Effects of cash transfers on food expenditure patterns in northern Kenya

Michael Joseph Matata¹*, Margaret W. Ngigi², Hillary Kiplangat Bett² and Phillip Musyoka Michael³

Abstract: Most households in the ASALs lack access to sufficient and nutritious food, among factors contributing to this include; conflicts, droughts, invasion of desert locusts, increase in food prices, crop failure, and livestock diseases. Cash transfers have risen rapidly over the years in both emergency and developmental contexts as a means of responding to food security and livelihood threats. To understand whether cash transfers are effective in addressing food insecurity we need to know how cash transfers affect beneficiaries’ food expenditure patterns. This paper adopted the Quadratic Almost Ideal Model (QUAIDS) to understand how food expenditure patterns changes in presence of cash transfers. The findings indicate that households diversified their diet to some high-value foods, the diet was not only based on starch but also some proteins. The paper also adopted a difference-in-difference model to determine the effects of cash transfers on household food expenditure. The findings indicate that cash transfers increased the food expenditure of the beneficiaries.

Subjects: Economics; Microeconomics; Econometrics

Keywords: Cash transfers; food expenditure patterns; ASALs; QUAIDS

1. Introduction

The arid and semi-arid lands of northern Kenya suffer from poverty rates as high as 70% higher than the national average of 45% (World Bank, 2018). Pastoralism, a dominant livelihood activity that represents a considerable percentage of a household’s productive capital and wealth for the ASALs communities is very sensitive to climate shocks (Jensen et al., 2017; J. Tiwari et al., 2019). Climate and weather-related shocks such as drought have resulted in increased livestock loss.
leading to income loss that has rendered pastoralists vulnerable to poverty and food insecurity (Chantarat et al., 2013).

Most households in the ASALs lack access to sufficient and nutritious food, among factors contributing to this include; conflicts, droughts, invasion of desert locusts, increase in food prices, crop failure, and livestock diseases (FAO & WHO, 2018; Joseph, 2004; UNICEF & WHO, 2017). This implies that a large portion of ASALs communities is potentially hungry and vulnerable to food shortages (Amwata et al., 2016). In response to hunger and food security threats humanitarian organizations, donors, and national governments around the world provide cash transfers to poor and vulnerable households (Cejudo et al., 2020; Gentilini et al., 2020; O’Brien et al., 2014).

Cash transfers have risen rapidly over the years in both emergency and developmental contexts and have had different reactions from various quarters (Jahangir et al., 2020). Cash transfers in particular are widely favoured and often target recipients below specific poverty thresholds (Opalo, 2021). Cash transfer programs aim to meet social protection objectives by providing cash to the poor or vulnerable, thereby guaranteeing them a minimum level of stable income (Jensen et al., 2017). Cash transfers are increasingly being considered as a potential avenue for generating or supporting household spending, particularly in the context of adopting broader policy reforms or coping with financial downturns, in addition to enhancing human capital investment (Bazzi et al., 2015).

The growth of cash transfers has changed the face of crisis response and appears to promise greater efficiency and efficacy (Creti & Jaspars, 2006; Devereux, 2006; Gelan, 2006; Harvey, 2007). Cash transfers give the recipients freedom to choose anything they want to consume, either food or other necessities such as schooling and health-related expenses (Barrientos et al., 2010). The theoretical rationale for cash transfer programs is that regularity and consistency of cash transfers allow poor households to smooth consumption throughout the year and create human and physical resources to withstand shocks (Arnold et al., 2011; McGuire & FAO, 2015).

Understanding the changes in food expenditure patterns in the context of cash transfers is important for it may differ in the absence of cash transfers. Theoretically, small amounts of money are very significant to poor households. Climate shocks may disrupt local economies, and household incomes hence affecting food spending patterns (Hanna & Olken, 2020; Jensen et al., 2017). Food expenditure patterns have important implications for arid and semi-arid land development through opportunities created for the local economy (Chisanga & Zulu-Mbata, 2018). As a result of differences in preferences, food prices, food availabilities, and resource constraints there may be significant heterogeneities in food consumption across households (Humphries et al., 2017).

To understand whether cash transfers are effective in addressing food insecurity we need to know how cash transfer beneficiaries adapt to their food expenditure patterns. This paper aimed at answering the question; Does cash transfer affect household food expenditure? Does cash transfer affect food expenditure patterns? What are the policy implications? To answer these questions the paper used Quadratic Almost Ideal Demand System (QUAIDS) to determine the household food expenditure patterns in the ASALs of northern Kenya. Further, the study employed a difference-in-difference model to determine the effects of cash transfers on food expenditure and food expenditure patterns.

