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Cost-Effectiveness of Food and Cash Transfers to Patients under Anti-Retroviral Treatment in Zambia *

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This study determines the relative cost-effectiveness of food and cash transfers when administered to Human Immuno-deficiency Virus (HIV) / Acquired Immune-Deficiency Syndrome (AIDS) patients on Anti-Retroviral Therapy (ART) in Zambia. The results show that cash transfers are not only cheaper but also unambiguously more cost-effective with respect to nutrition and health outcomes such as body-mass index (BMI) and Cluster of Differentiation 4 (CD4) count. This seems to suggest that, whenever market conditions and institutional capacities (banks, personnel, etc.) permit, cash should be given a higher rating by governments and other programming stakeholders than physical food aid as an instrument for influencing health and nutrition outcomes among HIV patients that are on ART.

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1. Introduction

Living standard surveys conducted throughout the 1990s and 2000s reveal that Zambia is among countries with a large proportion of people in poverty. The nation-wide surveys indicate overall poverty rates at around 70%, with rural poverty at 80% and urban poverty at 50% (CSO 2010).[1] These very high poverty figures suggest widespread livelihood stress among most households. Although poverty is the major cause of high vulnerability to food entitlement failures among poor households, high incidences of Human Immuno-deficiency

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[1]See also CSO (2000), CSO (2002), CSO (2004) and CSO (2006). Living Conditions Monitoring Surveys (LCMS) are conducted by the Central Statistical Office (CSO), the Ministry of Finance (MoF), and the World Bank. They are nationally representative surveys with the goal to monitor living standards and various Government and donor policies and programs.

Virus (HIV) / Acquired Immune-Deficiency Syndrome (AIDS) (estimated in 2005 at 14% of the adult population aged 15-49 years) have exacerbated the situation. Empirical studies show that Zambia has over the last two decades witnessed the highest levels of poverty since the emergence of HIV/AIDS (Drinkwater et al., 2006; Wietler, 2007). The increase in poverty due to HIV/AIDS is largely attributed to reduced productivity due to poor nutrition and health conditions among the affected households (WHO, 2003a; Ladzani, 2009).

The impact of HIV/AIDS has gone far beyond the household and community levels. All areas of the public sector and the economy have been affected. Because of high infection rates of about 25% among the economically active adult population, households that consist of vulnerable members with no or too few viable members are increasing (Wietler, 2007). According to the IMF, the epidemic is likely to affect economic growth (IMF, 2002). Agriculture, from which the vast majority of Zambians make their living, is particularly affected by the impact of HIV/AIDS (Shepekesa, 2011). HIV/AIDS is believed to have made a major contribution to the food shortages that hit Zambia in 2002, which were declared a national emergency (Jayne et al., 2007).

The negative socio-economic consequences resulting from HIV/AIDS have highlighted the need for broader, innovative and effective interventions, besides treatment. In recent years, the Government of the Republic of Zambia (GRZ), through the Ministry of Health (MoH) and the Ministry of Community Development Mother and Child Health (MCDMCH), and cooperating partners have developed and supported a multi-sectoral response system. This has involved, among other things, provision of Anti-Retroviral Therapy (ART) to suppress the HIV virus, and social protection to help improve the nutritional and health conditions of those affected (Temin, 2010). It is widely understood that adherence to and efficacy of ART are greatly improved when food or nutritional supplements are provided with the treatment. As a result, social protection, consisting mainly of food and/or cash transfers, has been provided along with ART.

Social protection has become increasingly popular as a means for helping HIV/AIDS patients and their families to cope with the disease and related vulnerabilities (Nyasha and Wim, 2009; Kawana et al., 2011). According to Kawana et al. (2011), social transfers are a critical enabler for successful HIV prevention and treatment outcomes, transforming the AIDS patients to being HIV-infected and reducing HIV-related vulnerabilities. United Nations AIDS (UNAIDS) has identified social protection as a strategic priority in the global HIV response because of its importance in addressing the drivers of the epidemic and in helping to mitigate the impact of the disease on communities, households and individuals (Kawana et al., 2011).

