

**A Study to
Compare the Effects of Cash and
Food Transfer Schemes
on HIV Patients Initiating
Antiretroviral Therapy (ART)**

**FINAL ASSESSMENT
REPORT**

NFNC/CARE

2012

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ACKNOWLEDGMENTS

This final report is a joint product of the National Food and Nutrition Commission (NFNC) and CARE International – Zambia with the financial support provided by DFID – Zambia. We wish to thank in particular the ART Project Manager in Katete for his abilities and efforts in ensuring all aspects of the study were well coordinated. Special thanks also go to all staff at St. Francis Hospital who participated in the identification and recruitment of the study clients. All research assistants and data entry clerks are acknowledged for their contribution to this study. We wish also to acknowledge the role played by Isusyas General Dealers in getting cash and food to all our study clients during the entire period of the study. Lastly, but of course not the least, the validation role played by University of Free States (UFS) in the Republic of South Africa and University of Zambia (UNZA) went a long way in ensuring that this report answers the objectives of the study.

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ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
ANOVA	Analysis of Variance
ARV	Antiretroviral
ART	Antiretroviral Therapy
BMI	Body Mass Index
CAFOD	Catholic Agency for Overseas Development
CD4	Cluster Difference 4
CI	Confidence Interval
CARE	Cooperative Agreement for Relief Everywhere
df	Degrees of Freedom
DFID	Department for International Development
DDS	Dietary Diversity Score
ESARO	Eastern and Southern Africa Regional Office
FANTA	Food and Nutrition Technical Assistance
GAM	Global Acute Malnutrition
GRZ	Government of the Republic of Zambia
HIMS	Health Information Management System
HDD	Household Dietary Diversity
HIV	Human Immunodeficiency Virus
HSRC	Human Sciences Research Council
ITNs	Insecticide Treated Nets
IDA	Iron Deficiency Anemia
MD	Mean Difference
MUAC	Mid Upper Arm Circumference
MOH	Ministry of Health
MTZL	Mobile Transactions Zambia Limited
NFNC	National Food and Nutrition Commission
NRC	National Registration Card
NGO	Non-Governmental Organization
OECD	Organization for Economic Cooperation and Development
SD	Standard Deviation
SPSS	Statistical Package for Social Scientists
UNICEF	United Nations Children Fund
UNAIDS	United Nations Programme on HIV/AIDS
US\$	United States Dollars
UFS	University of Free State
UNZA	University of Zambia
VIP	Ventilation Improved Pit Latrines
WFP	World Food Programme
WHO	World Health Organization
ZDHS	Zambia Demographic and Health Survey
ZMK	Zambian Kwacha

EXECUTIVE SUMMARY

The ART study had two treatment arms (cash and food) and aimed at comparing outcomes for clients initiating an ART regime. These interventions (i.e. cash and food) were designed to improve the nutritional status of ART Study clients and their families with the intention of increasing adherence to and effectiveness of ART. The clients were supported unconditionally with monthly food or cash transfers using electronic vouchers for a period of 8 months in accordance with the WFP Zambia protocol. WFP standard food basket utilized under this study consisted of a 25kg maize meal, 4kg beans, 2kg sugar, 2.5litres vegetable oil and 1kg salt. Clients on cash transfer received the amount which was equivalent to the value of the cost of the food basket.

The overall study aim was to fully understand which transfer mechanism (cash or food) ensures adequate nutrition improvement for those initiating ART treatment, and increases adherence to Anti-Retroviral Treatment (ART) in a more effective way. This study specifically the study was intended 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 Diet Diversity Score (HDDS); assess which transfer type (cash or food) improves adherence to ART; examine whether CD4 count is improved by providing a patient initiating ART with a food or cash transfer; assess whether the household asset base is increased by providing cash or food transfers to patients initiating ART; examine whether household income is improved when patients initiating ART are provided with cash or food transfers; and assess which of the two transfers (cash or food) is more cost effective.

The study was conducted in Eastern Province of Zambia, in Katete District, at St. Francis Mission Hospital. This was an intervention study, focusing on HIV positive individuals initiated on ART. The enrolled adults (both male and female aged 18 to 55 years) were randomly allocated to two treatment arms (cash or food) using computer-generated random numbers.

A total of 351 clients were enrolled in the study of 175 were on cash and 176 on food transfers at baseline. However, during data analysis, 13 (3.7%, 8 and 5 on cash and food respectively) were disqualified on account of them being above the required age of 55 years in this study and thus were not included in the analysis. 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 clients from 338 completed the whole period of 8 months of intervention indicating an attrition rate of 45 (13.3%) of which 147 and 146 were on cash and food transfers respectively. This attrition is attributable to deaths of 12 clients (3.6%) while 33 (9.8%) clients voluntarily dropped out. The study did not formally investigate the reasons why clients voluntarily dropped out of the study. However, through observations and interactions with their close associates by the project team, it was noted that relocation, stigma and

preference of a particular transfer to another as among the reasons for this dropout rate.

The results of this study show that the increase in mean BMI from baseline to midline was statistically significant in both treatment groups (p-value < 0.001). This was the case at when post assessment results were compared to the baseline (p-value <0.001). However, results of an independent t test conducted during the post assessment suggested that there was no significant differences between the two treatment groups in the levels of improvements (p-value = 0.711).

The mean HDDS for households on cash transfer increased from 5.5 at baseline to 6.5 at post assessment compared to those on food transfer from 5.1 at baseline and 6.4 at post assessment. The results further indicated that the increase in the mean HDDS across the three different time periods was statistically significant (p-value = 0.001). However, the results suggest that there was no significant difference in HDDS between the two treatment groups across all the three different time periods (p-value = 0.189).

More than 95 percent of the study clients in both treatment groups had good adherence at all the three survey points. The highest adherence score was recorded during the post assessment, where study clients on cash and food transfer had 100 percent and 99 percent adherence status respectively. The results further suggest that clients adherence to treatment was independent of the transfer type (p-value = 1.000). The increase in mean CD4 count from baseline to midline was statistically significant in both treatment groups (p-value < 0.001). The mean CD4 increase was also significant in both treatment groups from baseline to post assessment (p-value < 0.001). A comparative evaluation of the two treatment groups using the independent t-test, at the post assessment shows that there were no significant differences in the effects of the interventions between the treatment groups (p-value = 0.521).

A considerable proportion of study clients involved in informal employment activities while others were employed in the formal sector. This picture was the same across the three different time periods and between the two treatment groups. A Chi-square test of independence showed that at baseline, study clients' main economic activity was independent of the transfer type (p-value = 0.233). However, at post assessment, there was a statistically significant relationship between study clients main economic activity and treatment type (p-value = 0.034).

At post assessment, the cost of delivering both cash and food per study client is estimated at US\$323 for the period of 8 months. As both transfers were administered through an e-voucher system and the cash given was equivalent to the cost of the food basket, and given the similar effects conferred by both treatment arms, the study did not generate evidence to ascertain which transfer is more cost effective.

Results of the post assessment showed that there were significant improvements in the key outcome indicators when they are compared to the results reported at baseline. 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). However, when the two treatment groups were compared in respect to these key indicators, the post assessment showed that both interventions conferred similar effects. Therefore, the conclusion made from these findings is that both treatment approaches confer similar effects in improving CD4 count, nutrition status and adherence to ART.

DEFINITION OF KEY TERMS

1. *Clients*

Under this study, clients refers to individuals who have recently been diagnosed HIV positive and are put on Anti Retroviral Treatment (ART) and have been enrolled to participate in the ART Study.

2. *Cash Transfer*

Cash transfer, sometimes referred to as income transfer or cash subsidies is where recipients are given cash or in form of cheques, money orders or vouchers as a safety net, not only to improve the ability to purchase food, but also enable them retain productive assets or to continue to be productive and be resilient. It is a regular non-contributory payment of money provided by government or non-governmental organizations to individuals or households, with the objective of decreasing chronic or shock-induced poverty, addressing social risk and reducing economic vulnerability (Michael, 2009)¹.

3. *Food Transfer*

Food transfer is all food supported interventions aimed at improving the food security of the vulnerable people in short and long term whether funded via Government, NGO or private sources.

4. *Antiretroviral Therapy*

Standard antiretroviral therapy (ART) consists of the combination of at least three antiretroviral (ARV) drugs to maximally suppress the HIV virus and stop the progression of HIV disease (WHO, 2012)². The therapy also involves counseling and support, advice on nutrition and lifestyle, blood tests to determine status of one's health and the eventual taking of medicines i.e. ARVs to treat HIV infection, prevent progression to AIDS and assist the return to good health.

5. *Body Mass Index*

According to the World Health Organization (WHO), Body Mass Index (BMI) is a simple index of weight-for-height that is commonly used to classify nutritional status in adults. It is defined as the weight in kilograms divided by the square of the height in metres (kg/m²). BMI provides a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems (CDC, 2011)³. In this study, BMI was used to measure the nutritional status of study clients.

6. *CD4 Count*

A measure of the number of T-cells per cubic millimetre of blood, used to analyse the prognosis of patients infected with HIV⁴. WHO recommends that HIV treatment is started when the

¹ Michael, S. 2009. Social Cash Transfer and Pro-Poor Growth. OECD

² WHO, 2012. Antiretroviral Therapy. Available at <http://www.who.int/hiv/topics/treatment/en/index.html>

CD4 cell count is around 350 to reduce the risk of HIV-related illnesses, as well as some other serious illnesses. If it drops below 200 to 250 one is at increased risk from serious infections and it is very important that HIV treatment is started (Michael, 2011)⁵. In this study, CD4 count was classified as follows; below 200 cells/ μ L, between 200 to 350 cells/ μ L, and above 350 cells/ μ L.

7. *Food Basket*

The Food Basket is an assessment undertaken periodically (period) to illustrate the prices for selected essential food and non food items that comprise the bare minimum survival basket of goods needed for an urban family of six to maintain a decent and healthy standard of living. (ICTR, 2005)

8. *Anthropometry*

Anthropometry provides the single most portable, universally applicable, inexpensive and non-invasive technique for assessing the size, proportions and composition of the human body (WHO 2012)⁶.

9. *E-voucher or electronic voucher*

This is an electronic delivery/payment mechanism in which cash and other products are given to targeted beneficiaries through scratch cards and phones. Through the e-voucher system, a beneficiary receives a scratch card which they take to an identified retail agent for redeeming. The system validates the scratch card against beneficiary ID and the retail agent provides the required product e.g. cash, food etc to the beneficiary.

10. *Household*

A household is a group of people living together under one roof who eat from the same pot and consider one member as the head, regardless of their relationship.

11. *Household Welfare*

Household welfare was measured in terms of the household asset base (both productive and non-productive), livestock ownership and the main economic activity.

12. *Household Dietary Diversity Score*

This is the score or number of different foods consumed in the different food groups over a given reference period. It is a proxy indicator of household food security (FANTA 2006)⁷.

³ CDC, 2011. Healthy Weight – it's not a diet, it's a lifestyle. Available at <http://www.cdc.gov/healthyweight/index.html>

⁴ <http://www.thefreedictionary.com/CD4+count>

⁵ Michael, C. 2011. CD4 Cell Count. Available at <http://www.aidsmap.com/CD4-cell-counts/pages/1044596/>

⁶ available at http://www.who.int/childgrowth/publications/physical_status/en/index.html

⁷ FANTA 2006. Household Dietary Diversity Score (HDDS) for measurement of households' food access: Indicator Guide, version II.

13. *Adherence*

Adherence is defined as the extent to which a person's behaviour in terms of taking medications, following a diet and executing life style changes, follows agreed recommendation from health care provider (WHO, 2003)⁸. According to St Francis Mission Hospital classification criteria, adherence was classified as either good or poor. Good adherence meant a client scoring at least 95% of the adherence assessment criteria which included a client taking the right/correct ARVs/drugs at the right time and in the correct dose as prescribed by the clinician, having a treatment supporter, linked to home based care, and not sharing the drugs with another client. On the other hand poor adherence meant a client having scored less than 95% of the adherence assessment criteria stated above.

⁸ Sabate, E. 2003. Adherence to Long Term Therapies, Evidence for Action. WHO, Geneva.

1.0 BACKGROUND

According to UNAIDS, the HIV incidence has fallen by more than 25 percent between 2001 and 2009 in 33 countries globally. Of these, 22 countries are in Sub-Saharan Africa (UNAIDS, 2010)⁹. At regional level, Zambia is among the countries with the smallest prevalence drop between 2001 and 2007 (MOH, 2010). The UNAIDS 2010 report further indicates that majority of new HIV infections continue to occur in Sub-Saharan Africa.

The HIV prevalence rates in Zambia vary significantly according to age, sex and geographical area (MOH 2010). The national HIV prevalence rate stands at 14.3 percent with provincial HIV prevalence ranging from 6.8 percent in Northern Province to 20.8 percent in Lusaka province (CSO, MOH, TDRC, UNZA and Macro International, 2009)¹⁰. In addition, the 2007 Zambia Demographic and Health Survey (ZDHS) indicate that the prevalence of HIV in Eastern province currently stands at 10.3 percent while Chronic Energy Deficiency (CED) prevalence (nutritional status as measured by BMI) for women in Zambia currently stands at 9.6 percent with Eastern province having a prevalence of 6.6 percent (CSO, MOH, TDRC, UNZA and Macro International, 2009). However, data on prevalence rates at district level is not available.

Katete is a rural district in Eastern province of Zambia, with a total population of 247,551. The 2009 Health Information Management System (HIMS)¹¹ indicates that a total of 17,429 adults aged 15 years and above were tested for HIV, excluding women attending antenatal care. Out of the total tested, 2,063 were found to be positive representing a prevalence of 11.8 percent (49.2 percent males and 50.8 percent females). Amongst those who tested positive, 1,476 were initiated on ART representing 81.1 percent programme coverage (37.2 percent males and 62.8 percent females).

State provision of antiretroviral therapy in Zambia began in 2002, although initially very few people could afford to pay for the drugs. Beginning in 2004, the Ministry of Health has offered antiretroviral therapy (ART) for free. The programme which started in Lusaka has expanded rapidly with over 281,600 people receiving ART at most health facility across the country by 2009, thus making ART affordable and accessible for eligible Zambians (GRZ, 2010). The potential of ART programmes to reduce morbidity and mortality attributable to HIV and AIDS is well documented (James et al, 2008).

Despite these government efforts, there is still more that needs to be done to ensure expansion of

⁹ UNAIDS. 2010. *UNAIDS Report on the Global AIDS Epidemic 2010*.

¹⁰ Central Statistical Office (CSO), Ministry of Health (MOH), Tropical Disease Research Centre (TDRC), University of Zambia, and Macro International Inc. 2009. *Zambia Demographic and Health Survey 2007*. Calverton, Maryland, USA: CSO and Macro International Inc.

¹¹ MOH, Katete District. 2009. Health Information Management System

ART services in the country. One of the major challenges facing people who are on ART is poor adherence. There is little literature on ART adherence in Eastern province. However, some studies carried out in Zambia have shown that adherence to ART is a problem. A cohort study carried out in Lusaka, Zambia among adults on ART showed that a third (37.1%) of study subjects demonstrated poor adherence after 12 months of follow-up (Chi et al. 2009). Another retrospective study conducted in rural Zambia by Birbeck et al in 2009 showed that more than one third (40.8%) had poor adherence during the first 12 months of treatment (Birbeck et al, 2011).

Adherence to ART is a key factor to achieve optimal health improvements for the HIV patients on treatment (Bangsburg et al, 2000; Coetzee et al, 2004; Unge et al, 2010). A high level of adherence is a prerequisite for maintaining viral suppression and a lower risk of drug resistance, in turn preventing premature morbidity and mortality (Bangsburg et al, 2001). Studies have suggested several important factors influencing adherence to ART, including forgetfulness, lack of understanding of treatment regimens or benefits, complexity of drug regimens, disclosure of status, stigma, and depression. Apart from the above mentioned factors, food and nutrition insecurity has also been identified as one of the key factors affecting adherence to ART (Nawa et al, 2008).

Malnutrition in Zambia is a serious problem in people living with HIV and may increase the rate at which HIV progresses to AIDS and survival. For instance, a study done in urban Lusaka among 40,778 persons with advanced HIV disease who started ART revealed that 34% (9% with BMI less than 16, 8% BMI between 16 and 16.99, and 17% with BMI between 17 and 18.49) were undernourished (Koethe and Heimburger, 2010).

HIV and AIDS have major socio-economic consequences for the patient and associated household members (Nyasha and Wim, 2009). It is important to note that individuals infected with HIV have special nutrition needs, such as increased energy requirements irrespective of whether they use ART (WHO, 2003). For people infected with HIV, poverty, food insecurity, and poor nutrition contribute to worsening health conditions, reduced capacity for work and ability to earn a living to support their families (HSRC, 2009). This reduces the socioeconomic welfare and nutritional status of the entire household.

One estimate is that one quarter (25%) of ART users do not achieve optimal adherence in Africa. One CAFOD partner in Zambia described their concerns about adherence to HIV as a potential 'time bomb', with huge implications in the longer term. The challenges around adherence are multi-faceted and, and there is a growing body of literature which is looking at some of the issues. Some of the factors documented include: costs (cost of lab test, transport, registration, lost wages due to waiting times), hunger and nutrition, the need for on-going support for people on treatment, information and misinformation, side effects, the length of time on treatment, and the quality of health service provision.

Over the past decade, there has been recognition of the importance of social protection to respond to a range of challenges faced by developing countries, including food insecurity, chronic poverty and HIV pandemic (UNICEF, UNAIDS, IDA 2010). Testing and refining different ways to avoid, or mitigate the consequences of the HIV pandemic is important, as is understanding the cost implications of each approach if taken to scale by national governments.

The negative socio-economic consequences resulting from HIV/AIDS highlight the need for broader innovative and effective social protection interventions to support HIV/AIDS patients and their households coping with the disease (Nyasha and Wim, 2009). Social cash transfer programmes are an increasingly important social protection instrument (UNICEF-ESARO, 2009). Social protection which encompasses cash and food transfers can significantly reduce HIV-related vulnerability and is a critical enabler for successful HIV prevention and treatment outcomes. The evidence also suggests another important potential of social protection: to interrupt the cycle from being AIDS-affected to becoming HIV-infected. 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, as well as helping to mitigate its impacts on communities, households and individuals. Moreover, according to the UNAIDS Investment Framework, investments in social protection are necessary to achieving the vision of zero new HIV infections, zero discrimination and zero AIDS-related deaths.

Among the several social protection measures, cash or food transfers are increasingly being used as methods for improving nutrition and adherence to treatment (Temin, 2010). However, there is limited information on whether the provision of cash instead of food would have a greater impact for patients to adhere to ART and ^{on} the welfare of the household as a whole, as well as which of the two is more cost-effective.

1.1 ART Study Intervention Partners

The Katete ART adherence study was a two year pilot study implemented by CARE International Zambia with financial assistance from the Department for International Development (DFID). CARE implemented this study in partnership with the Government of the Republic of Zambia (GRZ) through the National Food and Nutrition Commission (NFNC) and St. Francis Hospital. Other partners were the University of Zambia (UNZA) and the University of Free State (UFS) in South Africa, who validated the research findings, and a private company called Mobile Transactions Zambia Limited (MTZL), who developed the electronic voucher system. The selected partners were chosen based on their expertise and experience in conducting research particularly in areas of HIV and AIDS, nutrition and social protection.