The paper evaluated the Hunger Safety Net Program (HSNP), one of the largest unconditional cash transfer programs in Kenya. The HSNP targeted poor people in ASALs of northern Kenya including the counties of Turkana, Wajir, Marsabit, and Mandera. HSNP intended to support vulnerable households in the target areas by increasing their capacities to meet immediate essential needs as well as encourage them to accumulate and retain assets. The HSNP program designers expected the program would also have positive impacts on broader aspects of household well-being (Merttens et al., 2013). The HSNP was implemented in two phases. Phase 1 started
in 2009 and ended in 2012 and reached 60,000 households every two months with KES 2,150 per household in the four counties (Merttens et al., 2013). The households collected cash, from pay points of their respective convenience using a biometric smartcard. Phase 2, funded by the Department for International Development (DFID) and the government of Kenya, began in 2013 and ended in 2018. Phase 2 aimed to reach the poorest 100,000 households with a monthly cash transfer of KES 2,700. Phase 2 also served another 180,000 households with periodic emergency transfers (Merttens et al., 2018). This paper is structured as follows: Section 2 reviews relevant literature on cash transfers, Section 3 introduces data and our empirical approach, and Section 4 provides a discussion of the results. Conclusions and policy recommendations are presented in section 5.

2. Literature

People prefer to use the additional income from cash transfers on the goods and services they need most, which varies among individuals and contexts. Cash is often spent on a wide range of goods and services (Bailey & Harvey, 2015). Cash transfers are expected to increase the consumption of various foods through the income effect. Empirical evidence supports the tendency of households to consume a wider range of foods as income increases, reflecting a decrease in calorie marginal utility for individual foods and a concavity in the utility function (Clements & Si, 2018; Jensen & Miller, 2010; Li, 2021). A growing body of literature suggests that cash transfers increased household consumption with a positive impact on food consumption (Bastagi et al., 2016; Habimana et al., 2021). Pellerano et al. (2014) found that the Lesotho child grant program decreased the proportion of households without enough food household consumption. An evaluation of the Mchniji Social Cash Transfer Pilot Scheme in Malawi found that large effect sizes are statistically significant in food expenditure, intake, food adequacy, and a variety of diet diversity (Miller et al., 2011). The large effects are partially explained by the size of the cash transfer, which accounted for sixty per cent of the total household expenditure per capita on average (Miller et al., 2011). Hidrobo et al. (2014) found that randomly assigned cash, food, and voucher transfers all led to improvements in the quantity and quality of the food consumed in northern Ecuador. However, differences arise in the categories of food consumed, food transfers resulted in significant increases in calories consumed, and vouchers result in significantly greater increases in dietary diversity. MacAuslan and Schofield (2011) evaluated the emergency and food security cash transfer initiative in Korogocho Kenya. They observed that food consumption of the cash transfer beneficiaries increased by at least one meal per day during the transfer period, whereas dietary diversity also improved. However, this was more noticeable for small households since the transfer was uniform. Kurdi (2021) analyses the nutritional benefits of cash transfers in humanitarian crises, evidence from Yemen. Kurdi (2021) indicated that cash transfers significantly increased purchases of non-staple foods which resulted in large positive impacts on child dietary diversity scores. Habimana et al. (2021) further noted that the unconditional cash transfers on consumption and poverty in Rwanda led to a minor rise in food consumption, as well as a decrease in home-produced food consumption and no change in non-food consumption. S. Tiwari et al. (2016) found a significant increase of thirty-five per cent in food expenditures and 214 kcal per capita for the Zambia child grant program.

Evidence also suggests that cash transfers have no significant effects on food expenditure. Bhalla et al. (2018) found no significant effects of Malawi’s social cash transfer program on food expenditures and diet quality one year after scale-up, but an increase of eleven percentage points in the share of households that consumed multiple meals per day and a positive impact on the availability of households’ calorie. Brugh et al. (2018) found no impact of Zimbabwe’s harmonized social cash transfer program on food consumption, but positive and significant effects on food diversity and a food security score.

Kronebusch and Damon (2019) evaluated conditional cash transfers on nutrition outcomes in Mexico. Their findings demonstrated that conditional cash transfers have a dual effect on the nutrition outcomes of beneficiary households, likely improving macro and micronutrient
consumption levels, while also increasing the consumption of food categories that are likely to result in increased prevalence of overweight and obesity. Hidrobo et al., (2014) show that both cash and in-kind transfers significantly lead to an increase in calories consumed in an emergency context in Northern Ecuador. Rubalcava et al. (2009) found that the Progreso cash transfer program improved the protein per calorie intake for the beneficiary households in Mexico.

Dietrich and Schmerzeck (2019) use the HSNP data to analyse the role of local market isolation on the HSNP program’s impacts on the satisfaction of micro-nutrient requirements after a drought. While the program had a positive impact on food expenditures on average, in more isolated communities’ food prices increased stronger after the drought which attenuated the purchasing power of transfers and nullified program impacts on the satisfaction of micro-nutrient requirements. Dietrich and Schmerzeck (2019) show that, despite some inspiring effects on proxy indicators, the HSNP program has no long-term significant impacts on nutrient availability. HSNP targeted food-insecure households whose food expenditure is expected to rise as income increases.