However, while both cash and food transfers have been shown to have positive effects as mechanisms for combating extreme poverty and HIV/AIDS, few studies have measured the relative effectiveness and cost-effectiveness of the two interventions. In response, CARE International Zambia, with funding from the United Kingdom (UK) Department for International Development (DFID), between 2010 and 2012, implemented

an ART adherence study in Katete district, about 500 kilometers east of Lusaka. The two-year pilot project sought to determine the relative cost-effectiveness of food and cash transfers as measured by their effects on adherence to ART and key nutrition and health outcomes, such as Body-Mass Index (BMI) and Cluster of Differentiation 4 (CD4) count. For both food and cash, the transfer size was calculated based on the World Food Programme (WFP) Zambia standard food basket for a vulnerable and poor household per month, consisting of a 25 kg of maize meal, 4 kg of beans, 2 kg of sugar, 2.5 liters of vegetable oil and 1 kg of salt.

The ART adherence project included a coherent design for impact evaluation, involving collection of three-wave panel data, comprising one baseline and two follow up surveys. Initial descriptive statistical analysis of these data seems to suggest that both intervention types are achieving the desired effects on the outcomes of interest (Kawana et al., 2011). However, no attempt has been made to measure the relative cost-effectiveness of the two interventions. Literature suggests that although transferring cash is more cost-effective than distributing food whenever conditions are in place for cash delivery (Farrington, Harvey and Slater, 2005; Levine and Chastre, 2004), this may not necessarily be the case when the realities of implementation set in (Harvey and Marongwe 2006; Savage and Umar 2006). Gentilini (2006) admonishes most cash-food comparisons in the literature, arguing that cost comparisons should correctly include not just transport but also several other costs, many of which are peculiar to cash transfers.

The study reported in this paper seeks to determine the relative cost-effectiveness of food aid and social cash transfers as means for achieving health and nutritional outcomes for HIV patients receiving ART. We use data generated by the Katete ART adherence project, supplemented with social cash transfer (SCT) implementation data from 8 of the 11 SCT districts.[2] The goal is to generate empirical evidence for scaling up these interventions. To the best of our knowledge, this study represents the first comprehensive attempt at estimating the relative cost-effectiveness of cash and food transfers as instruments for influencing health and nutritional outcomes among HIV/AIDS patients that are under ART.

2. Conceptual Issues on Cash and Food Transfers

A number of conceptual issues arise in assessing the appropriateness and effectiveness of cash transfers and in-kind transfers, such as food (Akter et al., 2007). Several reasons are

[2]Social cash transfers (SCTs) in Zambia are currently being provided in 11 rural districts: Chipata, Kalabo, Kalomo, Kaputa, Katete, Kazungula, Luwingu, Monze, Serenje, Shang'ombo and Zambezi. These districts have been chosen on the basis of having high levels of vulnerability and exclusion, existence of functioning community and district welfare assistance committees.

commonly advanced for preferring cash over food and other in-kind transfers. Tabor (2002) contends that cash is preferable to in-kind transfers because it is economically more efficient to distribute, while Subbarao et al. (1997) assert that cash transfers are superior to food transfers because they do not distort individual consumption or production choices at the margin. It is also argued that cash provides the recipients with freedom of choice and a higher level of satisfaction at any given level of income than food (Ahmed, 1993; Akhteret al., 2007), in addition to cash's relatively higher potential to stimulate agricultural production and other productive activities (Akter et al., 2007).

Arguments in favor of in-kind and food transfers include their perceived relative effectiveness at controlling, modifying and influencing the behavior of the recipients (Tabor 2002; Gentilini, 2007). According to this strand of literature, a food-based program is superior to cash when the target households cannot afford the food and/or are unlikely to purchase adequate quantities of the food or services even if they had the cash. The argument is that, if not restricted, recipients are more likely to divert cash from the intended basic or normal goods to other commodities that they fail to afford on their own. As a result, Akter et al. (2007) assert that for food-based programs, an effective tool for targeting the poor is to select an inferior food for distribution.

In addition, other empirical works have disputed the ability of transfers to provide choice in consumption to recipient households. Gentilini (2007) and Migotto et al. (2006) assert that in addition to cash, choice also hinges on the availability and accessibility of information. As a result, Sen (1981) argues that there is real freedom only when people are aware and rightly informed about their choices. For example, in examining the role of nutrition education programs in Malawi, the World Bank (2006) noted that while very cost-effective in improving child health, such programs are rarely demanded by communities, as they may not be aware that their young children are deficient in micronutrients and suffer from anemia.

