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Determinants of Expenditure Patterns of Unconditional Cash Transfer Receipts in Kenya

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Abstract
Cash transfers take different forms -- unconditional or conditional. Higher- and middle-income Kenyans support the poor through cash and in-kind transfers. These private/individual transfers supplement the Government's own cash and in-kind transfer programmes. Non-profit institutions and corporate sector are also involved in cash and in-kind transfers. However, some policy makers and others are skeptical about the viability of unconditional cash transfer programmes. They fear that poor households will use such cash transfers to buy alcohol, tobacco, or other "temptation goods."This paper aims at: establishing the determinants of the items on which unconditional cash transfers are spent at the household level; determining if the concern often expressed by policy makers and others that poor households will use cash transfers to buy the so called "temptation goods" is justified; and determining if a case can be made for unconditional cash transfer in Kenya. We employed a multivariate regression technique to establish the determinants of cash transfer expenditures, using nationally representative household survey data. Our findings show that unconditional cash transfers are spent on food, education/school fees, health, investment/business, rent/housing, clothing, debt repayment, and others. Overall, households in Kenya seem to make "sensible" decisions in their expenditure of such income. They spend the money on items that are in line with their socioeconomic situation. The highest proportion of such income is spent on education which they consider as investment in human capital of their children. Next is expenditure on food and the pattern is consistent with our prior expectations. Expenditures on the so called "temptation goods" seem to be very small, if at all. These key priority expenditure patterns seem to invalidate the concern that cash transfers may be just "handouts" that promote purchase of the so-called "temptation goods" in addition to leading to dependency. Factors that influence how the recipients spend the cash include the household's poverty severity rating, food poverty rating, location (urban or rural), nutritional status and gender and education level of head of household.In light of the above findings, when planning and executing government's social protection programmes, the recipients should be given greater say than has been the case hitherto. During the disruptive times, there are opportunities for innovation in policy formulation and management of cash transfer programmes, especially the unconditional ones. The Government, donors, corporate and NGO sectors should be open to such innovations and the beneficiaries should be given lee-way in deciding how to spend the money, especially in disruptive times. This would improve effectiveness and sustainability of such programmes.
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1. Introduction

1.1 Background

We were motivated to undertake this study by a number of observations. Higher- and middle-income Kenyans support the poor through cash and in-kind transfers. These private individual transfers supplement the Government's own cash and in-kind transfer programmes. Non-profit institutions and corporate sector are also involved in cash and in-kind transfers. The transfers are either in form of cash or in kind and households can either receive or give out to other entities. The transfers comprise: (i) cash; (ii) food; (iii) clothing; (iv) healthcare/medical services; and (v) other in-kind support/gifts.

For the purposes of this research, we focused on cash transfers and adopted the official definition in Kenya where transfers are defined as "the provision of support or gift either in form of a good, service, financial asset or other assets by an individual, household or institution to another entity without any corresponding economic return."[1] Thus, transfers comprise income that the household receives without working for it and supplements household income by improving its welfare.

Cash transfers take different forms -- they can be unconditional or conditional. An unconditional cash transfer

[1]Kenya National Bureau of Statistics, Basic Report 2015/16 Kenya Integrated Household Budget Survey, March 2018, p. 132.

to beneficiaries does not involve any restriction on use -- beneficiaries are free to decide how they wish to spend it. These transfers can be universal or restricted (or targeted) to a specific sub-population, for example, the poor, elderly, and nursing mothers. Conditional cash transfer schemes essentially transfer cash, generally to target households, contingent on specific behavioural responses on the part of the household. These conditions can require that households make pre-specified investments in the human capital of their children, be employed in public works, use specific healthcare facilities, and so on[1]. In Kenya, some of the cash transfer programmes (such as elderly cash programmes) are unconditional. Some corporate cash transfer programmes (such as school fees programmes) are conditional -- that is, targeted to needy students. Transfers from individuals and friends are generally not targeted.

A number of studies have been carried out on cash transfer programmes in Kenya. For example, Innovations for poverty action (Ipa) conducted a randomized assessment to establish the impact of unconditional cash transfer, "GiveDirectly,"[2] between 2011 and 2014. The findings indicated that the programme improved the welfare of the locals. In addition, it was established that unconditional transfers are cheaper to administer than conditional transfers because they do not need any monitoring. However, we did not come across any study on the determinants of the items on which the unconditional cash transfers are spent.

We were also keen to find out if it was time for the Kenya Government to rethink the mechanisms of implementing its policy towards supporting food insecure groups. From time to time the Government is involved in food relief programmes, especially in the arid and semi-arid areas of the country. Food security is one of the Government's 'big four' development priorities. However, delivering food to the vulnerable groups requires a lot of logistical planning and, sometimes, relief food does not reach the recipients in a timely manner. Food relief in the form of unconditional cash transfer to the needy may be a better alternative. With the rapid advancement in electronic money transfer in the country, food aid (in the form of cash) would reach the recipients almost instantaneously. The only worry, frequently stated by policymakers and others, is that poor households will use unconditional cash transfers to buy the so-called "temptation goods" such as alcohol, tobacco, and so on. It would be useful to establish if such worries are justified in the context of Kenya.

We were also motivated by the finding from literature review that cash transfers, which put cash directly in the hands of the people for whom aid is intended, make up a very small proportion of aid and charitable giving. The poor rarely get to decide how aid money intended to help them gets spent. This study sought to find out the factors that influence how the beneficiaries spend unconditional cash transfers and if such cash transfers are spent responsibly.

1.2 Objectives of the Study

This paper aims at: (i) establishing the determinants of the items on which unconditional cash transfers are spent at the household level; (ii) determining if the concern often expressed by policy makers and others that poor households will use cash transfers to buy the so called "temptation goods" is justified; and (iii) determining if a case can be made for unconditional cash transfer in Kenya.

1.3 Research Questions

We set out to answer the following research questions to enable us achieve the objectives of the study:

1. Does poverty level influence how the recipients spend cash transfers? Do households with high overall estimates of poverty severity levels spend more on food than the ones with lower poverty severity rates?
2. Do households with higher food poverty headcount rates spend higher proportions of the cash transfer receipts on food than their counterparts with lower rates? Is there correlation between food poverty headcount rates and proportion of cash transfer receipts spent on food?
3. Do households with higher proportions of undernourished children spend higher proportions of the cash transfers on food and health services than their counterparts with lower proportions of malnourished children?
4. Does the sex of the head of household affect how cash transfers are spent?
5. Does the level of education of the head of household influence the pattern of expenditure of cash transfer receipts?
6. Does the location (rural or urban) of the household have any influence on how cash transfer receipts are spent?
7. Do households make "sensible" decisions in their expenditure of unconditional cash transfer receipts?

[1] Baird, S, Ferreira, F H G, Özler, B. and Woolcock, M. (2014). "Conditional, Unconditional and Everything in between: A Systematic Review of the Effects of Cash Transfer Programmes on Schooling Outcomes", *Journal of Development Effectiveness* 6 (1). doi:10.1080/19439342.2014.890362.

[2] Programme on poor households in Rarieda Constituency (Siaya County). Featured in "The Economist": Impact of unconditional cash transfers on general welfare in Kenya, by Haushofer and colleagues.

2. Methodology

There are many plausible factors that may influence the way in which unconditional cash transfers are spent by households in Kenya. We applied a multivariate linear regression model[1] to help us determine those factors.

2.1 Generating List of Potential Dependent and Independent Variables

Dependent variables: Our dependent variables are the items on which the cash transfers are spent. They include cash transfer expenditure on food, education/school fees, health, investment/business, debt repayment, rent, and other. We also considered cash transfer rate itself as a dependent variable.

Independent variables: The expenditure items may be influenced by a wide range of factors that may include severity of poverty, food poverty (headcount rate), morbidity status, nutritional status (underweight), sex of head of household, level of education of head of household, and location of household (rural or urban).