1.2 ART Study Interventions

1.2.1 Selection of Study Intervention

As a means of strengthening social protection security in Zambia, Zambia is currently implementing the use of cash and food transfers, and a Community Response to HIV and AIDS (CRAIDS), among other social security interventions as outlined in the Social Protection Strategy. These interventions are targeted at the vulnerable population groups such as low capacity households (widows, disabled, other marginalized, low income household), incapacitated households (those with no one fit to work), child-headed homes and street children, and are spearheaded by the Ministry of Community Development and Social Service (Social Protection Strategy for Zambia, 2005). It is against this background that this study opted to use the cash and food transfers as interventions for clients initiating ART.

1.2.2 Intervention Description

The ART study had two treatment arms (cash and food) and aimed at comparing outcomes between clients initiating an ART regime. These interventions (i.e. cash and food) were designed to improve the nutritional status of ART Study clients and their families (as the WFP ration basket provides for a family, not just the individual), with the intention of increasing adherence to and effectiveness of ART.

The clients were supported unconditionally with monthly food or cash transfers, using electronic vouchers, for a period of eight months, in accordance with the WFP Zambia protocol. The WFP standard food basket utilized under this study consisted of 25kg maize meal, 4kg beans, 2kg sugar, 2.5 litres vegetable oil and 1kg salt. Clients on 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 at the local market. Due to fluctuations in prices of the food commodities, the value of the food basket used in this study varied between \$20 and \$31 during the eight months of intervention (Table 1 below).

Table 1: Cost of the Food Basket from Baseline to Final Assessment Period

Period		Food Basket	Cash Equivalent	
From	To		ZMK	US (\$)
Aug 2010	Dec 2010	25kg Maize Meal, 4kg of Beans, 2 Kg Sugar, 1 Kg Salt and 2.5 L of Vegetable Cooking Oil	100,000	20
1 st Jan 2011	Jan 31 st	25kg Maize Meal, 4kg of Beans, 2 Kg Sugar, 1 Kg Salt and 2.5 L of Vegetable Cooking Oil	104,500	21
1 st Feb	31 st Mar	25kg Maize Meal, 4kg of Beans, 2 Kg Sugar, 1 Kg Salt and 2.5 L of Vegetable Cooking Oil	137,000	28
1 st April	30 th June	25kg Maize Meal, 4kg of Beans, 2 Kg Sugar, 1 Kg Salt and 2.5 L of Vegetable Cooking Oil	145,000	30
1 st July	30 th Nov 2011	25kg Maize Meal, 4kg of Beans, 2 Kg Sugar, 1 Kg Salt and 2.5 L of Vegetable Cooking Oil	150,000	31

The ART Study utilized an electronic voucher-based system to deliver transfers to study clients. The disbursement of transfers i.e. cash and food was tied to the client's schedule for medical review and collection of drugs from the St. Francis Hospital. There were three stages in the e-voucher program: 1) voucher registration, 2) voucher distribution and 3) voucher redemption.

The registration process which was managed by MTZL and CARE International Zambia involved registering and inputting study clients' information, such as names, sex, age, National Registration Card (NRC) number, type of transfer etc., on the database for the ART Study.

The voucher distribution process was handled by St. Francis Mission Hospital, who was responsible for distributing both food and cash e-vouchers to ART study clients on a monthly basis, each time the client visited the hospital to collect their ARVs. The e-voucher distribution process involved a client presenting his/her NRC to the clinical staff at St. Francis Hospital for purposes of identification and linking of the NRC number to an e-voucher. After a client's NRC number was successfully linked to a particular e-voucher, both the NRC and the e-voucher were given to the client for redemption.

The third stage in the e-voucher system was the e-voucher redemption process. This process was managed by the retail agents and involved a client taking his/her e-voucher and NRC to the retail agent. The agent confirmed the client's identity and the authenticity of the e-voucher. At this point, the client redeemed the designated transfer (i.e. cash or food). Mobile phone technology and internet service was required for one to successfully complete the processes involved at each of the three stages in the e-voucher system. Two retail agents, namely Isusyas General Dealers and Makwacha Agent, were used for food and cash e-vouchers respectively where ART study clients redeemed their vouchers. However, half way through the study, Isusyas General Dealers took on the distribution of both cash and food due to cash-flow problems experienced by Makwacha Agent during the course of study implementation.

1.3 Study Aim

The overall study aim is to fully understand which transfer mechanism (cash or food) ensures adequate nutrition improvement for those initiating ART treatment, and increases adherence to Anti-Retroviral Treatment (ART) in a more effective way.

1.4 Specific objectives

- To examine whether providing cash or food transfers to patients initiating ART improves their nutritional status (BMI);
- To assess whether providing cash or food transfers to patients initiating ART improves Household Diet Diversity Score (HDDS);
- To assess which transfer type (cash or food) improves adherence to ART;

- To examine whether CD4 count is improved by providing a patient initiating ART with a food or cash transfer;
- To assess whether the household asset base is increased by providing cash or food transfers to patients initiating ART.
- To examine whether household income is improved when patients initiating ART are provided with cash or food transfers; and
- To assess which of the two transfers (cash or food) is more cost effective.

1.5 Hypothesis testing

1.5.1 Hypotheses

In order to adequately address the objectives of our study, the following hypotheses were formulated.

H_0 : Both cash and food transfers have the same effect in improving nutritional status (BMI) of clients aged between 18 and 55 years diagnosed with HIV

H_1 : *Cash and Food transfers do not have the same effect in improving nutritional status (BMI) of clients aged between 18 and 55 years diagnosed with HIV*

H_0 : Both cash and food transfers have the same effect in improving Household Diet Diversity Score.

H_1 : *Cash and Food transfers do not have the same effect in improving Household Diet Diversity Score.*

H_0 : Both cash and food transfers have the same effect in increasing adherence to ART treatment of clients aged between 18 and 55 years diagnosed with HIV

H_1 : *Cash and Food transfers do not have the same effect in increasing adherence to ART treatment of clients aged between 18 and 55 years diagnosed with HIV*

H_0 : Both cash and food transfers have the same effect in improving the CD4 status of clients aged between 18 and 55 years diagnosed with HIV

H_1 : *Cash and Food transfers do not have the same effect in improving the CD4 status of clients aged between 18 and 55 years diagnosed with HIV*

H_0 : Both cash and food transfers have the same effect in increasing household asset base.

H_1 : *Cash and Food transfers do not have the same effect in increasing household asset base.*

H_0 : Both cash and food transfers have the same effect in improving household income.

H_1 : *Cash and Food transfers do not have the same effect in improving household income.*

H_0 : The cost of providing both cash and food transfers is the same

H_1 : The cost of providing cash and food transfers is not the same.

1.6 Assumptions

1. The change in treatment outcomes were attributed to the study interventions.
2. There is enough evidence suggesting that both cash and food transfer have an effect on adherence to ART and nutrition improvement (Beith and Johnson, 2006; ODI – Briefing Paper, 2008).

2.0 METHODOLOGY

2.1 Study location and population

The study was conducted in Eastern Province of Zambia, in Katete District, at St. Francis Mission Hospital. St. Francis Mission Hospital is a 350 bed capacity hospital providing medical and surgical care to over 200,000 people of Katete district, as well as accepting referrals from the whole of Eastern Province (about 1,500,000). St. Francis Mission Hospital has a wide ART programme coverage which includes satellite ART points dotted around Katete district and nearby districts in the province. The Hospital was among the pioneer institutions in the ART provision in Zambia when the rollout of the programme began.

The study population comprised of adult subjects aged 18 to 55 years recently diagnosed with HIV initiating ART, regardless of their socio-economic status. This age group was chosen because morbidity and mortality due to HIV/AIDS and related illnesses is concentrated among adults between the ages of 25 and 50. Despite the hospital providing the ART services to patients from neighbouring districts, the study was restricted to only those who resided within Katete district boundaries when implementation feasibility issues were considered.

2.2 Exclusion Criteria

1. Age below 18 or above 55 years old
2. Inability to access ART services on a monthly basis at St Francis's hospital
3. Subjects already receiving food supplements or other social services

2.3 Sample calculations

The sample size for this research was determined using the formula below (Ott et al, 2001)²⁴. The required sample was determined to provide a 95 percent confidence ($\alpha = 0.05$) and with a 90 percent power ($1 - \beta = 0.1$). The sample was also estimated to provide a 30 percent effect on adherence based on other similar studies ($\delta = 0.3$) (Nyasha et al, 2010)²⁵, (Bangsberg et al, 2011)²⁶. The above estimated effect on adherence of 30 percent was based on the fact that the above referred to studies had control groups, while the present study (Katete ART study) does not.

²⁴ Ott, Lyman. An introduction to statistical methods and data analysis/R. Lyman Ott, Micheal Longnecker. 2001, 5th Ed. ISBN: 0-534-25122-6

²⁵ Nyasha Tirivayi, John Koethe and Wim Groot; Food Assistance and its effect on the Weight and Antiretroviral Therapy Adherence of HIV Infected Adults: Evidence from Zambia, 2010; PhD. Thesis

²⁶ David Bangsberg, Conditional Cash Transfers: Cash-Contingency Management, Structural Support, and Poverty Reduction Interventions in Africa; Harvard initiative, 2011

This formula 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 from other regions and thus estimating using prevalence rates was not feasible in this case. Thus, based on *Ott, 2001* and, *Zodpey, et al 2004*²⁷ the corresponding Z-values for confidence coefficient ($\alpha = 0.05$) and study power ($1 - \beta = 0.9$) were fixed. The standard deviation ($\sigma = 0.8$) and the expected difference between two treatments ($\delta = 0.3$) were also estimated.

Thus:

$$n = \frac{2 \cdot \sigma^2 \cdot (Z_{1-\alpha/2} + Z_{1-\beta})^2}{\delta^2}$$

Where:

- α = Level of precision (0.05)
- $1 - \beta$ = Power (0.90)
- δ = Estimated effect on adherence (0.3)
- σ = Estimated Standard deviation (0.8)

Non response rate: 10 %

$$n = \frac{2 \cdot (0.8)^2 \cdot (1.96 + 1.28)^2}{(0.3)^2}$$

$$n = \frac{1.28 \cdot 10.4976}{0.09}$$

$$n = 149.3 = 149$$

10 % non response
14.9 ~ 15

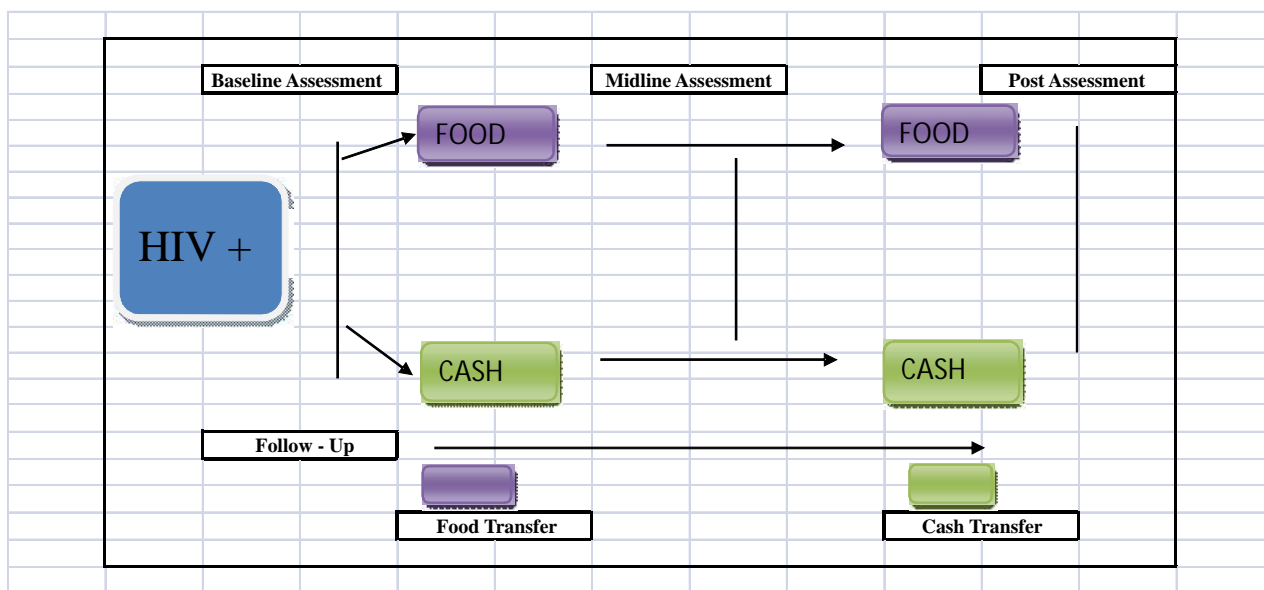
164 participants were therefore required in each treatment arm. Since there are two treatment arms a total sample of 328 participants was required.

2.4 Sample Design

This was an intervention study design, focusing on HIV positive individuals initiated on ART who were randomly allocated to two treatment groups (cash and food).

²⁶Sanjay P. Zodpey, Sample size and power analysis in medical research, Indian J. Dermatol, Vol 70, issue 2

Figure 1: Schematic view of design



The study was initially designed with two treatment categories namely cash transfer and food transfer, with each treatment category having two sub-arms based on CD4 count. One treatment arm constituted clients with CD4 count of 300 cells/ μ L and above and the other with clients having CD4 below 300 cells/ μ L. However after detailed review, it was noticed that there are a lot of determinants that influence CD4 count and BMI for these variables to be used as grouping variables. Therefore, it was decided that the two arms in each treatment category be collapsed to be food or cash. This meant that the sample numbers that were initially allocated to each arm in each treatment category was grouped to constitute the sample size for each treatment category. With consent from the ethics committee, the design was thus revised as indicated above.

2.5 Initiation of Study Clients and Allocation of Transfer Type

The study clients were recruited from those who came to St Francis Mission Hospital either as self referrals or referred by health centres to seek further medical services. Upon being counselled by a trained counsellor and tested, those found positive and who met the criteria for initiating ART were immediately put on ART. Thereafter, they were then informed about the ART study. Therefore, before the client was initiated on the study, a counsellor provided details about the study objectives and the benefits of him or her participating on the study, while assuring confidentiality that the data collected was only going to be used for its intended purpose. However, though this was a non-probability sampling procedure, the enrolled adults (both male and female aged 18 to 55 years) were randomly allocated to two treatment arms (Cash or food) using computer generated random numbers.

Following this a serial number was allocated to clients who consented to be enrolled on the study.

These numbers were given on the first come basis from 1 to 351 at St. Francis Mission Hospital. At this point, staffs that were enrolling clients at St. Francis Mission Hospital were blinded from knowing the type of transfer the client was allocated. At the end of each day of enrolment, the list comprising of clients serial numbers were relayed to CARE's Katete office, where the allocation of transfer type to clients was done using already computer generated random numbers.

The enrolled clients were followed up for a period of eight months at three different intervals, at baseline, midline and post assessment. At baseline, each client was followed up to collect baseline data within the first week of enrolment. The clients were traced by research assistants using a client locator form which was prepared at enrolment by staff at St. Francis Mission Hospital. Each study client was further followed up after a period of four months of receiving transfers, to collect midline data. Finally, at eight months of the study, a post assessment was conducted to collect final assessment data. The different data collection intervals are presented schematically in Figure 1.

2.6 Data Collection and Management

2.6.1 Training of Field Staff

A five day training workshop was conducted for Research Assistants (RAs) in the ART Study methodology and field data collection. The training which was conducted from 15th – 19th July 2010 was practical, with a special focus on the research methodology, roles and responsibilities of Research Assistants, techniques for data collection, conducting household interviews and taking of anthropometric measurements (height and weight) for study clients in the household.

Issues of data quality were insistently addressed during the training to ensure that errors were minimized during data collection. Pre-testing of the questionnaires was also conducted to ensure that Research Assistants were familiar with the survey questionnaire and how to take anthropometric measurements.

A total of 18 people were trained in the ART Project research methodology and data collection. Of the 18 people trained, the best ten were engaged as Research Assistants to undertake field data collection for the three surveys involved in the study, i.e. baseline, midline and terminal evaluation.

2.6.2 Household Questionnaire Data Collection

The data collection was undertaken at three different intervals. The baseline was undertaken within the first week of enrolment for each client. This was closely linked to the enrolment process in that for every client enrolled on the study, the research team would undertake field visits to collect baseline data from those particular enrolled clients. The baseline data collection spanned for a period of seven months, from August 2010 to March 2011. The midline was undertaken four months after

the baseline visit, from December 2010 to June 2011. The post assessment was undertaken eight months after the baseline, from May 2011 to November 2011.

These surveys were conducted at household level and mainly involved interviews with study clients to collect data on a number of topics such as social demographics, food consumption diversity and taking of anthropometric measurements i.e. weight and height (height in centimetres was collected using a Standometer and weight in kilograms using a digital Seca scale). The CD4 counts and adherence levels of the study clients were obtained from ART clinical records at St. Francis Mission Hospital. In addition, the NRC was used to confirm the age of the Clients and that of their spouses if married.

The household interviews were conducted by trained Research Assistants using standard data collection tools, i.e. structured household questionnaire. The Research Assistants were provided with a reference manual which acted as a guide in conducting household interviews in general and in particular field data collection.

2.6.3 Data Quality

Questionnaire Data Verification

In order to ensure data quality control of the data collected at baseline, midline and post evaluation surveys, the study had a mechanism where all data was checked by the field supervisor at the point of data collection. Further the collected data was verified by research experts from NFNC and UNZA before data entry was done. The data verification process involved going through all completed questionnaires one by one to check for completeness, errors, omissions or inconsistencies that may have occurred in the collection process. In some cases, on the spot field supervisory visits were undertaken to provide technical backstopping to research assistants as a way of improving the quality of data at the collection point.

External Validation of Research Results

Two academic experts from the University of Zambia (School of Agriculture, Department of Agricultural Economics) and the University of Free States in South Africa (Faculty of Economics and Management Sciences, Department of Economic) provided technical assistance to the study team through validation of study reports produced at baseline, midline and post-assessment, as per the established protocol under that ART study. The validation process involved reviewing of the various steps involved in the study processes and the replication of the results presented in the reports.

2.6.4 Data Processing

Data Entry and Cleaning

The data collected was entered using CPro version 4.1 which was then exported to Statistical Package for Social Scientists (SPSS) version 15.0 for cleaning.

Data Analysis

The Statistical Package for Social Scientists (SPSS) programme version 15 was used to analyze the collected data. The nutrition status of adults was determined by calculating the Body Mass Index (BMI) using weight and height in SPSS. In this study BMI was classified as follows; less than 16.0 severely underweight, 16.0 to 18.49 moderately underweight, 18.50 to 24.99 normal, 25.00 to 29.99 overweight and 30 and above obese.

Statistical Tests

Descriptive statistics were generated to profile the Demographic and Socio-economic characteristics of the households and clients on the two treatment groups (cash and food). In addition, chi-Square tests with significant level set at 95% were used to assess associations between outcome variables (Adherence, CD4 Count and Nutrition Status) and socio-economic characteristics of study subjects by treatment groups. The paired sample tests was used to compare effects of the treatment at different intervention times in respective intervention groups while the independent t-tests was used to compare the means of the continuous outcome indicators for the two treatment groups (cash and food).

