In Kind Transfers, Household Spending Behaviour and Consumption Responses in HIV-affected Households: Evidence from Zambia

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Abstract

In this paper we evaluate the effects of a food aid program in households with a patient receiving HIV/AIDS treatment. Using data from a food transfer program in Zambia, we employ propensity score matching, non-parametric analysis and instrumental variables (with double difference) methods to estimate the effects of food aid rations on household spending and food consumption. We find that food transfers have a significant positive effect on total expenditures, food consumption expenditures and actual food intake. This demonstrates that integrating HIV/AIDS treatment with food transfers leads to greater welfare gain compared to HIV/AIDS treatment alone. Our findings depart somewhat from theoretical predictions on inframarginal in-kind transfers but are consistent with empirical literature on inframarginal food stamps. We also find that program participants have a larger marginal propensity to consume food out of food transfers compared to the marginal propensity to consume food out of cash income. Our findings are consistent with empirical literature on intrahousehold decision making regarding social transfers, as female-headed households in our study spend more on food compared to male headed households.

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1. Introduction

HIV/AIDS is a major contributor to prime age adult morbidity and mortality in sub-Saharan Africa. Consequently, HIV/AIDS is an economic shock that leads to loss of income and labour supply by prime-age adults in an affected household. Consequently an affected household experiences, consumption insecurity which can have lasting effects on household welfare (Linnemayr 2010, Cogneau and Grimm 2008, Booysen, 2003). In recent years HIV/AIDS treatment has become the integral component of HIV/AIDS interventions. However there has been a movement towards integrating treatment with social assistance such as food aid to broaden mitigation efforts beyond physical health of the infected individual to include household food security and household welfare (Tirivayi and Groot 2009, Byron et al 2006, Slater 2004). In this context, food aid rations given to affected households may insure households from detrimental economic effects of HIV/AIDS and may act as a safety net with short and long term positive effects on household welfare. Food aid rations may also contribute to better health outcomes such as improving the efficacy of HIV/AIDS treatment (Tirivayi et al 2010, Cantrell et al 2008).

The literature attests to the positive impact of HIV/AIDS treatment such as significant health improvement for infected patient and broader welfare gains like improved household labour supply and children's school attendance (Zivin et al 2009, Thirumurthy et al 2008, Koenig et al 2004, Morgan et al 2002). Chhagan et al (2008) finds that there was an increase in mean personal and household income after HIV treatment was initiated with mean personal income rising 53% over baseline income. To our knowledge, no studies assessing the welfare effects of food aid have focused on HIV affected households with a patient(s) receiving treatment. There is also little research that has estimated the marginal propensity to consume food out of food aid rations especially in a developing country. This paper is unique in that it offers new insights into consumption and spending patterns in HIV affected households benefiting from the integration of HIV/AIDS treatment with food aid. The paper also estimates the marginal propensity to consume food out of the food transfers for the recipients of food transfers.

Our research focuses on an integrated food aid and HIV/AIDS treatment program in Lusaka, Zambia. Over 100 000 individuals in Zambia access HIV/AIDS treatment through a public-sector HIV care and treatment programme. The government has partnered with the UN World Food Programme (WFP), which provides nutritional support for food-insecure patients and their households. The WFP food aid ration program supports over 10,000 food-insecure HIV/AIDS patients receiving anti-retroviral therapy (ART) and their households, in the country. The food aid rations are targeted to poor households, with high age dependency ratios and vulnerable to food insecurity (through unemployment or owning few productive assets or having no regular source of income). Participants are recruited through the use of a screening questionnaire which captures information on household income, household demographics, food consumption, employment status and asset wealth. Intended outcomes of the program include improved health and food consumption. The food aid rations comprise of staple and fortified blended food (25kg Maize Grain, 4.5kg Pulses, 6kg HEPS, 1.8Kg oil). Primary distribution sites for the program are government/public sector clinics where patients receive their treatment (Anti-retroviral therapy or ART).

We are particularly interested in the effect of the food aid rations and in determining whether there is an additional welfare gain from providing food transfers together with another welfare improving intervention like HIV/AIDS treatment (ART). Since all households in the study have a patient receiving treatment, to measure the effects of the food aid ration, we compare households receiving food aid rations with households not receiving food aid rations. We are also interested in estimating the marginal propensity to consume food out of food transfers for the program participants. We shall use these terms “participants” and “non-participants” to describe the treated and comparison households respectively. We also use the terms food transfers and program interchangeably. Participants began receiving food transfers during the month of February 2009. We measure the program’s effects on household consumption expenditures and food intake. We use data collected in august 2009 during a follow up survey to measure the effect of the food aid on consumption. The survey also captured pre-program data on household consumption, wealth and employment, retrospectively. Our study takes place after 6 months of the ongoing monthly food aid program. The data set covers 400 households with an identified patient on HIV treatment, randomly sampled from 8 localities in the peri-urban vicinity of Lusaka, the capital of Zambia. The data includes retrospective pre-program data on consumption obtained through recall questions asked in the questionnaire. We acknowledge the limitations of such retrospective data especially the greater prospects of higher recall bias since the recall period was 6 months. We therefore interepret all panel estimates cautiously.

Quasi experimental methods are used to estimate the average treatment effect of the food transfers. We employ propensity score matching to determine the average treatment effect of food aid on food consumption expenditure, total household expenditure and food intake. Propensity score matching is a reliable method to use in impact evaluation as it provides reliable estimates of average program impact (Heckman et al 1997, 1998). We also use OLS and IV regression methods to estimate the average impact of food aid on the food consumption expenditure and determine the marginal propensity to consume food from food transfers. Single difference estimators for cross sectional data and double difference estimators for panel data are used in propensity score matching and parametric estimation .

We find a positive significant effect of participation in the food transfers on per capita food consumption expenditures and total expenditures, 6 months after the food transfers program began. We also find a significant average impact of food transfers on food intake and diversity. We find that the marginal propensity to consume food out of food transfers is larger than the marginal propensity to consume food out of cash income, despite the food transfers in being inframarginal. An explanation for this could be that the program participants are constrained by the in-kind nature of the food transfers. To analyze whether the gender of household decision makers was important, we split the sample into households headed by females only and households headed by males only. We find that the program had larger effects in female headed households compared to male headed households, consistent with empirical literature which shows that women tend to spend more on food. Possible explanations are that women attach importance to nutrition or that female headed households are poorer than male headed households. Additionally, the marginal propensity to consume food out food transfers for economically disadvantaged or poorer households is larger than the marginal propensity to consume food out of cash income, suggesting that most vulnerable or poorer households behave as Engel's law predicts .

The paper is organized as follows. In the next section, we briefly explain our theoretical foundations. The following section discusses the estimation strategy for measuring the effects of the food transfers. Section IV describes the data. Section V presents the estimation results and section VI concludes the paper by discussing the implications of the estimation results and the limitations of the paper.

2. Theoretical Framework

Traditional neo-classical theories have influenced the study of food transfers and their effects on household consumption. Engel's law states that a poor household, would devote a higher proportion of its total expenditure to the acquisition of food. Southworth's traditional neo-classical economic theory on consumer choice regarding a food stamp transfer has been the major theoretical foundation for most studies seeking to compare the marginal effects of food transfers compared to cash income (Fraker 1990). This paper tests Southwork's theoretical predictions using empirical evidence. According to the theory, there are two types of transfers depending on their size. If an in-kind transfer program is "extramarginal" i.e. it is greater than the amount the household would have consumed without the transfer, then the transfer would cause both an income effect and a substitution effect that makes the good cheaper hence will increase the consumption of that food (Alderman, 2002; Ahmed, 1993). The substitution effect would only occur where there is no resale of the transfer (Sharma, 2006; Ahmed and Shams, 1994). If an in-kind transfer is 'inframarginal" i.e. it is less than the amount the receiving household would have consumed without the transfer, the in-kind transfer would have an income effect on expenditures, the same as a similar sized cash transfer or cash income (Castanella 2000). The majority of the literature which focuses on food stamps finds that the marginal propensity to consume food out of food stamps is two to ten times higher than out of cash income and surprisingly even for inframarginal transfers (Fraker 1990). However Hoynes and Schanzenbach (2009)'s study findings on inframarginal food stamps are consistent with Southwork's theory.

In the case of food aid rations, there are fewer studies that confirm a similar effect on food expenditures effect like food stamps. In a study of various in kind transfer programs in Bangladesh Del Ninno and Dorosh (2002) find that the marginal propensity to consume wheat out of a wheat transfer is significantly higher than from cash income. Their study focused on a commodity specific transfer and not the multi-commodity take home food aid rations distributed in many African countries. Gilligan and Hoddinott (2007) find that food aid has a positive effect on food consumption expenditures and total household expenditures at the end of a food aid program in Ethiopia. However they did not determine if the marginal propensity to consume food from food aid was greater or less than that of cash income. Our paper intends to fill this gap.

The paper is also influenced by modern household economic theory which highlights the importance of intrahousehold decision making in household spending behaviour, particularly the gender of who controls or makes decisions on using the transfer. There is substantial empirical evidence that women tend to spend more on food and child welfare compared to men, and that female-headed households have a greater marginal propensity to consume food than male-headed households (Attanasio and Mesnard 2006, Ezemenari et al 2003, Lundberg et al 1997, Katona-Apte, 1986; Holmboe-Ottesen and Wandel, 1991; Rogers, 1995). Another factor to take into consideration is that our data were collected after 6 months of a food aid program that was expected to continue for another 6 months[1]. Consequently, following the permanent income hypothesis food transfer recipients could be making spending decisions based on a rational assessment of anticipated future income which would include the food transfer (Friedman 1957). In addition to analysing spending levels, it is important to determine if actual food consumption is affected by the food transfer since studies have shown that food

[1] Data were collected in August 2009. The food aid rations continued for another 6 months and the recipients were transitioned to a food voucher system (similar to food stamps except the recipients must only buy certain commodities at certain amounts)

aid rations increase food security and total calories consumed by a household (Ahmed et al 2009, Sharma 2005, Alderman 2002, Ahmed and Shams 1994, Ahmed 1993).