We outline below plausible reasons for our selection of independent variables:

1. **Poverty severity rate**: Holding other things constant, one would expect to see a positive correlation between poverty headcount rates and proportion of cash transfer receipts spent on food. Thus households with higher overall estimates of poverty severity levels would be expected to spend more of the cash transfer receipts on food than the ones with lower poverty severity rates.
2. **Food poverty rate**: Similarly, one would expect to see a positive correlation between food poverty headcount rates and proportion of cash transfer receipts spent on food. Consequently, households with higher food poverty headcount rates would be expected to spend higher proportions of the cash transfer receipts on food than their counterparts with lower rates.
3. **Nutrition level**: We used "underweight" (low weight for age) in this study as a measure of nutritional status. It is a composite index of weight for height and height for age. The proportion of underweight children reflects both conditions of chronic and acute under-nutrition and is a pointer to the extent of nutritional problems. So we would expect households with higher proportions of undernourished children to spend higher proportions of the cash transfers on food and health services.
4. **Education level of household head**: Level of education of head of household (no education, primary, secondary, post-secondary) would be expected to influence the way the cash transfer receipts are spent.
5. **Sex of head of household**: We were curious to find out if and how sex of household head may influence how cash transfer receipts are spent.
6. **Location**: The location of the household (rural or urban) may also have some influence on how the cash transfers are spent. For example, households living in urban areas are more likely to spend the cash transfer receipts on rent than their counterparts in the rural areas who are more likely to live in their own houses.

2.2. Model Specification

Based on the above discussion, this study adopts an argument that the pattern of cash transfer expenditures is a function of: Poverty Severity Rate (PSR); Food Poverty Rate (FPR, head count); Nutrition Level (NUT); Male Household Head (MALE); Female Household Head (FEMALE); No Education for Household Head (NONE); Primary Education for Household Head (PRIMO); Secondary Education for Household Head (SECO); Post-Secondary Education for Household Head (POSEC); Household in the Rural Area (RURAL) and Household Located in the Urban Area (URBAN).

Using Cross section pool objects estimation, we applied a simple model of the form:

$$\gamma_{i,t} = \propto + X_{i,t}\,\beta_{i,t} + \delta_i + \gamma_t + \varepsilon_{i,t}$$

where: $\gamma_{i,t}$ is the dependent variable

$X_{i,t}$ is a vector of regressors

$\beta_{i,t}$ are the coefficients of the independent variables (regressors)

$\varepsilon_{i,t}$ are the error terms observed for the cross-section units

$\propto$ represents the overall constant in the model

δ_i and γ_t represent cross-section or period specific effects

E-Views pool object was used since it allows model estimation using least squares, with correction for fixed or random effects in the cross-section and period dimensions -- Auto Regressive (AR) errors, Generalized Least Squares (GLS) weighting, and robust standard errors, all without rearranging or reordering the data.

To estimate this model, we used data on Cash Transfer Rate (CTR) as Y and the 11 independent variables as the Xs for Kenya's 47 Counties as cross sections. The dataset was organized in excel to consist of the 11 variables with 47 Counties observed in 2005/06 and 2015/16 (2006 and 2016 as the cross section identifiers). In order to estimate the cross section pool model using this data, the data was stacked to have data on the 11 variables for each County. The data was then exported to E- views 10 work file for analysis.

[1] Pertaining to **multiple** dependent variables and **multiple** independent variables

The Pooled Least Square method was used for analysis. In computing the output, the White heteroscedasticity cross section method treats the pool regression as a multivariate regression with an equation for each cross section. It then computes robust standard errors for the system of equations, accommodating arbitrary heteroscedasticity and within cross-section serial correlation. Thus allows for a different residual variance for each cross section. Residuals between different cross sections are assumed to be zero. Autoregressive (AR) models are used as a way of explicitly accounting for autocorrelation in the error allowing for valid inference.

2.3 Data source

We used, for our analysis, nationally representative household survey data sourced mainly from Kenya National Bureau of Statistics publications (2007 and 2018). We acknowledge that the period 2005/2006 was before the County units came into existence and data was reported according to Districts. For this purpose, we aggregated the respective districts that formed the County units as a basis for analysis within the 47 Counties.

2.4 Diagnostic checks

Given that panel data combines time series and cross-sectional data, it was important to perform the following diagnostic tests: heteroscedasticity, autocorrelation, multicollinearity and cointegration (help determine stationarity). Given the presence of cross-section component to panel data, there is always potential for heteroscedasticity. Cointegration tests are done when time-series are suspected to have non-stationary trends, to determine if they have a stable long-run relationship. The presence of unit roots in time-series depict unpredictable patterns, hence the need for unit-root testing. We used Augmented Dickey-Fuller (ADF)[1] and Phillips Pheron (P-P)[2] unit-root tests. Serial correlation is usually a problem when dealing with macro panels.[3] Ours is micro panel data[4]. There is a general assumption that disturbances in panel data models are cross-sectionally independent.[5] Besides, cross-section dependence tends to be more of a problem in macro panels (where there are long time-series).

The Breusch-Pagan (B-P)/Lagrange Multiplier (L-M) was used to test for autocorrelation. It is commonly assumed that disturbances in panel data models are cross-sectionally independent, especially when the cross-section dimension is large. There is, however, considerable evidence that cross-sectional dependence is often present in panel regression settings. The Breusch-Pagan Lagrange Multiplier test is appropriate with fewer number of cross-section series settings. Pesaran CD gives an alternative statistic based on average of the pairwise correlation coefficients. Based on the statistic and p-values, we fail to reject the null hypothesis of no autocorrelation at conventional significance levels. The null hypothesis for this test is that there is no cross-section dependence (correlation). It included a total of 88 panel observations for 2005/06 and 2015/16. Non-zero cross-section means detected in the data and cross-section means were removed during computation of correlations.

Table 1: B-P/L-M test for autocorrelation

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	0.00481252	1	0.94469328
Pesaran scaled LM	-0.70370382		0.48161724
Pesaran CD	-0.06937230		0.94469328

Source: Computed from regression results

The decision criteria for the B-P/L-M test involves studying the probability values. If greater than 0.05, we fail to reject the null hypothesis that there is no autocorrelation. This is observable in the last column of the results table.

2.4.1 Unit Root and Cointegration

Unit roots cause non-stationarity in series, therefore must be tested for. A summary of unit root tests was obtained using E-Views. The null hypothesis stated that there is unit root in the series while the alternative hypothesis: no unit root in the series, meaning the series is stationary. All tests assumed asymptotic normality except probabilities for Fisher tests which were computed using an asymptotic Chi-square distribution. The Newey-West automatic bandwidth selection and Bartlett Kernel spectrum estimation[6] were used to compute the summary of various unit root tests on the level of F. The results are given in Table 2.

[1] Dickey, D. and Fuller, W. (1981). Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root. Econometrica.
[2] Phillips, P.C.B. and P. Perron (1988). Testing for Unit Roots in Autoregressive Moving Average Models with Unknown Order. Biometrica.
[3] Green, W.H. (2008).Econometric Analysis. 6th Edition, Pearson Prentice Hall, Upper Saddle River.
[4] Micro panels have shorter time series and larger cross-sections, that is, fewer years in the panel.
[5] Pesaran, M.H. (2004). General Diagnostic Tests for Cross-section Dependence in Panels. Cambridge Working Papers in Economics. Faculty of Economics, University of Cambridge.
[6] Newey, W and West, K.D. (1987). A Simple, Positive Semi-definite, Heteroscedasticity and Autocorrelation Consistent Covariance Matrix. Econometrica, Econometric Society.

Table 2: Testing for unit root and cointegration

Method	Statistic	Prob	Cross-sections	Obs
Null: Unit Root (Assumes Common Unit Root Process)				
Levin, Lin & Chu t	-2.42435	0.0077	2	1080
Null: Unit Root (Assumes Individual Unit Root Process)				
LM, Pesaran and Shin W-stat	-9.52002	0.0000	2	1080
ADF - Fisher Chi-square	195.871	0.0000	2	1080
PP - Fisher Chi-square	350.425	0.0000	2	1080

The results shown in the table indicate probability values of less than 0.05 for each test, implying that we reject the null hypothesis and accept the alternative hypothesis that there is stationarity in the series.

