68	0.89	2.23	20.08
Female headed	18.18	1.82	1.82	1.82	1.82	21.83
Male headed	7.1	6.51	2.96	0.59	2.37	19.52

Source: Author's estimation results; = not available.

Table 6. Discriminant analysis results for 2006/07 season – survival strategies.

Households	Obtain from relatives/friends	Eat unripe	Food handouts	Eat wild plants	Reduce consumption	Total
All households	9.19	5.30	4.95	0.35	2.12	21.93
Female headed	14.01	7.69	5.13	1.23	3.85	32.05
Male headed	7.32	4.39	4.88	0.00	1.46	18.05
Mortality	12.2	4.88	4.88	0.00	2.44	24.40
Female headed	15.00	5.00	5.00	0.00	5.00	30.00
Male headed	9.52	4.76	4.76	0.00	0.00	19.04
Morbidity	8.93	5.35	2.68	0.89	2.23	20.08
Female headed	13.79	8.62	5.17	1.72	3.46	32.76
Male headed	7.07	4.35	4.89	0.00	1.63	17.94

Source: author's estimation results; = not available.

This implies that female headed households were more engaged in survival strategies compared to male headed households both during 2004/05 and 2006/07.

Determinants of coping strategies

In determining the probability of choosing coping

Table 7. Marginal effects on the conditional mean function for 2004/05 season..

Households	Mkt	Labour	Relative	Unripe	Fwork	Fhand	Irrig	Wplant	Reduce	Barter
All households										
Gender (female=1)	-0.113(0.07)	0.079(0.07)	-0.069(0.03)	0.045(0.04)	-0.02(0.02)	0.013(0.02)	0.054(0.03)	0.00(0.00)	-0.008(0.02)	0.000(0.00)
Age	0.000(0.00)	-0.003(0.00)	0.002(0.00)	-0.001(0.00)	0.00(0.00)	0.000(0.00)	-0.000(0.00)	0.00(0.00)	-0.000(0.00)	0.000(0.00)
Edu (no education=0)	0.109(0.05)	-0.113(0.05)	0.021(0.03)	-0.035(0.02)	0.017(0.01)	0.012(0.01)	-0.013(0.01)	0.00(0.00)	0.002(0.02)	0.000(0.00)
Female headed										
Age	0.002(0.00)	-0.006(0.00)	0.003(0.00)	0.00(0.00)	0.00(0.00)	-0.000(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.000(0.00)
Edu	0.067(0.11)	0.009(0.09)	-0.101(0.09)	0.00(0.00)	0.013(0.02)	0.009(0.02)	0.00(0.00)	0.00(0.01)	-0.007(0.04)	0.011(0.01)
Male headed										
Age	0.00(0.0)	-0.002(0.00)	0.002(0.00)	-0.001(0.00)	0.001(0.00)	0.001(0.00)	0.00(0.00)	0.00(0.00)	-0.0002(0.00)	0.000(0.00)
Edu	0.13(0.06)	-0.166(0.06)	0.055(0.03)	-0.033(0.03)	0.012(0.02)	0.013(0.02)	-0.038(0.03)	0.00(0.00)	0.008(0.02)	0.014(0.01)
Mortality										
Gender	-0.1863(0.65)	0.1250(0.200)	-0.220(0.293)	0.2759(0.16)	0.006(0.17)	.....	0.00(0.00)	.....	-0.000(1.11)	.....
Age	0.002(0.00)	-0.005(0.005)	0.005(0.006)	-0.006(0.00)	0.004(0.00)	.....	0.00(0.00)	.....	0.000(0.00)	.....
Edu	0.2123(0.29)	0.115(0.157)	-0.092(0.233)	-0.259(0.18)	0.024(0.16)	.....	0.00(0.00)	.....	0.000(0.07)	.....
Female headed										
Age	-0.000(0.01)	-0.004(0.00)	0.005(0.01)	0.00(0.00)	0.00(0.00)	.....	.....	.....	-0.000(0.00)	.....
Edu	0.009(0.31)	0.037(0.104)	-0.092(0.31)	0.00(0.29)	0.00(0.36)	.....	.....	.....	0.047(0.10)	.....