Our empirical strategy includes analysing the average impacts of the food transfer on household expenditures and food diversity through matching food transfer recipients and eligible non-food transfer recipients. We also analyse food spending levels before and after 6 months of food transfer receipts and compare the marginal propensity to consume food out of a food transfer with that from cash income.

3. Estimation Strategy

3.1. Propensity score matching

We use a probit model that includes determinants of participation in the food aid program to estimate the propensity score. The conditioning variables used in the model to estimate the propensity score are based on our knowledge on how the food transfers program targeting criteria were actually implemented, and on theory and empirical evidence of factors determining participation in the food transfers program (Gilligan and Hoddinott 2007). We use local linear matching with bias corrected confidence intervals following Heckman, Ichimura, and Todd (1997). The matching estimator generally takes the following form (Diaz and Handa 2004):

$$B_m = \frac{1}{n_1} \sum_{i \in I_1 \cap S}^{n_1} \left[Y_{1i} - \sum_{j \in I_0 \cap S} W(i, j) Y_{0j} \right]$$

Where B_m is the matching estimator, n_1 is the total number of participants (treated), Y_{1i} is the outcome for the participants and Y_{0i} is the outcome for the non-participants, I_i and I_0 denote the set of participant group and non-participant group respectively, S represents the region of common support, and the term *W (i, j)* represent a weighting function that varies depending on the matching estimator. The weighting function *W* for the local linear estimator is in the following form:

$$W(i,j) = \frac{G_{ij}\sum_{k\in I_0} G_{ik}(P_k - P_i)^2 - \left[G_{ij}(P_j - P_i)\right]\left[\sum_{k\in I_0} G_{ik}(P_k - P_i)\right]}{\sum_{j\in I_0} G_{ij}\sum_{k\in I_0} G_{ij}(P_k - P_i)^2 - \left(\sum_{k\in I_0} G_{ik}(P_k - P_i)\right)^2}$$

Where G_{ij} is $G_{ij} = G\left(\frac{P_j - P_i}{a_n}\right)$ a kernel function and G_{ik} is $G_{ik} = G\left(\frac{P_k - P_i}{a_n}\right)$ a kernel function, where a_n is the bandwidth and P_k and P_j are estimated propensity scores for non-participant units *k* and *j* and P_i is the estimated propensity score for participant unit *i*. *W (i, j)* measures the weighted averages of all individuals in the non- participant group who match to participant *i* on the propensity score (Guo et al 2006). Local linear matching thus includes an intercept and a linear term in the propensity score of the participant (Caliendo and Kopeinig 2008).

As part of sensitivity analysis, we also present alternative results from local linear matching where 10% of the cases where trimmed and results from using a nearest neighbour matching estimator (1 to 1). We employ propensity score matching on cross sectional data and use difference in difference matching on panel data to remove any potential time invariant sources of bias. We use bootstrapped standard errors for all the matching estimators. The matching estimator is implemented using Leuven and Sianesi's method (Leuven and Sianesi 2003).

3.2 Non-Parametric Analysis

We use kernel-weighted local polynomial smoothing to analyse the food spending of the households by income level. Log per capita monthly food expenditure is the indicator for food spending while we use log per capita total consumption expenditures as a proxy for household income. We fit the data using a local polynomial for the first degree (locally linear) and analyse food spending before and after 6 months on the food aid program. The non-parametric analysis is not corrected for endogenous program take-up. Kernel density functions are also used to estimate the probability density function of food spending before and after 6 months on the food aid program.

3.3 Parametric analysis

We use parametric estimation to determine the effects of food transfers on food spending, results which could be compared to results from propensity score matching. We are also interested in estimating the marginal propensity food out of food transfers and comparing with general cash income. We include food transfer and cash income as covariates in the specifications (Hoynes and Schanzenbach 2007, Fraker 1990). In our specifications expenditure values are logged to normalize values especially in case of skewed distributions and to stabilize variances . Since we have follow up data and retrospective panel data, we use two parametric specifications of the data. The first specification focuses only on the cross sectional data (data from the follow up survey). We use a double log specification:

$$\log W_{ic} = \alpha_0 + \beta_1 \, Foodtransfer_{ic} + \beta_2 \mathbf{log} Income_{ic} + X_{ic}\gamma + \mu_{ic} + \varepsilon_{ic} \qquad (1)$$

Where $\log W_{ic}$ is per capita food expenditure, $Foodtransfer_{ic}$ is a dummy that takes the value of 1 if the household receives food transfers, $\log Income_{ic}$ is log per capita cash income (proxy is log per capita total expenditure), X_{ic} is a vector that summarizes observed household characteristics; female household head, work status, gender, age, education level and marital status, household size, dependency ration, marital status, total number of females, total number of males. ε_{ict} is the unobserved idiosyncratic household error. All the αs, γs and βs are unknown parameters and ic denotes household i in locality c.

A valid concern in our specification is the measurement error in per capita expenditures which could potentially be serious since our data are from a developing country (Kedir and Girma 2007, Gibson 2002, Deaton 1997). Measurement error in expenditures would bias our estimates through regression error correlation or endogeneity. Hence, we instrument log per capita total expenditures with log per capita non-food expenditures (Schady and Rosero 2008). Another concern arises from the fact that the food transfers program was not randomly assigned to “treatment” and “control groups”, therefore we expect participation in the food transfers program to be endogenous. We correct for the potential endogeneity of participating in the food transfers program, by instrumenting food transfers receipt with variables based on the targeted clinics and rationale behind eligibility into the programme (vulnerability to food insecurity). Hence we use clinic HIV sero-prevalence rates and the interaction of locality (sections of the municipality where the households reside) with several variables; proximity to clinic/food distribution point, asset holdings and household age dependency ratio and past receipt of food aid to reflect any inertia effects from food aid targeting[2] (Jayne et. al.2002). We test for the validity of our instruments using the Kleibergen-Paap Wald F statistic (Kleibergen and Paap. 2006) and Hansen's J statistic (Hansen 1982) respectively.

We use retrospective panel data for longitudinal analysis. We employ the difference in difference estimator through fixed effects regressions while correcting for potential endogeneity. The specification is in double differences:

$$\log W_{\mathrm{ict}} = \alpha + \alpha_1 \mathrm{R2} + \beta_1 \, Foodtransfer_{ic} * R2_{\mathrm{t}} + \beta_2 \log Income_{\mathrm{ict}} + X_{\mathrm{ict}}\gamma + \mu_{\mathrm{ict}} + \varepsilon_{\mathrm{ict}} \quad (2)$$

Where $\log W_{ict}$ measures the per capita food expenditure of household i in locality c at time t. *Foodtransfer*R2* is a dummy that takes the value of 1 if the household receives food transfers at the follow up survey R2 , $logincome_{ict}$ represents the changes in the log per capita cash income (proxy is log per capita total expenditure). X_{ict} is a vector that summarizes observed household characteristics; female household head, work status, gender, age, education level and marital status, household size, dependency ration, marital status, total number of females, total number of males. U_{ict} are all household-level and locality level fixed effects i (also implicitly controlling for locality effects). ε_{ict} is the unobserved idiosyncratic household error. The use of retrospective data in this case, is fraught with concerns of recall bias since the reference period was quite high (6 months). We assume that recall bias is random across the sample. We nevertheless proceed with longitudinal analysis, while exercising extreme caution in interpreting the results. Finally in all regressions we calculate robust standard

[2] Jayne et al 2002 show that inertial effects significantly influence food aid targeting i.e. whether a locality or individual receives food aid is dependent on having received it in previous years.

errors. All the αs, γs and βs are unknown parameters and ict denotes household i in locality c at time t.

4. Data and Descriptive Statistics

The main source of data used in this paper is the follow-up survey we carried out in collaboration with World Food Programme on their food transfer program for HIV affected households in Lusaka. The survey was conducted during the month of August in 2009 when the food transfer program had reached 6 months. The data were collected from households residing in the low income per-urban areas of Lusaka, the capital city of Zambia. The survey instrument captured information on household size, composition by gender, level of education completed, marital status, employment status of all members in the household, healthseeking behaviour and illness in the household, identified HIV patient's characteristics (health seeking behaviour, demographics). The survey questionnaire also captured information on household expenditures, income sources, dwelling conditions, productive and durable assets owned, access to social transfers, access to community assistance, perceived wellbeing and health and perceptions on HIV stigma. Aggregate food consumption expenditures were calculated for each household based on food consumed by the households from all sources (outside the home, food transfers and from home production). Other expenditure data were collected for various items; fuel, clothing, health, personal hygiene items, education, social events, transportation, entertainment, rentals and durables. The survey questionnaire included retrospective questions on consumption and wellbeing before the food transfer program began. The consumer price index for Zambia was used to deflate or compute real values of expenditure based on the food basket prices of the pre-program period (Central Statistical Office, Zambia 2010).

The sample comprises 400 households and is divided into two groups, food transfer program participants (199) and non-participants (201). We use descriptive statistics to describe the household socio-economic characteristics and the characteristics of the patients on HIV/AIDS treatment who were central to the recruitment of the households into the program. Descriptive statistics show that both groups of households and the patients live below the poverty line, are asset poor and there is high unemployment amongst the respondents (see table 1). The majority of patients in the households are female; more than 70% among both groups. The average age for the majority of the patients is 40 years. Approximately 42% of the patients among the participants are married compared to 48% among non-participants. Around 48% of the patients in both groups have primary education. While a large majority of the patients in both groups are unemployed, 76% of the patients among participants are unemployed, higher than the 64% among non-participants.

