

Cash or Food? Which Works Better to Improve Nutrition Status and Treatment Adherence for HIV Patients Starting Antiretroviral Therapy

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Abstract The overall objective of this DFID-funded study was to understand whether cash or food transfers were more effective for HIV-positive individuals starting antiretroviral therapy (ART) in improving nutrition, health status and adherence to ART. HIV-positive individuals initiating ART at the St Francis Mission Hospital in Katete District, Eastern Province, were randomly allocated to two treatment groups (cash and food), and given a food basket or its cash equivalent monthly, for eight months. Both treatment groups saw significant increases (p -value <0.001) in Body Mass Index (BMI), Household Dietary Diversity Score, good adherence to ART, and in mean CD4 count, but there were no significant differences between the two treatment groups in these measures. The study concluded that the provision of cash or food for eight months when clients start ART confers similar and significantly positive effects in improving clients' nutrition and health. Providing cash is likely to be more cost-effective.

1 Introduction

According to UNAIDS, new HIV infections fell by 33 per cent between 2001 and 2012, from 3.4 to 2.3 million globally, but 70 per cent of new infections occur in sub-Saharan Africa (UNAIDS 2013). At regional level, Zambia was among the countries with the smallest prevalence drop between 2001 and 2007 (Government of Zambia 2010). State provision of antiretroviral therapy (ART) in Zambia began for a few people in Lusaka in 2002 and by the beginning of 2004 the Ministry of Health offered ART for free in a wide range of health facilities. The programme expanded rapidly with over 400,000 people now receiving ART across the country. With high levels of coverage of ART achieved in recent years, attention has also started to be paid to related concerns, including nutrition.

Adequate dietary intake and absorption are essential for achieving the full benefits of ART, and there is emerging evidence that patients who begin therapy without adequate nutrition have lower survival rates (Paton *et al.* 2006). ART itself may increase appetite and it is possible to reduce some side-effects and promote adherence if some of the medicines are taken with food. Food insecurity and poor nutrition can also hasten the progression of AIDS-related illnesses, while the virus itself reduces the capacity of people living with HIV to work to provide food for themselves and their families. Given the need for adherence in delaying resistance to first-line drugs, nutritional support is increasingly seen as critical to sustaining antiretroviral treatment (World Bank 2007).

Studies have also suggested that several important factors influence adherence to ART, including forgetfulness, lack of understanding of treatment regimens or benefits, complexity of drug regimens, and depression, as well as food and nutrition insecurity (Sanjobo, Frich and Frøtheim 2008). A study carried out in Kenya and Zambia (ODI 2008) suggested that the provision of food assistance for HIV-infected adults already receiving ART may improve medication adherence, with likely greater effects at earlier stages of treatment. A matched case control study in northern Ethiopia (Berhe, Tegabu and Alemayehu 2013) also showed that an association exists between adherence and getting enough and quality food. These findings pointed to the fact that the capacity to effectively manage the food and nutrition implications of ART adherence is a critical factor in the success of ART in resource-limited settings such as Zambia.

Further, over the past decades, there has been acknowledgement of the importance of social protection to respond to a range of challenges faced by individuals and households affected by the HIV pandemic. Social protection measures have been known to reduce HIV-related vulnerability and are critical drivers for efficacious HIV prevention and treatment outcomes. Among the several social protection measures, cash or food transfers are increasingly being used as methods for improving nutrition and adherence to treatment. It is not known, however, whether the provision of cash instead of food would lead to different impacts for patients, in terms of nutrition status, adherence to ART and the welfare of the

Table 1 Nutrition status of study clients by survey points and by treatment group

Nutrition status category	Baseline				Endline			
	Cash		Food		Cash		Food	
	n	%	n	%	n	%	n	%
Severely underweight	7	4.5	4	2.6	1	0.7	2	1.5
Moderately underweight	35	22.6	29	19.1	9	6.7	16	12.2
Normal	103	66.5	106	69.7	109	80.7	95	72.5
Overweight	8	5.2	11	7.2	13	9.6	17	13.0
Obese	2	1.3	2	1.3	3	2.2	1	0.8
Total	155	100	152	100	135	100	131	100

Source Authors' own from Kawana *et al.* (2012).

household as a whole, as well as which of the two transfers is more cost-effective.