2.4.2 Multicollinearity

Multicollinearity happens when multivariate analysis contains many variables that are significantly correlated. This can cause significant variables to appear statistically insignificant, so it should be corrected if it exists. There are two main ways of testing for multicollinearity: correlation coefficients and variance inflation factors. This paper applied correlation coefficients.

Data on variables used in this paper for the 47 Counties reported in 2007 and 2018 for the periods 2005/2006 and 2015/ 2016 were opened as a group to obtain the correlation matrix. The results were presented on the basis of the cross section identifiers: 2006 and 2016 as shown in Appendix 4. Conventionally, a correlation less than 0.5 indicates no multicollinearity while the opposite is the case. However, Gujarati (1995) posits that a correlation above 0.5 but below 0.84 indicates no serious multicollinearity.

The results show that multicollinearity is not widespread. However, it exists among the following variables: gender of household heads, food poverty rate and poverty severity rate (Appendix 4). This may be justified by the tendency of economic variables to move together. The need to reduce multicollinearity depends on how severe it is and the primary goal of the regression model.[1] Moderate multicollinearity may not need to be resolved. If the presence of multicollinearity in some regressors does not affect either the predictions or the precision of the predictions, as well as goodness of fit, it does not need to be reduced[2], like in our case where the economic variables are known to move together.

2.4.3 White Cross-section Method:

The white cross-section method was used to attain coefficient covariances for the pool. The method assumes that the errors are cross-sectionally correlated. The pool regression is treated as a multivariate regression with an equation for each cross-section, and computes robust standard errors for the system equations. Results were presented unstacked according to respective cross sections: 2006 and 2016 in Appendix 3.

3.Analysis and Results

3.1 Pattern of Cash Transfer Expenditures

Cash transfers are spent on food, education/school fees, health, investment/business, and other. Table 3 shows the share of cash transfers received from within Kenya by expenditure items. At the national level, education/school fees accounts for the largest share (44.6%) followed by food (33.5%), health (6.9%), and investment/business (4.5%) in that order. The expenditure category identified as "other," accounting for 10.5% of total cash transfer receipts, comprises rent/housing, clothing, debt repayment, etc. This is the category in which the so-called "temptation goods" such as alcohol, tobacco, and so on, would fall. Given that the category comprises many items and the total share is relatively small, expenditure on the temptation goods would be minor, if any at all.

These key priority expenditure patterns for the cash transfer received appear to negate the concern that cash transfers may be just "handouts" that promote purchase of alcohol, tobacco, or other so-called "temptation goods" in addition to leading to dependency. Table 3 also shows that female-headed households spend a higher proportion of cash transfers on food compared to male-headed households at the national level and in rural and urban areas. The male-headed households spend a higher proportion of the transfers on education/school fees and investment/business than their female-headed counterparts in all the three categories (national, rural and urban). Male-headed households spend more on health than female-headed households nationally and in rural areas while the opposite is the case in urban areas. Female-headed households tend to spend more on rent/housing, clothing, and debt repayment than male-headed households nationally and in the urban areas while in the rural areas male-headed households spend slightly higher on the same items.

[1] Neter et.al. (1983). Applied Linear Regression Models. 4th Edition.
[2] Weisberg, S. (2013). Applied Linear Regression. 4th Edition. Regents of the University of Minnesota.

Table 3: Percentage share of cash transfers by expenditure items

Residence/Household Headship	Food	Education/School fees	Health	Investment/Business	Other
National	**33.5**	**44.6**	**6.9**	**4.5**	**10.5**
Male-Headed	29.0	50.7	5.8	5.0	9.5
Female-Headed	37.4	39.4	7.8	4.1	11.3
Rural	38.9	38.2	7.0	4.2	11.7
Male-Headed	35.2	39.7	7.6	5.0	12.5
Female-Headed	41.8	37.0	6.6	3.6	11.0
Urban	**27.9**	**51.2**	**6.7**	**4.9**	**9.3**
Male-Headed	23.3	60.7	4.2	5.0	6.8
Female-Headed	32.2	42.1	9.2	4.8	11.7

Source: Kenya National Bureau of Statistics, Basic Report, 2015/16 Kenya Integrated Household Budget Survey, March 2018, p.137

3.2 Determinants of Cash Transfer Expenditures

As explained above, we used the pool object in E-Views to manage the cross section data for 47 Counties in Kenya. The E-Views 10 statistical package was used to run the regression and other statistical analyses. For the purpose of data analysis, dependent and independent variables used are described above.

3.2.1 Analysis of the Regression Results

For purpose of interpreting regression output, a probability value of 5% (0.05) or less is generally accepted point at which to reject the null hypothesis. This implies that there is only a 5% chance that results would have come up in a random distribution. So it can be said with 95% probability of being correct that the variable is having some effect. This applies to the probability value for the whole model. The value is important because when there is multicollinearity among independent variables, coefficients of individual variables may be insignificant when the regression as a whole is significant. This is because highly correlated independent variables tend to explain the same part of variation in the dependent variable. For the purpose of interpretation, when:

- $P < 0.001$ we have extremely strong evidence against the null hypothesis
- $0.001 < P < 0.01$ we have strong evidence against the null hypothesis
- $0.01 < P < 0.05$ we have rather strong evidence against the null hypothesis
- $0.05 < P < 0.1$ we have some evidence against the null hypothesis
- $P > 0.1$ we have no evidence against the null hypothesis

3.2.2 Regression of Cash Transfer Rate and the Independent Variables

This section of the regression analysis attempts to establish the general relationship between cash transfer rate (CTR) and determinants of cash transfer expenditures. The purpose is to determine the extent to which the cash transfer rate is influenced by the independent variables listed above.

The functional form of the regression is given as specified in section 2.2. Cross section pool objects estimation applied a simple model of the form:

$$\boldsymbol{CTR = f(PSR, FPR, NUT, MALE, FEMALE, NONE, PRIMO, SECO, POSEC, RURAL, URBAN)}$$

The results are presented in the Table 4.

Table 4: Determinants of cash transfer

Dependent Variable: CTR				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	152.5296	76.97284	1.981603	0.0518
PSR_2006	0.051889	0.280663	0.184879	0.8539
PSR_2016	0.535785	1.523109	0.351770	0.7262
FPR_2006	-2.403136	0.869955	-2.762368	0.0075
FPR_2016	0.508534	0.681047	0.746695	0.4580
NUT_2006	0.383148	0.484333	0.791085	0.4318
NUT_2016	-0.931244	0.491275	-1.895568	0.0625
NONE_2006	2.250332	1.075536	2.092288	0.0404
NONE_2016	-13.67434	16.57648	-0.824924	0.4125
PRIMO_2006	-0.056653	0.012285	-4.611449	0.0000
PRIMO_2016	81.28627	65.57265	1.239637	0.2196
SECO_2006	-2.261756	0.720799	-3.137844	0.0026
SECO_2016	-95.77368	77.98974	-1.228029	0.2239
POSEC_2006	7.590814	5.929831	1.280106	0.2051
POSEC_2016	-4.198450	97.28152	-0.043158	0.9657
MALE_2006	-0.163931	0.980068	-0.167265	0.8677

MALE_2016	-118.8083	69.17743	-1.717444	0.0907
FEMALE_2006	0.437878	0.985069	0.444515	0.6582
FEMALE_2016	100.5476	58.83455	1.708988	0.0923
RURAL_2006	-0.169509	0.233331	-0.726474	0.4702
RURAL_2016	-0.242907	0.159617	-1.521809	0.1330
URBAN_2006	0.702595	0.077180	9.103347	0.0000
URBAN_2016	-0.277884	0.155990	-1.781417	0.0796
AR(3)	-0.183588	0.079385	-2.312635	0.0240
R-Squared	0.913778	**Mean Dependent Var**		60.64545
Adjusted R-Squared	0.882792	**S.D. Dependent Var**		60.10152
S.E. Of Regression	20.57619	**Sum Squared Resid**		27096.30
Log Likelihood	-373.5229	**F-Statistic**		29.48987
Durbin-Watson Stat	2.073511	**Prob(F-Statistic)**		0.000000

From the regression output summarized in Table 4, the general regression model which is AR (3) is significant with a probability value of 0.000000. The output indicates that approximately 88% of changes in cash transfer rate are explained within the model. Accordingly, the following variables in the year 2006 significantly influenced cash transfer rate: food poverty rate, level of education (none, primary or secondary) and location in the urban area. This is shown by the probability values that are ≤ 0.05.