Table1 Characteristics of Sample Households

	Participants (N=199)	**Comparison Group (N=201)**
Patient Characteristics		
Age, mean (se)	41.46 (0.75)	39.78 (0.61)
Female,%	77.39	73.63
Male ,%	22.61	26.37
No education, %	11.44	12.56
Primary education, %	48.74	48.76
Secondary education, %	38.81	31.66
College education, %	1.01	2.49
Married, %	42.21	48.75
Divorced or separated,%	13.57	15.42
Widowed, %	38.19	31.34
Never married, %	6.03	4.48
Patient unemployed at baseline %	76.32	64.06
Support from community home based care volunteers , %	58.29	34.83
Member of HIV support group, %	61.30	64.06
Stage of HIV disease, by WHO standards is 3 or 4 %	73.37	60.70
Household Characteristics		
Food distribution point/clinic is less than 1 hr , %	94.97	82.59
Disabled household members , %	7.04	4.98
Female headed household, %	56.22	43.78
Household uses charcoal as fuel source,%	88.94	77.61
Household does not own a house,%	61.69	70.85
Total number of females, mean (se)	2.6 (0.09)	2.46 (0.10)
Total number of males, mean (se)	2.08 (0.09)	2.23 (0.08)
HIV positive household members, mean (se)	1.55 (0.05)	1.57 (0.05)
Members on ART, mean (se)	1.4 (0.05)	1.39 (0.04)
Household size, mean (se)	4.84 (0.11)	4.74 (0.11)
Durable or productive assets owned[3], mean (se)	1.84 (0.16)	2.10 (0.14)
Age dependency ratio, mean (se)	96.88 (7.47)	72.56 (5.39)
Child dependency ratio, mean (se)	93.83 (0.07)	71 (0.05)
Clinic HIV sero-prevalence rates, mean (se)	21.97 (0.07)	20.35 (0.16)
Monthly per capita food expenditure, baseline, mean (se)	23653.94 (1415.19)	31740.24 (1960.65)
Monthly per capita total expenditure, baseline mean (se)	59084.6 (4820.17)	87576.05 (7324.50)
Monthly per capita cereal expenditure, baseline mean (se)	35430.65 (4317.54)	55835.81 (6125.53)
Monthly per capita lentils expenditure, baseline mean (se)	1797.91 (211.96)	2148.22 (194.90)

[3] Durable or productive assets refer to the following; bicycle, farm implements, mobile phone, household furniture, stove and refrigerator, vehicles

Table1 Characteristics of Sample Households (ctd)

	Participants (N=199)	Comparison Group (N=201)
Household Characteristics		
Monthly per capita vegetable oil expenditure, baseline mean (se)	2183.01 (171.32)	3270.07 (290.63)
Monthly per capita non food expenditure, baseline mean (se)	35430.65 (4317.54)	55835.81 (6125.53)
Log monthly per capita food expenditure, baseline mean (se)	9.78 (0.06)	10.03 (0.07)
Log monthly per capita total expenditure, baseline mean (se)	10.55 (0.07)	10.92 (0.07)
Log monthly per capita non-food expenditure, baseline mean (se)	9.71 (0.09)	10.15 (0.10)

Source: Authors' calculations from collected data

Over 43% of the non-participants had a female head compared to 56% participants. Both groups have a high age dependency burden with nearly 97% of the participants and 77% for the non-participants, a sign of potential vulnerability to income shocks like HIV/AIDS and food security. Households in both groups have an average of approximately two durable/ productive assets. The retrospective monthly per capita pre-program expenditures for the non-participants is K87576 (US$17.52[4] or US$0.58 per person per day) higher than the K 59084 (US$11.82 or US$0.38 per person per day) for the program participants. However these expenditure levels show that household members for both groups live on less than the US$1.25 per person per day (World Bank poverty line).

[4] We use an approximate exchange rate of US$1: K5000 (Zambian Kwacha) based on the average exchange rates at pre-program and follow up found on www.oanda.com

5. Results

5.1. Propensity Score Matching Estimates

There are no guidelines available on how to select conditioning variables used in constructing the propensity score (Smith and Todd 2005). With that in mind we use theory, similar studies, knowledge of the food transfer program and intuition in selecting our conditioning variables. We run a probit model to predict the likelihood of receiving food transfers, and use the model results to estimate the propensity score for the matching algorithms. We use the estimates of the model to explain association rather than make any causal inferences. We find that the probability of receiving food transfers or participating in the program declines with the increases in the age of the identified HIV patient. The latter stages of a patient's disease (when they are symptomatic), receiving moral support and care from community volunteers and membership in a support group are significantly associated with participating in the food transfer program. We find that the probability of participating in the food transfer program increases if a household resides close to a public sector clinic (where the food aid is distributed) and uses charcoal instead of electricity as the main cooking and heating fuel (charcoal is commonly used in low income residential areas compared to electricity used in the middle and upper income residential areas). The probability of participating in the food transfer program declines with increases in pre-program expenditures. Common support is imposed. Two matching methods are used which are local linear matching and nearest neighbour (1 to 1), and for sensitivity analysis we also carry out local linear matching where the bottom 10 % of the distribution is trimmed. A histogram showing the region of common support is shown in appendix 2. Observations whose estimated propensity score is above the maximum or below the minimum propensity score did not have "common support" and are dropped from the matched sample (Smith and Todd 2005).

Table 2 Predicted Likelihood of Receiving Food Transfers: Probit estimates

	Coef.	***z***	
Index patient characteristics			
Age	-0.114	-2.05	**
Age squared	0.002	2.30	**
No education	0.126	0.32	
Primary education level	0.236	0.67	
Secondary education level	0.001	0.01	
Divorced or separated	-0.184	-0.72	
Widowed	-0.155	-0.72	
Never married	0.416	1.14	
Patient is unemployed	0.283	1.62	
WHO stage 3 and 4 of HIV disease at baseline	0.496	3.03	***
Receives support from community home based care volunteers	0.778	5.18	***
Member of HIV support group	0.532	3.35	***
Household characteristics			
Time to reach public sector clinic less than 1 hr	0.961	3.46	***
Household does not own a house	0.276	1.61	
Number of HIV positive household members	0.106	0.90	
Number of disabled household members	0.335	1.00	
Household size	0.044	0.35	
Dependency ratio	0.001	1.61	
Female headed household	0.112	0.65	
Household uses charcoal as fuel source	0.377	1.79	*
Total number of females	0.0004	0.000	
Total number of males	-0.078	-0.59	
Log monthly expenditure per capita(pre-program)	-0.182	-2.16	**
Constant	0.889	0.55	
Number of observations = 368			
LR chi2 (23) = 125.11			
Prob > chi2 = 0.0000			
Pseudo R2 = 0.2452			

Source: Authors' calculations from collected data. * = significant at the 10 percent level; ** = significant at the 5percent level; *** = significant at the 1 percent level. Propensity score yielded common support region of (0.06, 0.9).

The histogram showing the distribution of the propensity score for participating in the food transfers program is presented in appendix 1. The probit model in table 2 is used to generate new samples of matched beneficiaries (185) and non-beneficiaries 183) for the food transfers program.

5.1.1. Estimated Effect of Food Transfers on Food Intake and Diversity

We use the food consumption score (FCS) as a measure of food intake, diversity and security. This is a frequency-weighted diet diversity score calculated using the frequency of consumption of 14 different food groups consumed by a household during the 7 days before the survey (Wiesmann et al. 2008, WFP2008). The foods are maize (staple), cereals, roots and tubers, sugar, pulses, nuts, vegetables, fruits, beef, poultry/eggs, fish, oil, milk and corn-soya blend. Each food is assigned a weight based on nutrient density, a term which describes food quality based on caloric density, macro-micronutrient content and quantities eaten. Higher weights are attached to meat and fish. The weights and the reasoning behind them are displayed in appendix 3. Thresholds for the food consumption score that we use are 0-28 for poor food consumption, 28-42 for borderline food consumption and >42 for acceptable food consumption[5]. Wiesmann et al (2008) find that the food consumption score is a useful indicator of food security and is significantly associated with calorie consumption per capita. We are mainly interested in finding out the food diversity and intake levels from the provision of food transfers. The food consumption score is calculated using follow-up data only.

Table 3 shows propensity score matching results on the outcome food consumption score. The difference is 8 units (while sensitivity analysis shows a range from 5.9 to 9.6 units). At first glance, both groups appear to have acceptable food diversity or intake (above the required threshold). This increase in food intake could be explained by seasonal patterns in food prices. The follow up survey was carried out during the post harvest season when food

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[5] Note: For populations that consume oil and sugar nearly daily, the thresholds are raised from 21 and 35 to 28 and 42 (Wiesmann et al 2008, World Food Programme 2007). Our intuition and observation of dietary habits in Lusaka, Zambia is that peri-urban populations consume sugar and oil products daily.

prices are low (FEWSnet 2009). However the participants have a significantly higher diet diversity and food consumption than the non-participants. This finding suggests that the food transfers have a positive average effect on the participants. The food consumption score for the non-participants is also just above 42 (borderline consumption) compared to participants. Thus the non-participants appear to be at risk of food insecurity compared to the participants.

Table 3 Single Difference Matching Estimates for the Food Consumption Score

Average Treatment Effect on the Treated	Local Linear Regression Matching	Nearest neighbour matching	Local Linear Regression matching (Trimmed 10 cases)
Participants, mean	51.905	51.905	51.29
Non-participants, mean	43.821	42.482	45.354
Difference (ATT)	8.084 (3.67)***	9.623 (3.67)***	5.936 (2.88)***

Source: Authors' calculations from collected data. Notes: * = significant at the 10 percent level; ** = significant at the 5 percent level; *** = significant at the 1 percent level Absolute values of t statistics on ATT are in parentheses. Propensity score satisfies the balancing property. Table only shows average treatment effect on the treated (ATT). Trimmed 10% cases; refers to trimming the upper 10 percent of the propensity score distribution.

5.1.2. Estimated Effect of Food Transfers on Household Consumption Expenditures

Estimates from using follow up data only, show a significant and positive average impact of the food transfers on per capita total monthly household and food consumption expenditures. We find that the per capita expenditures for participants is significantly higher than that for the non-participants. The estimated treatment effect is K18967.64 (US$ 3.79) for total expenditures, K21483.51 (US$4.30) for food expenditures, a K15516.30 (US$3.10) for cereal expenditures. At the time of the follow up survey, there are no significant differences in pulses, vegetable oil and non food expenditures between the two groups (see table 4). Alternative matching estimators also confirm the results from local linear matching.