3. Methods and Procedures

3.1 Data and Data Sources

This study aims to determine the relative cost-effectiveness of cash and food transfers to individuals starting ART treatment. This study uses data from a three-wave longitudinal survey (baseline, midline and endline) on the Katete ART adherence pilot project to estimate the BMI and CD4 count – the two outcome variables of interest. A total of 351 clients were enrolled in the pilot project that lasted for 2 years (2010-11), of which 175 were on cash and 176 on food transfers at baseline. However, during data analysis, 13 (3.7%, 8 on cash and 5 on food) were disqualified on account of being above the required

age of 55 years for the study. Therefore at baseline only 338 study clients (167 on cash and 171 on food) were included in the analysis. At post assessment, a total of 293 from 338 clients completed the whole period of 8 months of intervention, indicating an attrition rate of 45 (13.3%). Although clients were enrolled as individuals, they received transfers sufficient for the entire household, consistent with the WFP standard food basket. The three surveys collected data on both individual and household level variables.

The pilot project aimed at examining whether providing cash relative to food transfers to patients initiating ART improves their: (a) nutritional status as measured by the body mass index (BMI); (b) Household Diet Dietary Score (HDDS); (c) adherence to ART; (d) CD4 count; (e) asset base; (f) household income; (g) whether cash transfers are more cost-effective than in-kind transfers. However, the pilot study report identifies BMI and CD4 count as the only quantitative indicators that depict significant differences between the two interventions in all the three survey waves (baseline, midline and endline). According to Levin (1995), and Levin and McEwan (2000), cost-effectiveness analysis (CEA) is used to address only those types of intervention alternatives with outcomes that cannot be expressed in monetary values but are quantitative in nature. We, therefore, perform CEA using only BMI and CD4 count as the outcome variables.

Better nutrition and adherence to ART regimes are expected to raise both the BMI and CD4 count for the HIV/AIDS patients, regardless of their base levels. We, however, recognize that for BMI this may not be beneficial if the base BMI is in the overweight or obesity region. However, because these are very poor people and households, we expect their base BMI to more likely depict underweight than overweight status. Thus, we assume in this study that higher BMI is beneficial to these clients.

To arrive at a comparable size of the transfer for the two treatment arms, we use the World Food Program (WFP) standard food basket. Due to lack of recent data on the cost of transferring this unit of food from Lusaka to the representative final consumer nationally, we use estimates made by WFP (2006) and reported by Harvey and Marongwe (2006) and Wietler (2007), to estimate the total cost (sum of commodity cost; loading, transportation, storage and handling costs; direct and indirect costs) that would have been incurred had the food provided to the HIV clients between 2010 and 2011 through an e-voucher system in only one district (Katete) been delivered through a national food distribution program.

For the cost of transferring cash, we use estimates provided by DFID and MCDMCH (2013) based on actual data compiled during the period 2010 through 2012. These per-Dollar estimates of cash transfer costs were then combined with the estimated cost of WFP's standard food basket, net delivery costs, to arrive at the cost of a cash equivalent of the WFP standard food basket.

One of the key assumptions of the pilot project is that there is enough empirical evidence elsewhere suggesting that HIV patients on ART respond well and quickly when they are provided with either cash or food transfers (Beith and Johnson 2006; ODI – Briefing Paper, 2008). On this basis, the Katete pilot study that provided the two health

outcome variables (BMI and CD4 count) to this study, did not include a control group to help infer that the changes seen in the key outcome indicators were due to the effect of study interventions. This omission prohibits us from measuring the impact of the two transfer types, but enables a comparison of the relative efficacy of the two intervention types.

3.2 Data Analysis

While cost data were estimated in 2006, the corresponding health outcomes for the two transfer types were measured through a 2011 study of the Katete ART project. To combine the two types of data in a CEA, we compounded the cost data to 2011 values. Literature contends that program transfer costs be estimated to their comparable values at the time the outcomes are measured (WHO, 2003b). For studies that seek to evaluate alternative interventions implemented over a period of time and for whose costs data are available over the entire period of implementation, discounting is the appropriate mechanism for bringing future streams of costs to their comparable present values (Gold et al., 1996; Drummond et al., 1997). Conversely, if a study makes use of historical cost data to compare present alternative program interventions, compounding becomes the right procedure for bringing past streams of costs to their equivalent present values (Pearce, 1986). Given that this study uses 2006 cost data to compare two transfer mechanisms (food and cash) implemented between 2010 and 2011, we use the latter to bring the historical cost data to their corresponding present values.

According to Gold et al. (1996), there is generally no single preferred discount or compound rate and, as such, several rates are used in the literature to discount or compound costs. However, for comparability across studies, it is recommended that analysis be performed using a common discount rate (Levin and McEwan, 2000). The World Health Organization (WHO) recommends as social discount or compound rates 3 percent for developed countries with very low interest rates and country-specific rates of long-term government bonds for country-specific studies (WHO, 2003). We use the long-term government bond compounding rate of 10% obtained from the Zambia Revenue Authority (ZRA, 2013). The policy-laden government security rate is preferred to market rates of interest in this case because the cash, food and ART interventions are all government social programs. Market interest rates would unfairly over-penalize future outlays compared to the present.