3. Materials and methods

3.1. Research design

This paper is based on the randomized design of the hunger safety net program. Forty-eight program sub-locations were selected from the pool of all hunger safety net program sub-locations. The selection of the sub-location was by probability proportional to size (PPS). From the selected sub-locations each pair were randomly assigned between treatment and control at a public lottery event. In the selection of beneficiary households, three types of targeting mechanisms were implemented simultaneously within the treatment sub-locations: community-based targeting (The community was instructed to select those households that are most food insecure. Half of the community’s households were selected this way), dependency ratio targeting (All households in which a certain percentage of the members are older than 55, younger than 18, disabled or chronically ill are eligible), and a social pension approach (All members in the community over the age of 54 years were eligible to receive transfers). Simple random sampling was used to select the treatment and control households. The procedure for selecting treatment households was repeated exactly in the same way as the selection of control households. This selection procedure when it is joined with the random allocation of treatment guarantees comparability between treated households and control households. The selection procedure is known as perfect mimicry (Merttens et al., 2013).

3.2. Sample size

This study compared the treatment and control households to estimate the effects of cash transfers. A household is “treated” if it received a cash transfer. Control households did not receive cash transfers. The control households are used as a counterfactual in the study. At the beginning of the hunger safety net program, a total of 5108 households were selected. In the midline and endline surveys, a decision by hunger safety net program stakeholders to reduce the sample size was made (Merttens et al., 2013). The final sample size for the endline survey round is 2436 households among which 1,224 are in the treated group and 1,212 control group households. This study focused on 1,224 treatment group households and 1,212 control group households for which there are observations at both baseline and endline.

3.3. Data

The HSNP panel data was obtained from the World Bank data catalogue (World Bank, 2020). The data was available in four waves and covered responses from the community and household levels. The first wave captured baseline data collected in 2009. The second and third covered midline and endline surveys conducted in 2010 and 2012, respectively. The fourth, for data collected in 2016 was not used in this study because there was no proper household-to-household link with the other three waves. The HSNP provides detailed information on household demographics, household income, and household expenditure (food expenditure and non-food expenditure). For this study food items were
aggregated into seven different food groups to avoid zero expenditures. The food expenditure aggregates include purchased and non-purchased foods (food from own production and gifted foods). It is not the purchase of these items that is considered as the source of expenditure for this category, but an estimated monetary value measuring the benefit that the household received from using the relevant food item. Food expenditure and total household expenditure values were in the logarithmic form to minimize the possible outliers present.

### 3.4. Empirical approach

This paper seeks to determine cash transfer effects on household food expenditure and food expenditure patterns. The study used difference-in-difference estimator to determine the effects of cash transfers on household food expenditure. The difference-in-difference relies on the comparison of beneficiaries and non-beneficiaries before and after the program (Khandker et al., 2009). The difference-in-difference at least takes care of any unobserved characteristics that are constant across time between the treatment and the control groups (Gertler et al., 2016). In determining the effects of cash transfers on household food expenditure, this paper estimated equation (3.1).

\[
f dexp_t = \beta_0 + \beta_1 X_i + \beta_2 treat_t + \beta_3 time_i + \beta_4 (time_t \times treat_t) + \beta_5 cnty + u_t
\]  

(3.1)

In this case, \( f dexp_t \) represents total food expenditure for household \( i \) at time \( t \), \( treat_t \) represents the treatment status of household \( i \) at the endline, \( time_t \) represents the time dummy, and \( cnty \) represents a vector of county dummies. The \( cnty \) (county-specific effects) eliminates time variant systematic differences across counties. \( u_t \) is the error term. As for the coefficients, \( \beta_0 \) is a constant, \( \beta_1 \) is the coefficient of household characteristics, \( \beta_2 \) captures the time-variant differences between the treatment and control, \( \beta_3 \) captures the time effect, \( \beta_4 \) the coefficient of interest shows the effect of cash transfers on food expenditure.

This study seeks further to establish household food expenditure patterns of different food groups. To achieve this, the study employed the Quadratic Almost Ideal Demand System (QUAIDS) of Banks et al. (1997). QUAIDS is an extension of the Almost Ideal Model (AIDS) by Deaton and Muellbauer (1980) with a quadratic logarithm of expenditure. QUAIDS model can approximate non-linear Engel curves in empirical analysis. QUAIDS model is based on indirect utility as shown in equation (3.2).

\[
lnV(p, m) = \left[ \left( \frac{lnm - ln(p)}{b(p)} \right)^{-1} + \lambda(p) \right]^{-1}
\]  

(3.2)

Where \( ln(p) \) is given by

\[
ln(p) = a_0 + \sum_{i=1}^{k} a_1 \ln p_i + \frac{1}{2} \sum_{i=1}^{k} \sum_{j=1}^{k} \gamma_{ij} \ln p_i \ln p_j
\]  

(3.3)

Where \( p_i \) is the price of food group \( i = 1 \ldots k \), \( b(p) \) and \( \lambda(p) \) are defined as follows

\[
b(p) = \prod_{i=1}^{k} p_i^{\lambda_i}
\]  