Table 4 Single Difference Matching Estimates for Household Consumption Expenditures

Average Treatment Effect on the Treated	Local Linear Regression Matching	Nearest neighbour matching	Local Linear Regression matching (Trimmed 10% cases)
Monthly total expenditure per capita	18.967.64 (1.78)*	13127.86 (1.79)*	19062.74 (1.93)*
Monthly food expenditure per capita	21483.51 (3.46)***	16.598.02 (3.42)***	20735.12 (3.51)***
Monthly cereal expenditure per capita	15516.30 (6.92)***	14873.88 (4.62)***	15669.39 (7.35)***
Monthly pulses expenditure per capita	945.82 (1.01)	616.72 (0.64)	818.58 (0.88)
Monthly vegetable oil expenditure per capita	133.26 (0.79)	388.93 (0.45)	92.89 (0.71)
Monthly non food expenditure per capita	-2515.87 (-1.00)	-3470.16 (-0.44)	-1672.38 (-0.77)

Source: Authors' calculations from collected data. Notes: * = significant at the 10 percent level; ** = significant at the 5 percent level; *** = significant at the 1 percent level Absolute values of t statistics on ATT are in parentheses. Propensity score satisfies the balancing property. Table only shows average treatment effect on the treated (ATT). Trimmed 10% cases; refers to trimming the upper 10 percent of the propensity score distribution.

While we acknowledge the liabilities of retrospective panel data on expenditures (with a longer recall period), we are still interested in obtaining some idea of the effect of the food transfers over 6 months. We estimate the effect of food transfers on the 6 month change in household consumption expenditures using difference in difference matching on retrospective data. Our findings, presented in table 5, show a significant and positive average impact of the food transfers on change in per capita monthly total household and food consumption expenditures. The results show an estimated treatment effect of K30316.41 (US$ 6.06) for total expenditures, K19685.92 (US$3.94) for food expenditures, K14041.96 (US$2.81) for cereal expenditures. The results also show a positive treatment effect of food transfers on household non-food expenditures of K13989.88 (US$ 2.80, significant at 10% level). The estimated treatment effect on expenditures for pulses is negative at K793.84 (US$0.15)

While the single difference and double difference matching estimates seem to confirm positive average effects of the food transfers on total expenditures and food expenditures, the difference in difference estimates also show a significant positive average effect of the food transfers on non-food expenditures. Alternative matching estimators also confirm the results from local linear matching.

Table 5 Difference in Difference Matching Estimates: Household Consumption Expenditures

Average Treatment Effect on the Treated	Local Linear Regression Matching	Nearest neighbour matching	Local Linear Regression matching (Trimmed 10 cases)
Change in monthly total expenditure per capita	30316.41 (3.95)***	27645.21 (3.49)***	29737.25 (4.06)***
Change in monthly food expenditure per capita	19685.92 (4.33)***	16346.81 (2.73)***	19118.38 (4.42)***
Change in monthly cereal expenditure per capita	14041.96 (6.27)***	13795.83 (4.42)***	13939.68 (6.57)
Change in monthly pulses expenditure per capita	-793.84 (-2.12)**	-840.07 (-2.12)**	-880.19 (-2.46)**
Change in monthly vegetable oil expenditure per capita	-155.11 (-0.62)	266.22 (0.34)	-164.09 (-0.58)
Change in monthly non-food expenditure per capita	13989.88 (1.70)*	16148.82 (1.77)*	13977.17 (1.76)*

Source: Authors' calculations from collected data. Notes: * = significant at the 10 percent level; ** = significant at the 5 percent level; *** = significant at the 1 percent level Absolute values of t statistics on ATT are in parentheses. Propensity score satisfies the balancing property. Table only shows average treatment effect on the treated (ATT). Trimmed 10% cases; refers to trimming the bottom 10 percent of the propensity score distribution.

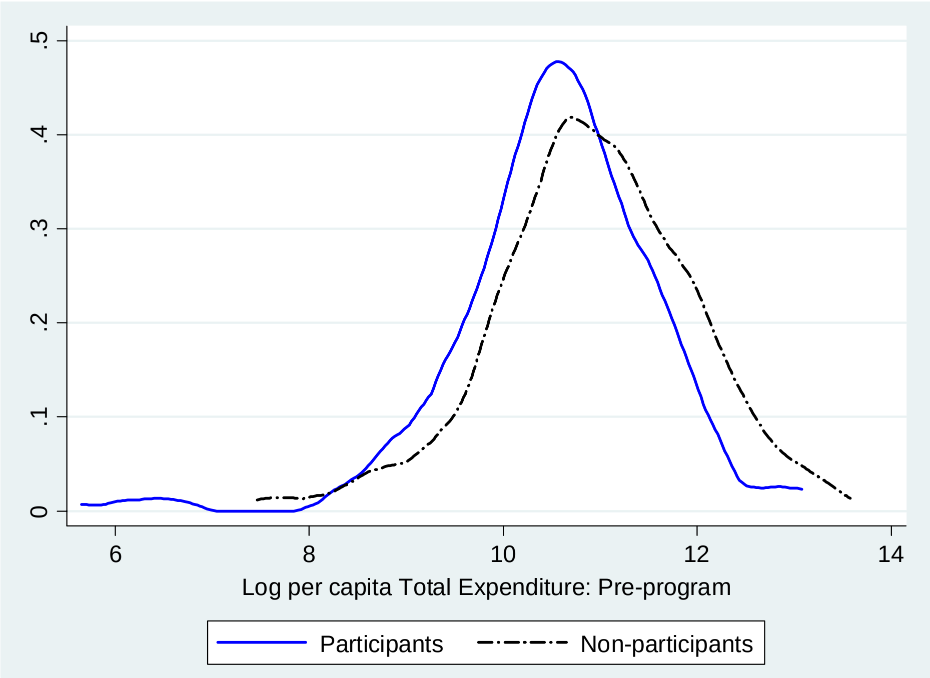
The key takeway from the matching estimates is that the food transfers have a significant and positive average effect on total expenditures and food consumption expenditures. Since the counterfactual per capita food expenditure at follow up is K47034.25 and the approximate average per capita value of the food transfers is K16892.93, our results suggest that the food transfer is inframarginal (see appendix 2)[6].

[6]. Average total food expenditures for the counterfactual (non-participants) is K198482.51 (US$ 39.70)while approximate total worth of the food transfers take home ration is K71095 (US$ 14.22)

5.2. Non-Parametric Analysis

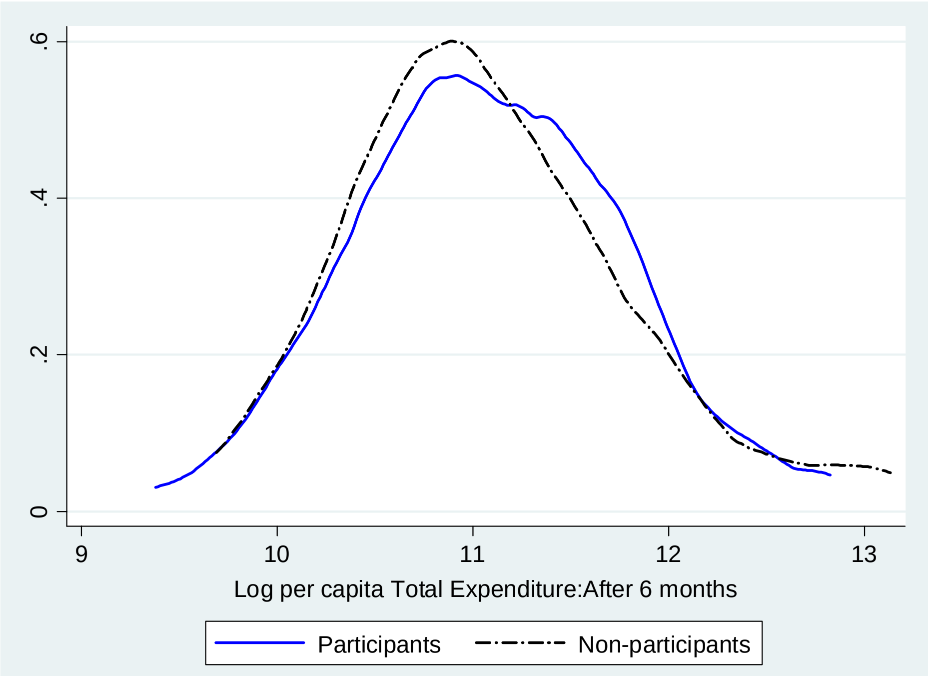
Non-parametric results from kernel density estimations seem to reinforce a positive effect of the food transfer program on the participants. A comparison of the pre-program total expenditure kernel density functions, shows a rightward skew of the distribution for the non-participants with higher means than the non-participants (see figure 1). Figure 2 shows a modest rightward shift of the distribution for the participants from pre-program to after 6 months, an indication of a somewhat modest increase in total consumption expenditures. Figure 3 and 4 show a modest rightward shift of the distribution for the participants from pre-program to after 6 months, an indication of a modest increase in total food consumption expenditures. These two graphs also show a leftward shift for food spending of the non-participants.