3.2.3 Regression of expenditure Options and the Independent Variables

Reports show that individuals who benefit from cash transfers spend on food, education/school fees, health, investment/business, debt repayment, rent, and other. For the purpose of this section, data for 2016 was used for analysis. There was no available data reported on respective variables in 2006. This may be explained on the basis that this was the first household survey and that by the second survey, lessons learnt had been incorporated as well as more efficient methods and tools for data collection were used.

The purpose of this section is to establish whether cash transfer expenditure options were influenced by the various independent variables listed in the sections above. The analysis of regression on expenditure options for cash transfer recipients followed a model optimization criterion in ARMA[1] maximum likelihood assuming Gauss-Newton[2] innovations (BHHH)[3] using outer product of the gradient (OPG). The maximum likelihood estimation is preferred for its efficiency in terms of low variance estimates. It also follows that the Gaussian assumption in econometric analysis is considered reasonable. ARIMAX[4] is one of the multivariate forecasting tools that support policy makers' decisions. The method consists of estimating the parameters in such a manner that the probability of observing the dependent variables is as high as possible, that is, finding maximum of the function.

Accordingly, it follows that if $\gamma = \beta_0 + \beta_1 X_1 + \beta_n X_n + \mu_i$ with mean and variance; then a joint probability density function can be derived to take the form: $f(\gamma_1 \dots \gamma_n | \beta_0 + \beta_1 X_1 + \beta_n X_n + \sigma^2)$ thus a likelihood function generally denoted as $LF(\beta_1, \dots \beta_n, \sigma^2)$.

While specifying the model, the log is used as a process of nullifying outliers in data and also to determine relevant percentage change in respective variables. The difference operator (d) was also used on some of the exogenous variables. Each expenditure option has a linear logarithmic (lin-log) regression function. The outputs are summarized below and interpretation criteria remain as was in part a) above.

3.2.3.1 Cash Transfer Expenditure on Food

The functional form of the model autoregressive is stated as:

$$\boldsymbol{CTE\_F = f(PSR, FPR, NUT, MALE, FEMALE, NONE, PRIMO, SECO, POSEC, RURAL, URBAN, CTR)}$$

The results are presented in Table 5.

The general probability value (0.000044) shows that the model is significant in determining cash transfer expenditure on food. It is established that the following variables influence decision to spend on food based on probability values that are ≤ 0.05: gender of the household head, food poverty rate, location of the household in the urban area as well as the cash transfer rate itself. The adjusted R- squared indicates that approximately 60% of decision to spend cash transfers on food is explained within the model as specified.

[1] Autoregressive Moving Average
[2] The Gauss-Newton method is an iterative algorithm to solve nonlinear least squares problems.
[3] "Berndt, Hall, Hall, Hausman"
[4] Autoregressive Moving Average with Explanatory Variable

Table 5: Determinants of cash transfer expenditure on food

Dependent Variable: Cash Transfer Expenditure on Food (CTE_F)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	120.5382	60.53319	1.991275	0.0556
FEMALE_2016	-116.2108	35.58957	-3.265305	0.0027
FPR_2016	-1.678616	0.570465	-2.942542	0.0062
MALE_2016	135.8140	43.23242	3.141484	0.0038
NONE_2016	-17.56129	12.13535	-1.447119	0.1582
DLOG(NUT_2016)	2.283542	2.405628	0.949250	0.3501
POSEC_2016	-31.51022	45.43526	-0.693519	0.4933
PRIMO_2016	128.4126	66.33939	1.935692	0.0624
PSR_2016	1.144535	1.003334	1.140731	0.2630
RURAL_2016	-0.164802	0.113436	-1.452813	0.1567
SECO_2016	-153.3322	78.87309	-1.944036	0.0613
URBAN_2016	-0.300288	0.131614	-2.281576	0.0298
CTR_2016	0.233618	0.113755	2.053689	0.0488
AR(3)	0.538668	0.188885	2.851829	0.0078
MA(4)	0.506529	0.295688	1.713050	0.0970
SIGMASQ	65.81259	19.20057	3.427637	0.0018
R-squared	0.729797	**Mean dependent var**		36.29783
Adjusted R-squared	0.594696	**S.D. dependent var**		15.77911
S.E. of regression	10.04553	**Akaike info criterion**		7.768946
Sum of squared residuals	3027.379	**Schwarz criterion**		8.404995
Log likelihood	-162.6858	**Hannan-Quinn criter.**		8.007214
F-statistic	5.401855	**Durbin-Watson stat**		2.167190
Prob(F-statistic)	0.000044			

Appendix 1 corroborates the finding on the influence of food poverty rate on cash transfer expenditure on food at the county level. It shows, with a few exceptions, that counties with higher food poverty headcount rates tend to spend higher shares of the cash transfer receipts on food than their counterparts with lower food poverty headcount rates. Further details are given in Appendix 2. For example, out of the 11 counties with the highest overall severity of poverty ratings, eight spent between 41.7% and 72.7% of the cash transfer receipts on food. Two spent about 33% and one (West Pokot) 10.9%. West Pokot spent 70.8% on education/school fees, an investment in human capital. The county with the highest overall severity of poverty rating, Turkana, spent about 59.3% of the cash transfers on food while the one with the second highest rating, Mandera, spent 72.7% on food. The three counties (Tharaka-Nithi, Nyeri, and Kirinyaga) with the lowest overall severity of poverty rating spent 21.3%, 32.1%, and 25.9% on food, respectively.

3.2.3.2 Cash Transfer Expenditure on Education or Fees

The functional form of the model is stated as:

$$\boldsymbol{CTE\_ED = f(PSR, FPR, NUT, MALE, FEMALE, NONE, PRIMO, SECO, POSEC, RURAL, URBAN, CTR)}$$

The results are presented in Table 6.

The general probability value (0.000336) shows that the model is overall significant in determining cash transfer expenditure on education. It is established that the following variables significantly influence decision to spend on education based on probability values that are ≤ 0.05: food poverty rate, poverty severity rate and location of the household (rural and urban). Changes in cash transfer rate also significantly influence expenditure on education according to the regression output. The adjusted R- squared indicates that approximately 51% of decision to spend cash transfers on education is explained within the model as specified.

Table 6: Determinants of cash transfer expenditure on education/fees

Dependent Variable: Cash Transfer Expenditure on Education (CTE_ED)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-170.4588	48.07645	-3.545578	0.0013
FEMALE_2016	68.67398	39.26971	1.748777	0.0902
LOG(FPR_2016)	23.97647	11.19266	2.142160	0.0401
MALE_2016	-81.34303	45.35256	-1.793571	0.0826
NONE_2016	12.64436	12.99986	0.972654	0.3383
DLOG(NUT_2016)	2.123781	3.300281	0.643515	0.5246
POSEC_2016	4.187821	72.50353	0.057760	0.9543
PRIMO_2016	-81.07661	43.19125	-1.877154	0.0699
DLOG(PSR_2016)	-16.01411	4.282173	-3.739715	0.0007
RURAL_2016	0.289064	0.106644	2.710560	0.0108
SECO_2016	97.99201	51.38624	1.906970	0.0658
URBAN_2016	0.382220	0.099425	3.844325	0.0006
DLOG(CTR_2016)	2.356782	2.951783	0.798426	0.4307
AR(2)	0.531827	0.220486	2.412072	0.0220
SIGMASQ	92.86338	30.79859	3.015183	0.0051
R-squared	0.661146	**Mean dependent var**		38.95848
Adjusted R-squared	0.508115	**S.D. dependent var**		16.73742
S.E. of regression	11.73871	**Akaike info criterion**		8.035635
Sum of squared residuals	4271.715	**Schwarz criterion**		8.631931
Log likelihood	-169.8196	**Hannan-Quinn criter.**		8.259011
F-statistic	4.320339	**Durbin-Watson stat**		1.961431
Prob(F-statistic)	0.000336			

3.2.3.3 Cash Transfer Expenditure on Health

The functional form of the model is stated as:

$$CTE\_H = f(\mathbf{PSR, FPR, NUT, MALE, FEMALE, NONE, PRIMO, SECO, POSEC, RURAL, URBAN, CTR})$$

The results are presented in Table 7.