(3.4)

\[
\lambda(p) = \sum_{i=1}^{k} \lambda_i \ln p_i, \text{ where}
\]  

(3.5)

By applying Roy’s identity to the indirect utility function, the QUAIDS is given by

\[
w_i = a_1 + \sum_{i=1}^{k} \gamma_{ij} \ln p_j + \beta_1 \ln \left( \frac{m}{a(p)} \right) + \frac{\lambda}{b(p)} \left( \ln \left( \frac{m}{a(p)} \right) \right)^2
\]  

(3.6)

\( i = 1 \ldots k \)
where $\alpha$, $\gamma$, $\beta$, $\lambda$ are parameters to be estimated, when $\lambda$ equals zero then the equation becomes the AIDS model. $w_i$ is the food share given by $w_i = \frac{p_i}{m}$ where $p_i$ is the price of food group $i$ and $q_i$ quantity of food group $i$ and $m$ is the total food expenditure. Adding household demographics to equation (3.6) QUAIDS model becomes

$$w_i = \alpha_i + \sum_{j=1}^{s} \gamma_{ij} \ln p_j + \beta_i \ln \left( \frac{m}{\ln (\alpha(p))} \right) + \frac{\lambda}{\beta(p)} \left( \ln \left( \frac{m}{\alpha(p)} \right) \right)^2 + \sum_{k=1}^{t} \delta_{ik} D_{ik} + e_i$$

where the household demographics are represented by $D$. $s$ represents food groups and $t$ is the year of the survey. QUAIDS model is consistent with demand theory (Banks et al., 1997). It satisfies demand function properties of adding up, homogeneity, and Slutsky symmetry Deaton and Muellbauer (1980) as follows:

$$\sum_{i} \alpha_i = 1; \; \sum_{i} \beta_i = 0; \; \sum_{i} \lambda_i = 0; \; \sum_{i} \gamma_{ij} = 0; \; \text{and} \; \gamma_{ij} = \gamma_{ji}$$

The QUAIDS post-estimation commands allow the computation of expenditure elasticities, Marshallian(uncompensated) and Hicksian (compensated) elasticities. The expenditure and price elasticity can be derived from differentiating equation (3.6) with respect to $lnm$ and $lnp_j$ as shown by equations (3.8) and (3.9).

$$\mu_i = \frac{\partial w_i}{\partial (\ln m)} = \beta_i + \frac{2\lambda_i}{\beta(p)} \left( \ln \left( \frac{m}{\alpha(p)} \right) \right)$$

$$\mu_j = \frac{\partial w_i}{\partial (\ln p_i)} = \gamma_{ij} - \mu_i \left( \alpha_i + \sum_{k} \gamma_{ik} \ln p_k \right) - \frac{\lambda_i \beta_i}{\beta(p)} \left( \ln \left( \frac{m}{\alpha(p)} \right) \right)^2$$

Using first expression (3.8), expenditure elasticity is estimated by equation (3.10)

$$e_i = 1 + \frac{\mu_i}{w_i}$$

Further, the Marshallian elasticity is estimated by equation (3.11)

$$e_j^m = \frac{\mu_j}{w_i} - \delta_{ij}$$

The Hicksian elasticity is obtained from the Slutsky equation as shown by equation (3.12)

$$e_j^h = e_j^m + e_i w_i$$

4. Results and discussion

4.1. Descriptive statistics

The arid and semi-arid counties experience drought and climate variability which affect household livelihoods negatively hence leading to households depending on food assistance. The results in Table 1 indicate that majority of the households received food aid, but only 4.52% participated in cash-for-work programs, an indicator of food aid dependency. The major source of livelihood in the arid and semi-arid counties is pastoralism, out of the sampled households 79.02% owned livestock. In pastoral areas land ownership in most cases is communal, from the results we find that only 13.55% owned land, these can be the few agro-pastoralist. On average 95.76% of the household heads had gone up to the primary level, 2.73% had gone up to the secondary level while 1.27% had gone to the tertiary level, and only 0.24% had gone up to the madrassa level. The low levels of education are attributed to marginalization, poverty, and lack of exposure to the importance of education. Only 6.98% of the sampled household the house head
Table 1. Demographic characteristics of the household head

| Variable                                      | Percentage  |
|-----------------------------------------------|-------------|
| Percentage of the male-headed household       | 69.91       |
| Percentage of households that received food aid | 81.12       |
| Percentage of households that participated in cash for work | 4.52       |
| Percentage of households that owned Livestock  | 79.02       |
| Percentage of households that owned Land      | 13.55       |
| Percentage of household heads with primary education | 95.76   |
| Percentage of household heads with secondary education | 2.73       |
| Percentage of household heads with tertiary education | 1.27       |
| Percentage of household heads with madrassa education | 0.24       |
| Percentage of household heads with Disability  | 6.98        |
| Mean household head age                       | 54.51       |
| Mean household size                           | 5.92        |

had a disability. The results indicate that the average household size in the four counties was about 5.9, which is a bit higher compared to Kenya’s average household size which is 3.9 (KNBS, 2019). The large household size can be attributed to high poverty levels for the poor tend to have many children. The average age of the household head was 54.51 years and 69.91% were male-headed.