Figure 1 *Kernel density of Log per capita Total expenditures (pre-program)*



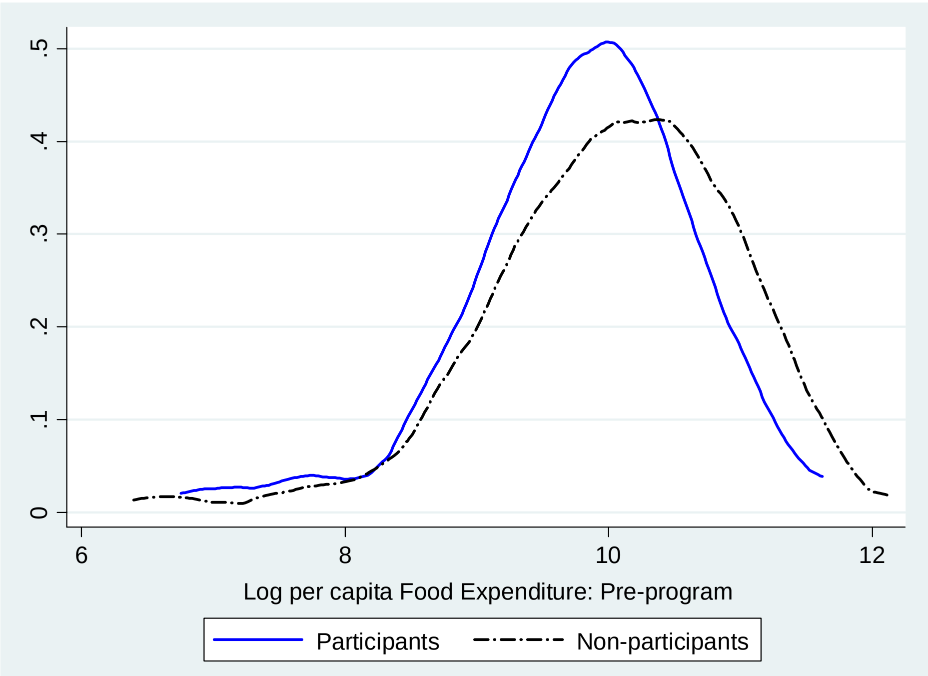
Source: Authors' calculations from collected data

Figure 2 Kernel density of log per capita Total expenditures (after 6 months)



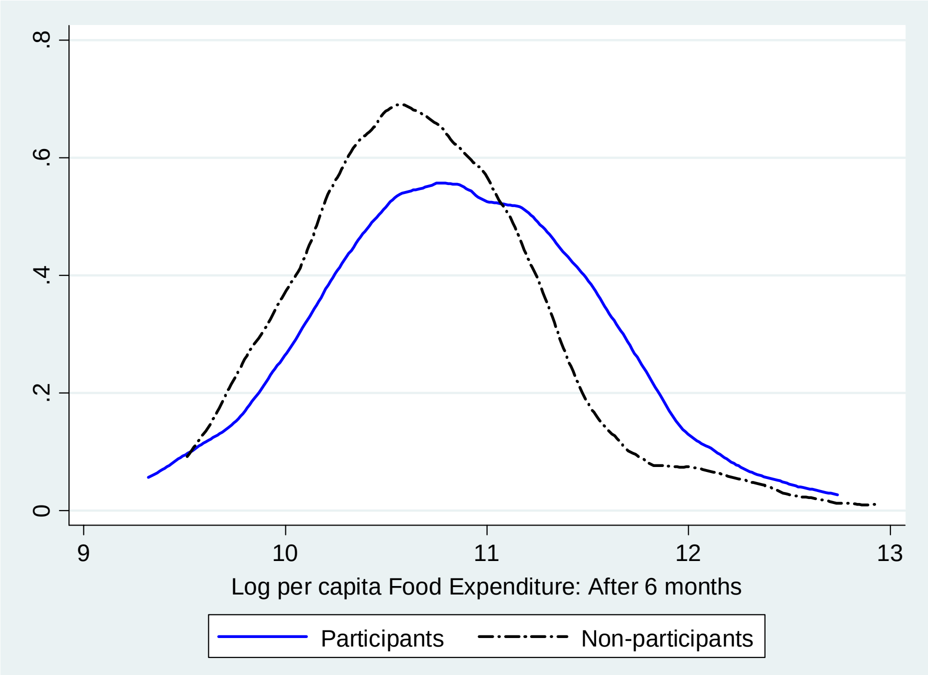
Source: Authors' calculations from collected data

Figure 3 Kernel density of log per capita Food expenditures (pre-program)



Source: Authors' calculations from collected data

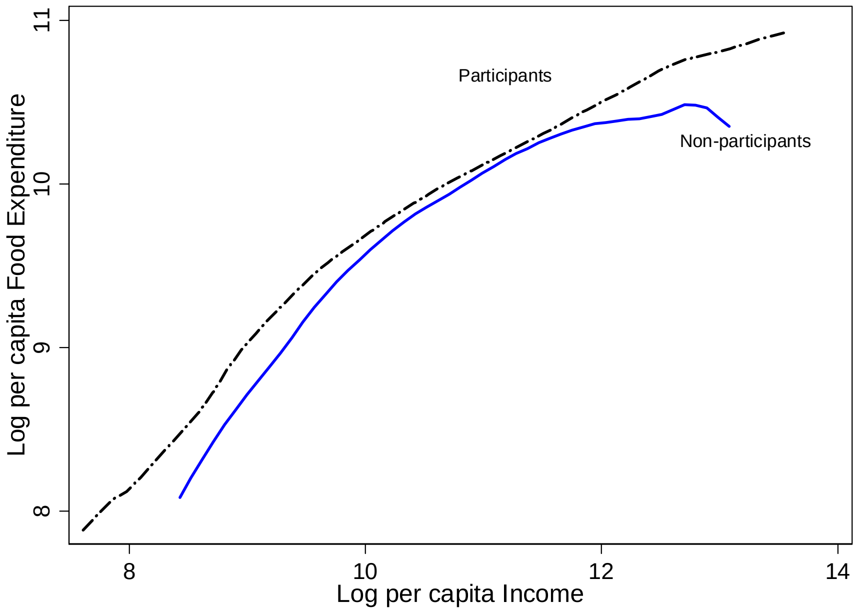
Figure 4 Kernel density of log per capita Food expenditures (after 6 months)



Source: Authors' calculations from collected data

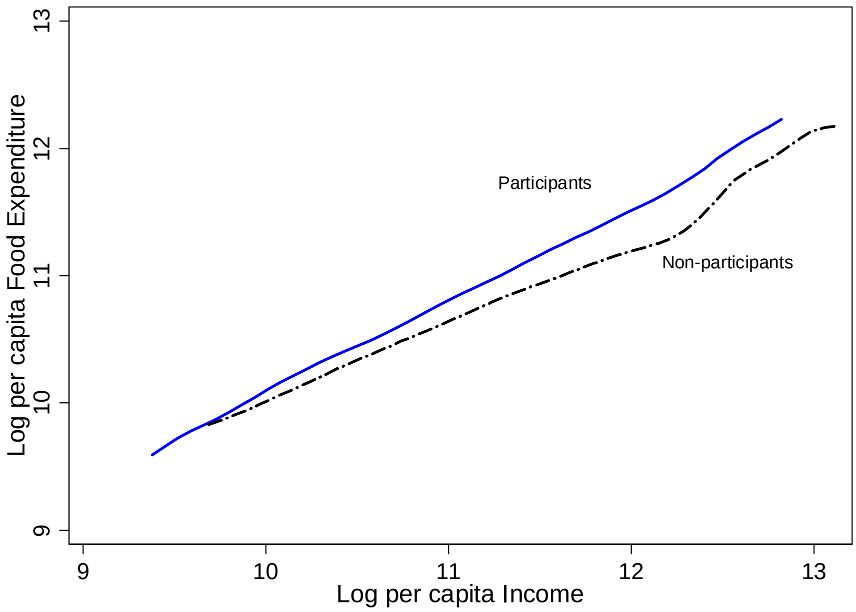
The results from the kernel weighted local polynomial regression are based on a double-log engel functional form (log per capita food expenditures regressed against log per capita income (proxied by total expenditures). The expenditures for this analysis were not corrected for measurement error, which we expect especially since our expenditure data are from a developing country (Kedir and Girma 2007, Gibson 2002, Deaton 1997). The pattern of the pre-program curve presented in figure 5, while not exactly linear, shows that food expenditures for the food beneficiaries were lower than those for the non-participants. However the fact that the pre-program expenditure data were obtained by recall after 6 months, makes us offer a guarded interpretation of the pattern of the curves. Figure 6 shows the food expenditures regressed on income at follow up, and participants appear to have greater food expenditures than the non-participants, with the curve for the participants higher than that for the non-participants at every point. This is a different pattern from what we find for the pre-program. At the baseline, curves for both groups had their starting point (intercept) below 9 on the y-axis (K8103,08) but at follow up both groups have their intercepts after 9 showing that food expenditures increased for both groups. A possible explanation for this increase in food expenditures could be seasonal changes in food supply and prices at the time of the follow up, when usually food prices are lower possibly leading to greater food consumption. However, figure 6 seems to suggest that food transfers led to a greater increase in food consumption expenditures for participants than the non-participants.

Figure 5 *Local polynomial regression of food expenditures on income (pre-program)*



Source: Authors' calculations from collected data

Figure 6 Local polynomial regression of food expenditures on income (after 6 months)



Source: Authors' calculations from collected data

It is clear from the non-parametric analysis and matching estimates that the food transfers led to participants increasing their household food consumption expenditures. Despite the food transfers being inframarginal in size, all indications from the results so far are that the food transfers have an income effect and possibly a substitution effect. A substitution effect since food consumption has actually increased, as shown by the increased food expenditures, and the increased food intake and diversity as measured by the food consumption score.

5.3. Parametric Results

We carry out analysis using cross sectional and retrospective panel data. Our specifications include both the food transfers and cash income as arguments. The specifications are in a double logarithmic form, hence the coefficients for income and food expenditure are elasticities of consumption or spending behaviour. However, for ease of interpretation we will refer to the coefficient for income as the marginal propensities to consume food (MPC) out of cash income. The coefficient on the dummy for food transfers is a semi-elasticity. We use the Kennedy estimator (Kennedy 1981) to determine the elasticity of the dummy variable for food transfers which we shall refer to as the MPC food out of food transfers. The estimator is as follows:

$$g^* = \exp\left(\hat{C} - \frac{1}{2}\hat{V}(\hat{c})\right) - 1 \qquad (3)$$

Where exp denotes the exponential, $\hat{C}$ is the estimated coefficient, $\hat{V}(\hat{c})$ is the estimated variance for the coefficient.