The general probability value (0.070290) shows that the model is relatively significant in determining cash transfer expenditure on health as reiterated by adjusted R-squared of approximately 20%. It is established that the following variables significantly influence decision to spend on health based on probability values that are ≤ 0.05: changes in poverty severity rate and level of education (primary, secondary and post-secondary). Regression output indicates that cash transfer rate does not significantly influence expenditure on health. The results also show that nutritional status does not have a significant influence on expenditure on health, contrary to our expectation.

Table 7: Determinants of cash transfer expenditure on health

Dependent Variable: Cash Transfer Expenditure on Health (CTE_H)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	56.27545	28.19412	1.995999	0.0542
FEMALE_2016	-20.18127	20.58483	-0.980395	0.3340
FPR_2016	-0.084786	0.230811	-0.367339	0.7157
MALE_2016	24.82162	23.96418	1.035780	0.3078
D(NONE_2016)	0.005548	0.014488	0.382938	0.7042
DLOG(NUT_2016)	2.111044	1.195982	1.765113	0.0868
POSEC_2016	-47.02198	22.90221	-2.053163	0.0481
PRIMO_2016	35.50185	17.53194	2.024982	0.0510
LOG(PSR_2016)	-18.80212	9.579102	-1.962827	0.0581
RURAL_2016	0.031620	0.048218	0.655779	0.5165
SECO_2016	-42.13650	20.88918	-2.017145	0.0519
URBAN_2016	-0.008022	0.051023	-0.157231	0.8760
CTR_2016	-0.032210	0.062426	-0.515968	0.6093
R-squared	0.409701	**Mean dependent var**		8.093478
Adjusted R-squared	0.195047	**S.D. dependent var**		6.571163
S.E. of regression	5.895592	**Akaike info criterion**		6.619370
Sum of squared residuals	1147.014	**Schwarz criterion**		7.136160
Log likelihood	-139.2455	**Hannan-Quinn criter.**		6.812963
F-statistic	1.908659	**Durbin-Watson stat**		2.270053
Prob(F-statistic)	0.070290			

3.2.3.4 Cash Transfer Expenditure on Investment

The functional form of the model is stated as:

$$CTE\_INV = f(\text{PSR}, \text{FPR}, \text{NUT}, \text{MALE}, \text{FEMALE}, \text{NONE}, \text{PRIMO}, \text{SECO}, \text{POSEC}, \text{RURAL}, \text{URBAN}, \text{CTR})$$

The results are presented in Table 8.

The general probability value (0. 032633) shows that the model is overall significant in determining cash transfer expenditure on investment. The model seeks to establish whether changes in food poverty rate, poverty severity rate, nutrition level and cash transfer rate would affect expenditure on investment. It is established that the following variables significantly influence decision to spend on investment based on probability values that are ≤ 0.05: nutrition, location of the household in the rural areas (urban to a small extent). Changes in cash transfer rate have a relatively insignificant influence on expenditure on investment according to the regression output. The adjusted R- squared indicates that approximately 27% of decision to spend cash transfers on investment is explained within the model as specified.

Table 8: Determinants of cash transfer expenditure on investment

Dependent Variable: Cash Transfer Expenditure on Investment (CTE_INV)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	105.4160	39.63882	2.659413	0.0123
FEMALE_2016	58.30226	35.44050	1.645075	0.1101
DLOG(FPR_2016)	3.038798	7.947263	0.382370	0.7048
MALE_2016	-67.21497	41.13966	-1.633824	0.1124
NONE_2016	-8.197390	9.917358	-0.826570	0.4148
NUT_2016	-0.595488	0.245230	-2.428284	0.0212
POSEC_2016	84.81443	51.62605	1.642861	0.1105
PRIMO_2016	-15.40011	30.31742	-0.507962	0.6151
DLOG(PSR_2016)	-0.939626	7.043897	-0.133396	0.8947
RURAL_2016	-0.229368	0.075374	-3.043063	0.0047
SECO_2016	17.74235	36.07707	0.491790	0.6263
URBAN_2016	-0.175339	0.090359	-1.940484	0.0615
CTR_2016	-0.016444	0.104685	-0.157076	0.8762
AR(5)	0.519576	0.266753	1.947777	0.0605
SIGMASQ	31.68027	8.853284	3.578364	0.0012
R-squared	0.499231	**Mean dependent var**		5.273913
Adjusted R-squared	0.273077	**S.D. dependent var**		8.041709
S.E. of regression	6.856343	**Akaike info criterion**		6.979947
Sum of squared residuals	1457.293	**Schwarz criterion**		7.576243
Log likelihood	-145.5388	**Hannan-Quinn criter.**		7.203323
F-statistic	2.207484	**Durbin-Watson stat**		2.018237
Prob(F-statistic)	0.032633			

3.2.3.5 Cash Transfer Expenditure for Loan and/or Debt Repayment

The functional form of the model is stated as:

$$CTE\_DBT = f(\text{PSR}, \text{FPR}, \text{NUT}, \text{MALE}, \text{FEMALE}, \text{NONE}, \text{PRIMO}, \text{SECO}, \text{POSEC}, \text{RURAL}, \text{URBAN}, \text{CTR})$$

The results are presented in Table 9.

The general probability value (0. 006420) shows that the model is overall significant in determining cash transfer expenditure on loan or debt repayment. The model seeks to establish whether changes in food poverty rate, nutrition level, poverty severity rate and cash transfer rate, would affect expenditure on loan or debt repayment. It is established that only changes in nutrition level (P= 0.0047) affect cash transfer expenditure on loan or debt repayment. Changes in cash transfer rate have a relatively insignificant influence expenditure on loan or debt repayment according to the regression output. The adjusted R- squared indicates that approximately 39% of decision to spend cash transfers on loan or debt repayment is explained within the model as specified.

Table 9: Determinants of cash transfer expenditure on loan and/or debt repayment

Dependent Variable: Cash Transfer Expenditure on Debt/ Loan Repayment (CTE_DBT)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	16.54189	8.659027	1.910364	0.0657
FEMALE_2016	0.628736	0.344349	1.825870	0.0778
LOG(FPR_2016)	-5.954008	3.735325	-1.593973	0.1214
D(MALE_2016)	-0.550046	0.655714	-0.838851	0.4082
NONE_2016	5.145697	3.707371	1.387964	0.1754
DLOG(NUT_2016)	2.225762	0.728889	3.053635	0.0047
POSEC_2016	-22.27327	26.41743	-0.843128	0.4058
PRIMO_2016	-13.82546	15.43407	-0.895775	0.3775
DLOG(PSR_2016)	2.918817	6.602269	0.442093	0.6616
D(RURAL_2016)	0.009062	0.015701	0.577166	0.5681
SECO_2016	16.88320	18.38135	0.918496	0.3657
URBAN_2016	-0.029860	0.023917	-1.248475	0.2215
DLOG(CTR_2016)	0.959518	0.829333	1.156976	0.2564
AR(2)	-1.000000	0.000749	-1335.194	0.0000
MA(4)	-0.999994	8.53E-05	-11717.11	0.0000
SIGMASQ	6.054896	2.769087	2.186604	0.0367
R-squared	0.591385	**Mean dependent var**		1.456522
Adjusted R-squared	0.387078	**S.D. dependent var**		3.891966
S.E. of regression	3.046994	**Akaike info criterion**		5.516525
Sum of squared residuals	278.5252	**Schwarz criterion**		6.152574
Log likelihood	-110.8801	**Hannan-Quinn criter.**		5.754793
F-statistic	2.894588	**Durbin-Watson stat**		1.945812
Prob(F-statistic)	0.006420			

3.2.3.6 Cash Transfer Expenditure on Rent

The functional form of the model is stated as:

$$\boldsymbol{CTE\_RNT = f(PSR, FPR, NUT, MALE, FEMALE, NONE, PRIMO, SECO, POSEC, RURAL, URBAN, CTR)}$$

The results are presented in Table 10.