To compare the mean for a continuous dependent variable, by a single independent variable, analysis of variance (ANOVA) technique was applied. Correlation between outcome variables and other socio-economic factors was also performed to determine associations. In addition, a one-way repeated measure ANOVA was used to examine the household income across the three survey points. Incomes from the first and second most important economic activities were aggregated for each household in the study area. These aggregate incomes were adjusted for inflation using the following formula: $[Y_{real} = (Y_{current}) / (CPI/100)]$; where Y_{real} is real income, $Y_{current}$ is nominal income, and CPI is the Consumer Price Index (CPI).

The linear mixed-effects model (LMM) was used because it fitted the model better than those of the general linear model (GLM) procedure and it encompasses all models in the variance components (VARCOMP) procedure. Its major capabilities compared to GLM are that it handles correlated data and unequal variances. This is because correlated data are very common in such situations as

repeated measurements of survey respondents or experimental subjects. Furthermore, the LMM also extends to repeated measures models in GLM to allow an unequal number of repetitions. For this study, the LMM was only conducted for clients who appeared in all the three survey rounds.

Multivariate analysis (Binary Logistic Regression) was applied to determine causality between treatment outcomes (Nutritional Status as measured by BMI, CD4 count and Adherence) and other explanatory variables. This was used because the data had explanatory variables that were either categorical or continuous, or a mix of both in one model. The model allowed us to test models to predict categorical outcomes with two or more categories (Pallant, 2005). It also combined the independent variables to estimate the probability that a particular event will occur, i.e. a subject will be a member of one of the groups defined by the dichotomous dependent variable. This model has been used in a number of situations such as: calculation of risk of heart disease as a function of certain personal and behavioural characteristics such as age, weight, blood pressure, cholesterol level, and smoking history; and calculation of the risk of teenage pregnancy as a function of academic performance, religion, and family size. In this study, the variate or value that was produced by binary logistic regression was a probability value between 0 and 1. If the probability for group membership in the modelled category was above some cut-off point (the default is 0.50), the subject was predicted to be a member of the modelled group. If the probability was below the cut-off point, the subject was predicted to be a member of the other group. For any given case, the model computed the probability that a case with a particular set of values for the independent variable was a member of the modelled category. However, since we were interested in estimating the probability that an event will occur as against the probability that it will not occur when we used the model, the dependent variable in logistic regression was the odds ratio, which is just another way of expressing probability.

2.7 Study Limitations

As it is the case with any other study, this study had its own limitations. Due to ethical and feasibility considerations, clients' recruitment was not made at once but over a period of four to six months. Therefore, provision of the study intervention (transfers) did not begin at the same point in time for each and every client. One of the key assumptions of this study is that there is enough evidence suggesting that HIV patients on ART respond well and quickly when they are provided with either a cash or food transfer (Beith and Johnson²⁸; ODI – Briefing Paper²⁹, 2008) On this basis, the study did not include a control group to help infer with great deal of certainty that the changes being seen in the key outcome indicators were due to the effect of study interventions. This omission had also a great bearing on how results were analyzed and interpreted. In addition, the study did not collect enough data to help analyze which transfer is cost effective.

²⁸ Beith, A., and A. Johnson. 2006. Interventions to Improve Adherence to Antiretroviral Therapy: A Review of the Evidence. Submitted to the U.S. Agency for International Development by the Rational Pharmaceutical Management Plus Program. Arlington, VA: Management Sciences for Health.

²⁹ Overseas Development Institute (ODI). 2008. Briefing Paper: HIV, Food and Drugs – Livelihoods, Nutrition and Anti-Retroviral Therapy (ART) in Kenya and Zambia. (available at www.odi.org.uk)

3.0 RESULTS

This study was designed to have 90% power to show a 30% difference in adherence, nutrition and treatment improvement at the two-sided 5% level among 328 targeted participants that received the cash support and those who received the food. A total of 351 clients were enrolled in the study of 175 were on cash and 176 on food transfers at baseline. However, during data analysis, 13 (3.7%, 8 and 5 on cash and food respectively) were disqualified on account of them being above the required age of 55 years in this study and thus were not included in the analysis. 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 clients from 338 completed the whole period of 8 months of intervention indicating an attrition rate of 45 (13.3%) of which 147 and 146 were on cash and food transfers respectively.

This attrition is attributable to deaths of 12 clients (3.6%) while 33 (9.8%) clients voluntarily dropped out. The study did not formally investigate the reasons why clients voluntarily dropped out of the study. However, through observations and interactions with their close associates by the project team, the following reasons were noted. The first reason was partly due to clients' relocation from the study area to another place where it was not possible for them to continue receiving the services provided by the study. One other reason was associated with stigma whereby certain clients felt that continued collection of the transfers and follow-ups by research assistants abrogated their confidentiality. On the other hand, some clients had preference for a particular transfer type especially cash to food as such they decided to drop off the study. Lastly, it should be noted that the study was open to every person diagnosed with HIV and initiated on ART regardless of the socio-economic background. Therefore, those who were already economically better-off by virtue of them having a steady income felt they did not need this kind of support.

Literature suggests that loss to follow-up of more than 20 percent of subjects is likely to seriously undermine the validity of results, less than 5 percent loss is reassuring, while for rates in between, it may be helpful to consider how study findings would vary if all lost subjects had either completed or had not completed the study (American Society for Reproductive Medicine, 2008).

The results of post assessment presented in this report are being compared to the baseline results to help in determining the effect of the two interventions on the study clients over a period of eight months of intervention. The Tables 2 and 3 below show the chi square and two group t-tests for some of the key variables in order to determine the balance between the two treatment groups at baseline. These baseline results concluded that there was a significant balance between clients allocated on cash transfer scheme and those allocated on the food transfer scheme.

Both groups of study clients exhibited similar demographic and socio-economic 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 similar and the randomization 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.

Table 2: Significance Test for Balance between the Treatment groups at baseline using the Chi-Square Test of Independence

Test Variables	Value	p-value
Sex of Clients	3.391	0.07 ^p
Marital Status of Clients	2.652	0.75 ^p
Education Level of Clients	1.091	0.95 ^p
Literacy Level of Clients	1.218	0.54 ^p
Adherence to Treatment of Clients	1.356	0.57 ^f
Type of Dwelling for Household	2.615	0.88 ^f
Water Sources for Household	6.669	0.59 ^f
Toilet Facilities for Household	2.967	0.57 ^f
Fuel for Cooking for Households	2.122	0.71 ^p

^p Pearson Value;

^f Fisher's Exact Test

Table 3: Significance Test for Balance between the Two Treatment Groups at Baseline using the Independent t-test at Baseline

Test of Balance between Treatment Groups using the Independent t-test at Baseline Assessment						
Test Variable	Transfer Type				MD	p-value
	Cash		Food			
	Mean	SD	Mean	SD		
Age of Clients	35.3	8.5	35.4	8.6	-0.1	0.877
CD4 Count	202.2	106.1	212.5	138.6	-10.3	0.443
Body Mass Index	20.4	3.2	20.7	3	-0.3	0.372
Household Diet Diversity Score	5.5	1.9	5.1	1.9	0.4	0.062
No. of Rooms in a Household	3.5	2.5	3.1	1.7	0.4	0.139
Total Land under Cultivation	1.9	2	2.1	1.8	-0.2	0.348
Number of months with Staple from own Production	2.8	2	2.7	2	0.1	0.779
Total Income from main Economic Activities	3,065,277	6,431,339	3,025,965	8,838,520	39,312	0.963
Household Asset Value	6,374,333	14,512,274	7,058,545	17,727,719	-684,212	0.699
Livestock Asset Value	4,775,149	20,066,893	2,930,210	6,887,621	1,844,939	0.385

3.1 DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS OF STUDY POPULATION

Table 4 below shows the distribution of study clients by sex from baseline to post assessment. Across all the three assessment points, there were more females than males on both treatment groups, with a chi-square test of independence showing that at both baseline and post assessments, sex was independent of the transfer type [χ^2 (df=1, n=338) = 3.291, p=0.066 and χ^2 (df=1, n=292) = 2.839, p=0.092]. Further, with regard to age, the majority of the respondents on both treatment groups were aged between 22 – 44 years, with a Chi-square test of independence using fishers exact two sided test showing that at both baseline and post assessment, age was independent of the transfer type p=0.842 and p=0.716. The results in the table also indicate a loss to follow in almost all age groups between baseline and the post assessment.

In addition, the below table further shows that the majority of the study clients in both transfer treatment groups were married followed by those who were divorced. There was no difference in marital status at the three follow up assessment points. A Chi-square test of independence using fishers exact two sided test showed that at both baseline (p=0.808) and post assessment [χ^2 (df=4, n=290) = 1.502, p=0.826], marital status was independent of the transfer type.. With regard to educational attainment, no major differences were noticed among the study clients on both treatment groups and across the three survey points. The table shows that majority of the study participants had attended primary education across all the survey points and that only one in every ten study clients had some senior secondary (grade 10 – 12) education respectively. A Chi-square test of independence using fishers exact two sided test showed that at both baseline and post assessment, educational attainment was independent of the transfer type (p=0.962 and p=0.519).

With regard to literacy levels, about four in every ten clients in all the treatment groups and survey points were able to read and write. The table below describes the literacy levels among the study participants. A Chi-square test of independence showed that at both baseline and post assessment, literacy levels was independent of the transfer type [χ^2 (df=2, n=338) = 1.218, p=0.544 and χ^2 (df=2, n=292) = 1.110, p=0.574].

Table 4: Percentage Distribution of Study Clients Sex, Age Group, Educational Attainment and Literacy by Transfer Type

	Baseline						Midline						Post						P-values		
	Cash			Food			Cash			Food			Cash			Food			Base	Final	
	N	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%			
Sex																					
Male	76	45.5	61	35.7	66	44.0	53	34.6	63	43.2	49	33.6	0.066 ^p	0.092 ^p							
Female	91	54.5	110	64.3	84	56.0	100	65.6	83	56.8	97	66.4									
Age group in years																					
15 - 24 yrs	18	10.8	14	8.2	14	9.3	12	7.8	13	8.9	9	6.2	0.842 ^f	0.716 ^f							
25 - 34 yrs	62	37.1	72	42.1	54	36.0	65	42.5	52	35.6	62	42.5									
35 - 44 yrs	59	34.7	58	33.9	55	36.7	51	33.3	55	37.7	51	34.9									
45 - 54 yrs	26	15.6	24	14.0	25	16.7	22	14.4	23	15.8	20	13.7									
55 - 64 yrs	2	1.2	3	1.8	2	1.3	3	2.0	3	2.1	4	2.7									
Marital Status																					
Never married	10	6.0	15	8.8	10	6.7	10	6.7	11	7.6	10	6.8	0.808 ^f	0.835 ^p							
Married	98	58.7	96	56.1	89	59.3	86	57.3	87	60.4	81	55.5									
Cohabiting	-	-	1	0.6	-	-	-	-	-	-	-	-									
Divorced	34	20.4	30	17.5	26	17.3	26	17.3	24	16.7	25	17.1									
Widowed	20	12.0	22	12.9	20	13.3	22	14.7	17	11.8	23	15.8									
Separated	5	3.0	7	4.1	5	3.3	6	4.0	5	3.4	7	4.8									
Educational Attainment																					
No education	39	23.4	38	22.2	33	21.9	30	19.7	32	21.9	31	21.2	0.962 ^f	0.519 ^f							
Grade 1 - 4	34	20.4	33	19.3	35	23.2	32	21.1	34	23.3	33	22.6									
Grade 5 - 7	48	28.7	48	28.1	42	27.8	44	28.9	44	30.1	39	26.7									
Grade 8 - 9	22	13.2	24	14.0	22	14.6	22	14.5	19	13.0	17	11.6									
Grade 10 - 12	21	12.6	22	12.9	16	10.6	16	10.5	15	10.3	18	12.3									
Certificate	3	1.8	6	3.5	3	2.0	8	5.3	2	1.4	8	5.5									
Literacy																					
Can read and write	75	44.9	75	43.9	69	45.7	77	50.7	62	42.5	70	47.9	0.544 ^p	0.574 ^p							
Can read only	11	6.6	7	4.1	7	4.6	7	4.6	8	5.5	9	6.2									
Cannot read or write	81	48.5	89	52.0	75	49.7	68	44.7	76	52.1	67	45.9									
Total	167	100	171	100	151	100	152	100	146	100	146	100									

(-) Refers to no member in that category

(p) Refers to pearsons chi square test

(f) Refers to fishers exact test for cells with expected counts less than 5

3.1.1 Main Occupation for Study Clients

Among both cash and food transfer treatment groups, crop farming is the main occupation for the study clients. In general farming is seasonal and to complement farming the clients are also engaged in employment, both formal and informal. Table 5 below shows the main occupation among the study clients. A Chi-square test of independence using fishers exact two sided test showed that at both baseline and post assessment, main occupation was independent of the transfer type (p=0.440 and p=0.088).

Table 5: Main Occupation for Study Client

	Baseline				Midline				Final				P- value	
	Cash Transfer		Food Vouchers		Cash Transfer		Food Vouchers		Cash Transfer		Food Vouchers		Base	Final
	n	%	n	%	n	%	n	%	n	%	n	%		
Farmer (Crop,Animal & Mixed)	72	43.1	78	45.9	97	64.7	97	63.8	84	57.5	94	64.4	0.440	0.088
Housewife	4	2.4	8	4.7	2	1.3	4	2.6	3	2.1	3	2.1		
Casual (Agric,Transport & Restau rant)	18	10.8	13	7.6	6	4.0	8	5.3	9	6.2	5	3.4		
Trader (Merchant, Sales person etc)	45	26.9	40	23.5	27	18.0	17	11.2	36	24.7	20	13.7		
Technical (Construction Worker)	1	0.6	0	0.0	1	0.7	0	0.0	0	0.0	2	1.4		
Professional (Teachers, Health staff e)	3	1.8	8	4.7	2	1.3	6	3.9	2	1.4	6	4.1		
Others (Unemployed, Pupil etc)	24	14.4	23	13.5	15	10.0	20	13.2	12	8.2	16	11.0		
Total	167	100	170	100	150	100	152	100	146	100	146	100		

3.1.2 Housing, Hygiene, Sanitation and Water Sources

This section looks at housing and housing materials used to construct the dwellings as some of the underlying factors that may contribute to the wellness of study clients and household member's health status.

3.1.2.1 Type of Dwelling

The results across the three survey points show that single houses/hut was the most popular type of dwelling among the study clients, making up to more than 60 percent of the total dwelling types on both transfers. The second most popular dwelling type for the study client was several separate structures (Table 6). A Chi-square test of independence using fishers exact two sided test showed that at both baseline and post assessment, dwelling type was independent of the transfer type (p=0.881 and p=0.579).

Table 6: Distribution of Dwelling Type by Transfer Type and by Residence for the Study Clients

Type of Dwelling	Baseline				Midline				Post				P-values	
	Cash		Food		Cash		Food		Cash		Food		Base	Final
	n	%	N	%	n	%	n	%	n	%	n	%		
Single house /Hut	108	64.7	104	60.8	96	64	97	63.8	88	59.9	77	52.4	0.881 ^f	0.579 ^f
Several separate structures	50	29.9	56	32.7	46	30.7	50	32.9	53	36.1	62	42.2		
Flat	2	1.2	3	1.8	3	2	1	0.7	2	1.4	2	1.4		
Room in larger dwelling	6	3.6	7	4.1	3	2	4	2.6	4	2.7	6	4.1		
Improvised Housing	1	0.6	-	-	-	-	-	-	-	-	-	-		
Other	-	-	1	0.6	2	1.3	-	-	-	-	-	-		
Total	167	100	171	100	150	100	152	100	147	100	147	100		

(-) Refers to no member in that category

(f) Refers to fishers exact test for cells with expected counts less than 5

3.1.2.2 Main Sources of Water

Table 7 below shows the important sources of water for study clients' households. The majority of the households reported to have been drawing their water from boreholes during all the three assessment points. Households that were drawing water from boreholes accounted for about two thirds of all the households at baseline, midline and post assessment points for both transfer types. However, though not statistically significant, there was a slight increase in the number of households on cash and food treatment groups that had borehole as the main source of water as the clients continued to receive either cash or food. A Chi-square test of independence using fishers exact two sided test showed that at both baseline and post assessment, main source of water was independent of the transfer type (p=0.586 and p=0.800).

Table 7: Distribution of Water sources among the Households by Treatment Group

Water Source	Baseline				Midline				Post				P-values	
	Cash		Food		Cash		Food		Cash		Food		Base	Post
	n	%	n	%	n	%	n	%	n	%	n	%		
Household metered water	11	6.6	10	5.8	10	6.7	5	3.3	11	7.5	8	5.4	0.586 ^f	0.800 ^f
Communal standpipe	8	4.8	6	3.5	5	3.3	6	3.9	5	3.4	2	1.4		
Borehole	94	56.3	102	59.6	93	62	95	62.5	92	62.6	94	63.9		
Protected well	25	15	18	10.5	20	13.3	19	12.5	20	13.6	18	12.2		
Unprotected well	25	15	23	13.5	19	12.7	21	13.8	16	10.9	22	15		
Dam/pool/stagnant water	1	0.6	2	1.2	-	-	1	0.7	-	-	1	0.7		
River/stream	1	0.6	5	2.9	2	1.3	2	1.3	2	1.4	1	0.7		
Spring well	1	0.6	4	2.3	1	0.7	3	2	1	0.7	1	0.7		
Other (specify)	1	0.6	1	0.6	-	-	-	-	-	-	-	-		
Total	167	100	171	100	150	100	152	100	147	100	147	100		

(-) Refers to no member in that category

(f) Refers to fishers exact test for cells with expected counts less than 5

3.1.2.3 Main Type of Toilets Used by Households

The commonest toilet facility that was reported to have been used was the pit latrine followed by bush at all the three assessment points by both transfer types (Table 8). However, there was a decrease in the number of households who used pit latrines without ventilation in both treatment groups to 51 percent and 50 percent at midline and post assessment points from 58 percent for households on cash transfer compared to 55 percent and 54 percent at midline and post assessment points respectively from 57 percent for households on food transfer at baseline assessment. A Chi-square test of independence using fishers exact two sided test showed that at both baseline and post assessment, households main type of toilet was independent of the transfer type ($p=0.575$ and $p=0.385$).

Table 8: Distribution of households main type of toilet by treatment group and survey point

Toilet Facility	Baseline				Midline				Post				P-values	
	Cash		Food		Cash		Food		Cash		Food		Base	Post
	n	%	n	%	n	%	n	%	n	%	n	%		
Flush toilet	3	1.8	4	2.3	3	2.0	3	2.0	2	1.4	2	1.4	0.569	0.349
Pit latrine with ventilation	11	6.5	28	16.4	21	14.0	25	16.4	24	16.3	21	14.3		
Pit latrine without ventilation	57	33.5	98	57.3	77	51.3	84	55.3	74	50.3	80	54.4		
Bush	45	26.9	39	22.8	45	30.0	39	25.7	43	29.3	44	29.9		
Other	4	2.4	2	1.2	4	2.7	1	0.7	4	2.7	-	-	0.575	0.385
Total	167	100	171	100	150	100	152	100	147	100	147	100		

(-) refers to no member in that category

(f) Refers to fishers exact test for cells with expected counts less than 5

3.1.2.4 Fuel Used for Household Cooking

The table below (Table 9) shows results of all the three assessment points. The results show that wood and charcoal were the most important cooking fuel among the households at baseline, midline and post assessment points. The assessments revealed that almost two thirds used wood and one third used charcoal in both treatment groups. A Chi-square test of independence using fishers exact two sided test showed that at both baseline and post assessment, households' main type of fuel used was independent of the transfer type ($p=0.734$ and $p=0.874$).