Table 7. Cont'd

Male headed										
Age	0.000(0.01)	0.00(0.01)	0.00(0.00)	-0.002(1.29)	0.00(1.33)	.....	0.00(0.00)	.....	.....	.....
edu	0.529(0.18)	0.27(0.16)	0.00(0.00)	-0.269(0.34)	0.12(0.109)	.....	-0.629(.319)	.....	.....	.....
Morbidity										
Gender	-0.088(0.08)	0.04(0.08)	-0.042(0.04)	0.034(0.04)	0.003(0.02)	0.012(0.03)	0.03(0.04)	0.00(0.00)	0.006(0.03)	0.01(0.001)
Age	0.00(0.00)	-0.000(0.00)	0.00(0.00)	-0.001(0.00)	0.00(0.00)	0.00(0.00)	-0.00(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)
edu	0.101(0.05)	-0.139(0.05)	0.029(0.03)	-0.022(0.02)	0.02(0.01)	0.01(0.02)	0.00(0.02)	0.00(0.00)	-0.001(0.02)	0.00(0.00)
Female headed										
Age	0.003(0.00)	-0.006(0.00)	0.003(0.00)	0.00(0.00)	0.00(0.00)	-0.000(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)	.....
Edu	0.079(0.12)	-0.004(0.12)	-0.101(0.08)	0.00(0.00)	0.00(0.00)	0.012(0.03)	0.00(0.00)	0.00(0.00)	0.00(0.00)	.....
Male headed										
Age	0.00(0.00)	-0.000(0.00)	0.001(0.00)	-0.002(0.00)	0.00(0.00)	0.00(0.00)	-0.000(0.00)	0.00(0.00)	-0.000(0.00)	0.00(0.00)
Edu	0.121(0.06)	-1.88(0.06)	0.06(0.03)	-0.025(0.03)	0.009(0.02)	0.0112(0.02)	-0.016(0.03)	0.00(0.00)	0.008(0.02)	0.016(0.01)

Source: Author's estimation results; = not available.

Table 8. Determinants of coping strategies for 2006/07

Households	Mkt	Labour	Relative	Unripe	Fwork	Fhand	Irrig	wplant	Reduce	Barter
All households										
Gender	0.022(0.07)	0.037(0.69)	-0.051(0.03)	-0.034(0.03)	0.0124(0.02)	-0.008(0.02)	0.045(0.03)	0.00(0.00)	-0.0103(0.02)	-0.010(0.02)
Age	-0.002(0.00)	-0.001(0.00)	0.002(0.00)	-0.001(0.00)	-0.00(0.00)	0.002(0.00)	-0.000(0.00)	0.00(0.00)	-0.000(0.00)	-0.000(0.00)
Edu	0.103(0.05)	-0.125(0.05)	0.03(0.03)	-0.018(0.02)	-0.009(0.01)	0.032(0.02)	-0.019(0.02)	0.00(0.00)	-0.019(0.01)	0.03155(0.01)
Female headed										
Age	-0.001(0.00)	-0.007(0.00)	0.006(0.00)	-0.002(0.00)	0.00(0.00)	0.002(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)	-0.000(0.00)
Edu	-0.0306(0.11)	-0.081(0.10)	0.023(0.07)	-0.009(0.06)	0.000(0.00)	0.055(0.03)	0.00(0.00)	0.00(0.00)	0.011(0.04)	0.033(0.03)
Male headed										
Age	-0.005(0.00)	-0.002(0.00)	0.002(0.00)	-0.000(0.00)	0.001(0.00)	0.002(0.00)	-0.000(0.00)	.....	-0.0002(0.00)	-0.000(0.00)
Edu	0.168(0.06)	-0.173(0.06)	0.033(0.03)	-0.026(0.03)	0.002(0.02)	0.021(0.02)	-0.048(0.02)	.....	0.008(0.02)	0.028(0.02)
Mortality										
Gender	-0.0956(0.27)	0.0959(0.175)	-0.058(0.119)	0.0300(0.05)	0.0133(0.08)	0.0146(.082)	0.00(0.00)	.....	-0.000(0.271)	.....
Age	0.007(0.01)	-0.010(0.001)	0.004(0.005)	-0.002(0.00)	0.000(0.00)	0.000(0.00)	0.00(0.00)	.....	0.000(0.00)	.....
Edu	0.285(0.22)	-0.115(0.196)	0.0253(0.148)	-0.064(0.07)	-0.413(0.09)	-0.051(0.09)	0.00(0.00)	.....	0.000(0.01)	.....
Female headed										
Age	0.0033(0.00)	-0.011(0.00)	0.006(0.01)	0.00(0.00)	0.00(0.00)	0.002(0.00)	.....	.....	-0.000(0.00)	.....
Edu	-0.0343(0.27)	-0.042 (0.23)	-0.036(0.22)	0.00(0.06)	0.00(0.08)	0.076(0.08)	.....	.....	0.037(0.09)	.....