2 Study objective and methodology

The overall study aim was to fully understand which transfer mechanism (cash or food) ensures adequate nutrition improvement for those initiating ART treatment, and which increases adherence to ART in a more effective way. Specifically the study was meant to:

- Examine whether providing cash or food transfers to patients initiating ART improves their nutritional status (BMI);
- Assess whether providing cash or food transfers to patients initiating ART improves Household Dietary Diversity Score (HDDS);
- Assess which transfer type better improves adherence to ART;
- Examine whether CD4 count is improved by providing a patient initiating ART with food or cash; and
- Assess which of the two transfers (cash or food) is more cost-effective.

The study was conducted in Zambia's Eastern Province, in Katete District, at the St Francis Mission Hospital. The hospital has a 350-bed capacity and provides medical and surgical care to over 200,000 people in Katete District, as well as accepting referrals from the whole of Eastern Province. Adults, male and female, aged 18–55 years, recently diagnosed with HIV and initiated on ART, were randomly allocated to two treatment arms (cash or food), regardless of socioeconomic status. The study was restricted to only those clients who resided within Katete District boundaries.

The required sample size was determined to provide a 95 per cent confidence and with a 90 per cent power, and a 30 per cent effect on adherence, based on similar studies (Tirivayi, Koethe and Groot 2010; Bangsberg 2011). This estimated effect on adherence of 30 per cent was based on the fact that the studies referred to had control groups, while the Katete ART study did not. The sample estimation was chosen as it depends on a population-estimated standard deviation, as opposed to the use of prevalence rates to estimate the sample size. This was necessary because St Francis Hospital is a referral centre attending to

patients not only from Katete or Eastern Province but also other parts of Zambia, and so estimating using prevalence rates was not feasible. The study sample was therefore estimated to be 149 participants per treatment arm, which meant that, allowing for 10 per cent non-response rates, the study aimed to enrol a total sample of 328 participants across the two treatment arms. By the end of the study, a total of 147 clients in each treatment arm remained in the study. As this sample size would have been required had we intended 94.68 per cent confidence, rather than 95 per cent, the findings can be treated as significant, despite this small reduction in final sample size.

The clients were supported unconditionally with monthly food or cash transfers, using electronic vouchers, for a period of eight months, in accordance with the World Food Programme (WFP) Zambia protocol. The monthly WFP standard food basket utilised under this study consisted of 25kg maize meal, 4kg beans, 2kg sugar, 2.5 litres vegetable oil and 1kg salt. Clients on the cash transfer received the amount which was equivalent to the value of the cost of the food basket. The value of the e-vouchers (both cash and food) was reviewed on a monthly basis through surveys of the food basket's cost in the local market. Due to fluctuations in prices of the food commodities, the value of the food basket used in this study varied between US\$20 and US\$31 during the eight months of intervention.

3 Limitations

The study had three principal limitations. Firstly, due to ethical and feasibility considerations, clients' recruitment was not made at once but over a period of four to six months, and so provision of the study intervention (transfers) did not begin at the same point in time for each and every client, which in turn meant that baseline and endline surveys were occurring for different clients at different stages of the agricultural cycle and associated hunger season. This does, however, mean that the timing of surveys in the agricultural cycle would not have had a significant effect across the whole sample. Secondly, one of the key assumptions of this study was that there was already sufficient evidence suggesting that HIV patients on ART respond well and quickly when they are provided with either a cash or food transfer (Hughes *et al.* 2009; Temin 2010). On this basis, the study did not include a control group,¹ which would have helped infer with a

Table 2 Percentage distribution of households' diet diversity score by treatment group