Table 9: Distribution of households main type of fuel used for cooking by treatment group and survey points

	Baseline				Midline				Post				P-values	
	Cash		Food		Cash		Food		Cash		Food		Base	Post
	n	%	n	%	n	%	n	%	n	%	n	%		
Electricity	2	1.2	8	4.7	2	1.3	8	5.3	-	-	6	4.1	0.734 ^f	0.874 ^f
Wood	108	64.7	110	64.3	105	70	105	69.1	102	69.4	106	72.1		
Charcoal	55	32.9	50	29.2	43	28.7	37	24.3	45	30.6	34	23.1		
Gas	-	-	-	-	-	-	1	0.7	-	-	-	-		
Solar	2	1.2	1	0.6	-	-	-	-	-	-	-	-		
Paraffin	-	-	1	0.6	-	-	1	0.7	-	-	1	0.7		
Other	-	-	1	0.6	-	-	-	-	-	-	-	-		
Total	167	100	171	100	150	100	152	100	147	100	147	100		

(-) refers to no member in that category

(f) Refers to fishers exact test for cells with expected counts less than 5

3.2 NUTRITION STATUS OF STUDY CLIENTS

In order to determine the nutrition status of the study clients, the Body Mass Index (BMI) was used by categorizing it into 5 groups based on the WHO recommended thresholds (BMI <16 =Severe Underweight; BMI (16.00 – 18.49) Moderate Underweight; BMI between 18.50 – 24.99 = Normal weight; BMI between 25.00 – 29.99 = Overweight/pre-obese; BMI > 30.00 = Obese). Table 10 below gives an overall picture of the nutrition status of the study clients. From baseline through to post assessment, there was an increase in the percentage of clients falling in the normal BMI category in both groups compared to the baseline results. There was also a notable decline between baseline and post assessment in the proportion of study clients on cash transfer who were severely underweight from about 5 percent to 0.7 percent. Similar observations were noted among clients on the food transfer scheme. A Chi-square test of independence using fishers 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).

Table 10: Distribution of Nutrition Status of Study Clients by Survey Point and by Treatment Group

Nutrition Status Category	Baseline (N=310)				Midline(N=271)				Post				P-value	
	Cash		Food		Cash		Food		Cash		Food		Base	Post
	n	%	N	%	n	%	n	%	n	%	n	%		
Severe Underweight	7	4.5	4	2.6	1	0.7	4	3.0	1	0.7	2	1.5	0.754	0.317
Moderate Underweight	35	22.6	29	19.1	11	8.1	15	11.1	9	6.7	16	12.2		
Normal	103	66.5	106	69.7	110	81.5	102	75.6	109	80.7	95	72.5		
Overweight	8	5.2	11	7.2	11	8.1	14	10.4	13	9.6	17	13.0		
Obese	2	1.3	2	1.3	2	1.5	-	-	3	2.2	1	0.8		
Total	155	100	152	100	135	100	135	100	135	100	131	100		

(-) refers to no member in that category

Table 11 below shows the distribution of study clients with respect to their nutrition status by selected demographic and socio-economic characteristics. The results at baseline shows that, the sex of the client was found to be related to the BMI of the study clients ($p=0.055$). The other variables that were found to be related to the BMI at baseline include illness ($p=0.027$), staple food from own production ($p=0.060$), Household Dietary Diversity Score ($p=0.000$) and fuel that the clients used for lighting ($p=0.082$).

Table 11: Percentage distribution of Nutrition Status of Study Clients by selected demographic and socio-economic characteristics at baseline

	Baseline										P-value n
	Severe Underweight		Moderate Underweight		Normal		Overweight		Obese		
	n	%	n	%	n	%	n	%	n	%	
Transfer Type											
Cash Transfer	7	4.5	35	22.6	103	66.5	8	5.2	2	1.3	0.754
Food Vouchers	4	2.6	29	19.1	106	69.7	11	7.2	2	1.3	
Sex											
Male	4	3.1	36	27.5	85	64.9	6	4.6	0	0.0	0.055*
Female	7	4.0	28	15.9	124	70.5	13	7.4	4	2.3	
Age Group											
15 - 24	2	6.7	4	13.3	24	80.0	0	0.0	0	0.0	0.106
25 - 34	2	1.7	17	14.5	88	75.2	9	7.7	1	0.9	
35 - 44	4	3.7	33	30.8	64	59.8	4	3.7	2	1.9	
45 - 54	3	6.1	10	20.4	29	59.2	6	12.2	1	2.0	
55 - 64	0	0.0	0	0.0	4	100	0	0.0	0	0.0	
Marital Status											
Never married	1	4.5	4	18.2	16	72.7	1	4.5	0	0.0	0.674
Married	5	2.9	38	22.2	117	68.4	9	5.3	2	1.2	
Cohabiting	0	0.0	0	0.0	1	100	0	0.0	0	0.0	
Divorced	3	4.8	10	15.9	43	68.3	6	9.5	1	1.6	
Widowed	1	2.5	6	15.0	29	72.5	3	7.5	1	2.5	
Separated	1	10.0	6	60.0	3	30.0	0	0.0	0	0.0	
Literacy											
Can read and write	5	3.7	25	18.5	92	68.1	11	8.1	2	1.5	0.402
Can read only	1	5.9	5	29.4	9	52.9	1	5.9	1	5.9	
Cannot read or write	5	3.2	34	21.9	108	69.7	7	4.5	1	0.6	
Education Attainment											
No education	4	5.6	16	22.2	50	69.4	1	1.4	1	1.4	0.651
Grade 1 - 4	1	1.6	15	24.2	41	66.1	3	4.8	2	3.2	
Grade 5 - 7	4	4.5	20	22.5	57	64.0	7	7.9	1	1.1	
Grade 8 - 9	1	2.6	3	7.7	31	79.5	4	10.3	0	0.0	
Grade 10 - 12	1	2.7	7	18.9	25	67.6	4	10.8	0	0.0	
Certificate	0	0.0	3	37.5	5	62.5	0	0.0	0	0.0	
Illness											
Yes	10	4.6	54	24.7	139	63.5	14	6.4	2	0.9	0.027**
No	1	1.2	10	11.6	68	79.1	5	5.8	2	2.3	
Total	11	3.6	64	21.0	207	67.9	19	6.2	4	1.3	
CD4 Count											
Less than 200 cells/l	4	2.9	34	24.3	93	66.4	8	5.7	1	0.7	0.600
200.1-349.9 cells/l	7	4.6	27	17.8	106	69.7	10	6.6	2	1.3	
Above 350 cells/l	0	0.0	3	20.0	10	66.7	1	6.7	1	6.7	
Total	11	3.6	64	20.8	209	68.1	19	6.2	4	1.3	
Adherence											
Poor Adherence	0	0.0	4	33.3	7	58.3	1	8.3	0	0.0	0.686
Good Adherence	5	2.3	48	22.5	143	67.1	14	6.6	3	1.4	
Total	5	2.2	52	23.1	150	66.7	15	6.7	3	1.3	
Staple food from own production											
Yes	5	2.8	35	19.8	123	69.5	13	7.3	1	0.6	0.060*
No	3	4.8	17	27.4	40	64.5	1	1.6	1	1.6	
Total	8	3.3	52	21.8	163	68.2	14	5.9	2	0.8	
HDDS											
Poor	5	9.6	3	5.8	41	78.8	2	3.8	1	1.9	0.000**
Moderate	4	2.2	33	18.5	130	73.0	10	5.6	1	0.6	
Good	2	2.6	28	36.8	37	48.7	7	9.2	2	2.6	
Total	11	3.6	64	20.9	208	68.0	19	6.2	4	1.3	
Toilet Facility											
Flush toilet	0	0.0	0	0.0	5	100	0	0.0	0	0.0	0.060*
Pit latrine with ventilation	0	0.0	4	9.3	33	76.7	6	14.0	0	0.0	
Pit latrine without ventilation	7	4.0	44	24.9	112	63.3	12	6.8	2	1.1	
Bush	4	5.2	15	19.5	56	72.7	1	1.3	1	1.3	
Other	0	0.0	1	20.0	3	60.0	0	0.0	1	20.0	
Total	11	3.6	64	20.8	209	68.1	19	6.2	4	1.3	
Fuel for lighting											
Electricity	0	0.0	6	37.5	8	50.0	2	12.5	0	0.0	0.082*
Paraffin	5	7.7	9	13.8	43	66.2	6	9.2	2	3.1	
Candles	0	0.0	16	20.8	52	67.5	7	9.1	2	2.6	
Solar	1	11.1	3	33.3	5	55.6	0	0.0	0	0.0	
Other	5	3.6	30	21.4	101	72.1	4	2.9	0	0.0	

Total	11	3.6	64	20.8	209	68.1	19	6.2	4	1.3	
Fuel for cooking											
Electricity	0	0.0	3	42.9	2	28.6	2	28.6	0	0.0	0.103
Paraffin	0	0.0	1	100	0	0.0	0	0.0	0	0.0	
Charcoal	3	3.3	17	18.5	62	67.4	8	8.7	2	2.2	
Solar	0	0.0	1	50.0	1	50.0	0	0.0	0	0.0	
Wood	8	3.9	41	20.1	144	70.6	9	4.4	2	1.0	
Other	0	0.0	1	100	0	0.0	0	0.0	0	0.0	
Total	11	3.6	64	20.8	209	68.1	19	6.2	4	1.3	
Water Sources											
Household metered water (municipal)	0	0.0	2	11.8	13	76.5	2	11.8	0	0.0	0.425
Communal standpipe	0	0.0	0	0.0	12	92.3	1	7.7	0	0.0	
Borehole	8	4.5	36	20.2	124	69.7	7	3.9	3	1.7	
Protected well	1	2.6	6	15.8	27	71.1	4	10.5	0	0.0	
Dam/pool/stagnant water	0	0.0	0	0.0	3	100	0	0.0	0	0.0	
River/stream	0	0.0	0	0.0	5	83.3	1	16.7	0	0.0	
Spring well	0	0.0	0	0.0	4	100	0	0.0	0	0.0	
Unprotected well	2	4.3	19	41.3	20	43.5	4	8.7	1	2.2	

*significant at 0.1, **significant at 0.05

Table 12 below shows that in spite of sex of the client, illness, having staple from own production, Household dietary diversity score and fuel for lighting having significant influences at baseline, at midline only age of the clients was found to be significantly related to BMI of the client (p=0.054).

Table 12: Percentage distribution of Nutrition Status of Study Clients by selected demographic and socio-economic characteristics at Midline

	Severe Underweight		Moderate Underweight		Midline Normal		Overweight		Obese		P-value
	n	%	n	%	n	%	n	%	n	%	
Transfer Type											
Cash Transfer	1	0.7	11	8.1	110	81.5	11	8.1	2	1.5	0.307
Food Vouchers	4	3.0	15	11.1	102	75.6	14	10.4	0	0.0	
Sex											
Male	2	1.8	14	12.3	92	80.7	6	5.3	0	0.0	0.156
Female	3	1.9	12	7.7	119	76.8	19	12.3	2	1.3	
Age Group											
15 - 24	0	0.0	2	9.5	18	85.7	1	4.8	0	0.0	0.054*
25 - 34	0	0.0	10	10.1	77	77.8	11	11.1	1	1.0	
35 - 44	3	3.0	5	5.0	86	86.0	6	6.0	0	0.0	
45 - 54	2	4.4	9	20.0	26	57.8	7	15.6	1	2.2	
55 - 64	0	0.0	0	0.0	4	100	0	0.0	0	0.0	
Marital Status											
Never married	0	0.0	3	18.8	12	75.0	1	6.3	0	0.0	0.388
Married	3	1.9	11	6.8	133	82.1	14	8.6	1	0.6	
Divorced	1	2.4	6	14.3	33	78.6	2	4.8	0	0.0	
Widowed	1	2.6	5	13.2	24	63.2	7	18.4	1	2.6	
Separated	0	0.0	1	10.0	8	80.0	1	10.0	0	0.0	
Literacy											
Can read and write	1	0.8	13	10.0	105	80.8	10	7.7	1	0.8	0.224
Can read only	0	0.0	3	23.1	7	53.8	3	23.1	0	0.0	
Cannot read or write	4	3.1	10	7.9	100	78.7	12	9.4	1	0.8	
Education Attainment											
No education	2	3.5	6	10.5	44	77.2	5	8.8	0	0.0	0.381
Grade 1 - 4	1	1.7	3	5.0	51	85.0	4	6.7	1	1.7	
Grade 5 - 7	2	2.7	9	12.2	53	71.6	10	13.5	0	0.0	
Grade 8 - 9	0	0.0	1	2.4	35	85.4	4	9.8	1	2.4	
Grade 10 - 12	0	0.0	4	13.3	24	80.0	2	6.7	0	0.0	
Certificate	0	0.0	3	37.5	5	62.5	0	0.0	0	0.0	
Illness											
Yes	2	3.0	6	9.1	55	83.3	2	3.0	1	1.5	0.409
No	3	2.2	12	9.0	108	80.6	11	8.2	0	0.0	
CD4 Count											
Less than 200 cells/l	0	0.0	8	8.8	71	78.0	12	13.2	0	0.0	0.538
200.1-349.9 cells/l	4	3.4	12	10.3	90	77.6	9	7.8	1	0.9	
Above 350 cells/l	1	1.8	5	8.8	46	80.7	4	7.0	1	1.8	
Adherence											
Poor Adherence	0	0.0	0	0.0	6	100	0	0.0	0	0.0	1.000
Good Adherence	2	1.1	17	9.7	137	77.8	18	10.2	2	1.1	
Staple from own production											
Yes	3	3.6	9	10.7	64	76	7	8.3	1	1.2	0.537
No	2	1.1	15	8.5	140	80	18	10.2	1	0.6	
HDDS											
Poor	1	5.6	0	0.0	14	77.8	3	16.7	0	0.0	0.249
Moderate	3	2.0	15	10.2	112	76.2	15	10.2	2	1.4	
Good	0	0.0	9	9.5	80	84.2	6	6.3	0	0.0	
Toilet Facility											
Flush toilet	0	0.0	1	25.0	3	75.0	0	0.0	0	0.0	0.748
Pit latrine with ventilation	0	0.0	4	9.5	34	81.0	4	9.5	0	0.0	
Pit latrine without ventilation	2	1.4	13	8.8	115	78.2	16	10.9	1	0.7	
Bush	3	4.2	8	11.1	56	77.8	4	5.6	1	1.4	
Other	0	0.0	0	0.0	3	75.0	1	25.0	0	0.0	
Total	5	1.9	26	9.7	211	78.4	25	9.3	2	0.7	

Fuel for lighting											
Electricity	0	0.0	2	14.3	11	78.6	1	7.1	0	0.0	0.295
Paraffin	0	0.0	4	13.8	20	69.0	4	13.8	1	3.4	
Candles	1	1.3	9	11.3	57	71.3	12	15.0	1	1.3	
Solar	0	0.0	1	12.5	7	87.5	0	0.0	0	0.0	
Other	4	2.9	10	7.2	116	84.1	8	5.8	0	0.0	
Total	5	1.9	26	9.7	211	78.4	25	9.3	2	0.7	
Fuel for cooking											
Electricity	0	0.0	1	12.5	6	75.0	1	12.5	0	0.0	0.507
Gas	0	0.0	0	0.0	1	100	0	0.0	0	0.0	
Paraffin	0	0.0	0	0.0	1	100	0	0.0	0	0.0	
Charcoal	0	0.0	5	6.8	56	76.7	11	15.1	1	1.4	
Wood	5	2.7	20	10.8	147	79.0	13	7.0	1	0.5	
Total	5	1.9	26	9.7	211	78.4	25	9.3	2	0.7	
Water Sources											
Household metered water (municipal etc)	0	0.0	1	9.1	9	81.8	1	9.1	0	0.0	0.762
Communal standpipe	0	0.0	0	0.0	7	77.8	1	11.1	1	11.1	
Borehole	5	3.0	16	9.5	134	79.3	14	8.3	0	0.0	
Protected well	0	0.0	5	13.9	26	72.2	5	13.9	0	0.0	
Dam/pool/stagnant water	0	0.0	0	0.0	1	100	0	0.0	0	0.0	
River/stream	0	0.0	0	0.0	3	100	0	0.0	0	0.0	
Spring well	0	0.0	0	0.0	3	100	0	0.0	0	0.0	
Unprotected well	0	0.0	4	10.8	28	75.7	4	10.8	1	2.7	
Total	5	1.9	26	9.7	211	78.4	25	9.3	2	0.7	

*significant at 0.1, **significant at 0.05

Table 13 below shows that at the post assessment, only sex of the clients ($p=0.026$), marital status ($p=0.004$) and illness ($p=0.015$) were found to be significantly related with the BMI.