Table 8. Cont'd

Male headed										
Age	0.000(0.00)	-0.000(0.00)	-0.000(0.00)	0.00(0.00)	0.00(0.27)	0.00(0.00)	0.00(0.00)	.....	.....	.....
edu	0.564(0.14)	-0.217(0.30)	-0.117(0.09)	0.00(0.00)	0.71(0.07)	-0.212(0.23)	-0.323(0.26)	.....	.....	.....
Morbidity										
Gender	0.063(0.08)	0.030(0.08)	-0.048(0.03)	0.043(0.03)	0.004(0.02)	-0.008(0.02)	0.03(0.04)	0.00(0.00)	0.007(0.01)	-0.0195(0.03)
Age	-0.003(0.00)	-0.000(0.00)	0.003(0.00)	-0.001(0.00)	-0.000(0.00)	0.002(0.00)	-0.00(0.00)	0.00(0.00)	-0.000(0.00)	-0.000(0.00)
edu	0.097(0.05)	-0.148(0.05)	0.023(0.03)	-0.015(0.02)	-0.000(0.00)	0.032(0.02)	-0.000(0.02)	0.00(0.00)	-0.0216(0.01)	0.037(0.02)
Female headed										
Age	0.0003(0.00)	.....	0.006(0.00)	-0.002(0.00)	.....	0.00(0.00)	0.00(0.00)	0.00(0.00)	0.00(0.00)	-0.000(0.00)
Edu	-0.0440(0.12)	.....	0.0253(0.07)	0.031(0.07)	.....	0.0498(0.04)	0.00(0.00)	0.00(0.01)	-0.004(0.05)	0.048(0.04)
Male headed										
Age	0.005(0.00)	0.003(0.00)	0.002(0.00)	0.000(0.00)	-0.001(0.00)	0.002(0.00)	-0.001(0.00)	.....	0.000(0.00)	-0.000(0.00)
Edu	0.153(0.06)	-1.76(0.06)	0.03(0.03)	-0.031(0.03)	-0.004(0.01)	0.027(0.02)	-0.026(0.02)	.....	0.000(0.00)	0.029(0.02)

Source: Author's estimation results; = not available

strategies, household characteristics such as age, gender and education have statistically significant influence on the choice of coping strategy (Tables 7 and 8). The coefficients for age and education

have positive signs on buying food from the market (mkt), obtaining food from relatives and friends(relative), food for work (fwork), food handouts (fhand) and barter trade (barter),

suggesting that older and more educated household heads are more likely to choose these coping strategies. On the other hand, the negative signs of age and education for casual labour

(labour), eating unripe maize before harvest (unripe) and irrigation farming (irrig) suggest that, being a younger and less educated household head increases the likelihood of engaging in these strategies.

In terms of the sex of the household head, the gender coefficient has a negative sign on buying food from the market (mkt), obtaining food from relatives and friends (relative), food for work (fwork), and eating wild plants (wplant), suggesting that female headed households are more likely to adopt these strategies. This pattern was observed for food insecure households during 2004/05, except for households with mortality, where the less education is associated with obtaining food from relatives, while more education is linked with reducing consumption (reduce). Having a female head and less education increases the probability of adopting survival strategies.