	Baseline				Post				P-Value	
	Cash		Food		Cash		Food		.155	0.146
	n	%	n	%	n	%	n	%		
Poor	22	13.3	34	19.9	4	2.7	7	4.8		
Moderate	97	58.4	100	58.5	72	49	85	57.8		
Good	47	28.1	37	21.6	71	48.3	55	37.4		
Total	166	100	171	100	147	100	147	100		

Source Authors' own from Kawana *et al.* (2012).

greater deal of certainty that the changes being seen in the key outcome indicators were due to the effect of study interventions. This omission also had a significant bearing on how results were analysed and interpreted. Finally, the study did not directly collect enough data to help analyse which transfer is more cost-effective.

4 Study data collection and management

Following a five-day training workshop for research assistants, and pre-testing of the questionnaires, data collection was undertaken at three different intervals: baseline, midline and endline. The baseline was undertaken within the first week of enrolment for each client, with baseline data collection spanning a period of seven months, from August 2010 to March 2011, as clients were successively enrolled as they initiated ART. The midline was undertaken four months after the baseline visit, over the period December 2010 to June 2011, while the post-assessment was undertaken eight months after the baseline, during May 2011 to November 2011.

These surveys were conducted at household level, collecting data on household variables such as the social demographics and food consumption diversity (household dietary diversification). Individual client data were also collected, including anthropometric data, CD4 counts and adherence levels. The CD4 counts and adherence data of the study clients were obtained from ART clinical records at the St Francis Mission Hospital.

Data were entered using CPro version 4.1, which was then exported to the Statistical Package for Social Scientists (SPSS) version 15.0, for cleaning and analysis. The nutrition status of adults was determined by calculating the BMI using weight and height in SPSS. In this study, BMI is classified as follows: less than 16.0 is severely underweight; 16.00 to 18.49 is moderately underweight; 18.50 to 24.99 is normal; 25.00 to 29.99 is overweight; and 30 and above is obese. For HDDS, a household was classified as having poor HDDS if they had consumed three or less food items in the previous 24 hours, moderate HDDS if they consumed between four to six food items and good HDDS if they consumed seven or more food items. Lastly, low CD4 count was classified as less than 200cells/l, moderate as 200.1–349.9cells/l, and high as above 350cells/l.

Descriptive statistics were generated to profile the demographic and socioeconomic characteristics of the

households and clients on the two treatment groups. In addition, chi-square tests with significance level set at 95 per cent were used to assess associations between outcome variables (adherence, CD4 count and nutrition status) and socioeconomic characteristics of study subjects, by treatment groups. Paired sample tests were used to compare effects of the treatment at different intervention times in the respective intervention groups, while independent t-tests were used to compare the means of the continuous outcome indicators for the two treatment groups (cash and food).

Finally, detailed qualitative case studies were carried out, by CARE International, on 17 clients, to compare subjective views on the impact and effectiveness of the two transfer types (Kawana *et al.* 2012).²

5 Study results

A total of 351 clients were enrolled in the study, with 175 on cash and 176 on food transfers at baseline. Data analysis disqualified 13 clients (3.7 per cent, 8 and 5 on cash and food respectively) for being above the required age of 55 years, and so at baseline, only 338 study clients were included in the analysis (167 on cash and 171 on food). At post-assessment, a total of 293 clients of the 338 completed the whole period of eight months of intervention, 147 and 146 on cash and food transfers respectively. This attrition rate of 13.3 per cent is attributable to deaths of 12 clients (3.6 per cent), while 33 clients (9.8 per cent) voluntarily dropped out. In some cases, clients relocated from the study area to another location where it was not possible for them to continue receiving the services provided by the study. Another reason for drop-out was related to stigma, whereby certain clients felt that continued collection of the transfers and follow-ups by research assistants compromised their confidentiality. Other clients had preference for a particular transfer type, especially cash rather than food, and so decided to drop off the study. Lastly, some economically better-off clients, by virtue of having a steady income, felt that they did not need this kind of support.