The general probability value (0. 087119) shows that the model is relatively significant in explaining cash transfer expenditure on rent. The model seeks to establish whether changes in food poverty rate, poverty severity rate, location in urban area and cash transfer rate, would affect expenditure on rent. It is established that the following variables explain decision to spend on rent by their probability values that are ≤ 0.05: change in food poverty rate, nutrition and change in poverty severity rate. Changes in cash transfer rate relatively insignificantly influence expenditure on rent, according to the regression output. Contrary to our expectation, results of our analysis shows that location of the household (urban or rural) does not influence cash transfer expenditure on rent. The adjusted R- squared indicates that approximately 21% of decision to spend cash transfers on rent is explained within the model as specified.

Table 10: Determinants of cash transfer expenditure on rent

Dependent Variable: Cash Transfer Expenditure on Rent/ Housing (CTE_RNT)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-31.57117	9.895327	-3.190513	0.0033
FEMALE_2016	-6.777931	3.926972	-1.725994	0.0946
LOG(FPR_2016)	6.508463	1.226411	5.306918	0.0000
MALE_2016	7.273471	4.525386	1.607260	0.1185
NONE_2016	-1.035061	2.180645	-0.474658	0.6385
NUT_2016	0.119613	0.060388	1.980722	0.0569
POSEC_2016	6.044171	9.268311	0.652133	0.5193
PRIMO_2016	1.923791	7.068231	0.272174	0.7874
DLOG(PSR_2016)	-2.179538	0.555265	-3.925221	0.0005
D(RURAL_2016)	0.007052	0.005293	1.332233	0.1928
SECO_2016	-2.513195	8.444353	-0.297618	0.7680
LOG(URBAN_2016)	3.003869	1.946304	1.543371	0.1332
DLOG(CTR_2016)	0.336734	0.332712	1.012090	0.3196
AR(2)	0.679771	0.161996	4.196220	0.0002
MA(5)	0.656611	0.258494	2.540143	0.0165
SIGMASQ	1.489800	0.506023	2.944132	0.0062
R-squared	0.471007	**Mean dependent var**		0.660870
Adjusted R-squared	0.206511	**S.D. dependent var**		1.696726
S.E. of regression	1.511410	**Akaike info criterion**		4.017615
Sum of squared residuals	68.53079	**Schwarz criterion**		4.653664
Log likelihood	-76.40515	**Hannan-Quinn criter.**		4.255883
F-statistic	1.780770	**Durbin-Watson stat**		1.993364
Prob (F-statistic)	0.087119			

3.2.3.7 Cash Transfer Expenditure on Other Items

The functional form of the model is stated as:

$$\boldsymbol{CTE_{OTHER} = f(\mathrm{PSR}, \mathrm{FPR}, \mathrm{NUT}, \mathrm{MALE}, \mathrm{FEMALE}, \mathrm{NONE}, \mathrm{PRIMO}, \mathrm{SECO}, \mathrm{POSEC}, \mathrm{RURAL}, \mathrm{URBAN}, \mathrm{CTR})}$$

The results are presented in Table 11.

The regression output above indicates that cash transfer expenditure on other items is mainly influenced by poverty severity rate and changes in cash transfer rate. However, only approximately 3% of variations in decisions to spend on other items is explained within this model, as shown by adjusted R- squared.

Table 11: Determinants of cash transfer expenditure on other items

Dependent Variable: CTE_OTHR				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	71.65269	22.36289	3.204089	0.0031
FEMALE_2016	10.52580	18.61961	0.565307	0.5759
DLOG(FPR_2016)	4.607031	2.688126	1.713845	0.0965
MALE_2016	-16.52043	22.18012	-0.744830	0.4620
NONE_2016	-0.419110	6.666269	-0.062870	0.9503
DLOG(NUT_2016)	-0.661795	1.383718	-0.478273	0.6358
POSEC_2016	-10.66671	31.17302	-0.342178	0.7345
PRIMO_2016	13.00182	26.76313	0.485811	0.6305
PSR_2016	1.140163	0.517556	2.202978	0.0352
RURAL_2016	-0.066526	0.044363	-1.499587	0.1438
SECO_2016	-16.52403	31.86663	-0.518537	0.6078
URBAN_2016	-0.058548	0.047584	-1.230414	0.2278
LOG(CTR_2016)	-6.487926	1.667764	-3.890194	0.0005
AR(2)	0.384360	0.226403	1.697678	0.0996
SIGMASQ	28.68552	8.702949	3.296069	0.0025
R-squared	0.330543	**Mean dependent var**		11.38696
Adjusted R-squared	0.028208	**S.D. dependent var**		6.618244
S.E. of regression	6.524233	**Akaike info criterion**		6.853394
Sum of squared residual	1319.534	**Schwarz criterion**		7.449690
Log likelihood	-142.6281	**Hannan-Quinn criter.**		7.076770
F-statistic	1.093301	**Durbin-Watson stat**		1.955536
Prob (F-statistic)	0.400380			

4. Conclusions

Our findings show that unconditional cash transfers are spent on food, education/school fees, health, investment/business, rent/housing, clothing, debt repayment, and other. Overall, households in Kenya seem to make "sensible" decisions in their expenditure of such income. They spend the money on items that are in line with their socioeconomic situation. The highest proportion of such income is spent on education which they consider as investment in human capital of their children. Next is expenditure on food and the pattern is consistent with our prior expectations – poverty severity rates and food poverty have significant influence on how the unconditional cash transfers are spent. Such income augments households' assets, consumption, food security and investment in the education of their children. Expenditures on temptation goods, such as alcohol and tobacco must be very small, if any. Such expenditures would fall under the category identified as "other," accounting for 10.5% of total cash transfer receipts and comprises rent/housing, clothing, debt repayment, etc. Given that the category's share is small and the category is composed of a number of items, expenditure on tobacco and alcohol, if any, would be very small.

At the national level, education/school fees accounts for the largest share (44.6%) followed by food (33.5%), health (6.9%), and investment/business (4.5%) in that order. These key priority expenditure patterns for the cash transfer received appear to negate the concern that cash transfers may be just "handouts" that promote purchase of alcohol, tobacco, or other so-called "temptation goods" in addition to leading to dependency. Factors that influence how the recipients spend the cash include the household's poverty severity rating, food poverty rating, location (urban or rural), nutritional status and gender and education level of head of household. They are summarized below.

Determinants of cash transfer rates: The following variables in the year 2006 significantly influenced cash transfer rate: food poverty rate, level of education (none, primary or secondary) and location in the urban area. This is shown by the probability values that are ≤ 0.05.

Cash transfer expenditure on food: This study established that the following variables influence decision to spend on food based on probability values that are ≤ 0.05: gender of the household head, food poverty rate, location of the household in the urban area as well as the cash transfer rate itself. Aside from a few exceptions, counties with higher food poverty headcount rates tend to spend higher shares of the cash transfer receipts on food than their counterparts with lower food poverty headcount rates.

Cash transfer expenditure on education/school fees: We established that the following variables significantly influence decision to spend on education based on probability values that are less than or equal to 0.05: food poverty rate, poverty severity rate and location of the household (rural and urban).