Conclusion and policy recommendations

This essay has examined the coping strategies for households facing food security problems. The results from both multinomial logistic and multinomial probit models for periods 2004/05 and 2006/07 show that, the dominant coping strategy among affected households facing food security problems is buying food from market, followed by labour, obtaining food from relatives and friends, eating unripe maize before harvest and irrigation farming. The other coping strategies include obtaining food handouts, reducing consumption and barter trade. The least used coping strategies are eating wild plants and food for work. The results from discriminant analysis indicate that, for all households, ordinary coping strategies are used by the majority of the households, accounting for close to 80% of the strategies while survival strategies represent 20% of the adopted strategies during 2004/05. This implies that a relatively small proportion of the households were just surviving. During 2006/07, the percentage of households that were surviving rose slightly, emanating from female headed households, especially among morbidity affected households. In general, more female headed households are engaged in survival strategies compared to male headed households over the 2004/05 and 2006/07 period.

Household characteristics have a significant impact on the choice probability of coping strategies. Higher levels of education are more associated with casual labour activities in recent years while lower ages and less education are more associated with food for work activities. Male headed households are more linked with casual labour and food for work activities. On the other hand, female headed households are more associated in eating unripe maize before harvest and obtaining food handouts. In terms of mortality and morbidity, higher age is associated with buying food and food for work, from the market with mortality compared to those with morbidity.

Less education is more associated with obtaining food handouts for households with mortality compared to those with morbidity. Thus, female headed households and less education is more associated with survival strategies.

The results imply that, despite Malawi's record success in food security at national level in recent years, incidences of food insecurity remain at household level, especially among vulnerable households. The problem is more acute among AIDS-affected female headed households with mortality. Thus Government should focus on ensuring food security for affected households by supplying the food insecure households with food handouts, and also ensuring food availability in rural markets. There is also need to conduct the necessary balancing act between investing in productivity growth (education, extension services, infrastructure and markets) and targeted assistance to the food-insecure households. Since financial resources are always inadequate in most developing countries, there is need for governments to examine which investments provide the greatest benefit.

Considering that buying food from the market is the dominant coping strategy, Government should strengthen the performance of food markets, particularly in rural areas, by developing the infrastructure and markets to ensure that food is available at affordable prices. It should also be noted that the major constraints to food security include Malawi's dependence on rain-fed agriculture and treatment of maize, a crop not resistant to drought, as main staple food by the majority of Malawians. Thus, government should put in place deliberate policies to simultaneously promote diversification into drought-resistant crops such as cassava and small-scale irrigation through farmer association.

Finally, as labour is the second dominant coping strategy, Government needs to promote income generating activities, as a source of livelihood for the food insecure households. This might include expansion of the already existing public work programs such as, rehabilitation of earth roads and road maintenance.

REFERENCES

- Adenegan KO, Adewusi OA (2007). "Determinants of Food Security Status of Rural Households living with HIV/AIDS in South-western Nigeria," *Afr. J. Biomedical Res.* 10(1): 9-18
- Akinboade OA (2008). "Gender, HIV/AIDS, land, restitution and survival strategies in the Capricorn district of South Africa," *Int. J. Social Econ.* 35 (11): 857-877
- Alumira JD, Kambewa PS, Binauli LD (2005). "Impact of HIV/AIDS on Inter- and Intra-Generational Information Flows among Smallholder Farmers in Malawi," ICRISAT, Malawi and RENEWAL, International Food Policy and Research Institute, Washington, D.C.
- Arrehag L, Durevall D, Sjoblom M, De Vylder S (2006). "The Impact of HIV/AIDS on the Economy, Livelihoods and Poverty of Malawi," Country Economic Report, Department for Policy and Methodology, SIDA, Sweden
- Bukusuba J, Kikafunda JK, Whitehead RG (2007). "Food security status