Both groups of study clients, cash and food, exhibited similar demographic and socioeconomic characteristics at baseline, entailing that the covariates and the key outcome variables were fully balanced between the treatment arms. This also suggested that the characteristics of the households and clients on cash and food transfer were

Table 3 Adherence to ART among clients

Adherence	Baseline assessment				Post-assessment			
	Cash		Food		Cash		Food	
	n	%	n	%	n	%	n	%
Good adherence	118	94.4	113	94.2	145	100.0	144	99.3
Bad adherence	3	2.4	1	0.8	-	-	-	-
Other	4	3.2	6	5.0	-	-	1	0.7
Total	125	100	120	100	145	100	145	100

Source Authors' own from Kawana et al. (2012).

similar and the randomisation process was a success. Therefore any comparison carried out between the two groups and changes in the key outcome variables to determine the impact and effect of the treatments can be ascribed to the effect of the interventions.

5.1 Nutrition status of study clients

From baseline through to post-assessment, there was a significant increase in the percentage of clients falling in the normal BMI category in both groups. There was also a notable decline in the proportion of study clients on cash transfer who were moderately or severely underweight, from 27.1 per cent to 7.4 per cent (see Table 1). Similar observations were noted among clients on the food transfer scheme (21.7 per cent at baseline, to 13.7 per cent at endline). A chi-square test of independence using Fisher's exact two-sided test showed that at both baseline and post-assessment, clients' nutritional status as measured by BMI was independent of the transfer type ($p=0.754$ and $p=0.317$).

The mean BMI for study clients also showed an increase for both treatment groups. The mean BMI for clients receiving cash increased from 20.42 to 21.88, while those receiving food saw their mean BMI increase from 20.74 to 21.75. A paired samples *t*-test was conducted to compare the baseline mean BMI of clients on both treatment groups to the midline and post-assessment BMI means. The results show that the increase in mean BMI from baseline to midline was statistically significant in both treatment groups [$t(123) = (-4.55)$, $p<0.001$ on cash and $t(125) = (-2.36)$, $p=0.020$ on food]. The results were similar from baseline to post-assessment [$t(124) = (-6.64)$, $p<0.001$ on cash and $t(116) = (-4.86)$, $p<0.001$ on food]. There were, however, no significant differences in the effect of the different transfers on mean BMI.

5.2 Household food availability and dietary diversity

During all the three assessment points, the main source of staple food was monitored. 'Own harvest' was the most important source of staple food for most of the study clients at all of the three assessment points, for both transfer types. The assessment results also showed that 'purchase' was becoming an important source of staple food for clients on cash transfer, as the study was being implemented. Compared to 32.3 per cent of client's households on cash transfer that were purchasing staple food at baseline, 46.9 per cent were purchasing staple food at endline, whereas for those on food transfers, the percentage of households purchasing staple foods fell,

from 28.1 per cent at baseline to 12.2 at endline. A chi-square test of independence using Fisher's exact two-sided test showed that at baseline, households' most important source of household staple was independent of the transfer type $p=0.710$, while at post-assessment, there was a statistically significant relationship between households' most important source of staple and treatment type $p<0.001$.

In terms of dietary diversity, Table 2 shows that in both treatment groups, poor diet diversity score (DDS) (less than three food items) decreased over the eight months of intervention, while good DDS (seven or more different food items consumed) increased, from baseline, midline until post-assessment, in both treatment groups. Households with a client on cash transfer had rates of good DDS, increasing from 28 per cent at baseline to 48 per cent at post-assessment, compared to an increase from 22 per cent to 37 per cent for those on food. A chi-square test of independence showed that at both baseline and post-assessment, household DDS was independent of the transfer type ($\chi^2(2, df=6, n=337) = 3.734$, $p=0.155$) and ($\chi^2(2, df=2, n=294) = 3.926$, $p=0.140$).