	Post										P-value
	Severe Underweight		Moderate Underweight		Normal		Overweight		Obese		
	n	%	n	%	n	%	n	%	n	%	
Transfer Type											
Cash Transfer	1	0.7	9	6.7	109	80.7	13	9.6	3	2.2	0.317
Food Vouchers	2	1.5	16	12.2	95	72.5	17	13.0	1	0.8	
Sex											
Male	1	0.9	12	10.9	91	82.7	6	5.5	0	0.0	0.026**
Female	2	1.3	13	8.4	112	72.3	24	15.5	4	2.6	
Age Group											
15 - 24	1	5.0	2	10.0	16	80.0	1	5.0	0	0.0	0.102
25 - 34	1	1.0	7	7.2	73	75.3	14	14.4	2	2.1	
35 - 44	0	0.0	9	9.0	84	84.0	7	7.0	0	0.0	
45 - 54	1	2.4	6	14.3	25	59.5	8	19.0	2	4.8	
55 - 64	0	0.0	1	16.7	5	83.3	0	0.0	0	0.0	
Marital Status											
Never married	1	5.6	2	11.1	14	77.8	1	5.6	0	0.0	0.004**
Married	0	0.0	13	8.4	129	83.2	10	6.5	3	1.9	
Divorced	0	0.0	3	6.8	33	75.0	7	15.9	1	2.3	
Widowed	2	5.3	7	18.4	19	50.0	10	26.3	0	0.0	
Separated	0	0.0	0	0.0	6	75.0	2	25.0	0	0.0	
Literacy											
Can read and write	1	0.8	10	8.2	95	77.9	15	12.3	1	0.8	0.586
Can read only	0	0.0	3	20.0	9	60.0	3	20.0	0	0.0	
Cannot read or write	2	1.6	12	9.4	99	77.3	12	9.4	3	2.3	
Education Attainment											
No education	1	1.7	8	13.6	45	76.3	5	8.5	0	0.0	0.345
Grade 1 - 4	1	1.7	3	5.1	49	83.1	4	6.8	2	3.4	
Grade 5 - 7	1	1.4	5	6.8	57	77.0	11	14.9	0	0.0	
Grade 8 - 9	0	0.0	3	9.1	22	66.7	6	18.2	2	6.1	
Grade 10 - 12	0	0.0	3	10.0	24	80.0	3	10.0	0	0.0	
Certificate	0	0.0	3	30.0	6	60.0	1	10.0	0	0.0	
Illness											
Yes	3	4.3	9	12.9	54	77.1	3	4.3	1	1.4	0.015**
No	0	0.0	16	8.6	142	76.8	24	13.0	3	1.6	
CD4 Count											
Less than 200 cells/l	1	2.4	6	14.6	30	73.2	4	9.8	0	0.0	0.779
200.1-349.9 cells/l	1	1.1	9	10.0	67	74.4	12	13.3	1	1.1	
Above 350 cells/l	1	0.7	10	7.4	107	79.3	14	10.4	3	2.2	
Adherence											
Poor Adherence	0	0.0	0	0.0	0	0.0	1	100.0	0	0.0	0.233
Good Adherence	3	1.1	25	9.6	201	77.0	28	10.7	4	1.5	
Staple from own production											
Yes	2	1.1	14	7.6	150	81.5	16	8.7	2	1.1	1.000
No	0	0.0	1	5.9	15	88.2	1	5.9	0	0.0	
HDSS											
Poor	0	0.0	0	0.0	9	90.0	1	10.0	0	0.0	0.784
Moderate	2	1.4	15	10.6	111	78.2	12	8.5	2	1.4	
Good	1	0.9	10	8.8	84	73.7	17	14.9	2	1.8	
Toilet Facility											
Flush toilet	0	0.0	0	0.0	3	75.0	1	25.0	0	0.0	0.317
Pit latrine with ventilation	0	0.0	5	11.9	32	76.2	5	11.9	0	0.0	
Pit latrine without ventilation	2	1.5	13	9.7	98	73.1	19	14.2	2	1.5	
Bush	1	1.2	6	7.2	70	84.3	4	4.8	2	2.4	
Other	0	0.0	1	33.3	1	33.3	1	33.3	0	0.0	

Fuel for lighting											
Electricity	0	0.0	0	0.0	14	82.4	3	17.6	0	0.0	0.124
Paraffin	0	0.0	3	12.5	15	62.5	5	20.8	1	4.2	
Candles	1	1.4	9	13.0	45	65.2	14	20.3	0	0.0	
Solar	0	0.0	1	8.3	11	91.7	0	0.0	0	0.0	
Other	2	1.4	12	8.3	119	82.6	8	5.6	3	2.1	
Total											
Fuel for cooking											
Electricity	0	0.0	0	0.0	4	66.7	2	33.3	0	0.0	0.130
Paraffin	0	0.0	0	0.0	1	100	0	0.0	0	0.0	
Charcoal	1	1.4	8	10.8	49	66.2	14	18.9	2	2.7	
Wood	2	1.1	17	9.2	150	81.1	14	7.6	2	1.1	
Total											
Water Sources											
Household metered water (municipal)	1	5.6	2	11.1	10	55.6	4	22.2	1	5.6	0.588
Communal standpipe	0	0.0	0	0.0	6	85.7	1	14.3	0	0.0	
Borehole	2	1.2	15	9.1	132	80.0	14	8.5	2	1.2	
Protected well	0	0.0	4	11.4	27	77.1	4	11.4	0	0.0	
Dam/pool/stagnant water	0	0.0	0	0.0	1	100	0	0.0	0	0.0	
River/stream	0	0.0	0	0.0	2	66.7	1	33.3	0	0.0	
Spring well	0	0.0	0	0.0	2	100	0	0.0	0	0.0	
Unprotected well	0	0.0	4	11.4	24	68.6	6	17.1	1	2.9	
Total	3	1.1	25	9.4	204	76.7	30	11.3	4	1.5	

**significant at 0.05

3.2.1 Effect of interventions on Body Mass Index (BMI)

The mean Body Mass Index for the study clients at baseline, midline and post assessment are presented in Table 14. The results show an increase in mean BMI from baseline to midline and from midline to post assessment in both treatment groups.

Table 14: Mean BMI of study clients

	Cash			Food			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
BMI Base	20.42	3.24	156	20.74	2.99	153	20.58	3.12	309
BMI Midline	21.44	2.97	135	21.19	12.81	135	21.32	2.89	270
BMI Final	21.88	2.93	135	21.75	3.00	131	21.81	2.96	266

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 shows that the increase in mean BMI from baseline to midline was statistically significant in both treatment groups [$t(123) = (-4.55)$, $p=0.000$ on cash and $t(125) = (-2.36)$, $p=0.020$ on food]. The results were similar from baseline to post assessment [$t(124) = (-6.64)$, $p=0.000$ on cash and $t(116) = (-4.86)$, $p=0.000$ on food] as presented in Table 15 below.

Table 15: Effect of intervention on BMI

Midline Assessment										Post Assessment									
Effect on BMI after 4 months of intervention										Effect on BMI after 8 months of intervention									
Cash					Food					Cash				Food					
MD	Se	CI: 95 %		p-value	MD	Se	CI: 95 %		p-value	MD	Se	CI:95 %		p-value	MD	Se	CI: 95 %		p-value
		Low	Upp				Low	Upp				Low	Upp				Low	Upp	
-0.823	0.181	-1.181	-0.465	0.001	-0.380	0.161	-0.699	-0.061	0.020	-1.132	0.171	-1.470	-0.795	0.001	-0.918	0.189	-1.293	-0.544	0.001

For clients on cash transfer, the mean BMI increased from (M=20.47) at baseline to (M=21.29, SD=2.92) at midline and from (M=20.72, SD=2.85) at baseline to (M=21.10, SD=2.73) for those on food transfer. On the other hand the mean BMI increased from (M=20.56, SD=3.03) at baseline to (M=21.70, SD=2.81) at post assessment for those clients on the cash transfer while the mean BMI for those on food transfer increased from (M=20.65, SD=2.86) at baseline to (M=21.57, SD=2.92) at post assessment.

Results of an independent t test conducted during the post assessment, to compare the nutrition status for clients on cash transfer and those on the food transfer using the body mass index (BMI), assuming equal variances, suggested that there was no significant differences between the two treatment groups in the levels of improvements [$t(264) = 0.370, p=0.711$]. This outcome was similar to the one reported at baseline [$t(307) = -0.895, p=0.372$].

3.2.2 Mixed Effects Model for Body Mass Index

The linear mixed models procedure was used to determine whether the error variances for the Body Mass Index did not change between measurement times baseline (time 1), midline (time 2) and post (time 3). Table 16 shows that overall, there was a statistically significant increase in Body Mass Index estimates between baseline and midline (0.616 (95% CI, 0.4 - 0.8), with a standard error of 0.1) and between midline and post evaluation (1.039 (95% CI, 0.8 - 1.3), with a standard error of 0.1).

However, when the data is disaggregated by transfer type: among those on cash, the increase in BMI estimate between baseline and midline was 0.8 (95% CI, 0.5 - 1.1), with a standard error of 0.2, and between midline and post evaluation it was 1.2 (95% CI, 0.9 - 1.5), with a standard error of 0.2; for those on food, the increase in BMI estimate between baseline and midline was 0.4 (95% CI, 0.1 - 0.7), with a standard error of 0.2 and between midline and post evaluation it was 0.9 (95% CI, 0.6 - 1.2), with a standard error of 0.2.

Therefore, since the significance value of the estimate is less than 0.05 in all the treatment groups we can confidently say that there is a significant difference in base, midline-and post Body Mass Indexes of approximately 0.8 and 1.2 for cash and 0.4 and 0.9 for clients on food transfers, and that the error variances for the BMI did not change among the three assessment periods.

Table 16: Mixed Model Estimate of Fixed Effects on Body Mass Index

Estimates of Fixed Effects on Body Mass Index Overall						
Parameter	Estimate	Std. Error	z	Sig.	95% CI	
					Upper Bound	Lower Bound
[Baseline 1 1=1]	0	0				
[Midline 2 1=2]	0.616	0.111	5.57	0.000	0.399	0.833
[Post 3 1=3]	1.039	0.112	9.29	0.000	0.820	1.259
Intercept	20.714	0.169	122.26	0.000	20.382	21.046
Cash Transfer						
[Baseline 1 1=1]	0	0				
[Midline 2 1=2]	0.815	0.157	5.18	0.000	0.507	1.124
[Post 3 1=3]	1.173	0.157	7.47	0.000	0.865	1.480
Intercept	20.548	0.244	84.21	0.000	20.070	21.026
Food Transfer						
[Baseline 1 1=1]	0	0				
[Midline 2 1=2]	0.416	0.155	2.69	0.007	0.113	0.719
[Post 3 1=3]	0.901	0.158	5.69	0.000	0.591	1.212
Intercept	20.882	0.235	89.01	0.000	20.422	21.342

3.2.3 Determinants of Body Mass Index (BMI) for Study Clients from Baseline to Post Assessment

Before performing the binary logistic regression model, a regression diagnostic test was performed to ensure non-violation of the multiple regression assumptions, including Sample Size, multicollinearity, outliers, normality and homoscedasticity, and none of them was violated. Table 17 shows the logistic regression coefficient, Wald test, and odds ratio for each of the predictors. Employing a .05 criterion of statistical significance, females were 2.4 times likely to be underweight compared to males. In addition, clients with CD4 count less than 350 μ /l and having an illness were 1.0 times likely to be underweight compared to those with CD4 count equal to 350 μ /l or more and not having had any illness at baseline among all the explanatory variables. Furthermore, the odds ratio for BMI at midline indicates that when holding all other variables constant, females were 2.6 times likely to be underweight (BMI less than 18.5) than males, and clients with CD4 count less than 350 μ /l and not having some income were 1.0 times likely to be underweight compared to those with CD4 count equal to 350 μ /L and having some income. Lastly, with regard to post assessment, the only determinants for BMI were Sex and CD4 count, with females being 1.8 times more likely to be underweight compared to males. Clients with CD4 count less than 350 μ /L were 1.0 times likely to be underweight than those with CD4 count equal to or more than 350 μ /L. Therefore, the table below indicates that the results are not different at baseline, midline and post assessment. These regression results uphold the hypothesis stating that both cash and food transfers have the same effect in improving the nutritional status (as measured by BMI) of clients initiating ART.

Table 17: Determinants of Body Mass Index among Study Clients at From Baseline, Midline and Post Assessment

Determinants at Baseline						
Eplanatory Variable	B	Wald	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
					Lower	Upper
Transfer Type						
Cash ^{RC}				1.000		
Food	0.357	1.004	0.316	1.430	0.710	2.877
Sex						
Males ^{RC}				1.000		
Females	0.881	6.344	0.012	2.414 *	1.216	4.791
CD4 Count	0.003	2.988	0.084	1.003**	1.000	1.006
WHO Stage	-0.319	2.353	0.125	0.727	0.484	1.093
Adherence						
Good ^{RC}				1.000		
Poor	0.364	0.260	0.610	1.439	0.355	5.831
Income from most Important Economic Activity	0.000	0.463	0.496	1.000	1.000	1.000
Household Dietary Diversity Score	-0.147	2.239	0.135	0.863	0.712	1.047
Illness						
Yes	-0.788	3.051	0.081	0.455**	0.188	1.101
No ^{RC}				1.000		
Determinants at Midline						
Eplanatory Variable	B	Wald	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
					Lower	Upper
Transfer Type						
Cash ^{RC}				1.000		
Food	0.456	1.251	0.263	1.578	0.709	3.513
Sex						
Males ^{RC}				1.000		
Females	0.979	5.750	0.016	2.662*	1.196	5.926
CD4 Count	0.003	3.536	0.060	1.003**	1.000	1.007
WHO Stage	-0.118	0.124	0.724	0.889	0.462	1.711
Adherence						
Good ^{RC}				1.000		
Poor	19.642	0.000	0.999	339205224.985	0.000	-
Income from most Important Economic Activity	0.000	2.879	0.090	1.000**	1.000	1.000
Household Dietary Diversity Score	0.086	0.533	0.465	1.090	0.865	1.373
Illness						
Yes	-0.108	0.063	0.801	0.898	0.388	2.078
No ^{RC}				1.000		
Determinants at Post Assessment						
Eplanatory Variable	B	Wald	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
					Lower	Upper
Transfer Type						
Cash ^{RC}				1.000		
Food	0.256	0.649	0.420	1.292	0.693	2.410
Sex						
Males ^{RC}				1.000		
Females	0.598	3.479	0.062	1.818**	0.970	3.409
CD4 Count	0.003	7.816	0.005	1.003*	1.001	1.006
Adherence						
Good ^{RC}				1.000		
Poor	19.815	-	1.000	403208394.901	-	.
Income from most Important Economic Activity	-	1.202	0.273	1.000	1.000	1.000
Household Dietary Diversity Score	-0.101	1.373	0.241	0.904	0.764	1.070
Illness						
Yes	0.080	0.051	0.821	1.083	0.542	2.166
No ^{RC}				1.000		

RC=Reference Category
Significance level: ** at 0.1 and * at 0.05

3.3.1 Household Food Availability and Household Dietary Diversity Score

3.3.1.1 Availability of staple food from own production

Table 18 below shows the distribution of households indicating having had staple food from own production among the two treatment groups. The results show that a higher proportion of households had staple food from own production at baseline and post assessment points, while only one third had staple food from own production at midline. A Chi-square test of independence showed that at both baseline and post, households indicating having staple from own production was independent of the transfer type (χ^2 (df=1, n=257) = 0.583, p=0.445] and χ^2 (df=1, n=223) = 0.664, p=0.415]).

Table 18: Percent distribution of households indicating having staple food from own production

Having staple from own production	Baseline				Midline				Post			
	Cash		Food		Cash		Food		Cash		Food	
	N	%	n	%	n	%	n	%	n	%	n	%
Yes	88	72.1	103	76.3	39	35.1	35	30.2	100	90.9	106	93.8
No	34	27.9	32	23.7	72	64.9	81	69.8	10	9.1	7	6.2
Total	122	100	135	100	111	100	116	100	110	100	113	100

3.3.1.2 Most important source of household staple

During all the three assessment points, the main source of staple food was monitored. Comparing the baseline to post assessment period, the survey results show that 'own harvest' was the most important source of staple food for most of the study clients at all the three assessment points in both transfer type. 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 three in every ten client's households at baseline that were purchasing staple food, about six in every ten were purchasing the staple food at post assessment (Table 19). A Chi-square test of independence using fishers 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=0.000.

Table 19: Distribution of households indicating the most important source of household staple by Treatment Group

Source of staple	Baseline				Midline				Final				P-value	
	Cash		Food		Cash		Food		Cash		Food		Base	Post
	N	%	n	%	n	%	n	%	n	%	n	%		
From own harvest	97	58.1	111	64.9	51	34.5	48	31.6	72	49	72	49	0.710	0.000
Casual labour	9	5.4	8	4.7	2	1.4	6	3.9	1	0.7	1	0.7		
Gift	5	3	4	2.3	2	1.4	-	-	-	-	-	-		
Purchases	54	32.3	48	28.1	83	56.1	21	13.8	69	46.9	18	12.2		
Food aid	1	0.6	-	-	1	0.7	4	2.6	-	-	-	-		
Barter	1	0.6	-	-	-	-	1	0.7	-	-	-	-		
Other	-	-	-	-	9	6.1	72	47.4	5	3.4	56	38.1		
Total	167	100	171	100	148	100	152	100	147	100	147	100		

(-) refers to no member in that category

3.3.1.3 Household Dietary Diversity Score

Table 20 below shows that majority of the clients on both treatment groups and across the survey points consumed four to eight food items in the 24 hours prior the survey. Besides the above, as the survey went on the number of clients who consumed only one or two food items in the 24 hours prior the survey decreased.

Table 20: Percentage distribution of number of food items consumed by treatment type and survey points

No. of Food Items Consumed	Baseline				Midline				Post				
	Cash		Food		Cash		Food		Cash		Food		
	N	%	n	%	n	%	n	%	n	%	n	%	
1	2	1.2	1	0.6	-	-	-	-	-	-	-	-	-
2	6	3.6	12	7.0	5	3.4	-	-	1	0.7	-	-	-
3	14	8.4	21	12.3	8	5.4	8	5.5	3	2.0	7	4.8	-
4	25	15.1	35	20.5	19	12.9	15	10.3	13	8.8	8	5.4	-
5	47	28.3	33	19.3	23	15.6	34	23.3	33	22.4	38	25.9	-
6	25	15.1	32	18.7	34	23.1	40	27.4	26	17.7	39	26.5	-
7	19	11.4	16	9.4	18	12.2	28	19.2	28	19.0	17	11.6	-
8	17	10.2	13	7.6	28	19.0	8	5.5	20	13.6	16	10.9	-
9	6	3.6	6	3.5	7	4.8	9	6.2	18	12.2	10	6.8	-
10	4	2.4	1	0.6	2	1.4	4	2.7	1	0.7	7	4.8	-
11	1	0.6	1	0.6	3	2.0	-	-	3	2.0	1	0.7	-
12	-	-	-	-	-	-	-	-	-	-	3	2.0	-
13	-	-	-	-	-	-	-	-	1	0.7	1	0.7	-
Total	166	100	171	100	147	100	146	100	147	100	147	100	

Table 21 below shows that in both treatment groups, poor diet diversity score (less than three food items) was decreasing as the intervention went on. On the other hand, good diet diversity score (7 or more different food items consumed) was increasing as the intervention went on from baseline, midline until post assessment, in both treatment groups. Besides the above, clients in households on cash transfer had a good DDS increasing from 28 percent at baseline to 48 percent at post assessment, compared to those on food where 22 percent had a good DDS at baseline, rising to 37 percent at post assessment. A Chi-square test of independence showed that at both baseline and post, households diet diversity score was independent of the transfer type (χ^2 (df=6, n=337) = 3.734, p=0.155) and χ^2 (df=2, n=294) = 3.926, p=0.140).

Table 21: Percentage Distribution of Households Diet Diversity Score by Treatment Group

	Baseline				Midline				Post				P-value	
	Cash		Food		Cash		Food		Cash		Food		Baseline	Post
	n	%	n	%	n	%	n	%	n	%	n	%		
Poor	22	13.3	34	19.9	13	8.8	8	5.5	4	2.7	7	4.8	0.155 ^p	0.146 ^p
Moderate	97	58.4	100	58.5	76	51.7	89	61	72	49	85	57.8		
Good	47	28.1	37	21.6	58	38.5	49	33.6	71	48.3	55	37.4		
Total	166	100	171	100	147	100	146	100	147	100	147	100		

Table 22 below shows that the mean HDDS for households on cash transfer increased from 5.5 at baseline to 6.5 at post assessment compared to those on food transfer from 5.1 at baseline and 6.4 at post assessment. In addition, a one-way repeated measure ANOVA was conducted to compare Household Diet Diversity Score at baseline, midline and post assessment. The results show that there was statistically significant effect for time, suggesting 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, though there was significant change in HDDS over time, the results suggest that 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].

Table 22: Mean HDD at all Reference Points

	Cash			Food			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
HDDS BASE	5.51	1.92	166	5.12	1.90	171	5.31	1.92	337
HDDS MID	6.09	1.94	147	5.99	1.60	146	6.04	1.78	293
HDDS FINAL	6.52	1.85	147	6.42	1.98	147	6.47	1.91	294

3.4 ADHERENCE TO ART

One of the key outcome variables of this study was the adherence to ART treatment by study clients. Determining adherence to ART treatment 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.

Table 23 below shows the adherence rates at all the three survey points by transfer type. From these result, it was clear that more than 95 percent of the study clients in both treatment groups had good adherence at all the three survey points. The highest adherence score was recorded during the post assessment, where study clients on cash and food transfer had 100 percent and 99 percent adherence status respectively. A Chi-square test of independence shows that at baseline, study clients adherence was independent of the transfer type [χ^2 (df=1, n=245) = 1.407, p=0.937]. In addition, at post assessment, Chi-square test of independence using fishers exact two sided test showed that clients adherence to treatment was independent of the transfer type (p=1.000).