Results in Table 2 indicate that a large share of the household budget was allocated to food in both control and treated households. On average 79% of the budget was spent on food in the treated households and about 81% in the control households in the baseline. For the food groups, drinks, vegetables and fruits had the lowest mean budget share which indicates that among the households they are least consumed. A large share of the budget was spent on cereals followed by sugar/salt/spices/oils &fats, milk, pulses, and meat for the treated households. The households receiving cash transfers are poor and vulnerable hence they allocate a larger share of their income to staples. The trend is relatively the same for the control households. On average 33% of the budget was spent on cereals for the treated households in the baseline and the endline. For the control households, about 35% of the budget was spent on cereal in the baseline which decreased to 34% in the endline. Households get their proteins mainly from milk and meat which represent 17% and 8% respectively for the treatment households in the baseline and endline. The same trend is seen in the control households where the major source of protein is milk and meat, 18% and 6% of the budget was spent in the endline survey on milk and meat respectively. Sugar, salt, spices, oils, and fats represent a significant share of the budget, where the treated and control households allocate 27% and 29%, respectively to sugar, salt, spices, oils, and fats. These food items are key to households since they cannot avoid buying them. The t-test p-values are for differences between treatment and control in the baseline. Table 2 shows that the p-values are significant for all other food groups except drinks, pulses, and milk. This implies that randomization across treatment and control to ensure that they were indeed comparable was not successful for food expenditure. The significant differences could be a result of exogenous time-varying community-level factors which could have affected treatment and control. These include the supply of food aid and other aid programs including emergency support; road access; severity of the drought; and supply of education and health facilities.
| Expenditure category | Treatment Baseline | Treatment Endline | Control Baseline | Control Endline | P-values |
|----------------------|--------------------|-------------------|------------------|-----------------|----------|
| Food expenditure     | 7293.725           | 7293.509          | 6812.951         | 6791.814        | 0.0011   |
| Food share (%)       | 78.67              | 78.58             | 80.66            | 80.9            | 0.0007   |
| Budget shares        |                    |                   |                  |                 |          |
| Cereals share        | 0.3331             | 0.3332            | 0.3486           | 0.3443          | 0.0041   |
| Pulses share         | 0.0993             | 0.1006            | 0.0956           | 0.1005          | 0.3100   |
| Milk share           | 0.1711             | 0.1799            | 0.1775           | 0.1751          | 0.0944   |
| Meats share          | 0.0763             | 0.0798            | 0.0534           | 0.0565          | 0.0000   |
| Drinks share         | 0.0779             | 0.0779            | 0.0275           | 0.0275          | 0.5213   |
| Vegetables, fruits   | 0.0772             | 0.0799            | 0.0200           | 0.0200          | 0.0009   |
| Sugar, salt, spices, | 0.0772             | 0.0772            | 0.2739           | 0.2739          | 0.2882   |
| & oils               | 0.2712             | 0.2712            | 0.0092           | 0.0092          | 0.0001   |

Table 2: Mean monthly expenditures.
4.2. Impact of cash transfers on food expenditure
The difference-in-difference model results in Table 3 indicate that cash transfers have a positive impact on household food expenditure. The results show that HSNP receipt increased food expenditures by 4.68% on average, consistent with Bastagli et al. (2016); Habimana et al. (2021); The Kenya CT-OVC Evaluation Team (2012) results. From Table 3 household size had a positive significant relationship with food expenditure, as household size increases food expenditure increases. Large households spend more on food than small households. These results are consistent with those of Sekhampu (2012). Households with higher education levels are associated with high food spending since education provides households with helpful knowledge about efficiency in food spending (Meng et al., 2013; Sekhampu, 2012). Location plays a key role in influencing food expenditures (Melo et al., 2015). Households living in Mandera and Wajir had high food spending compared to households in Turkana. The results also indicate that female-headed households had less spending on food.

4.3. Demographic effects on food expenditure patterns (QUAIDS Model)
Household demographics were introduced in the QUAIDS model to capture the effect of non-economic variables on household food expenditure. The variables are household size, education level, household head age, employment status of household head, and gender of the household head. The results for demographic effects are reported in Table 4. The results indicate that the gender of the household head has significant effects on expenditure patterns. Male-headed households have positive significant effects on milk, meat, salt, sugar, oils and fats, and drinks but negative significant effects on pulses, cereals, vegetables and fruits. This indicates males tend to spend on food items they prefer. Household head age had significant effects on all food groups except cereals, vegetables and fruits. As age increases consumption of milk, drinks, and salt, sugar oils, and fats increases. Household engagement in employment has a positive impact on the consumption of pulses and milk but negative significant effects on vegetables and fruits. Household size was significant with positive effects on all food groups except cereals, drinks salt, sugar oils, and fats. This implies that as household size increases consumption of milk, meat, pulses, vegetables, and fruits increases. The results indicate as household size increases consumption of cereals declines, which is contrary to the expectation. Education level shows a positive effect on cereals and pulses and negative significant effects on vegetables and fruits.