For the cross sectional data, we carry out single difference estimations through a double log specification with a dummy variable which is equal to one if a household is a program participant. The double log refers to log per capita food expenditures (dependent variable) and the log of per capita cash income (one of the covariates). Results for 4 specifications are presented in table 6. The first three specifications are ordinary least squares. The first specification only has the dummy variable with no controls. The second specification includes log per capita cash income (proxied by log per capita total cash expenditures). The third specification includes a vector of demographic controls. In the fourth and final specification the log per capita expenditures are instrumented with the log of non-food expenditures, while the dummy for food transfers is instrumented with clinic HIV sero-prevalence rates, past receipt of food aid and the interactions of locality (sections of the municipality where the households reside) with proximity to clinic/food distribution point, asset holdings and household age dependency ratio. The tests for weak instruments and overidentifying restrictions i.e. the Kleibergen-Paap Wald F statistic (Kleibergen, and Paap 2006) and Hansen's J statistic (Hansen 1982) show that our estimates do not suffer from weak instruments nor are they subject to over-identification. The test for endogeneity in the third specification unsurprisingly shows the presence of endogeneity in the OLS specification; hence all interpretations for parametric analysis are based on the fourth specification.

The elasticities are calculated at the means of log per capita food expenditures and log per capita income for the participants. The results from the four different specifications show that adding demographic controls slightly improves overall fit for the model, while instrumenting for log per capita income reduces the magnitude of the coefficient and the elasticity. The results from the single difference estimations are presented in table 6.

Table 6 Marginal Propensity to Consume Food out of Food Transfers: Single Difference Estimates

Dependent Variable: Log per capita Monthly Food Expenditure	OLS (1)	OLS (2)	OLS (3)	IV (4)
Single Difference Estimation				
Food transfers	0.174*** (0.064)	0.432*** (0.032)	0.415*** (0.028)	0.441*** (0.065)
Income		0.595*** (0.017)	0.535*** (0.016)	0.378*** (0.023)
Demographic controls			yes	yes
MPC_f Food Transfers	0.19	0.54	0.51	0.55
MPC_f Income		0.60	0.54	0.38
N	400	399	399	395
R-squared	0.02	0.77	0.83	0.79
Durbin-Wu-Hausman chi square statistic			202.729***	
Kleibergen-Paap rk Wald F statistic				38.429
Hansen J statistic				0.188

Source: Authors' calculations from collected data. Notes: * = p<0.10; ** = p<0.05; *** = p<0.01. Standard errors are in parentheses. The food transfer dummy equals one if household is a recipient of food transfers. Demographic controls include dummies for education, marital status, gender and age of identified patient, gender and age of household head, household size, work status of identified patient and whether household owns less than four productive assets. Locality effects are dummies for the different areas of the city, where the households reside in. Test for endogeneity is the Durbin-Wu-Hausman test, and test for weak instruments is the Cragg-Donald F test. The Hansen J statistic is the test for overidentifying restrictions. Yes denotes inclusion. MPC_f Food Transfers refers to the marginal propensity to consume food out of food transfers, based on elasticity. MPC_f Income refers to the marginal propensity to consume food out of cash income, based on elasticity.

The single difference estimates show that food transfers have a positive effect with a difference of around 44% in food expenditures between participants and non-participants. The results are consistent with the significant and positive estimates from propensity score matching and non-parametric analysis. The results are also in line with findings from similar empirical literature on commodity transfers (Del Ninno and Dorosh 2002) The elasticity for food spending with respect to food transfers is 0.55 for the participants. The coefficient for the log of cash income estimates an elasticity of food spending with respect to income of 0.38.

The results from the double difference estimations are presented in table 7. The four specifications for the double difference estimations are similar to the single difference specifications with the exception that they all include time effects and locality effects (for specifications 3 and 4).

Table 7 Marginal Propensity to Consume Food out of Food Transfers: Double Difference Estimates

Dependent Variable: Log per capita Monthly Food Expenditure	OLS FE (1)	OLS FE (2)	OLS FE (3)	IV FE (4)
Double Difference Estimation				
Food transfers	0.434*** (0.071)	0.481*** (0.063)	0.484*** (0.063)	0.367** (0.177)
Income		0.434*** (0.055)	0.427*** (0.056)	0.018 (0.061)
Demographic controls and locality fixed effects			yes	Yes
Time effects	yes	yes	yes	yes
MPC_f Food Transfers	0.54	0.61	0.62	0.42
MPC_f Income		0.43	0.43	Not sig
N	787	786	786	746
R-squared	0.23	0.66	0.67	0.64
Durbin-Wu-Hausman chi square statistic			79.95***	
Kleibergen-Paap rk Wald F statistic				18.182
Hansen J statistic				0.072

Source: Authors' calculations from collected data. Notes: * = p<0.10; ** = p<0.05; *** = p<0.01. Standard errors are in parentheses. The food transfer dummy equals one if household is a recipient of food transfers. Demographic controls include dummies for education, marital status, gender and age of identified patient, gender and age of household head, household size, work status of identified patient and whether household owns less than four productive assets. Locality effects are dummies for the different areas of the city, where the households reside in. Test for endogeneity is the Durbin-Wu-Hausman test, and test for weak instruments is the Cragg-Donald F test. The Hansen J statistic is the test for overidentifying restrictions. Yes denotes inclusion. FE denotes fixed effects. MPC_f Food Transfers refers to the marginal propensity to consume food out of food transfers, based on elasticity. MPC_f Income refers to the marginal propensity to consume food out of cash income, based on elasticity.

The results from the double difference estimations show that participants increased their food consumption expenditures by 37% compared to non-participants. The pattern of increased food expenditures is consistent with the propensity score matching estimates and findings from non-parametric analysis. The elasticity for food spending with respect to food transfers for the participants is 0.42. The coefficient for the log of cash income estimates an elasticity of food spending with respect to income of 0.02, which is not significant. Hence over the 6 months of the food transfers program, there is a significant MPC food out of food transfers while it seems that there is no food expenditure from cash income which appears to be almost entirely replaced by the food transfer. An alternative linear model was also developed for robustness checks and sensitivity analysis (see appendix 6). The linear model's single difference specifications show the MPC food out of food transfers to be 0.32, which is larger than the MPC food out of cash income of 0.22. The linear model's double difference specifications show the MPC food out of food transfers is 0.36 while cash income appears to have no effect on food consumption expenditures. The results show households receiving food aid together HIV/AIDS treatment having greater food consumption than households receiving HIV/AIDS treatment only.

For the participants, the MPC food out of food transfers appears to be much larger (nearly double) than MPC food out of cash income in single difference estimates, while cash income has no effect over time. Since the food transfers are inframarginal, this result contradicts theory which states that the MPC food out of an inframarginal in-kind transfer would be equivalent to that of cash income. However, the result is also consistent with empirical literature on food stamps in the USA which finds that the MPC out of inframarginal food stamps to be 2-10 times larger than the MPC food out of cash income (Fraker 1990). A possible reason for this finding could be that households are constrained by the in-kind nature of the program (Hoynes and and Schanzenbach 2009). Another probable reason for this finding is that despite the food transfer being inframarginal, these households are highly vulnerable to income shocks from HIV/AIDS, reside in localities where there is high unemployment and hence perceive might be perceiving the food transfer as a less transitory , reliable and more permanent income compared to their own earnings (Friedman 1957).

We proceed to analyse the MPC food with respect to intrahousehold decision making and vulnerability or economic disadvantages. We should caution however that by restricting the sample into several groups our estimates are likely to be imprecise. Table 8 presents the results on the effects of the program on a sample restricted separately into female-headed households and male-headed households. We find that from single difference estimates, female-headed households which are participants have significantly greater food consumption than similar non-participants, with a difference of 47% while for male headed households the difference was 27%. Panel estimates show that participating female headed households increased their food consumption expenditures by 36%, while participating male headed households saw no significant change. Single difference estimates also show that the MPC food out of food transfers for the participating female headed households is greater than the MPC food out of cash income, while for participating male headed households, the MPC food out of food transfers is slightly lower or nearly equivalent to that out of cash income. Double difference estimates show that the MPC food out of food transfers for participating female headed households is 0.41 compared to no significant MPC food out of food transfer for participating male headed households, who however have a significant MPC food out of cash income of 0.16. The results are consistent with empirical literature which has shown that female headed households spend more on food compared to male-headed households (Attanasio and Mesnard 2006, Ezemenari et al 2003, Lundberg et al 1997). Furthermore, it is highly likely female headed households are also more vulnerable or disadvantaged than male headed households in a developing country like Zambia.

Table 8 Marginal Propensity to Consume Food out of Food Transfers by Gender of Household Head

Dependent Variable: Log per capita Monthly Food Expenditure	Female-headed Households		Male-headed Households	
	Single Difference IV	Double Difference IV	Single Difference IV	Double Difference IV
Food transfers	0.466*** (0.084)	0.356*** (0.164)	0.267*** (0.083)	0.543 (0.380)
Income	0.413*** (0.029)	-0.043 (0.084)	0.326*** (0.035)	0.155* (0.087)
Demographic controls	yes	yes	yes	yes
Locality and time effects		yes		yes
MPC_f Food Transfers	0.59	0.41	0.30	
MPC_f Income	0.41		0.33	0.16
N	236	450	159	296
R-squared	0.80	0.65	0.78	0.63
Durbin-Wu-Hausman chi square statistic	61.48***	45.52***		
Kleibergen-Paap rk Wald F statistic	24.073	32.362	18.092	21.229
Hansen's J statistic	2.789	0.293	1.904	2.991

Source: Authors' calculations from collected data. Notes: * = p<0.10; ** = p<0.05; *** = p<0.01. Standard errors are in parentheses. The food transfer dummy equals one if household is a recipient of food transfers. Demographic controls include dummies for education, marital status, gender and age of identified patient, gender and age of household head, household size, work status of identified patient and whether household owns less than four productive assets. Locality effects are dummies for the different areas of the city, where the households reside in. Test for endogeneity is the Durbin-Wu-Hausman test, and test for weak instruments is the Cragg-Donald F test. The Hansen J statistic is the test for overidentifying restrictions. Yes denotes inclusion. MPC_f Food Transfers refers to the marginal propensity to consume food out of food transfers, based on elasticity. MPC_f Income refers to the marginal propensity to consume food out of cash income, based on elasticity.