Mean HDDS for households on cash transfer increased from 5.5 to 6.5, while for those on food transfer it increased from 5.1 to 6.4 at post-assessment. A one-way repeated measure Analysis of Variance within groups (ANOVA) showed that there was a significant increase in HDDS across the three different time periods [Wilks' Lambda = 0.808, $F(2, 290) = 34.399$, $p=0.001$, multivariate partial eta squared = 0.006]. However, there was no significant difference in HDDS between the two treatment groups across the three different time periods [$F(1,291) = 1.730$, $p=0.189$].

5.3 Adherence to ART

One of the key outcome variables of this study was the adherence to ART by study clients. Determining adherence to ART in HIV patients puts into consideration a composite of factors. These factors include the number of doses missed by the patient due to varied reasons, such as if the patient gave some pills to another person, and whether the patient has access to a treatment supporter and home-based care services.

The study results clearly show that more than 95 per cent of the study clients in both treatment groups had good adherence at all the three survey points (one study conducted in rural Zambia in 2009 showed that of patients

Table 4 Cost-effectiveness of food and cash transfers on nutrition (BMI)

Statistic	Programme type	
	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
Cost of transfer (8 months) in US\$	523.20	427.44
Cost-effectiveness ratio (CER) interval	21.28–27.12	19.58–20.44

Source Authors' own from Kawana *et al.* (2012).

for whom pill counts were available, 83.7 per cent had optimal (≤ 95 per cent) adherence). The highest adherence score was recorded during the post-assessment, where study clients on cash and food transfer had 100 per cent and 99 per cent adherence status respectively (see Table 3). A chi-square test of independence shows that at baseline, study clients' adherence was independent of the transfer type [X^2 (df=1, n=245) = 1.407, $p=0.937$]. In addition, at post-assessment, chi-square test of independence using Fisher's exact two-sided test showed that clients' adherence to treatment was independent of the transfer type ($p<0.001$).

5.4 CD4 count

The CD4 lymphocyte count is an excellent indicator of how healthy the immune system is. In HIV-infected people, the level of CD4 cell counts can predict how fast or slow the final stages of AIDS is progressing in an HIV-positive patient. The distribution of CD4 count by transfer type at the two reference points, from baseline assessment to post-assessment, showed a slight reduction in the number of clients with CD4 count below 200 cells/ μL , in both transfer groups. The study results also showed that the proportion of study clients with CD4 count above 350 cells/ μL was increasing from baseline to post-assessment, in both transfers. An increase would be expected with ART alone, even without nutrition support, and so may well be a reflection of increased adherence rates. However, studies have shown that malnourished people are less likely to benefit from antiretroviral treatment (see, for example, studies cited at www.avert.org/hiv-and-nutrition.htm), and so the improved nutrition outcomes reported above in Section 5.1 may also be contributing to improved effects of ART on CD4 count, although the lack of a control group makes this impossible to quantify. A chi-square test of independence shows that at both baseline and post-assessment, study clients' CD4 count was independent of the transfer type [X^2 (df=2, n=338) = 1.065, $p=0.587$ and X^2 (df=2, n=294) = 0.751, $p=0.687$].

Mean CD4 count increased among both cash and food transfer treatment groups, from 202.2 at baseline to 363.9 at post-assessment for clients on cash, and from 212.5 at baseline to 352.1 at post-assessment for clients on food. A paired samples *t*-test was conducted to compare the baseline mean CD4 count of clients on both treatment groups to the CD4 count means attained at both midline and post-assessment. The results show that the increase in mean CD4 count from baseline to midline was statistically

significant in both treatment groups [$t(159) = (-7.42)$, $p<0.001$ on cash and $t(161) = (-5.64)$, $p<0.001$ on food]. The picture was also the same from baseline to post-assessment [$t(146) = (-13.55)$, $p<0.001$ on cash and $t(146) = (-10.03)$, $p<0.001$ on food].