4.4. Food expenditure patterns of the beneficiaries and non-beneficiaries
The expenditure elasticities of all food groups are positive as shown in Table 5, an implication that an increase in income will increase consumption, hence normal goods. The expenditure elasticities were computed from the endline survey data. From Table 5 cereals, pulses, milk, sugar/salt/oils and fats were found to be necessities while meat and vegetables and fruits were found to be luxuries. This is consistent with (Musyoka, 2013) where meat, vegetables, and fruits were found to be luxuries. The results in Table 5 indicate that meat has the highest elasticity followed by vegetables and fruits. This finding indicates that an increase in income shifts demand from the consumption of cereals, and pulses to more meat, vegetables, and fruits. For meat in the pooled sample, it implies that a 10% increase in income will lead to a 13.3% increase in total meat demand. Cereals and pulses are necessities for the entire sample, implying a 10% increase in income will increase demand by 9.7%. The results indicate that expenditure elasticities differ across the treatment and control households. The expenditure elasticities for both control and treatment households are inelastic for all other food items apart from meat vegetables and fruits. Both the control and treatment households are expenditure elastic for meat and vegetables and fruits. The control households are more elastic for vegetables and fruits and meat. The expenditure elasticities for the control households were higher than those of treatment households for milk, meat and vegetables and fruits.

The Marshallian(uncompensated) and Hicksian (compensated) elasticities are reported in Table 6. The elasticities were estimated using the endline survey data. The results indicate that the Marshallian elasticities (own-price elasticities) are negative, consistent with demand theory.
Table 3. Difference in difference impact estimates on food expenditure

|                          | Log food expenditure | t-statistics |
|--------------------------|----------------------|--------------|
| Treat*Time               | 0.0468**             | (2.92)       |
| Treatment                | −0.0283              | (−1.25)      |
| Time                     | 0.0129               | (0.81)       |
| Age of the household head| 0.0009               | (1.65)       |
| Household size           | 0.0980***            | (36.76)      |
| Gender of the household head | −0.0698***         | (−5.25)      |
| Dependency ratio         | −0.000314            | (−1.63)      |
| Food aid received        | 0.0408**             | (2.60)       |
| Cash for work            | −0.0208              | (−0.75)      |
| Education level          |                      |              |
| Secondary                | 0.437***             | (9.88)       |
| Tertiary                 | 0.609***             | (9.67)       |
| Primary                  | 0.328***             | (26.79)      |
| County                   |                      |              |
| Turkana                  | −0.0426**            | (−2.59)      |
| Marsabit                 | 0                    |              |
| Mandera                  | 0.230***             | (13.97)      |
| Wajir                    | 0.249***             | (14.68)      |
| Household employed       | 0.153***             | (7.44)       |
| _cons                    | 7.834***             | (115.19)     |
| R-squared                | 0.4238               |              |
| N                        | 4872                 |              |

T statistics in parentheses
*p < 0.05, ** p < 0.01, *** p < 0.001

Table 4. Demographic effects on food items

| Expenditure share category | Household size | Gender | Age | Employment status |Education level |
|----------------------------|----------------|--------|-----|-------------------|----------------|
| Cereals                    | −0.0010***     | −0.0062*** | −0.00002** | 0.00003 (0.984) | 0.0027** (0.052) |
| Pulses                     | 0.0002** (0.039) | −0.0029*** | −0.00003** | 0.0026** (0.001) | 0.0018* (0.055) |
| Milk                       | 0.0003* (0.064) | 0.0056*** | 0.00005** | 0.0021* (0.068) | −0.0001 (0.948) |
| Meat                       | 0.0009*** (0.000) | 0.0022** (0.045) | −0.0001** (0.000) | −0.0011 (0.551) | 0.0003 (0.866) |
| Vegetables and fruits      | 0.0001* (0.061) | −0.0004*** (0.053) | 0.00005 (0.350) | −0.0032*** (0.000) | −0.0027** (0.000) |
| Suga/salt/oils and fats    | −0.0004*** (0.005) | 0.0014* (0.086) | 0.00008*** (0.000) | −0.0006 (0.667) | −0.0019 (0.129) |
| Drinks                     | 0.00001 (0.797) | 0.0003* (0.075) | 0.00001*** (0.001) | 0.0003 (0.321) | −0.0001 (0.729) |