Table 23: Distribution of clients adherence to treatment by Transfer Type at Midline

	Baseline		Midline		Post		P-value							
	Cash		Food		Cash		Food							
	N	%	n	%	n	%	n	%						
Good adherence	118	94.4	113	94.2	94	97.9	105	95.5	160	100	166	99.4	0.937 ^p	1.000 ^f
Poor Adherence	3	2.4	1	0.8	2	2.1	2	1.8	-	-	-	-		
Other	4	3.2	6	5.0	-	-	3	2.7	-	-	1	0.6		
Total	125	100	120	100	96	100	110	100	160	100	172	100		

(-) refers to no member in that category

(p) refers to Pearsons chi-square p-value

(f) refers to Fishers Test

Table 24 below shows that at baseline, only age group (p=0.034) and literacy levels (p=0.026) were found to be related to Adherence. The remaining variables were found to be insignificant.

Table 24: Percentage distribution of adherence of Study Clients by selected demographic and socio-economic characteristics at Baseline

	Baseline				P-value
	Poor		Good		
	n	%	n	%	n
Transfer Type					
Cash Transfer	7	5.6	118	94.4	1.000
Food Vouchers	7	5.8	113	94.2	
Sex					
Male	5	4.8	100	95.2	0.597
Female	9	6.4	131	93.6	

Age Group					
15 – 24	2	7.7	24	92.3	0.034**
25 – 34	1	1.1	93	98.9	
35 – 44	7	8.5	75	91.5	
45 – 54	3	8.1	34	91.9	
55 – 64	1	20.0	4	80.0	
Marital Status					
Never married	1	5.0	19	95.0	1.000
Married	9	6.4	132	93.6	
Cohabiting	0	0.0	1	100	
Divorced	3	6.4	44	93.6	
Widowed	1	3.6	27	96.4	
Separated	0	0.0	8	100.0	
Literacy					
Can read and write	2	1.7	118	98.3	0.026**
Can read only	1	7.1	13	92.9	
Cannot read or write	11	9.9	100	90.1	
Education Attainment					
No education	5	10.6	42	89.4	0.313
Grade 1 – 4	4	9.3	39	90.7	
Grade 5 – 7	4	5.4	70	94.6	
Grade 8 – 9	1	2.7	36	97.3	
Grade 10 – 12	0	0.0	35	100	
Certificate	0	0.0	9	100	
Illness					
Yes	13	7.3	166	92.7	123
No	1	1.6	62	98.4	
CD4 Count					
Less than 200 cells/l	8	7.1	104	92.9	0.591
200.1-349.9 cells/l	5	4.2	115	95.8	
Above 350 cells/l	1	7.7	12	92.3	
BMI					
Severe Underweight	0	0.0	5	100.0	0.686
Moderate	4	7.7	48	92.3	
Normal	7	4.7	143	95.3	
Overweight	1	6.7	14	93.3	
Obese	0	0.0	3	100.0	
HDDS					
Poor	4	11.4	31	88.6	0.208
Moderate	8	5.7	132	94.3	
Good	2	2.9	68	97.1	
Total	14	5.7	231	94.3	
Staple from own production					
Yes	8	6.2	121	93.8	0.337
No	5	10.6	42	89.4	
Total	13	7.4	163	92.6	

** significant at 0.05

Table 25 below shows that at midline, only CD4 count was found to be significantly related with adherence ($p=0.054$), at a 10 percent level of significance. The remaining variables were found not to be related with adherence.

Table 25: Percentage distribution of adherence of Study Clients by selected demographic and socio-economic characteristics at Midline

	Poor		Midline Good		P-value n
	n	%	n	%	
Transfer Type					
Cash Transfer	2	2.1	94	97.9	0.453
Food Vouchers	5	4.5	105	95.5	
	7	3.4	199	96.6	
Sex					
Male	3	3.8	77	96.3	1.000
Female	4	3.2	121	96.8	
Age Group					
15 – 24	1	5.6	17	94.4	0.124
25 – 34	1	1.2	80	98.8	
35 – 44	3	4.0	72	96.0	
45 – 54	1	3.7	26	96.3	
55 – 64	1	25.0	3	75.0	
Marital Status					
Never married	0	0.0	12	100	0.263
Married	3	2.4	121	97.6	
Divorced	3	10.7	25	89.3	
Widowed	1	3.3	29	96.7	
Separated	0	0.0	7	100	
Literacy					
Can read and write	3	2.8	103	97.2	0.793
Can read only	0	0.0	10	100	
Cannot read or write	4	4.5	84	95.5	
Education Attainment					
No education	1	2.7	36	97.3	0.846
Grade 1 – 4	2	4.5	42	95.5	
Grade 5 – 7	3	5.1	56	94.9	
Grade 8 – 9	0	0.0	33	100	
Grade 10 – 12	1	5.0	19	95.0	
Certificate	0	0.0	11	100	
Illness					
Yes	4	6.3	60	93.8	0.226
No	3	2.4	124	97.6	
CD4 Count					
Less than 200 cells/l	0	0.0	73	100	0.054*
200.1-349.9 cells/l	4	4.6	83	95.4	
Above 350 cells/l	3	7.1	39	92.9	
BMI					
Severe Underweight	0	0.0	2	100	1.000
Moderate	0	0.0	17	100	
Normal	6	4.2	137	95.8	
Overweight	0	0.0	18	100	
Obese	0	0.0	2	100	
HDDS					
Poor	1	7.1	13	92.9	0.453
Moderate	3	2.9	102	97.1	
Good	3	3.8	75	96.2	
Staple from own production					
Yes	0	0.0	40	100	0.574
No	4	3.6	106	96.4	

*significant at 0.1,

Table 26 below shows that despite age and literacy and CD4 count having been related to study clients adherence at baseline and midline respectively, none of these variables were found to be positively related with adherence at post assessment.

Table 26: Percentage distribution of adherence of Study Clients by selected demographic and socio-economic characteristics at Post

	Poor		Post Good		P-value n
	n	%	n	%	
Transfer Type					
Cash Transfer	0	0.0	145	100	1.000
Food Vouchers	1	0.7	144	99.3	
Sex					
Male	1	0.9	110	99	0.385
Female	0	0.0	177	100	
Age Group					
15 – 24	0	0.0	22	100	0.611
25 – 34	0	0.0	112	100	
35 – 44	1	1.0	103	99.0	
45 – 54	0	0.0	43	100	
55 – 64	0	0.0	7	100	
Marital Status					
Never married	0	0	20	100	1.000
Married	1	0.6	164	99.4	
Divorced	0	0	49	100	
Widowed	0	0	40	100	
Separated	0	0	12	100	
Literacy					
Can read and write	1	0.8	129	99.2	0.510
Can read only	0	0.0	17	100	
Cannot read or write	0	0.0	141	100	
Education Attainment					
No education	0	0	62	100	0.142
Grade 1 – 4	0	0	67	100	
Grade 5 – 7	0	0	82	100	
Grade 8 – 9	0	0	36	100	
Grade 10 – 12	1	3.0	32	97.0	
Certificate	0	0	8	100	
Illness					
Yes	0	0.0	75	100	1.000
No	1	0.5	200	99.5	
CD4 Count					
Less than 200 cells/l	0	0.0	42	100	1.000
200.1-349.9 cells/l	0	0.0	96	100	
Above 350 cells/l	1	0.7	151	99.3	
BMI					
Severe Underweight	0	0.0	4	100	0.203
Moderate	0	0.0	23	100	
Normal	0	0.0	204	100	
Overweight	1	4.3	22	95.7	
Obese	0	0.0	2	100	
HDDS					
Poor	0	0	11	100	1.000
Moderate	1	0.6	156	99.4	
Good	0	0	122	100	
Total	1	0.3	289	99.7	
Staple from own production					
Yes	1	0.5	204	99.5	1.000
No	0	0.0	17	100	
Total	1	0.5	221	99.5	

3.5 CD4 COUNT OF STUDY CLIENTS

3.5.1 Distribution of CD4

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. Table 27 below shows the distribution of CD4 count by transfer type at the two reference points. Comparatively, from baseline assessment to post assessment, the results showed a slight reduction in the number of clients with CD4 count below 200 cells/ μ L in both transfer groups. The results (Table 27) also show that the proportion of study clients with CD4 count above 350 cells/ μ L was increasing from baseline to post assessment in both transfers. A Chi-square test of independence shows that at both baseline and post assessment, study clients CD4 count was independent of the transfer type [χ^2 (df=2, n=338) = 1.065, p=0.587 and χ^2 (df=2, n=294) = 0.751, p=0.687].

Table 27: Distribution of CD4 Count by Transfer Type and by Survey Point

CD4 Category	Baseline		Midline				Post				P-value			
	Cash		Food		Cash		Food		Cash		Food		Baseline	Post
	n	%	N	%	n	%	N	%	n	%	n	%		
CD4 Below 200 cells/ μ L	80	47.9	77	45	56	35	61	37.7	19	13.9	24	16.3	0.587	0.687
CD4 Between 200 – 350 cells/ μ L	81	48.5	84	49.1	67	41.9	73	45.1	51	34.7	47	32		
CD4 Above 350 cells/ μ L	6	3.6	10	5.8	37	23.1	28	17.3	77	52.4	76	51.7		
Total	167	100	171	100	160	100	162	100	147	100	147	100		

Table 28 below shows that at baseline, only water source was significantly associated with CD4 count (p=0.091). None of the other remaining independent variables were significantly associated with CD4 count.

Table 28: Percentage distribution of CD4 count of Study Clients by selected demographic and socio-economic characteristics at baseline

Independent Variables	Baseline						P-value
	Less than 200 cells/l		200.1-349.9 cells/l		Above 350 cells/l		
	n	%	n	%	n	%	
Transfer Type							
Cash Transfer	80	47.9	81	48.5	6	3.6	0.587
Food Vouchers	77	45.0	84	49.1	10	5.8	
Total	157	46.4	165	48.8	16	4.7	
Sex							
Male	70	51.1	60	43.8	7	5.1	0.312
Female	87	43.3	105	52.2	9	4.5	
Total	157	46.4	165	48.8	16	4.7	
Marital Status							
Never married	12	48.0	13	52.0	0	0.0	0.158
Married	87	44.8	102	52.6	5	2.6	
Cohabiting	0	0.0	1	100.0	0	0.0	
Divorced	31	48.4	26	40.6	7	10.9	
Widowed	21	50.0	17	40.5	4	9.5	
Separated	6	50.0	6	50.0	0	0.0	
Total	157	46.4	165	48.8	16	4.7	

Literacy							
Can read and write	69	46.0	77	51.3	4	2.7	0.110
Can read only	7	38.9	8	44.4	3	16.7	
Cannot read or write	81	47.6	80	47.1	9	5.3	
Total	157	46.4	165	48.8	16	4.7	
Educational Attainment							
no education	36	46.8	38	49.4	3	3.9	0.924
Grade 1 - 4	30	44.8	32	47.8	5	7.5	
Grade 5 - 7	45	46.9	46	47.9	5	5.2	
Grade 8 - 9	25	54.3	20	43.5	1	2.2	
Grade 10 - 12	16	37.2	25	58.1	2	4.7	
Certificate	5	55.6	4	44.4	0	0.0	
Total	157	46.4	165	48.8	16	4.7	
CD4 Count Base							
Yes	114	47.1	118	48.8	10	4.1	0.666
No	42	45.2	45	48.4	6	6.5	
Total	156	46.6	163	48.7	16	4.8	
Body Mass Index							
Severe Underweight	4	36.4	7	63.6	0	0.0	0.600
Moderate Underweight	34	53.1	27	42.2	3	4.7	
Normal	93	44.5	106	50.7	10	4.8	
Overweight	8	42.1	10	52.6	1	5.3	
Obese	1	25.0	2	50.0	1	25.0	
Total	140	45.6	152	49.5	15	4.9	
Adherence							
Poor	8	57.1	5	35.7	1	7.1	0.591
Good	104	45.0	115	49.8	12	5.2	
Total	112	45.7	120	49.0	13	5.3	
Staple from own production							
Yes	82	42.9	98	51.3	11	5.8	0.264
No	36	54.5	27	40.9	3	4.5	
Total	118	45.9	125	48.6	14	5.4	
Household Dietary Diversity Score							
Poor	22	39.3	32	57.1	2	3.6	0.203
Moderate	95	48.2	89	45.2	13	6.6	
Good	40	47.6	43	51.2	1	1.2	
Total	157	46.6	164	48.7	16	4.7	
Water Sources							
Household metered water (municipal supply)	16	76.2	5	23.8	0	0.0	0.091*
Communal standpipe	9	64.3	5	35.7	0	0.0	
Borehole	77	39.3	106	54.1	13	6.6	
Protected well	25	58.1	17	39.5	1	2.3	
Dam/pool/stagnant water	3	100.0	0	0.0	0	0.0	
River/stream	2	33.3	3	50.0	1	16.7	
Spring well	2	40.0	3	60.0	0	0.0	
Unprotected well	22	45.8	25	52.1	1	2.1	
Other (specify)	1	50.0	1	50.0	0	0.0	
Total	157	46.4	165	48.8	16	4.7	

*significant at 0.1,

Table 29 below shows that at midline, only adherence was significantly associated with CD4 count ($p=0.054$). None of the other remaining independent variables were significantly associated with CD4 count.

Table 29: Percentage distribution of CD4 count of Study Clients by selected demographic and socio-economic characteristics at Midline

Independent Variables	Midline						P-value	
	Less than 200 cells/l		200.1-349.9 cells/l		Above 350 cells/l			
	n	%	n	%	n	%		
Transfer Type								
Cash Transfer	56	35.0	67	41.9	37	23.1	0.426	
Food Vouchers	61	37.7	73	45.1	28	17.3		
Total	117	36.3	140	43.5	65	20.2		
Sex								
Male	38	32.5	56	47.9	23	19.7	0.483	
Female	67	37.4	73	40.8	39	21.8		
Total	105	35.5	129	43.6	62	20.9		
Marital Status								
Never married	4	20.0	11	55.0	5	25.0	0.829	
Married	62	36.0	73	42.4	37	21.5		
Divorced	18	36.0	24	48.0	8	16.0		
Widowed	16	38.1	17	40.5	9	21.4		
Separated	4	40.0	3	30.0	3	30.0		
Total	104	35.4	128	43.5	62	21.1		
Literacy								
Can read and write	51	35.4	61	42.4	32	22.2	0.850	
Can read only	5	35.7	5	35.7	4	28.6		
Cannot read or write	49	35.3	64	46.0	26	18.7		
Total	105	35.4	130	43.8	62	20.9		
Educational Attainment								
no education	23	37.7	31	50.8	7	11.5	0.119	
Grade 1 - 4	19	28.8	29	43.9	18	27.3		
Grade 5 - 7	29	34.5	34	40.5	21	25.0		
Grade 8 - 9	21	47.7	16	36.4	7	15.9		
Grade 10 - 12	7	22.6	15	48.4	9	29.0		
Certificate	6	54.5	5	45.5	0	0.0		
Total	105	35.4	130	43.8	62	20.9		
Illness								
Yes	28	29.5	45	47.4	22	23.2		0.561
No	66	35.9	80	43.5	38	20.7		
Total	94	33.7	125	44.8	60	21.5		
Body Mass Index								
Severe Underweight	0	0.0	4	80.0	1	20.0	0.538	
Moderate Underweight	8	32.0	12	48.0	5	20.0		
Normal	71	34.3	90	43.5	46	22.2		
Overweight	12	48.0	9	36.0	4	16.0		
Obese	0	0.0	1	50.0	1	50.0		
Total	91	34.5	116	43.9	57	21.6		
Adherence								
Poor	0	0.0	4	57.1	3	42.9	0.054*	
Good	73	37.4	83	42.6	39	20.0		
Total	73	36.1	87	43.1	42	20.8		
Staple from own production								
Yes	24	32.9	34	46.6	15	20.5	0.672	
No	58	38.9	62	41.6	29	19.5		
Total	82	36.9	96	43.2	44	19.8		
Household Dietary Diversity Score								
Poor	9	42.9	9	42.9	3	14.3	0.693	
Moderate	52	32.3	75	46.6	34	21.1		
Good	42	39.3	43	40.2	22	20.6		
Total	103	35.6	127	43.9	59	20.4		
Water Sources								
Household metered water (municipal supply)	7	46.7	5	33.3	3	20.0	0.946	
Communal standpipe	2	22.2	4	44.4	3	33.3		
Borehole	61	33.0	84	45.4	40	21.6		
Protected well	15	39.5	15	39.5	8	21.1		
Dam/pool/stagnant water	1	100.0	0	0.0	0	0.0		
River/stream	2	50.0	1	25.0	1	25.0		
Spring well	1	25.0	3	75.0	0	0.0		
Unprotected well	16	40.0	17	42.5	7	17.5		
Total	105	35.5	129	43.6	62	20.9		

*significant at 0.1,

Table 30 below shows that at post assessment, only educational level was significantly associated with CD4 count (p=0.024). None of the other remaining independent variables were significantly associated with CD4 count.

Table 30: Percentage distribution of CD4 count of Study Clients by selected demographic and socio-economic characteristics at post assessment

Independent Variables	Post						P-value
	Less than 200 cells/l		200.1-349.9 cells/l		Above 350 cells/l		
	n	%	n	%	n	%	
Transfer Type							
Cash Transfer	19	12.9	51	34.7	77	52.4	0.687
Food Vouchers	24	16.3	47	32.0	76	51.7	
Total	43	14.6	98	33.3	153	52.0	
Sex							
Male	13	11.6	36	32.1	63	56.3	0.418
Female	30	16.7	60	33.3	90	50.0	
Total	43	14.7	96	32.9	153	52.4	
Marital Status							
Never married	2	9.5	7	33.3	12	57.1	0.411
Married	20	11.9	57	33.9	91	54.2	
Divorced	10	20.4	15	30.6	24	49.0	
Widowed	10	25.0	13	32.5	17	42.5	
Separated	1	8.3	2	16.7	9	75.0	
Total	43	14.8	94	32.4	153	52.8	
Literacy							
Can read and write	23.0	17.4	41.0	31.1	68.0	51.5	0.619
Can read only	2.0	11.8	4.0	23.5	11.0	64.7	
Cannot read or write	18.0	12.6	51.0	35.7	74.0	51.7	
Total	43.0	14.7	96.0	32.9	153.0	52.4	
Educational Attainment							
no education	12	19.0	24	38.1	27	42.9	0.024**
Grade 1 - 4	6	9.0	19	28.4	42	62.7	
Grade 5 - 7	7	8.4	28	33.7	48	57.8	
Grade 8 - 9	7	19.4	13	36.1	16	44.4	
Grade 10 - 12	6	18.2	9	27.3	18	54.5	
Certificate	5	50.0	3	30.0	2	20.0	
Total	43	14.7	96	32.9	153	52.4	
Illness							
Yes	9	11.7	27	35.1	41	53.2	0.619
No	33	16.3	65	32.0	105	51.7	
Total	42	15.0	92	32.9	146	52.1	
Body Mass Index							
Severe Underweight	1	33.3	1	33.3	1	33.3	0.779
Moderate Underweight	6	24.0	9	36.0	10	40.0	
Normal	30	14.7	67	32.8	107	52.5	
Overweight	4	13.3	12	40.0	14	46.7	
Obese	0	0.0	1	25.0	3	75.0	
Total	41	15.4	90	33.8	135	50.8	
Adherence							
Poor	0	0.0	0	0.0	1	100	1.000
Good	42	14.5	96	33.2	151	52.2	
Total	42	14.5	96	33.1	152	52.4	
Staple from own production							
Yes	26	12.6	76	36.9	104	50.5	0.838
No	3	17.6	6	35.3	8	47.1	
Total	29	13.0	82	36.8	112	50.2	
Household Dietary Diversity Score							
Poor	3	27.3	5	45.5	3	27.3	0.339
Moderate	22	14.0	48	30.6	87	55.4	
Good	18	14.3	45	35.7	63	50.0	
Total	43	14.6	98	33.3	153	52.0	
Water Sources							
Household metered water (municipal supply)	5	26.3	5	26.3	9	47.4	0.931
Communal standpipe	1	14.3	1	14.3	5	71.4	
Borehole	26	14.0	62	33.3	98	52.7	
Protected well	6	15.8	15	39.5	17	44.7	
Dam/pool/stagnant water	0	0.0	0	0.0	1	100	
River/stream	0	0.0	2	66.7	1	33.3	
Spring well	0	0.0	1	50.0	1	50.0	
Unprotected well	5	13.2	12	31.6	21	55.3	
Total	43	14.6	98	33.3	153	52.0	

**significant at 0.05

3.5.2 Effect of interventions on CD4 count

The study shows that the mean CD4 count increased among both cash and food transfer treatment groups from 202.2± 106.1 SD at baseline to 363.9± 164.4 SD at post assessment for clients on cash, and from 212.5 ± 138.6 SD at baseline to 352.1± 148.2 SD at post assessment for clients on food (Table 31).