Following Gold et al. (1996), we use the discrete-time compounding formula to estimate the value in 2011 of WFP's 2006 cost estimates:

$$Cost_{futurevalue} = Cost(1+r)^{t}, \qquad (1)$$

where r refers to the compound rate and t = 1, 2, ..., T is the time period in which the cost occurs.

The information collected on intervention costs and effects was thereafter combined to perform a cost-effectiveness analysis for the two interventions. This was done by computing a ratio of the total cost of the intervention, after compounding, to each outcome of interest, BMI and CD4 count (WHO, 2003b; Levin and McEwan, 2000). Following WHO (2003b), and Levin and McEwan (2000), the cost-effectiveness ratio (CER) for each intervention was obtained by dividing the total cost of delivery of each alternative (C) by its effectiveness or outcomes (E):

$$CER = \frac{C}{E}, \qquad (2)$$

After the ratios were calculated for each alternative, they were then rank-ordered from smallest to largest. The alternative with a smaller ratio was considered to be more cost-effective (Weinstein et al., 1996).

4. Results

4.1 Cost of Cash and Food Transfers

In the Katete ART adherence project, the food and cash interventions were given to the target individual but intended for the entire household hosting them. The outcome variables, on the other hand, were measured only for the target individual (i.e. the HIV positive client on ART). The intra-household dynamics related to differences in sharing ability between the two treatment arms and its effect on the outcomes are some of the sources of the differences that this study has sought to determine.

Table 1 presents cost estimates for procuring and delivering a standard WFP food basket to a representative recipient client/household, based on figures obtained from WFP (2006). The results indicate that, as at 2006, the average total cost of delivering a standard WFP food basket to a representative poor individual in Zambia was United States Dollars (USD) 40.61 per month. When compounded, this figure increases to USD 65.41 per month in 2011 Dollar equivalent. The results also show that delivery costs accounted for as much as 134 percent (USD 37.48 in 2011) of the purchase price of the food basket (USD 27.93 in 2011). These findings are consistent with those of Chiwele (2010) and White (2006) who also found the cost of transferring food significantly higher than the purchase price.

Table 1. Cost Estimates of Food Transfers in Zambia (2006) and Compounded Totals (2011 USD)

Commodity	Commodity cost (USD)	LTSH Costs (USD)	Direct Costs (USD)	Indirect Costs (USD)	Total Commodity Cost

					(USD)
25kg Maize meal	11.22	6.95	2.91	1.81	22.89
4kg Beans	1.81	0.82	1.91	0.21	4.75
2kg Sugar	1.81	0.82	1.91	0.18	4.72
2.5L Vegetable Oil	2.32	1.09	1.91	0.21	5.53
1kg Salt	0.18	0.45	1.91	0.18	2.72
Total					
2006 values (uncompounded)	17.34	10.13	10.55	2.59	40.61
2011 values (compounded)	27.93	16.32	16.99	4.17	65.41

Notes: 2006Exchange rate: USD1= ZMK4,000 (BoZ). LTSH refers to loading, transport, storage and handling costs

Source: Cost estimates based on data provided by WFP (2006); Oxfam Zambia (2006)

Table 2 presents comparable estimates of transferring a Dollar of cash transfers (Column 1). With the exception of the last row, these estimates were gathered from prior studies. We use the actual cash transfer cost estimates (last row of Table 2) in the rest of the cost-effectiveness analysis. This is because this, unlike all other estimates presented in Table 2, is not only based on actual cost data gathered by the MCDMCH but it is also from the same period as the health and nutrition outcomes (2010-12).

Using the actual cash unit transfer costs of $0.90 per USD, we estimate that it would cost $25.31, in 2011, to transfer $28.12 (the compounded value of the WFP standard food basket) to the intended beneficiaries. That is, if the recipient were given cash, the total cost of the transfer per month would be equal to the cash needed to purchase the food basket (USD28.12) plus the cost of transferring that cash (28.12 * 0.90 = USD25.31). Thus, cash is at least 32 percent cheaper to transfer than food and other in-kind transfers. The finding that cash is cheaper than food aid is consistent with several other studies. White (2006) and White and McCord (2006) found the cost-transfer ratios of cash to have been less than unity and those of food to have been more than one in both Malawi and Zambia SCT schemes.