- in households of people living with HIV & AIDS (PLWHA) in a Ugandan urban setting," *Br J. Nutrition*, 98: 211-7.
- Bardhan P, Udry C (1999). "Development Microeconomics," Oxford University Press, Oxford.
- Barnett T, Grellier R (2003). "Mitigation of the impact of HIV/AIDS on rural livelihoods through low-labour input agriculture and related activities," A report submitted to the department for international development, Overseas Development Group University of East Anglia, UK.
- Blackie M, Conroy A (2007). "The collapse of agriculture," In: Conroy, A., Blackie, M., Whiteside, A., Malewezi, J. & Sachs, J. (eds.) *Poverty, AIDS and Hunger: Breaking the Poverty Trap in Malawi*, Palgrave Macmillan, Basingstoke, UK.
- Booyesen, F. R. (2002). "Financial Responses of Households in the Free State province to HIV/AIDS-related Morbidity and Mortality," *South African Journal of Economics*, 70(7): 1193-1215.
- Cameron AC, Trivedi PK (2005). *Microeconometrics: Methods and Applications*, Cambridge University Press, UK.
- Castleman T, Seumo-Fosso E, Cogill B (2003). "Food and Nutrition Implications of Antiretroviral Therapy in Resource Limited Settings," Academy for Educational Development Technical Note 7, Food and Nutrition Technical Assistance Project, Washington DC.
- Chamunika M (2006). "Impact of HIV/AIDS on Agriculture and Food Security: The case of Limpopo Province in South Africa," FANRAPAN Working Document, Series Ref: NAT SA005.
- Chapoto TS, Jayne T (2005). "Measuring Impact of Working-Age Adult Mortality on Small-scale Farm Households in Kenya," *World Development*, 32 (1): 91-111.
- Chirwa EW (2007). "Sources of technical efficiency among smallholder farmers in Southern Malawi," AERC research paper 172. African Economic Research Consortium, Nairobi, Kenya.
- Cromwell E, Kyehombe N (2005). "Food security options in Malawi: good neighbours make good friends?" Forum for Food Security in Southern Africa, unpublished report. www.odi.org.uk/food-security-forum
- Croppenstedt A, Muller C (2000). "The Impact of Health and Nutritional Status of Farmers on their Productivity and Efficiency: Evidence from Ethiopia," *Economic Development and Cultural Change*, 48(3): 475-502.
- De Waal A (2007). "AIDS, hunger and destitution: theory and evidence for the 'new variant famines' hypothesis in Africa," in: Devereux, S. (ed.), *The New Famines: Why Famines Persist in an Era of Globalisation*, Routledge, London.
- De Waal A, Whiteside A (2003). "New Variant Famine: AIDS and food crisis in southern Africa," *The Lancet*, 362: 1234-1237.
- Epstein L (1995). "Food for People Living with HIV/AIDS", Report, Network of Zambian People Living with HIV/AIDS (NZP), Lusaka.
- Food and Agricultural Organisation (FAO) (2002). "Focus: Food Insecurity and AIDS: a Vicious Circle," <http://www.fao.org/Focus/E/aids/aids1-e.htm>
- Fraser E, Mabee W, Slaymaker O (2003). "Mutual vulnerability, mutual dependence: the reflective notion between human society and the environment," *Global Environmental Change*, 13: 137-144.
- Gibbs A (2008). "Gender, famine and HIV/AIDS: rethinking new variant famine in Malawi," *African Journal of AIDS research*, 7(1): 56-78
- Gill J (2001). *Generalized Linear Models: A Unified Approach*, Thousand Oaks, Sage, California, USA.
- Greene WH (1997). *Econometric Analysis*, (3rd ed.), Upper Saddle River, Prentice-Hall, New Jersey, USA.
- Haslwimmer M (1996). "AIDS and Agriculture in Sub-Saharan Africa," FAO Farm Management and Production Economics Service (AGSP). <http://www.fao.org/waicent/faoinfo/sustdev/WPdirect/WPre0003.htm>
- Harvey P (2003). "HIV/AIDS and humanitarian action?" Draft, Overseas Development Institute, Humanitarian Policy Group, UK, Unpublished report.
- Kinsey B, Burger K, Gunning JW (1998). "Coping with drought in Zimbabwe: Survey evidence on responses of rural households to risks," *World Development*, 26 (1): 89-110.
- Luce D (1959) *Individual Choice Behaviour*, Wiley, New York.
- Lundberg M, Over M (2000). "Sources of financial assistance for households suffering an adult death in Kagera, Tanzania," *The South Afr. J. Econ.* 68 (5): 1-39.