Table 31: Mean CD4 count of study clients

	Cash			Food			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
CD4 Count Base	202.21	106.06	167	212.53	138.64	171	207.43	123.55	338
CD4 Count Midline	255.23	129.07	160	243.57	122.10	162	248.37	125.55	322
CD4 Count Final	363.86	164.36	147	352.13	148.21	147	357.99	156.34	294

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 assessments. The results shows that the increase in mean CD4 count from baseline to midline was statistically significant in both treatment groups [t(159)= (-7.42), p=0.000 on cash and t(161)= (-5.64), p=0.000 on food]. The picture was also the same from baseline to post assessment [t(146)= (-13.55), p=0.000 on cash and t(146)= (-10.03), p=0.000 on food] as reflected in Table 32 below.

Table 32: Effect of intervention on CD4 Count

Midline Assessment										Post Assessment									
Effect on CD4 after 4 months of intervention										Effect on CD4 after 8 months of intervention									
Cash					Food					Cash					Food				
MD	Se	CI: 95 %		p-value	MD	Se	CI: 95 %		p-value	MD	Se	CI:95 %		p-value	MD	Se	CI: 95 %		p-value
		Low	Upp				Low	Upp				Low	Upp				Low	Upp	
-53.3	7.2	-67.5	-39.1	0.000	-39.7	7.0	-53.6	-25.8	0.000	-164.9	12.2	-188.7	-140.7	0.001	-137.1	13.7	-164.1	-110.1	0.000

For clients on cash transfer, the mean CD4 count increased from (M=201.93, SD=106.50) at baseline to (M=255.23, SD=129.07) at midline and from (M=203.86, SD=106.83) at baseline to (M=243.57, SD=122.10) for those on food transfer. On the other hand the mean CD4 count increased from (M=199.17, SD=105.08) at baseline to (M=363.86, SD=164.36) at post assessment for those clients on the cash transfer while the mean CD4 count for those on food transfer increased from (M=215.86, SD=142.56) at baseline to (M=352.13, SD=148.21) at post assessment.

A comparative evaluation of the two treatment groups using the independent t-test, at all survey points (baseline [t (336) = -0.768, p=0.443], midline [t (320) = 0.833, p=0.406] and post assessment [t (292) = 0.642, p=0.521]) shows that there were no significant differences in the effects of the interventions on the treatment groups, indicating that both treatments conferred similar effects.

3.5.3 Mixed Effects Model for CD4 count

The linear mixed models procedure was used to determine whether the error variances for the CD4 count did not change between measurement times baseline (time 1), midline (time 2) and post (time 3). Table 33 below shows that there was a statistically significant increase in CD4 count estimates between baseline and midline of 44.4 (95% CI, 30.2 - 58.6) with a standard error of 7.2, and between midline and post evaluation of 150.1 (95% CI, 135.5 - 164.7) with a standard error of 7.5. However, when the data is disaggregated by transfer type; among those on cash, the increase in CD4 count estimate between baseline and midline was 54 (95% CI, 34.5 - 73.6) with a standard error of 10.0 and between midline and post evaluation 162 (95% CI, 142.5 - 182.8) with a standard error of 10.3. This is compared to those on food, where the increase in CD4 count estimate between baseline and midline was 35.0 (95% CI, 14.7 - 55.3) with a standard error of 10.4 and between midline and post evaluation 137.8 (95% CI, 116.7 - 158.8) with a standard error of 10.7.

Therefore, since the significance value of the estimate is less than 0.05 in all the treatment groups we can confidently say that there is a significant difference in base, midline-and post CD4 count of approximately 54.0 and 162.6 for clients on cash, and 35.0 and 137.8 for clients on food transfers, and that the error variances for the CD4 count did not change among the three assessment period.

Table 33: Mixed Model Estimate of Fixed Effects on CD4 count

Estimates of Fixed Effects on CD4 count Overall						
Parameter	Estimate	Std. Error	z	Sig.	95% CI	
					Upper Bound	Lower Bound
[Baseline 1 1=1]	0	0				
[Midline 2 1=2]	44.421	7.220	6.150	0.000	30.270	58.573
[Post 3 1=3]	150.103	7.451	20.140	0.000	135.499	164.708
Intercept	207.432	7.357	28.200	0.000	193.014	221.850
Cash Transfer						
[Baseline 1 1=1]	0	0				
[Midline 2 1=2]	54.036	9.986	5.410	0.000	34.463	73.608
[Post 3 1=3]	162.618	10.283	15.810	0.000	142.462	182.774
Intercept	202.230	10.334	19.570	0.000	181.956	222.464
Food Transfer						
[Baseline 1 1=1]	0	0				
[Midline 2 1=2]	34.990	10.376	3.370	0.001	14.653	55.326
[Post 3 1=3]	137.763	10.731	12.840	0.000	116.730	158.796
Intercept	212.532	10.452	20.330	0.000	192.046	233.018

3.5.4 Determinants of CD4 Count from Baseline to Post Assessment

Before performing the binary logistic regression model, a regression diagnostic test was performed to ensure non-violation of the multiple regression assumptions including Sample Size, multicollinearity, outliers, normality and homoscedasticity, and none of them was violated. Table 34 shows the logistic regression coefficient, Wald test, and odds ratio for each of the predictors. At a .05 criterion of statistical significance, only WHO stage had significant effects on the CD4 Count of the client among all the explanatory variables (Transfer type, Sex, BMI, Household Diet Diversity Score,

Having an illness, adherence to treatment and total income for the households) across all the three survey points. The odds ratio for WHO stage indicates that when holding all other variables constant, clients with poor WHO stage were 2.9 times more likely to have CD4 counts less than 350µ/L. As seen from the table below, the transfer type that the client was on was not significantly associated with a client having a better CD4 count. Therefore, the table below indicates that the results are not different at baseline, midline and post assessment. These regression results upholds the hypothesis stating that both cash and food transfers have the same effect in improving the CD4 status of clients initiating ART.

Table 34: Determinants of CD4 count among Study Clients at Baseline, Midline and Post Assessment

Determinants at Baseline						
Eplanatory Variable	B	Wald	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
					Lower	Upper
Transfer Type						
<i>Cash</i> ^{RC}				1.000		
<i>Food</i>	0.435	0.424	0.515	1.545	0.417	5.724
Sex						
<i>Males</i> ^{RC}				1.000		
<i>Females</i>	-0.035	0.002	0.960	0.966	0.243	3.838
Body Mass Index	0.141	1.667	0.197	1.151	0.930	1.425
WHO Stage	1.062	9.663	0.002	2.893	1.481	5.653
Adherence						
<i>Good</i> ^{RC}				1.000		
<i>Poor</i>	-18.694	0.000	0.999	0.000	0.000	.
Income from most Important Economic Activity	0.000	0.294	0.588	1.000	1.000	1.000
Household Dietary Diversity Score	-0.264	1.712	0.191	0.768	0.518	1.140
Illness						
<i>Yes</i>	-1.002	2.219	0.136	0.367	0.098	1.372
<i>No</i> ^{RC}				1.000		
Determinants at Midline						
Eplanatory Variable	B	Wald	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
					Lower	Upper
Transfer Type						
<i>Cash</i> ^{RC}				1.000		
<i>Food</i>	-0.606	2.358	0.125	0.545	0.251	1.182
Sex						
<i>Males</i> ^{RC}				1.000		
<i>Females</i>	0.667	2.573	0.109	1.949	0.862	4.404
Body Mass Index	0.026	0.168	0.682	1.026	0.906	1.163
WHO Stage	0.130	0.176	0.675	1.138	0.621	2.088
Adherence						
<i>Good</i> ^{RC}				1.000		
<i>Poor</i>	1.371	2.351	0.125	3.940	0.683	22.736
Income from most Important Economic Activity	0.000	0.939	0.333	1.000	1.000	1.000
Household Dietary Diversity Score	0.153	1.922	0.166	1.166	0.939	1.447
Illness						
<i>Yes</i>	-0.014	0.001	0.972	0.986	0.443	2.196
<i>No</i> ^{RC}				1.000		
Determinants at Post Assessment						
Eplanatory Variable	B	Wald	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
					Lower	Upper
Transfer Type						
<i>Cash</i> ^{RC}				1.000		
<i>Food</i>	0.051	0.039	0.844	1.052	0.635	1.743
Sex						
<i>Males</i> ^{RC}				1.000		
<i>Females</i>	-0.325	1.465	0.226	0.723	0.427	1.223
Body Mass Index	0.039	0.723	0.395	1.039	0.951	1.136
Adherence						
<i>Good</i> ^{RC}				1.000		
<i>Poor</i>	20.746	0.000	1.000	1022921065.975	0.000	.
Income from most Important Economic Activity	0.000	1.032	0.310	1.000	1.000	1.000
Household Dietary Diversity Score	-0.019	0.073	0.787	0.981	0.854	1.126
Illness						
<i>Yes</i>	0.113	0.150	0.699	1.119	0.632	1.981
<i>No</i> ^{RC}				1.000		

RC=Reference Category

3.6 HOUSEHOLD WELFARE OF SURVEY SUBJECTS

In order to determine the household welfare of our survey subjects in the two treatment groups, the survey considered the main economic activities of household members and the estimated income realized before and during the period of the survey. Other factors considered included the household asset base (both productive and non-productive) and livestock ownership.

3.6.1 Economic activities

At baseline, the survey considered the main economic activities for study subjects in period of twelve months preceding the survey, while at midline the survey considered four months period after baseline. At post assessment, the survey considered a period of eight months after collection of the baseline data on the main economic activities and some of the assets that the households owned.

Table 35 below shows that agricultural related activities remained the main economic activity for most study clients across the three different time periods in both treatment groups.

The results also suggested that there were a considerable proportion of study clients involved in informal employment activities while others were employed in the formal sector. This picture was the same across the three different time periods and between the two treatment groups. A Chi-square test of independence showed that at baseline, study clients' main economic activity was independent of the transfer type [χ^2 (df=5, n=335) = 6.842, p=0.233]. However, at post assessment, there was a statistically significant relationship between study clients main economic activity and treatment type p=0.034.

Table 35: Distribution of Study Clients Main Economic Activities by Transfer Type and by Survey point

Economic Activity	Baseline Assessment				Midline Assessment				Post Assessment				P-value	
	Cash		Food		Cash		Food		Cash		Food		Base p	Final f
	n	%	n	%	n	%	n	%	n	%	n	%		
Formal Employment	20	12.1	20	11.8	16	11.0	11	7.5	10	7.3	15	10.6	0.233 p	0.034 f
Informal Employment	45	27.3	28	16.5	25	17.1	16	11.0	33	24.1	17	12.1		
Domestic Work	9	5.5	14	8.2	5	3.4	10	6.8	3	2.2	6	4.3		
Agricultural Related Activity	75	45.5	92	54.1	86	58.9	92	63.0	79	57.7	88	62.4		
Unemployed	6	3.6	5	2.9	8	5.5	11	7.5	5	3.6	12	8.5		
Other (Leisure, School, etc)	10	6.1	11	6.5	6	4.1	6	4.1	7	5.1	3	2.1		
Total	16	100.	17	100.	14	100.	14	100.	13	100.	14	100.		
	5	0	0	0	6	0	6	0	7	0	1	0		

A one-way repeated measure ANOVA was conducted to compare income (in Zambian Kwacha) at baseline, midline and post assessment. Incomes from the first and second most important economic activities were aggregated for each household in the study area. These aggregate incomes are expressed in real terms after adjusting for inflation using the Consumer Price Index (CPI). The means and standard deviations are presented in Table 36 below. These results indicate a 'U' trend with mean income declining by mid assessment and then increasing to almost similar levels by post assessment. However, this could be due to the differentials in the recall periods at all the three assessment times. At baseline, clients were asked about their total income from economic activities covering the past 12 months prior to being enrolled on the study while at midline the recall period was only 4 months covering the total number of months each client had been on the study. At post assessment, the recall period was 8 months.

Table 36: Mean Household Income from Economic Activities by Transfer Type

Survey Point	Cash			Food			Overall		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
Baseline Aggregate Income	2 326 128	3 194 032	146	2 805 074	8 743 440	145	2 564 778	6 566 485	291
Midline Aggregate Income	910 115	3 284 970	146	849 540	2 595 159	145	879 932	2 956 457	291
Post Aggregate Income	2 195 106	4 682 269	146	2 337 837	5 614 399	145	2 266 226	5 159 358	291

In order to smoothen the income trend, the aggregate household real incomes were converted to monthly income by dividing the baseline income figures by 12 months, midline income figures by 4 months and the post assessment income figures by 8 months. On these monthly adjusted incomes, we performed a one-way repeated measure ANOVA to compare monthly income (in Zambian Kwacha) at baseline, midline and post assessment. The means and standard deviations are presented in Table 37 below.

The results also show that the change in monthly income across the three survey points was not statistically significant. [Wilks' Lambda = 0.988, F (2, 288) = 1.792, $p=0.168$, multivariate partial eta squared = 0.012]. The results further show that there was no significant difference in income between the two treatment groups [F (1, 289) = 0.063, $p=0.802$].

Table 37: Mean Household Monthly Income from Economic Activities by Transfer Type

Survey Point	Cash (n=146)		Food (n=145)		Overall (n=291)	
	Mean	SD	Mean	SD	Mean	SD
Monthly Real Income at Base	193 844	266 169	233 756	728 620	213 731	547 207
Monthly Real Income at Midline	227 529	821 242	212 385	648 790	219 983	739 114
Monthly Real Income at Final	274 388	585 284	292 230	701 800	283 278	644 920

3.6.2 Household Assets

Survey subjects were asked if households owned any kind of asset at every point of the survey. Results of household asset ownership (excluding livestock assets) are presented in Table 38 below. The results showed that most household had at least a house, hoes and axes, bicycles, wireless radios at all stages/points of the survey. The results also indicated that cellular phones were increasingly becoming popular among the survey subjects. There were very minimal differentials between the two treatment groups in respect to asset ownership at every point of the survey.

Table 38: Distribution of Household Asset Ownership by Transfer Type and by Reference point

Type of Asset owned by Household	Baseline				Midline				Post			
	Cash		Food		Cash		Food		Cash		Food	
	n	%	n	%	n	%	n	%	n	%	n	%
House	132	77.6	138	76.7	122	79.2	116	77.9	115	77.2	116	80
Mortar/pestle	75	44.1	94	52.2	69	44.8	71	47.7	66	44.3	76	52.4
Beer brewing drum	8	4.7	6	3.3	7	4.5	5	3.4	8	5.4	5	3.4
Fishing net	1	0.6	2	1.1	2	1.3	2	1.3	2	1.3	2	1.4
Bed	73	42.9	86	47.8	68	44.2	67	45	64	43	71	49
Sofa	31	18.2	36	20	25	16.2	31	20.8	23	15.4	35	24.1
Table	82	48.2	86	47.8	79	51.3	67	45	77	51.7	71	49
Wooden chair	60	35.3	58	32.2	47	30.5	35	23.5	49	32.9	31	21.4
Fan	3	1.8	7	3.9	5	3.2	8	5.4	1	0.7	9	6.2
Telephone or cellular phone	88	51.8	93	51.7	84	54.5	87	58.4	87	58.4	90	62.1
Wireless (Radio)	91	53.5	81	45	89	57.8	68	45.6	96	64.4	78	53.8
Tape or CD player; HiFi	25	14.7	19	10.6	18	11.7	14	9.4	19	12.8	16	11
Television/VCR	27	15.9	27	15	20	13	18	12.1	18	12.1	21	14.5
Camera, video camera	1	0.6	2	1.1	4	2.6	3	2	3	2	4	2.8
Sewing machine	5	2.9	5	2.8	3	1.9	3	2	2	1.3	4	2.8
Electric or gas stove; hot plate	8	4.7	10	5.6	4	2.6	7	4.7	4	2.7	9	6.2
Bicycle	86	50.6	90	50	87	56.5	74	49.7	84	56.4	75	51.7
Motorcycle/scooter	-	-	3	1.7	1	0.6	2	1.3	-	-	1	0.7
Car or lorry	8	4.7	4	2.2	4	2.6	3	2	5	3.4	4	2.8
Oxcart	13	7.6	21	11.7	10	6.5	15	10.1	11	7.4	17	11.7
Plough	26	15.3	28	15.6	18	11.7	28	18.8	21	14.1	26	17.9
Hoe	148	87.1	147	81.7	140	90.9	124	83.2	132	88.6	125	86.2
Axe	114	67.1	108	60	98	63.6	91	61.1	102	68.5	91	62.8
Sickle	75	44.1	64	35.6	62	40.3	51	34.2	63	42.3	60	41.4
Panga	16	9.4	25	13.9	18	11.7	18	12.1	18	12.1	19	13.1
Other Asset	11	6.5	10	5.6	29	18.8	24	16.1	31	20.8	30	20.7
Cash at hand	106	62.7	106	58.9	120	77.9	94	63.1	138	92.6	124	85.5
Value of deposits in bank current account	2	1.2	2	1.1	-	-	-	-	-	-	-	-
Value of deposits in bank savings account	9	5.3	8	4.4	9	5.8	8	5.4	4	2.7	7	4.9

(-) refers to no member in that category

The estimated monetary value of each household asset was summed up or aggregated to come up with the household asset worth. A one-way repeated measure ANOVA was conducted to compare the total monetary value of household assets owned by households at baseline, midline and post assessment. The means and standard deviations are presented in Table 39 below. The results suggests that there were no significant changes in the total monetary value of household assets across the three different time periods [Wilks' Lambda = 0.996, $F(2, 288) = 0.592$, $p=0.554$, multivariate partial eta squared = 0.004]. The results further indicated that there was no significant difference in household asset value between the two treatment groups across the three different time periods [$F(1, 289) = 0.907$, $p=0.342$].