Table 2. Cost of Transferring Cash in Zambia

Scenario	Cost to transfer USD1.00
	(1)
Estimates based on the Kalomo Scheme	
Pilot Phase (2004-06)[a]	$1.09
Scaled-Up Phase (2005-07)[b]	$1.48

Hypothetical Scale-Up to all Districts (2009)[c]	$1.20
Actual costs (2010-12)[d]	$0.90

[a] Estimates by Harvey and Marongwe (2006) and White (2006)
[b] Estimates by White (2006) and White and McCord (2006)
[c] Estimates by Chiwele (2010). These figures include the cost of M&E
[d] Based on actual data compiled from ministry records of all social cash transfer schemes during the period 2010 through 2012 (DFID and MCDMCH (2013)). These figures do not include the cost of M&E, which is supported separately through the American Institutes for Research (AIR)

4.2 Cost-Effectiveness Analysis of Food and Cash Transfers

Tables 3 and 4 present point estimates and 95 percent confidence intervals (CIs) for the cost-effectiveness ratios (CER) for food and cash transfers as means for influencing the patients' BMI (Table 3) and CD4 Count (Table 4). The results in Table 3 show that the cost-effectiveness ratio (CER) of a cash transfer on BMI is not only lower but also lies within a narrower 95 percent CI of 19.58-20.44, compared to that of an equivalent food transfer of 21.28-27.12. This suggests that cash transfers are not only cheaper but also more cost-effective than food aid in improving nutrition and health of recipient individuals. According to Weinstein et al. (1996), an alternative with a smaller CER is more cost-effective than that with a relatively higher CER; that is, it provides a given effectiveness at a lower cost and therefore it is the best candidate for new investments. There are several other reasons that cash has come to be preferred to in-kind transfers, including its ability to provide the recipients with the freedom of choice in consumption and its ability to enable them to diversify their diets according to their preferences and nutritional requirements (Akhteret al., 2007; Ahmed, 1993).

Table 3. Cost-effectiveness of Food and Cash Transfers on Nutrition (BMI)

	Program Type	
Statistic	Food	Cash
Mean BMI	21.94	21.37
Std Error (SE)	2.65	0.46
BMI CI: 95% (Low-Upper)	19.29 – 24.59	20.91 – 21.83
Total Cost of Transfer (8 months) in US$	523.20	427.44
Cost Effectiveness Ratio (CER) Interval	21.28 – 27.12	19.58 – 20.44

Notes: SE is standard Error and CI is confidence Interval
Source: Our estimates are based on data obtained from Kawana et al. (2012); MCDMCH (2012); DFID (2013)

Similarly, the cost-effectiveness results in Table 4 demonstrate that cash transfers are more cost-effective at sustaining the general health conditions of HIV positive people. The 95 percent CI for the cash CER with respect to CD4 Count is not only narrower but also falls unambiguously below that of food aid.

Table 4. Cost-effectiveness of Food and Cash Transfers on CD4 Count

Statistic	Program Type	
	Food	Cash
Mean CD4 Count	351.95	361.95
Std Error (SE)	26.71	27.32
CD4 Count CI: 95% (Low-Upper)	325.24 – 378.66	334.63 – 389.27
Total Cost of Transfer (8 months) in US$	523.20	427.44
Cost Effectiveness Ratio (CER) Interval	1.38 – 1.61	1.10 – 1.28

Notes: SE is standard Error and CI is confidence Interval

Source: Our estimates are based on data obtained from Kawana et al. (2012); MCDMCH (2012); DFID (2013)

5. Conclusion

This study presents one of the first attempts at understanding the relative cost-effectiveness of cash versus food aid as instruments for influencing health and nutrition outcomes for HIV-positive people that are on anti-retroviral therapy (ART). The results confirm that cash transfers are not only cheaper but also unambiguously more cost-effective. This seems to suggest that, whenever market conditions and institutional capacities permit, governments, civil society groups, development practitioners and other organizations involved in social welfare schemes should give cash transfers a higher rating than food aid when designing interventions targeted at improving nutrition and health outcomes for HIV patients that are on ART.

However, the fact that the study uses estimates of nutrition and health outcomes (BMI and CD4 count) from a small pilot district and national cost estimates identifies the need to interpret the results cautiously and the need for bigger and context-specific studies. Additional qualitative studies are also required to examine in detail the causal mechanisms underlying the observed results.

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