6 Client preferences

The majority of the 17 clients interviewed for the qualitative study (CARE International Zambia 2012) stated that they preferred cash over food transfers. Among the ten clients interviewed who received cash, eight stated that they preferred it this way, and two of the six clients on food transfers would rather have received cash, with one of them even selling some of the received food to convert it into cash. Most clients pointed out that cash can be used to buy food and to pay for other expenses such as clothes, school fees, agricultural inputs and house-building. Many mentioned the need to look beyond the ART study by investing in the future.

7 Cost-effectiveness

The values of the cash transfer and food basket were the same in this study, as were the costs of producing an e-voucher (scratch card for each client), the transaction fees for the e-vouchers, and the commissions paid to the delivering agent. Overall, the total cost of both cash and food transfers was US\$323 over the eight months. A separate study was therefore carried out by one of the authors (Tembo and Mwansakilwa 2013), to project the costs of transferring cash or food, based on the amounts and values distributed in the ART study, assuming that these would be scaled up by the government. The estimated costs of transferring food were taken from WFP figures from 2006 from Zambia, compounded to 2011 equivalents, while the costs of transferring cash were taken from average costs from the Social Cash Transfer Programme during 2010–12. The study concluded that it would cost US\$25.31 in 2011, to transfer US\$28.12 (the compounded value of the WFP standard food basket) to intended beneficiaries, compared to a cost of transferring an equivalent in-kind food basket of US\$37.28.

Table 4 shows that the cost-effectiveness ratio (CER) of a cash transfer on BMI was not only lower, but also lies within a smaller 95 per cent confidence interval (CI) (of 19.58–20.44, compared to that of an equivalent food transfer, 21.28–27.12). This suggests that cash transfers are not only cheaper but also more cost-effective in improving the nutrition of recipient individuals than food aid.

8 Conclusions

The study shows that there were significant improvements in the key outcome indicators for both transfer groups, over the eight months of cash or food support. Significant improvements were noticed in the mean *CD4* count in both treatment groups, *adherence* to ART and nutrition status as measured by the Body Mass Index (*BMI*), as well as Household Dietary Diversity Scores (*HDDS*). However, when the two treatment groups were compared, the study showed that both groups responded similarly to the treatments, whether cash or food. The results also clearly suggest that there were enormous amounts of similarities in other characteristics at final assessment between the two treatment groups, as was the case at baseline and midline assessments. Therefore, the conclusion made from these findings is that the provisions of cash or food for eight months when clients start ART confer equally positive effects in improving clients' nutrition and health.

In the Zambian context, where poverty and undernutrition levels are very high, adequate nutrition support is necessary for some households to ensure the optimal benefits from antiretroviral treatment. The study has

shown the benefits of such support to vulnerable clients, and made a strong case for limited nutrition support (perhaps six to eight months) to be provided to vulnerable households to ensure high treatment uptake and adherence until patients are well enough to return to their productive lives.

Given similar effects of cash and food, and the likely greater cost-effectiveness of transferring cash rather than providing food, cash transfers or social protection should be considered as a cost-effective strategy in Zambia to help people affected by HIV regain their strength and lead productive lives, as well as to support effective treatment scale-up. The Government of Zambia's new National Food and Nutrition Strategic Plan, which promotes strengthening the linkages between nutrition and HIV under Strategic Direction 6, including the need to provide food security or social protection for vulnerable HIV-affected households, as well as the scale-up of the Social Cash Transfer (to cover 50 districts in 2014 and all 104 districts in 2015), provides the policy framework and a cost-effective vehicle to start providing such support for the most vulnerable clients starting ART.

Notes

- 1 Because of the existing evidence of positive effects of nutrition support for clients starting ART, approval from the Ethical Review Board in Zambia would not have been obtained had there been a control group.
- 2 The full study is available online at: www.scribd.com/doc/227599322/A-Study-to-Compare-the-Effects-of-Cash-and-Food-Transfer-Schemes-on-HIV-Patients-Initiating-Antiretroviral-Therapy-ART (accessed 2 June 2014).

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