*** p < 0.01, ** p < 0.05, * p < 0.1
p—values are in parentheses
For the own-price elasticities, all the food groups were price inelastic ranging between −0.9927 to −0.9261 except for meat, vegetables and fruits which were found to be price elastic. The own-price elasticities for meat, vegetables and fruits were −1.2934 and −1.221 respectively, an indication that a 10% increase in the price of these food items will lead to around a 12% decrease in meat and vegetables and fruits in absolute terms. The magnitude of price elasticities across the treatment and control households does not differ significantly. The two groups are price elastic for meat, vegetables and fruits. The price elasticities for cereals, milk, and pulses are slightly below the unity elasticity for both the control and treatment households. The Marshallian cross-price elasticities are reported in Table 7, compared to own price they are much lower indicating that households are responsive to their prices. Positive cross-price elasticity implies that the food groups are substitutes while the negative indicates that the food items are complements. The Marshallian cross-price elasticities indicate most food groups are substitutes and others complement, for instance, milk and cereals are substitutes while milk and meat are complements. The Marshallian cross-price elasticities are less than unity hence the price is inelastic.

| Table 5. Expenditure elasticities of food items |
|-----------------------------------------------|
| Expenditure share category | Pooled sample | Treatment households | Control Households |
| Cereals | 0.9721 | 0.9729 | 0.9713 |
| Pulses | 0.9740 | 0.9783 | 0.9696 |
| Milk | 0.9729 | 0.9649 | 0.9810 |
| Meat | 1.3316 | 1.2726 | 1.4121 |
| Vegetables and fruits | 1.2363 | 1.1825 | 1.3335 |
| Suga/salt/oils and fats | 0.8580 | 0.8593 | 0.8566 |
| Drinks | 0.7065 | 0.7123 | 0.7005 |

| Table 6. Marshallian and Hicksian own price elasticities across treatment and control households |
|-----------------------------------------------|
| Expenditure share category | Pooled sample | Treatment households | Control Households |
| Marshallian own elasticities |
| Cereals | −0.9927 | −0.9929 | −0.9926 |
| Pulses | −0.9757 | −0.9762 | −0.9751 |
| Milk | −0.9912 | −0.9899 | −0.9924 |
| Meat | −1.221 | −1.1852 | −1.2725 |
| Vegetables and fruits | −1.2934 | −1.2110 | −1.4787 |
| Suga/salt/oils and fats | −0.9541 | −0.9530 | −0.9552 |
| Drinks | −0.9261 | −0.9267 | −0.9256 |
| Hicksian elasticities |
| Cereals | −0.6616 | −0.6684 | −0.6548 |
| Pulses | −0.8797 | −0.8787 | −0.8806 |
| Milk | −0.8201 | −0.8240 | −0.8162 |
| Meat | −1.1097 | −1.0633 | −1.1710 |
| Vegetables and fruits | −1.2719 | −1.1839 | −1.4633 |
| Suga/salt/oils and fats | −0.7064 | −0.7122 | −0.7007 |
| Drinks | −0.9047 | −0.9048 | −0.9046 |
| Expenditure share category | Cereals  | Pulses  | Milk    | Meat    | Vegetables & fruits | Suga/salt/oils & fats | Drinks   |
|----------------------------|----------|---------|---------|---------|---------------------|-----------------------|----------|
| Cereals                    | -0.9927  | -0.0038 | 0.0082  | 0.0310  | -0.0002             | -0.0156              | -0.0024  |
|                           | (−0.6616) | (0.0924)| (0.1770)| (0.0959)| (0.0144)            | (0.2577)             | (0.0242) |
| Pulses                    | -0.0124  | -0.9757 | 0.0269  | -0.0307 | 0.0046              | 0.0134               | 0.0001   |
|                           | (0.3181) | (−0.8797)| (0.1956)| (0.0341)| (0.0192)            | (0.2862)             | (0.0266) |
| Milk                      | 0.0115   | 0.0139  | -0.9912 | -0.0167 | 0.0065              | -0.0083              | -0.0039  |
|                           | (0.3469) | (0.1112)| (−0.8201)| (0.0491)| (0.0234)            | (0.2685)             | (0.0231) |
| Meat                      | -0.0778  | -0.1139 | -0.1646 | -1.2210 | 0.0003              | -0.0942              | -0.0008  |
|                           | (0.4897) | (0.0508)| (0.1248)| (−1.1097)| (0.0254)            | (0.3741)             | (0.0449) |
| Vegetables & fruits       | -0.1559  | -0.0137 | -0.0023 | 0.0095  | -1.2934             | -0.0362              | 0.0641   |
|                           | (0.3287) | (0.1270)| (0.2449)| (0.1045)| (−1.2719)           | (0.3637)             | (0.1031) |
| Suga/salt/oils & fats     | 0.0119   | 0.0134  | 0.0133  | 0.0301  | 0.0059              | -0.9541              | -0.0051  |
|                           | (0.3121) | (0.1006)| (0.1664)| (0.0890)| (0.0192)            | (−0.7064)            | (0.0192) |
| Drinks                    | 0.0347   | 0.0187  | 0.0117  | 0.0562  | 0.0442              | -0.0233              | -0.9261  |
|                           | (0.3007) | (0.0960)| (0.1474)| (0.1084)| (0.0560)            | (0.1963)             | (~0.9047)|