Cash transfer expenditure on health: We also established that the following variables significantly influence decision to spend on health based on probability values that are ≤ 0.05: changes in poverty severity rate and level of education (primary, secondary and post-secondary). Contrary to our expectation, the results of the analysis show that nutritional status does not have a significant influence on expenditure on health.

Cash transfer expenditure on investment: We also ascertained that the following variables significantly influence decision to spend on investment based on probability values that are ≤ 0.05: nutrition, location of the household in the rural areas (urban to a small extent). Changes in cash transfer rate have a relatively insignificant influence on expenditure on investment according to the regression output.

Cash transfer expenditure on loan and/or debt repayment: We found that only changes in nutrition level ($P= 0.0047$) affect cash transfer expenditure on loan or debt repayment. Changes in cash transfer rate have a relatively insignificant influence expenditure on loan or debt repayment according to the regression output. In any case, only approximately 39% of decision to spend cash transfers on loan or debt repayment is explained within the model as specified.

Cash transfer expenditure on rent: It is established that the following variables explain decision to spend on rent by their probability values that are ≤ 0.05: change in food poverty rate, nutrition and change in poverty severity rate. Changes in cash transfer rate relatively insignificantly influence expenditure on rent. Contrary to our expectation, results of our analysis show that location of the household (urban or rural) does not influence cash transfer expenditure on rent.

5. Recommendations

In light of the above findings, when planning and executing government's social protection programmes, the recipients should be given greater say than has been the case hitherto. Donors, corporate and NGO sectors should also consider supporting unconditional cash transfer programmes. The beneficiaries should be given lee-way in deciding on how to spend the money, especially in disruptive times. This would improve effectiveness and sustainability of such programmes. Additionally, there is need to embrace non-physical means of transferring funds to beneficiaries such as use of mobile money transfers like Mpesa as opposed to cash payments. This is particularly relevant during periods of disruptions like COVID-19. Furthermore, the government and food-aid agencies should adopt the idea of food relief in the form of unconditional cash transfer as one of the delivery mechanisms. This

would ensure timely delivery of aid to the needy.

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APPENDICES

Appendix 1: Food poverty estimates (individual) and share of cash transfers spent on food by county, 2015/16

National/County	Food Poverty Headcount Rate %	Share of Cash Transfers Received Within the Country Spent on Food %
National	**32.0**	**33.5**
Mombasa	23.6	20.3
Kwale	41.1	36.6
Kilifi	48.4	51.8
Tana River	55.4	44.0
Lamu	19.9	50.0
Taita/Taveta	38.9	42.0
Garissa	45.2	50.0
Wajir	41.3	59.4
Mandera	61.9	72.7
Marsabit	55.6	60.8
Isiolo	34.2	48.6
Meru	15.5	46.5
Tharaka-Nithi	31.2	21.3
Embu	28.3	36.1
Kitui	39.4	43.2
Machakos	24.1	46.6
Makueni	30.7	55.8
Nyandarua	29.8	27.7
Nyeri	15.5	32.1
Kirinyaga	18.8	25.9
Murang'a	22.7	40.6
Kiambu	23.5	30.4
Turkana	66.1	59.3
West Pokot	57.3	10.9
Samburu	60.1	33.6
Trans Nzoia	33.3	13.3
Uasin Gishu	38.2	21.8
Elgoyo/Marakwet	44.8	22.2
Nandi	31.5	17.6
Baringo	41.4	27.1
Laikipia	28.5	33.2
Nakuru	19.6	36.8
Narok	22.1	42.0
Kajiado	36.9	8.2
Kericho	31.4	16.9
Bomet	32.8	58.6
Kakamega	33.3	33.6
Vihiga	36.6	48.2
Bungoma	32.4	38.3
Busia	59.5	41.7
Siaya	27.3	55.1
Kisumu	32.5	8.7
Homa Bay	22.7	28.1
Migori	32.0	38.3
Kisii	44.5	12.4
Nyamira	36.3	27.7
Nairobi City	16.1	14.0

Source: Computed from KIHBS data

Appendix 2: Overall poverty estimates by severity of poverty and proportion of cash transfers spent on food by county

Poverty Category (%)	County	No. of counties		Share of Food Expenditure (%)	County	No. of counties
0.5 – 1.0	Tharaka-Nithi, Nyeri, Kirinyaga,	3		8 – 10	Kajiado, Kisumu	2
1.1 – 3.0	Lamu, Meru, Embu, Machakos, Nyandarua, Murang'a, Kiambu, Nakuru, Narok, Bomet, Migori, Nairobi City	12		10.1 - 20	West Pokot, Trans Nzoia, Kisii, Nairobi City, Kericho, Nandi	6
3.1 – 4.0	Mombasa, Kwale, Taita-Taveta, Makueni, Nandi, Kericho, Kakamega, Bungoma, Siaya, Kisumu, Homa Bay, Kisii, Nyamira	13		20.1 - 30	Mombasa, Tharaka-Nthi, Uasin Gishu, Elgeyo/Marakwet, Nyandarua, Kirinyaga, Baringo, Homa Bay, Nyamira	9
4.1 – 5.0	Kilifi, Trans-Nzoia, Baringo, Vihiga	4		30.1 - 40	Kiambu, Nyeri, Migori, Bungoma, Kakamega, Nakuru, Laikipia, Samburu, Embu, Kwale	10
5.1 – 6.0	Kitui, Uasin-Gishu, Elgeyo Marakwet, Kajiado	4		40.1 - 50	Lamu, Tana River, Murang'a, Busia, Vihiga, Narok, Machakos, Kitui, Meru, Isiolo, Garissa, Taita/Taveta	12
6.1 – 7.0	Wajir, Isiolo, Laikipia	3		50.1 - 60	Siaya, Bomet, Turkana, Makueni, Wajir, Kilifi	6
7.1 – 9.0				60.1 - 70	Marsabit	1
9.1 – 10.0	Tana River, West Pokot, Busia	3		70.1 - 80	Mandera	1
10.1 – 12.0	Garissa, Marsabit	2				
12.1 – 16.0						
16.1 – 17.0	Mandera, Samburu	2				
17.1 – 30.0						
30.1 – 31.0	Turkana	1				
Total number of counties		47				47