We also carried out further analysis by restricting the sample by number of AIDS patients per household. Table 9 shows that participants with more than one sick patient have significantly greater food consumption expenditures than similar non-participants for both single difference and double difference estimates (45% and 64% respectively). In contrast in households with only one sick patient there are modest effects on food consumption expenditure as shown by both single and double difference estimates (37% and 41% respectively). The MPC food out of food transfers for participants with more than one sick patient is much larger than the MPC food out of cash income (in all estimates), compared to the MPC food out of food transfers for participants with only one sick patient.

Table 9 Marginal Propensity to Consume Food out of Food Transfers by HIV Burden

Dependent Variable: Log per capita Monthly Food Expenditure	One Patient on AIDS treatment		More than one patient on AIDS treatment	
	Single Difference IV	Double Difference IV	Single Difference IV	Double Difference IV
Food transfers	0.374***	0.414**	0.452***	0.638***
	(0.077)	(0.187)	(0.120)	(0.313)
Income	0.378***	-0.074	0.376***	0.227***
	(0.028)	(0.080)	(0.047)	(0.083)
Demographic controls	yes	yes	yes	yes
Locality and time effects		yes		yes
MPC_f Food Transfers	0.45	0.49	0.56	0.80
MPC_f Income	0.38		0.38	0.23
N	262	498	133	258
R-squared	0.80	0.62	0.80	0.68
Durbin-Wu-Hausman chi square statistic	73.106***	55.414***	36.258***	24.421***
Kleibergen-Paap rk Wald F statistic	29.688	30.825	12.661	23.745
Hansen J statistic	4.402	1.467	1.435	0.111

Source: Authors' calculations from collected data. Notes: * = p<0.10; ** = p<0.05; *** = p<0.01. Standard errors are in parentheses. The food transfer dummy equals one if household is a recipient of food transfers. Demographic controls include dummies for education, marital status, gender and age of identified patient, gender and age of household head, household size, work status of identified patient and whether household owns less than four productive assets. Locality effects are dummies for the different areas of the city, where the households reside in. Test for endogeneity is the Durbin-Wu-Hausman test, and test for weak instruments is the Cragg-Donald F test. The Hansen J statistic is the test for overidentifying restrictions. Yes denotes inclusion. MPC_f Food Transfers refers to the marginal propensity to consume food out of food transfers, based on elasticity. MPC_f Income refers to the marginal propensity to consume food out of cash income, based on elasticity.

Table 10 shows the estimated MPCs by expenditure quantile. We only use 2 quantiles to avoid restricting our analysis into small sample sizes. Hence we compare the program effects for households below and above the median per capita expenditure. Results show that participants in the bottom quantile have significantly greater food consumption expenditures than similar non-participants for both single difference and double difference estimates (25% and 67% respectively). In contrast participants in the upper quartile who have no significant program effects on food consumption expenditure. The MPC food out of food transfers is only estimated for the lower quantile since for the upper quantile there is no significant program effect. However there is a significant MPC food out of cash income for the upper quantile (single difference) while for the lower quantile there is no significant MPC food out of cash income in all estimates.

Table 10 Marginal Propensity to Consume Food out of Food Transfers by 2-Quantile Expenditures

Dependent Variable: Log per capita Monthly Food Expenditure	Bottom quantile (below median)		Upper quantile (above median)	
	Single Difference IV	Double Difference IV	Single Difference IV	Double Difference IV
Food transfers	0.253***	0.671***	0.238	0.196
	(0.079)	(0.208)	(0.248)	(0.239)
Income	0.093	0.035	0.176*	-0.125
	(0.057)	(0.080)	(0.094)	(0.175)
Demographic controls	yes	yes	yes	yes
Locality and time effects		yes		yes
MPC_f Food Transfers	0.28			
MPC_f Income				
N	196	358	199	388
R-squared	0.33	0.58	0.52	0.65
Durbin-Wu-Hausman chi square statistic	62.404***	45.717***	51.070	37.676***
Kleibergen-Paap rk Wald F statistic	26.676	46.676	16.160	12.216
Hansen J statistic	3.059	1.507	1.829	3.737

Source: Authors' calculations from collected data. Notes: * = p<0.10; ** = p<0.05; *** = p<0.01. Standard errors are in parentheses. The food transfer dummy equals one if household is a recipient of food transfers. Demographic controls include dummies for education, marital status, gender and age of identified patient, gender and age of household head, household size, work status of identified patient and whether household owns less than four productive assets. Locality effects are dummies for the different areas of the city, where the households reside in. Test for endogeneity is the Durbin-Wu-Hausman test, and test for weak instruments is the Cragg-Donald F test. The Hansen J statistic is the test for overidentifying restrictions. Yes denotes inclusion. MPC_f Food Transfers refers to the marginal propensity to consume food out of food transfers, based on elasticity. MPC_f Income refers to the marginal propensity to consume food out of cash income, based on elasticity

Summarily tables 8-10 show that for the more economically disadvantaged households the MPC food out of food transfers is larger than the MPC food out of cash income, suggesting that they are constrained by the in-kind nature of the program (Hoynes and Schanzenbach 2009, Whitemore 2002). As mentioned earlier, it is also probable that the households may perceive food transfers as a more permanent source of income compared to earnings since at the time of the survey the food aid program that was expected to continue for another 6 months.

6. Conclusion

In this paper we present empirical evidence on the effect of a targeted food aid program on the spending behaviour and food consumption in households with patients on AIDS treatment. We test theoretical predictions of consumer behaviour towards in-kind transfers. Using recently collected data, we find that the food transfers have a significant and positive effect on total expenditures and food consumption expenditures, as evidenced by the propensity score matching estimates, non-parametric analysis and parametric estimates. Our findings contradict theoretical predictions on inframarginal in-kind transfers but are consistent with empirical literature on food stamps. Program participants have a larger MPC food out of food transfers than MPC food out of cash income, despite the transfer being inframarginal. Furthermore, for the more economically disadvantaged households the MPC food out of food transfers is larger than the MPC food out of cash income. There are four possible explanations for these findings. Firstly, the food transfers might be leading to an income and substitution effect from the food transfers as shown by the significant and positive effect of the food transfers on total expenditures (a proxy for income) and food consumption expenditures and actual food intake. Secondly, despite the food aid rations being inframarginal its likely that participants are still constrained by their in kind nature, resulting in them possibly altering their consumption preferences unlike if they were receiving a similar sized cash transfer (Hoynes and Schanzenbach 2009, Leonesio 1988). Thirdly, we posit that the participants (and moreso the most economically disadvantaged), may perceive food transfers as a more permanent source of income compared to earnings, especially since at the time of the follow up survey the food aid program was expected to continue. Fourthly, food spending is higher for households below the median per capita expenditure consistent with Engel's law which states that poorer households devote greater proportions of income to food. Finally our findings are consistent with empirical literature on the gender differences in intrahousehold decision making on social transfers, as female-headed households in our study spend more on food compared to male headed households. Furthermore, despite some studies showing positive welfare gains from HIV/AIDS treatment alone, our findings show that integrating HIV/AIDS treatment with food transfers leads to greater significant and positive effects on food spending, incomes and actual food intake compared to HIV/AIDS treatment alone.

A major limitation of our study is the lack of prospective panel data, since we could not obtain or collect data before the program was implemented. Our retrospective data are liable to recall bias. Hence we present single and double difference estimates for each outcome. Despite this shortcoming, the paper is still an important contribution to the literature on evaluating the impacts of social transfer programs. This paper offers new insights into consumption and spending patterns in HIV affected households benefiting from the integration of HIV/AIDS treatment with food aid.We would however recommend further research on this subject considering similar programs integrating HIV/AIDS treatment and food transfers are multiplying, especially in sub-Saharan Africa.

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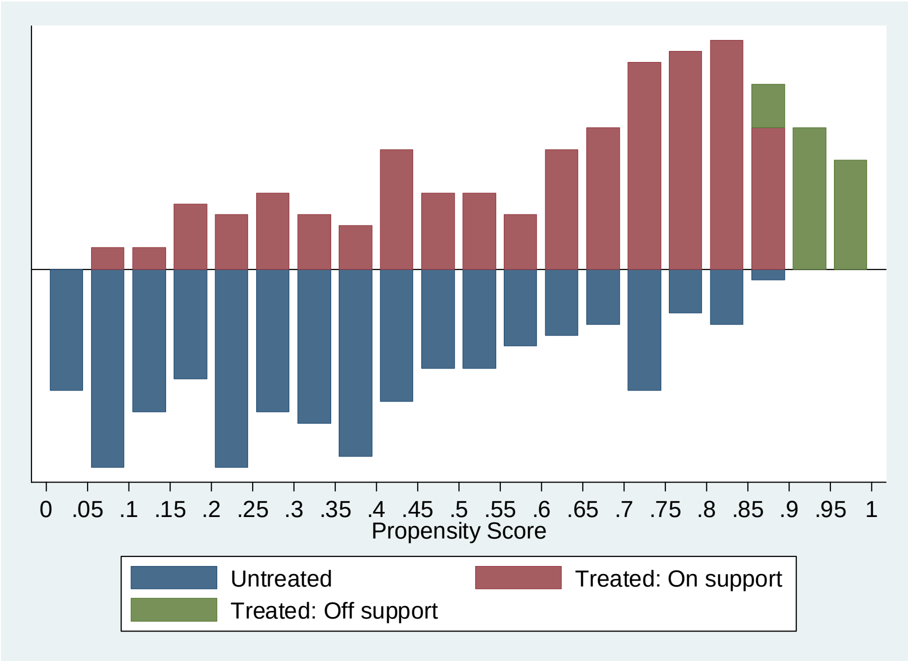
Appendix 1 Histogram of region of common support and propensity score distribution



Source: Authors' calculations from collected data.