Hicksian elasticities are shown in parentheses
Table 8. Estimates of cash transfer program on food expenditure elasticities

|                | Cereals | Pulses | Milk   | Meat   | Salt/sugar/oils & fats | Veg&fruits | Drinks |
|----------------|---------|--------|--------|--------|------------------------|------------|--------|
| Time           | −0.002* | −0.003 | −0.001 | 0.134  | −0.009*                | 0.027      | 0.012  |
| Treat          | 0.005***| 0.012***| −0.071***| −0.06  | 0.015*                 | −0.092***  | 0.048***|
| (Treat*time)   | 0.004   | 0.001  | 0.019* | −0.113 | 0.015                  | 0.001      | −0.003 |
| R-squared      | 0.108   | 0.271  | 0.164  | 0.015  | 0.067                  | 0.109      | 0.077  |
| F-statistic    | 48.620  | 117.770| 67.817 | 1.886  | 28.783                 | 11.708     | 31.446 |

*** p < 0.01, ** p < 0.05, * p < 0.10
Control variables include household head age, household head education level, county dummies, household size, gender of the household head, employment status of household head, and log of total expenditure

The Hicksian (compensated) price elasticities reported in Table 6 are negative conforming to demand theory. All the food items were less than unity hence price inelastic except meat and vegetables and fruits which were greater than unity hence price elastic. This implies that increase in price for the price inelastic food items households have no alternative but to continue purchasing them. The Hicksian own-price elasticities for cereals pulses milk drinks sugar/salt/oils and fats range between −0.9047 to −0.6616 while own-price elasticities for meat and vegetables/fruits lie between −1.2719 to −1.1097 for the entire sample. The trend is relatively similar in the control and treatment households with the magnitudes in elasticities slightly varying. The compensated own price elasticities for meat, vegetables and fruits in the control households lie between (−1.4633 to −1.1710) and (−1.1839 to −1.0633) in the treatment households. The price inelastic cereals, pulses, milk, drinks, sugar, salt, oils, and fats range between −0.9048 to −0.6684 for the treatment households and −0.9046 to −0.6548 for the control households. The Hicksian cross-price elasticities provide a better measure of substitution effects between two food items because they measure substitution effects leaving income effects. From Table 7 most of the Hicksian cross-price elasticities are positive, indicating that the food groups are substitutes.

4.5. Impact of cash transfers on food expenditure patterns

To determine HSNP’s effect on food expenditure patterns, the paper computed four sets of expenditure elasticities calculated at the mean shares for each of the four groups (treatment at baseline, treatment at follow-up, controls at baseline, and controls at follow-up) and difference-in-difference was applied to establish the program impacts. Equation 3.1 was used, for this case, our estimates on elasticity for each food group were used as our dependent variable. The results in Table 8 indicate that the program had a statistically significant impact on elasticities at the p < 0.10 level for milk only. The effect is positive indicating increasing elasticities. The positive impact on the expenditure elasticity for milk while only significant at the p < 0.10 level, suggests that this elasticity increased between baseline and endline as a result of the program. Therefore, an increase in income will lead to an increase in spending on milk. While not statistically significant, coefficient signs for cereals, pulses drinks, salt, sugar oils and fats, and vegetables and fruits were all in the expected directions, while that of meat was not.

5. Conclusion

This paper aimed to determine the effect of cash transfers on household food expenditure patterns. This paper evaluated the hunger safety net program which aimed at addressing poverty, food insecurity, and vulnerable livelihoods in areas affected by droughts. The provision of cash transfers to poor and vulnerable households enables households to access food and other basic needs. The paper used a difference-in-difference estimator to determine the effects of cash transfers on food expenditure and food expenditure patterns. The results indicated that cash transfers had a positive effect on food expenditure. Determining how cash transfers influence...
food expenditure patterns is important to food and nutrition security policy, cash transfer programming, and arid and semi-arid counties development. The results indicated that the HSNP had a positive significant impact on the spending on milk. The majority of the households were found to spend a larger share of their income on food. Households spend a larger share of their income on cereals. This study calculated expenditure elasticities, and Marshallian and Hicksian price elasticities of different food groups across the beneficiary and non-beneficiary households to understand the food spending patterns. The results indicated similarities among the beneficiary households and non-beneficiary households. The price elasticity of all food items was inelastic except for meat, vegetables, and fruits in both control and treatment households though the magnitudes slightly varied. The results indicated that households were sensitive to price and income changes. Cash transfer policies should consider the implication of price and income on food and nutrition security. The price elasticities are larger than the expenditure elasticities except for meat, vegetables, and fruits. This indicates that price-oriented policies will work better for households than income-oriented prices. The findings indicate that households diversified their diet to some high-value foods. The diet was not only based on starch but also on some proteins. For cash transfers to be effective, donors and policymakers should consider food prices, general inflation as well as local economies.

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Author details
Michael Joseph Matata1
E-mail: matatajoseph90@gmail.com
Margaret W. Ngigi1
Philipp Musyoka Michael1
1 Masters Student Department Of Agricultural Economics And Agribusiness Management, Egerton University, Nakuru, Kenya.

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