- Malawi Growth and Development Strategy (MGDS) (2007), IMF country report 07/55, <http://www.imf.org/external/pubs/cat/longres.cfm?sk=20417.0>
- Mather D (2004). "Household Responses to Prime Age Adult Mortality in Rural Mozambique: Implications for HIV/AIDS Mitigation Efforts and Rural Economic Development Policies," Centre for Study of African Economies Conference, Oxford University, UK
- Marschak J (1960). "Binary Choice Constraints on Random Utility Indicators." Arrow, K, ed., *Stanford Symposium on Mathematical Methods in Social Sciences*, Stanford University Press, California
- McFadden D (1968). "The Revealed Preferences of a Public Bureaucracy," Department of Economics, University of California, Berkeley, USA
- McFadden D (1976). "The Revealed Preferences of a Bureaucratic Government: Empirical Evidence," *The Bell J. Econ. Mgt. Sci.* 7: 55-72
- McFadden DL (2000). "Economic choices," Nobel Prize lecture http://nobelprize.org/nobel_prizes/economics/laureates/2000/mcfadden-lecture.pdf
- Mikael L (2004). "Exploring the impact of HIV/AIDS on household food security in rural Ethiopia: two case studies," A joint UNECA/UNDP/WFP study http://uneca.org/eca_programmes/policy_analysis/publications/AIDS_food_security-report.pdf
- Mtika M (2001). "The AIDS epidemic in Malawi and its threat to household food security," *Human Organisation*, 60(2): 178-188
- Munthali A (2002). "Adaptive Strategies and Coping Mechanisms of Famines and Communities Affected by HIV/AIDS in Malawi," United Nations Research Institute for Social Development (UNRISD), Geneva, Switzerland
- Musita CP, Ariga ES, Kaseje DK, Otieno A (2009). "Impact of HIV and AIDS on household food and nutrition security in suba district, Kenya," *AIDS*, 9 (7): 1452-1467
- Mutangadura GB (2000). "Household Welfare impacts of mortality of adult females in Zimbabwe: Implications for policy and program development," Paper presented at the AIDS and Economics Symposium organized by IAEN Network, Durban, South Africa
- Muwanga FT (2002). "Impact of HIV/AIDS on Agriculture and the Private Sector in Swaziland. State of the World's Forests/FAO," *Eldis Report on HIV/AIDS*, University of Sussex Institute of Development Studies, UK.
- NAADS (2003). "The Impacts of HIV/AIDS on the Agricultural Sector in Uganda," Baseline survey report, FAO's Integrated Programme, Rome
- Naidu V, Harris G (2006). "Survival Strategies of HIV/AIDS affected households in Soweto," *Development Southern Africa*, 23(3): 417-426
- National Statistical Office (2005). *Integrated Household Survey, 2004/05, Final Report*, Lilongwe, Malawi
- Nguthi FN, Niohoff A (2008). "Effects of HIV/AIDS on the livelihood of banana farming households in Central Kenya," *Int. J. Life Sci.* 50 (3): 179-190
- Roumasset J (1976). *Rice and Risk: Decision Making among Low-income Farmers*, North-Holland Publishing, Amsterdam.
- Rugalema G (1998). "AIDS and African Rural Livelihoods: From Knowledge to Action", keynote paper presented at the 'International Conference on AIDS, Livelihood and Social Change in Africa,' Wageningen, The Netherlands
- Rugalema G (2000). "Coping or struggling: A journey into the impact of HIV/AIDS in southern Africa," *Review of African Political Economy*, 86: 537-545
- SADC FANR Vulnerability Assessment Committee (2003). "Towards identifying impacts of HIV/AIDS on food security in southern Africa and implications for response: Findings from Malawi, Zambia and Zimbabwe," Report, Harare, Zimbabwe
- Thurstone LL (1927). "Law of Comparative Judgement," *Psychological Review*, 34: 273-286.
- Train K (2003). *Discrete Choice Methods with Simulation*, First Edition, Cambridge University Press, UK.
- Wagner PA (1986). "Meeting Human Nutritional Needs," in: (Art Hansen and Della E. Mc Millan (eds), *Food in sub-Saharan Africa*, *American Anthropologist*, 89(4): 965-966.

World Bank (WB) (1986). Annual Economic Report, World Bank, Washington D.C.
Wooldridge JM (2002). Econometric Analysis of Cross Section and Panel data, Massachusetts Institute of Technology, USA

Yamano T, Jayne TS (2004). "Measuring the Impacts of Prime-Age Adult Death on Rural Households in Kenya," World Development, 32(1): 91-119.