Source: Computed from KIHBS data

Appendix 3: White cross-section test results

2006	C	PSR	FPR	NONE	PRIMO	SECO	POSEC	NUT	MALE	FEMALE	RURAL	URBAN	AR(3)
C	5924.82	0.0876	-0.3124	-0.3072	-0.0034	0.03897	1.0410	0.0261	-59.284	-59.176	0.0462	-0.005	-0.0006
PSR	0.0876	0.0788	-0.104	-0.1441	0.0004	0.0308	0.1542	-0.0659	0.0258	-0.0352	-0.0073	-0.0034	-0.0030
FPR	-0.312	-0.1041	0.7568	0.1956	-0.0045	0.1819	0.1819	0.09924	0.7496	-0.4119	0.1237	0.0228	0.0108
NONE	-0.3072	-0.1441	0.0219	-0.0118	0.2328	-0.4032	0.1231	-0.0123	0.4106	-0.1121	0.0072	0.0169	0.0325
PRIMO	-0.0034	0.0004	-0.0045	-0.0051	0.0002	-0.0067	-0.0138	-0.0025	0.0051	0.0024	-0.0013	7.2472	1.7349
SECO	0.0389	0.0309	0.1819	0.2550	-0.0067	0.5196	-0.2192	0.1231	-0.2249	-0.1733	0.0298	-0.0141	-0.0003
POSEC	1.0410	0.1542	0.7496	-1.2446	-0.0138	-0.2192	35.1628	0.4106	-0.9428	-0.9002	0.3695	-0.1102	-0.1364
NUT	0.0261	-0.0659	0.0993	0.2539	-0.0025	0.1231	0.4106	0.2346	-0.1121	0.0072	0.0169	-0.0025	-0.0003
MALE	-59.2842	0.0258	-0.4119	-0.1203	0.0051	-0.2249	-0.9428	-0.1121	0.9605	0.8575	-0.1208	-0.0181	0.0055
FEMALE	-59.1757	-0.0352	-0.3529	0.1034	0.0024	-0.1733	-0.9002	0.0072	0.8575	0.9704	-0.1071	-0.0152	-0.0025
RURAL	0.0462	-0.0073	0.1237	-0.0305	-0.0013	0.0298	0.3695	0.0169	-0.1208	-0.1071	0.0544	0.0097	-0.0039
URBAN	-0.0049	-0.0034	0.0228	-0.0051	7.2472	-0.0141	-0.1102	-0.0025	-0.0181	-0.0152	0.0097	0.0059	0.0003
AR(3)	-0.0006	-0.0030	0.0108	0.0326	1.7349	-0.0003	-0.1364	-0.0003	0.0055	-0.0025	-0.0039	0.0003	0.0063
2016	**C**	**PSR**	**FPR**	**NONE**	**PRIMO**	**SECO**	**POSEC**	**NUT**	**MALE**	**FEMALE**	**RURAL**	**URBAN**	**AR(3)**
C	41.9891	-2.2609	-18.321	1256.59	-1519.78	-1519.78	-749.571	-104.69	-95.3259	-43.7241	-12.138	-11.443	-0.0006
PSR	41.9891	2.3199	-0.3660	4.5560	-12.4396	14.7848	-18.4089	-0.0421	-20.3959	10.9171	-0.0636	-0.0455	0.0022
FPR	-2.2609	-0.3660	0.4638	-2.2524	8.6937	-10.5449	6.3812	0.0394	0.0104	0.0414	0.0015	0.0029	0.0006
NONE	-104.693	4.5560	-2.2524	274.779	-696.199	827.624	-1184.13	0.4831	-87.4532	69.4998	0.1676	0.1999	0.0384
PRIMO	1256.585	-12.44	8.6937	-696.199	4299.773	-5113.79	-323.169	-6.2076	896.179	-758.481	-2.5788	-2.3323	0.0325
SECO	-1519.778	14.7848	-10.545	827.624	-5113.79	6082.401	385.608	7.3836	-1084.21	918.415	3.1207	2.8298	-0.0524
POSEC	-749.57	-18.409	6.3812	-1184.13	-323.169	385.608	9463.69	4.3886	-453.93	416.335	1.8918	1.3067	-0.2979
NUT	-18.3211	-0.0421	0.0394	0.4831	-6.2076	0.0372	4.3886	0.2414	0.1229	-0.2588	0.0409	0.0347	-0.0039
MALE	-95.3259	-20.40	0.0104	-87.453	896.179	-1084.21	-453.927	0.1229	4785.517	-4057.587	0.1955	-0.3850	0.7921
FEMALE	-43.7241	10.9171	0.0414	69.4998	-758.481	918.4148	416.335	-0.2588	-4057.59	3461.5047	0.0146	0.4521	-0.6872
RURAL	-12.1384	-0.0636	0.0015	0.1676	-2.5788	3.1207	1.8918	0.0409	0.1955	0.0146	0.0255	0.0238	5.8444
URBAN	-11.4428	-0.0455	0.0029	0.1999	-2.3323	2.8298	1.3067	0.0347	-0.3850	0.4521	0.0238	0.0243	0.0003
AR(3)	-0.0006	0.0022	0.0006	-0.0039	0.0384	0.0325	-0.0524	-0.2979	0.7921	-0.6872	5.8444	0.0003	0.0063
	Observations: 47 **Cross sections: 2**												

Appendix 4: Multicollinearity

2006	CTR	PSR	FPR	NONE	PRIMO	SECO	POSEC	NUT	MALE	FEMALE	RURAL	URBAN
CTR	1	-0.1496	-0.3152	0.0205	-0.1209	0.3142	0.6925	0.0034	0.0947	-0.0948	-0.4421	0.8636
PSR	-0.1496	1	0.5751	0.2344	-0.0563	-0.6199	-0.3806	0.5075	-0.3434	0.3433	0.0028	-0.2439
FPR	-0.3152	0.5751	1	0.2273	-0.0926	-0.6841	-0.4083	0.3805	-0.1479	0.1476	-0.0192	-0.3707
NONE	0.0205	0.2344	0.2273	1	0.0604	-0.3979	-0.0924	0.0872	0.1239	-0.1239	0.2321	-0.1783
PRIMO	-0.1209	-0.0563	-0.0926	0.0604	1	0.1532	0.0556	-0.0548	-0.0515	0.0515	0.0724	-0.0152
SECO	0.3142	-0.6199	-0.6841	-0.3979	0.1532	1	0.5372	-0.4092	0.3222	-0.3221	-0.2880	0.5573
POSEC	0.6925	-0.3806	-0.4083	-0.0924	0.0556	0.5372	1	-0.0290	0.1687	-0.1688	-0.4577	0.7062
NUT	0.0034	0.5075	0.3805	0.0872	-0.0548	-0.4092	-0.0290	1	-0.1357	0.13555	-0.0627	-0.1259
MALE	0.0947	-0.3434	-0.1479	0.1239	-0.0515	0.3222	0.1687	-0.1357	1	-0.9999	-0.1513	0.2409
FEMALE	-0.0948	0.3433	0.1476	-0.1239	0.0515	-0.3221	-0.1688	0.1356	-0.9999	1	0.1515	-0.2409
RURAL	-0.4421	0.0028	-0.0192	0.2321	0.0724	-0.2880	-0.4577	-0.0627	-0.1514	0.1515	1	-0.6127
URBAN	0.8636	-0.2439	-0.3707	-0.1783	-0.0152	0.5573	0.7062	-0.1259	0.2409	-0.2409	-0.6127	1
2016	**CTR**	**PSR**	**FPR**	**NONE**	**PRIMO**	**SECO**	**POSEC**	**NUT**	**MALE**	**FEMALE**	**RURAL**	**URBAN**
CTR	1	0.2029	0.2636	-0.1661	-0.1633	-0.1623	-0.1662	0.0008	0.1825	0.1834	0.2504	-0.2848
PSR	0.2029	1	0.9342	-0.4543	-0.4534	-0.4532	-0.4542	0.6783	0.9899	0.9899	0.2313	-0.3709
FPR	0.2636	0.9342	1	-0.4222	-0.4171	-0.4153	-0.4222	0.5675	0.9202	0.9199	0.2423	-0.3736
NONE	-0.1661	-0.4543	-0.4222	1	0.9994	0.9988	0.9999	-0.3084	-0.4510	-0.4518	-0.5421	0.8029
PRIMO	-0.1633	-0.4534	-0.4171	0.9994	1	0.9999	0.9994	-0.3057	-0.4506	-0.4515	-0.5410	0.7999
SECO	-0.1623	-0.4532	-0.4153	0.9988	0.9999	1	0.9988	-0.3047	-0.4506	-0.4515	-0.5404	0.7985
POSEC	-0.1662	-0.4542	-0.4222	0.9999	0.9994	0.9988	1	-0.3084	-0.4509	-0.4517	-0.5422	0.8031
NUT	0.0008	0.6783	0.5675	-0.3084	-0.3057	-0.3047	-0.3084	1	0.6861	0.6875	-0.0952	-0.1252
MALE	0.1825	0.9899	0.9202	-0.4510	-0.4506	-0.4506	-0.4509	0.6861	1	0.9999	0.1921	-0.3454
FEMALE	0.1834	0.9899	0.9199	-0.4518	-0.4515	-0.4515	-0.4517	0.6875	0.9999	1	0.1919	-0.3453
RURAL	0.2504	0.2313	0.2423	-0.5421	-0.5410	-0.5404	-0.5422	-0.0952	0.1921	0.1919	1	-0.9067
URBAN	-0.2848	-0.3709	-0.3736	0.8029	0.7999	0.7985	0.8031	-0.1252	-0.3454	-0.3453	-0.9067	1