Appendix 2 Expenditures of matched sample

Matched Sample	**Participants (N=185)**	**Comparison Group (N=183)**
Pre-program expenditures		
Monthly per capita food expenditure, mean	24746.77	22949.18
Monthly per capita total expenditure, mean	63524.62	78403.84
Monthly per capita cereal expenditure, mean	8670.65	7196.32
Monthly per capita lentils expenditure, mean	1961.33	1651.93
Monthly per capita vegetable oil expenditure, mean	2323.27	2034.89
Monthly per capita non food expenditure, mean	38777.86	55454.66
Expenditures at follow up, 6 months		
Monthly per capita food expenditure, mean	68517.76	47034.25
Monthly per capita total expenditure, mean	85991.67	67024.04
Monthly per capita cereal expenditure, mean	37404.74	21888.44
Monthly per capita lentils expenditure, mean	7529.37	6583.55
Monthly per capita vegetable oil expenditure, mean	5509.60	5376.34
Monthly per capita non food expenditure, mean	17473.91	19989.79

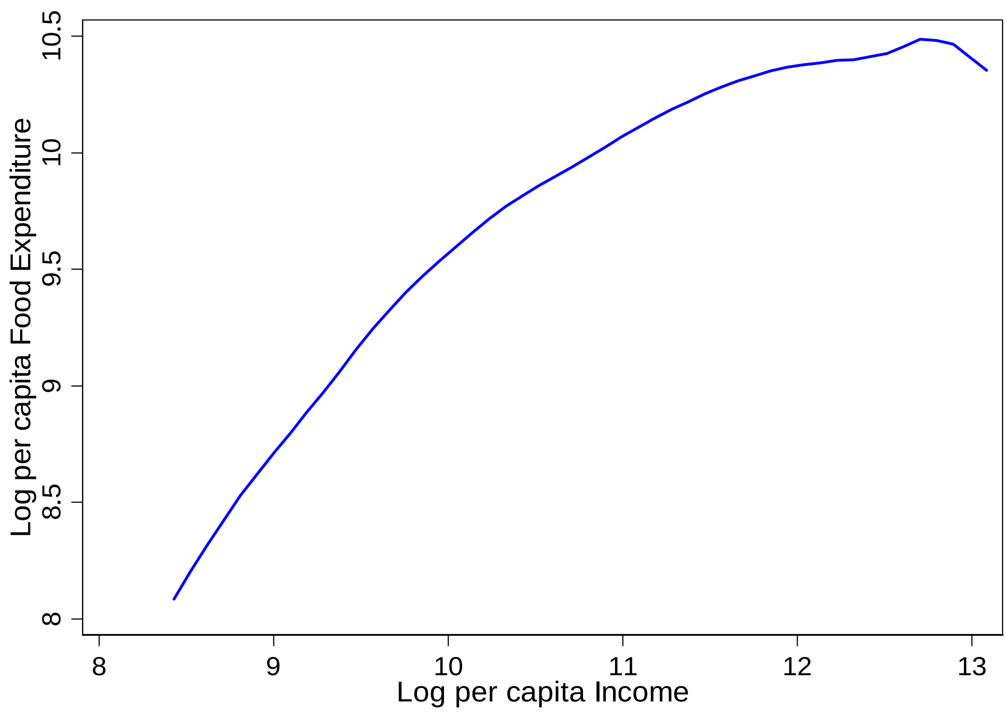
Source: Authors' calculations from collected data.

Appendix 3 Aggregate Food Groups and Weights to Calculate the Food Consumption Score

Food groups	**Weight**	**Justification**
Main staples	2	Energy dense, protein content lower and poorer quality than legumes, micronutrients. (bound by phytates)
Pulses	3	Energy dense, high amounts of protein but of lower quality than meats, micronutrients
Vegetables	1	Low energy, low protein, no fat, micronutrients
Fruit	1	Low energy, low protein, no fat, micronutrients
Meat and fish	1	Highest quality protein, easily absorbable micronutrients (no phytates), energy dense, fat. Even when consumed in small quantities, improvements to the quality of diet are large.
Milk	4	Highest quality protein, micronutrients, vitamin A, energy. However, milk could be consumed only in very small amounts and should then be treated as condiment, and therefore reclassification in such cases is needed.
Sugar	0.5	Empty calories. Usually consumed in small quantities.
Oil	0.5	Energy dense but usually no other micronutrients. Usually consumed in small quantities.

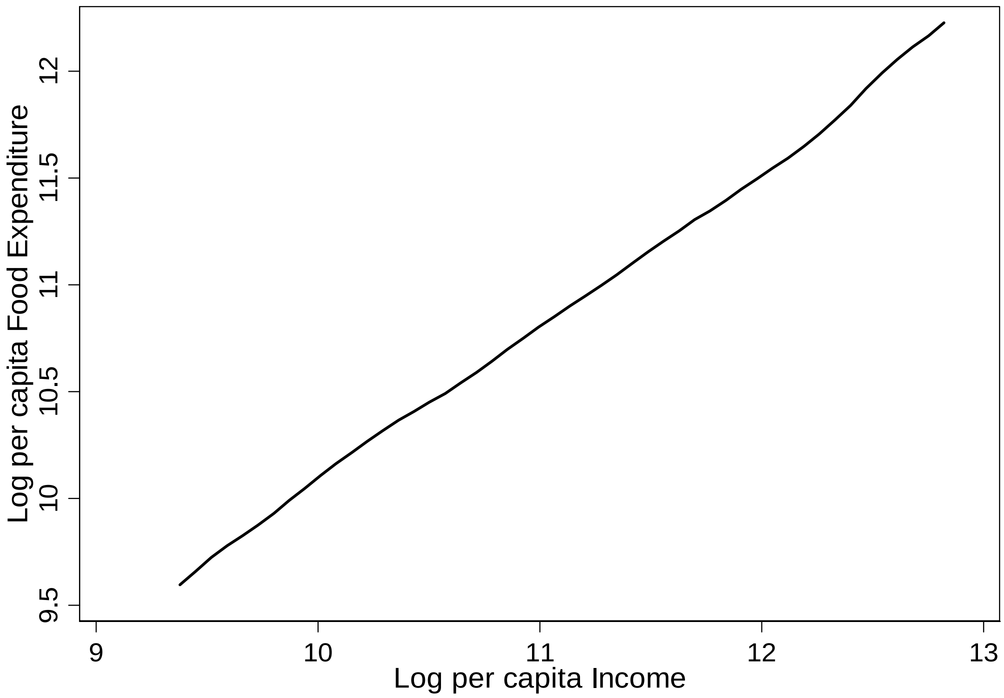
Source: World Food Programme (2007, 17ff.).

Appendix 4 Local polynomial regressoin of food expenditure on income (combined pre-program)



Source: Authors' calculations from collected data.

Appendix 5 Local polynomial regression of food expenditure on income (combined after 6 months sample)



Source: Authors' calculations from collected data.

Appendix 6 Marginal Propensity to Consume Food: Sensitivity to Alternative Functional Form

	Double -Log		**Linear**	
Dependent Variable: Log per capita Monthly Food Expenditure	OLS	IV	OLS	IV
Single Difference Estimation				
Food transfers	0.415*** (0.028)	0.441*** (0.065)	28101.43*** (2798.738)	21331.69*** (6171.679)
Income	0.535*** (0.016)	0.378*** (0.023)	0.541*** (0.023)	0.351*** (0.028)
Constant	5.789*** (0.269)	7.356*** (0.398)	69106.92*** (18783.08)	100810.2*** (21165.36)
Demographic controls	yes	yes	yes	yes
MPC_f Food Transfers	0.51	0.55	0.42	0.32
MPC_f Income	0.54	0.38	0.33	0.22
N	399	395	292	400
R-squared	0.83	0.78	0.72	0.65
Durbin-Wu-Hausman chi square statistic	202.729***		259.937***	
Kleibergen-Paap rk Wald F statistic		38.429		39.055
Hansen J statistic		0.188		<0.0001
Double Difference Estimation	OLS FE	IV FE	OLS FE	IV FE
Food transfers	0.484*** (0.063)	0.367** (0.177)	19948.06*** (3556.73)	21689.11*** (10448.91)
Income	0.427*** (0.056)	0.018 (0.061)	0.194*** (0.066)	(-0.025) (0.035)
Constant	5.256*** (0.593)		13530.06*** (4981.95)	
Demographic controls and locality fixed effects	yes	yes	yes	yes
Time effects	yes	yes	yes	yes
MPC_f Food Transfers	0.62	0.42	0.36	0.36
MPC_f Income	0.43	Not sig	0.17	Not sig
N	786	746	798	778
R-squared	0.67	0.64	0.47	0.41
Durbin-Wu-Hausman chi square statistic	79.95***		19.116***	
Kleibergen-Paap rk Wald F statistic		18.182		29.668
Hansen J statistic		0.072		0.118

Source: Authors' calculations from collected data. Notes: * = p<0.10; ** = p<0.05; *** = p<0.01. Standard errors are in parentheses. The food transfer dummy equals one if household is a recipient of food transfers. Demographic controls include dummies for education, marital status, gender and age of identified patient, gender and age of household head, household size, work status of identified patient and whether household owns less than four productive assets. Locality effects are dummies for the different areas of the city, where the households reside in. Test for endogeneity is the Durbin-Wu-Hausman test, and test for weak instruments is the Cragg-Donald F test. The Hansen J statistic is the test for overidentifying restrictions. Yes denotes inclusion. MPC_f Food Transfers refers to the marginal propensity to consume food out of food transfers, based on elasticity. MPC_f Income refers to the marginal propensity to consume food out of cash income, based on elasticity.

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