Table 39: Mean Household Asset Value by Transfer Type

Survey Point	Cash			Food			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
Total Value of Household Assets at Baseline	6,135,967	14,818,780	147	7,262,084	17,994,540	144	6,693,221	16,448,163	291
Total Value of Household Assets at Midline	4,730,704	8,174,817	147	7,365,623	20,715,284	144	6,034,581	15,715,845	291
Total Value of Household Assets at Post	5,957,650	12,217,829	147	7,025,573	18,370,996	144	6,486,107	15,551,775	291

3.6.3 Livestock Assets

At every point of the survey, clients were asked if households owned any kind of livestock asset. Results of livestock ownership are presented in Table 40 below. The results showed that chickens, pigs and cattle were the main types of livestock assets that most households owned at all stages/points of the survey. There were very minimal differentials between the two treatment groups in respect to livestock ownership at every point of the survey.

Table 40: Distribution of Livestock Asset Ownership by Transfer Type and by Reference point

Type of Livestock	Baseline				Midline				Post			
	Cash		Food		Cash		Food		Cash		Food	
	n	%	n	%	n	%	n	%	n	%	n	%
Cattle	36	21.3	39	22.3	32	20.8	38	25.5	29	19.5	38	26.4
Sheep	1	0.6	1	0.6	-	-	1	0.7	-	-	1	0.7
Goats	9	5.3	15	8.6	13	8.4	9	6	9	6	10	6.9
Pigs	48	28.4	59	33.7	48	31.2	51	34.2	42	28.2	44	30.6
Chickens	87	51.5	79	45.1	75	48.7	67	45	64	43	67	46.5
Guinea Fowl	6	3.6	8	4.6	5	3.2	4	2.7	5	3.4	4	2.8
Turkey	-	-	-	-	-	-	-	-	-	-	-	-
Ducks	7	4.1	5	2.9	6	3.9	4	2.7	7	4.7	3	2.1
Pigeons	6	3.6	7	4	3	1.9	3	2	3	2	2	1.4
Donkeys	-	-	-	-	-	-	-	-	-	-	-	-
Rabbits	1	0.6	-	-	-	-	-	-	-	-	-	-
Other	1	0.6	-	-	1	0.6	-	-	-	-	-	-

(-) refers to no member in that category

The estimated monetary value of each livestock was summed up or aggregated to come up with the household livestock worth. A one-way repeated measure ANOVA was conducted to compare the total monetary value of livestock assets owned by households at baseline, midline and post assessment. The means and standard deviations are presented in Table 41 below. The results suggests that there were no significant changes in the total monetary value of livestock assets across the three different time periods [Wilks' Lambda = 0.986, $F(2, 130) = 0.906$, $p=0.407$, multivariate partial eta squared = 0.014]. The results further indicated that there was no significant difference in income between the two treatment groups across the three different time periods [$F(1, 131) = 0.066$, $p=0.798$].

Table 41: Mean Household Livestock Value by Transfer Type

Survey Point	Cash			Food			Total		
	Mean	SD	N	Mean	SD	N	Mean	SD	N
Total value for Livestock Assets at Baseline	5,736,529	23,814,065	68	3,763,277	8,023,188	65	4,772,158	17,889,714	133
Total value for Livestock Assets at Midline	3,755,662	12,957,163	68	4,592,038	8,211,888	65	4,164,417	10,866,823	133
Total value for Livestock Assets at Post	6,512,074	35,264,146	68	5,495,262	9,864,131	65	6,015,135	26,050,671	133

3.7 COST EFFECTIVENESS OF THE STUDY INTERVENTIONS

Measuring the cost effectiveness of the two transfer types was one of the critical objectives of this study. However as stated in the limitations of the study, there was insufficient data for comprehensive analysis of the cost effectiveness of the interventions. The study sought to determine whether providing cash transfers is more cost effective at improving nutritional outcomes and household welfare than providing food transfer to aART patient. In our analysis, the central question being asked is how much does it cost to increase the CD4 count, nutrition status as measured by BMI and the food consumption score as measured by the household dietary score (HDD) by 1 percent through programme transfers.

In our analysis of the cost-effectiveness of the transfers, direct costs of transfers themselves (cash and food) were considered. Other costs considered are the costs of delivering the transfers to the clients. These included the cost 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.

Our analysis at midline shows that the cost of production of an e-voucher (scratch cards) was at US\$ 4.80 per card/vouchers and each client on the study was expected to use 4 vouchers. Every transaction for each e-voucher attracted a US\$2.00 transaction fee and each client was entitled to 4 vouchers translating into 4 transactions at midline. The cost of transfer/food basket (depending on the market prices) was estimated at US\$31.92 and the commission paid to the agent was estimated at 5% of the value of the food basket, i.e. US\$1.60 per client per month. With this breakdown of cost estimates, the aggregate cost of delivering a transfer (both cash and food) was estimated at US\$40.32 per client per month. To determine the total amount spent on each client, the aggregate cost of delivering a transfer was multiplied by the number of transfers received by each client at midline. At midline, this translated into an estimated cost of US\$161 for both transfers. At post assessment, the estimated cost of delivering both transfers was US\$323.

Considering the fact that from the supply side of the survey, both transfers were administered through an e-voucher system and the cash given was equivalent to the cost of the food basket at all the three different periods of the survey, the survey did not generate enough evidence to ascertain which transfer bestows greater benefit as far as the cost benefit is concerned.

4.0 DISCUSSION

HIV and AIDS threaten the social and economic fabric of the most affected countries, especially those in sub-Saharan Africa, as it affects the most economically productive age group in society. The loss of a male adult can leave the remaining women and children with fewer economic opportunities and less control over productive assets, as most families are dependent on males for labour and income in African society. On the other hand, the loss of a female adult may result in increased malnutrition and generally less care for the most vulnerable groups in society (Economic Commission for Africa, 2010).

The results from this study showed that about half of the study clients are in the most economically productive age group of 25 – 44 years in both treatment groups (Table 4). People in this age group are often described as being in the prime of their productive years, working and raising their families. The post assessment results presented in this study (Table 5) shows that the predominant occupation for majority of the study clients in both treatment groups is crop farming. This type of occupation and means of livelihood and survival require a healthy and active individual. Therefore the effects of the HIV and AIDS pandemic on these families cannot be over emphasised as documented in several studies. Katete being predominantly rural, the majority of the study clients rely on agricultural-related activities as their main source of livelihood and food security. According to the UNICEF Conceptual Framework, food insecurity is one of the underlying causes of malnutrition and several studies have shown that HIV and AIDS affects rural household food security by impacting on people's ability to produce adequate and nutritious food and/or engage in waged labour to purchase food (ICAD, 2006). There is evidence that there is an improvement in the nutrition status among the HIV and AIDS affected individuals when they are initiated on ART and given the necessary support in the form of social support transfer schemes (Beith and Johnson; ODI – Briefing Paper, 2008).

From this study, it can be noted that the BMI of the clients increased during the period of support, for both treatment groups. Furthermore, the number clients severely underweight reduced across the survey points for the two treatment groups (cash and food transfers). Besides the above, when a paired sampled t-test was conducted, the results indicated that there were statistically significant differences in the mean BMI increase from baseline to post assessment among clients on cash $t(124) = (-6.64), p < 0.001$ and those on food $t(116) = (-4.86), p < 0.001$ (Table 15). In addition, when the independent t-test was conducted to compare the nutritional status for clients on cash and those on food transfer, the results suggested that there were no significant differences between the treatment groups in the levels of improvement.

In addition, the bivariate analysis showed that, sex of the client, having an illness, owning staple food from own production, HDDS and fuel that clients used for lighting were associated with BMI at baseline; at midline assessment only clients' age was associated with BMI, while at post assessment,

only sex, marital status and clients having an illness were associated with the BMI.

Results of this study reveal that there was a statistically significant increase in Body Mass Index estimates between baseline and midline; and between midline and post evaluation (Table 16). However, when the data was disaggregated by transfer type; among those on cash, the increase in BMI estimate between baseline and midline was 0.8 and between midline and post evaluation was 1.2 compared to those on food, the increase in BMI estimate between baseline and midline was 0.4 and between midline and post evaluation 0.9 with a standard error of 0.2. Therefore, since the significance value of the estimate was less than 0.05 in all the treatment groups we can confidently say that there was a significant difference in base, midline-and post Body Mass Indexes of approximately (-1.2 and -0.4) for and (-0.9 and 0.5) for clients on cash and food transfers respectively; and that the error variances for the BMI did not change among the three assessment period.

The multivariate binary logistic regression model shows that, considering the results obtained at baseline, the post assessment results suggested that study clients in both treatment groups showed an improvement in the nutrition status as measured by the Body Mass Index (BMI). In this study, female clients were more likely to be to underweight compared to males across all the three assessment points, indicating problems that there are gender and physiological differentials in the nutritional status of study clients. Furthermore, the odds ratio for BMI also shows that at midline and post assessment, clients with CD4 count less than 350 μ /l were more likely to be underweight compared to those with CD4 count equal to or more than 350 μ /L. These findings may be attributed to the fact that when the clients CD4 count is very low, it increases the chances of the patient being vulnerable to other opportunistic infections which may also lead to loss of appetite, and as a result clients even lose the few stores of nutrients in their bodies, hence leading to higher rates of underweight.

Studies have shown that, when people get the HIV virus, their livelihoods experience major setbacks. However, with ART, their health rebounds but livelihoods lag behind. This is because illness means the loss of jobs, sale of assets, the collapse of traditional safety nets and falls in standard of living and quality of life (Overseas Development Institute, 2008). In addition, our study reveals that clients who had an illness at baseline were also more likely to be underweight. Therefore, this regression results upholds the hypothesis stating that both cash and food transfers have the same effect in improving the nutritional status (as measured by BMI) of clients initiating ART.

One other, key result of the study which is greatly associated with nutrition status was a notable increase from baseline in the proportion of households having a good HDDS in both treatment groups. HDDS has been used as a proxy measure of household food availability, food access (ability to acquire sufficient quality and quantity of food to meet all household members' nutritional

requirements for productive lives) and social economic level (Swindale, 2006; FAO, 2007) and overall dietary quality (Savy, 2006). Studies suggest that reduced food intake leads to malnutrition, especially among children. In parts of Africa, households affected by HIV and AIDS tend to decrease their consumption and switch to cheaper foods. For example, in Thailand, one third of households affected by HIV and AIDS reported an average decrease in household income of 48 per cent (Sumalee et al)³⁰.

Therefore, from the finding above, it could further be argued that the provision of the transfer schemes contributed to an improvement seen in the nutrition status of the study clients as they provided opportunities for the households to diversify their diets. Literature shows that there is a link between nutrition and HIV/AIDS: HIV-negative people with poor diets are more susceptible to infection and have reduced immunity to HIV; HIV-positive people with poor diets develop AIDS more quickly; and people with AIDS have increased nutritional requirements. Both malnutrition and HIV/AIDS have a direct effect on the immune system, impairing people's ability to resist and fight infection (Overseas Development Institute, 2008). However, nutrition interventions to prevent or reverse the weight loss associated with HIV may help to preserve independence, improve quality of life, and prolong survival (Piwoz and Preble, 2000).

Another key outcome of this study was adherence. The findings of this study indicate that when clients are provided with either cash or food transfers, their adherence to treatment improves. Furthermore, a bivariate analysis showed that only age and literacy were related to adherence at baseline; while only CD4 count was related to adherence at midline. However, at post assessment, none of the variables were associated with adherence not even transfer type. Nonetheless, despite results indicating that adherence was independent of transfer type, studies suggest that clients on ART adhere more closely to medication when they have food, side effects are reduced and the overall impact is improved when the drugs are taken with food. When people are already feeling the benefits of ART, cash transfers may be more effective than food though it needs to be well targeted (Overseas Development Institute, 2008). In addition, according to a 2010 study in Haiti, food assistance was associated with improved clinic attendance and adherence to ARV. Others also argue that, patients often abandon their HIV medication due to hunger; for others, the costs associated with travelling long distances to seek treatment are simply too high.

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 advance in an HIV positive patient. A lower CD4 count predisposes an individual to higher risk of opportunistic and recurrent infections, increasing the chances of one dying (Pacheco et al 2009). For clients who are also household heads, their breadwinning proficiency is greatly compromised (Masuku, 2009). Comparatively, from baseline assessment, the results of this study showed that the

³⁰ Sumalee, P., Sukhontha K., Wattana, S.J. The Economic Impact of HIV/AIDS Mortality on Households in Thailand

proportion of study clients with CD4 count above 350 cells/ μ L increased from baseline to post assessments in both transfers.

Additionally, the results of a bivariate analysis highlights the importance that access to safe and clean water, adherence and educational attainment plays a role in improving the CD4 count of patients initiating ART. Therefore, our study confirms that ART adherence is associated with immunological recovery in HIV-infected clients, and good adherence contributes to greater growth of CD4 cells count as also found by others (Wang et al; 2009). A Chinese clinical study conducted between 2003 and 2006 reported that only 5% (2/41) of patients receiving domestic antiretroviral drugs showed drug resistance and adherence played key roles in the recovery of immunity (Yang et al; 2006). *Mannheimer et al in 2002* also found that participants who reported 100% adherence at all study visits were more likely to achieve better virological and immunological outcomes after 12 months of treatment. *Yu et al in 2005* also reported that missing doses and interrupting ART were significant factors leading to a slow increase of CD4 counts. This present study supports the need to promote adherence and encourage consistently high levels of adherence to achieve a good immunological outcome and slow the development of drug resistance (Wang et al; 2009).

HIV and AIDS related Opportunistic Infections (OIs) are also a concern for clients on ART (Wang et al; 2009) especially that some of our study participants still had CD4 count less than 200 cells/ μ L. Therefore, improvements in access to safe and clean water as the results of this study indicates will definitely reduce the chances of other OIs such as diarrhoea, which may reduce the chances of the clients' adhering to ART and also fighting disease, and in turn lead to reduce CD4 count. Moreover, literature shows that HIV/AIDS clients who maintain good adherence to ART can reduce the occurrence rate of OIs from 56.1% before treatment to 9.8% three years after starting treatment (Yang et al; 2006). Therefore, consistent adherence to ART is one of the key components in delaying the progression of HIV to AIDS.

However, central to this study, was to see which of the two transfers cash or food confers better improvements in the CD4 count cells of the clients on ART treatment. The results of this study indicates that there were statistically significant improvement in the mean CD4 count in both treatment groups from baseline to midline and post assessment (Table 32). This finding was also confirmed by the linear mixed-effects model in Table 33, where it was found that there is a significant difference in base, midline-and post CD4 count of approximately 54.0 and 162.6 for clients on cash, and 35.0 and 137.8 for clients on food transfers, and that the error variances for the CD4 count did not change among the three assessment periods. Nonetheless, when the multivariate binary logistic regression was performed the results indicates that there were statistically insignificant differences between the two treatment groups' cash or food in improving the CD4 count of clients on ART treatment.

This study also highlights that, in the absence of improved household welfare, the improvements in the first four treatment outcomes (BMI, CD4 count, adherence, and HDDS) may not be realised. Findings of our study indicates that agricultural-related activities and informal sector activities such as trading and carpentry remained the main economic activities for most study clients at all the three assessment periods in both treatment groups (Table 35). It is important to note that, most households in our study area relied on the income generated from these activities for survival and general wellbeing. A one-way repeated measure ANOVA nonetheless indicated the change in the clients monthly income across the three survey points was not statistically significant. [Wilks' Lambda = 0.988, $F(2, 288) = 1.792$, $p = 0.168$, multivariate partial eta squared = 0.012]. The results further show that there was no significant difference in income between the two treatment groups [$F(1, 289) = 0.063$, $p = 0.802$].

In addition, besides income from most important economic activity, in this study household also owned several other household assets mainly hoes, axes and bicycles. It is also a well known fact that, the household asset base is greatly threatened by the HIV and AIDS pandemic because during periods of illness, medical costs rise, work and incomes are disrupted and family members are drawn away from work to provide care. Therefore, AIDS-affected families may experience rapid transition from relative wealth to relative poverty. For poorer and rural households, the ability to cope with external shocks, such as drought or increases in the prices of staple products, will be reduced further (Economic Commission for Africa, 2010). What stands out from numerous studies over the past decade is how HIV and AIDS induce impoverishment of many affected households. Income is lost and assets are sold or rented in order to get cash. Widespread disinvestment of assets appears to be occurring as households spend their savings and wealth to cope with HIV and AIDS. In this study however, household asset values did not vary significantly across the three assessment periods in both treatment groups, although the mean value of livestock assets at post assessment showed an upward trend in both treatment groups. This suggests that the provision of cash or food transfers enabled clients and their households to avoid any significant disinvestment of assets.

Lastly, measuring the cost effectiveness of the two transfer types is one of the critical outcomes of this study. However as stated in the limitations of the study, there were insufficient data for comprehensive analysis of the cost effectiveness of the interventions, as both interventions cost the same to deliver in this study, and conferred similar effects.

5.0 CONCLUSION

The results of the post assessment show that there were significant improvements in the key outcome indicators when they are compared to the results reported at baseline. 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 in respect to these key indicators, the evidence from the post assessment strongly suggests that both groups responded similarly to the treatments, cash and 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 similar effects in improving clients' nutrition and health.

6.0 RECOMMENDATIONS

Having concluded that both treatment approaches confer similar effects in improving household livelihoods in respect to the CD4 count, nutrition status and adherence to ART, the study team makes the following recommendations:

1. Provision of transfers either cash or food can be used in improving the prognosis and clinical or nutritional outcomes and must be aggressively marketed and where possible should be provided under well stipulated conditions for people initiating ART in Zambia.
2. Vigorous campaigns for improved access to safe and clean water and sanitation facilities should be encouraged so as to reduce on the Opportunistic Infections which may deter the benefits gained by providing the two transfers.
3. Future studies should include variables that can be used to calculate the propensity of the potential clients to migrate so as to minimise the drop-outs rates.
4. A control group should be included besides the two experimental arms of cash and food transfers which will provide a much stronger basis for comparison.
5. Future similar studies should include more variables that could allow computing the Adherence score and the cost effectiveness of the study.
6. A follow-up be carried out on the same clients who participated in this study to find out how they have fared following the discontinuation of the transfers. This may help determine the post intervention effects of transfers in terms of client's welfare and overall health on both treatment groups respectively.

7.0 REFERENCES

1. CDC, 2011. Healthy Weight – it's not a diet, it's a lifestyle. Available at <http://www.cdc.gov/healthyweight/index.html>
2. Central Statistical Office (CSO), Ministry of Health (MOH), Tropical Disease Research Centre (TDRC), University of Zambia, and Macro International Inc. 2009. Zambia Demographic and Health Survey 2007. Calverton, Maryland, USA: CSO and Macro International Inc.
3. David Bangsberg, Conditional Cash Transfers: Cash-Contingency Management, Structural Support, and Poverty Reduction Interventions in Africa; Harvard initiative, 2011
4. Government of Republic of Zambia (2010) "Zambia Country Report: Monitoring the Declaration of Commitment on HIV and AIDS and the Universal Access Biennial Report
5. HSRC, 2009. The Impact of HIV and AIDS on Food Security and Nutrition in South Africa.
6. ICAD, 2006. HIV/AIDS, Gender, and Household Food Security: The Rural Dimension. Interagency Coalition on AIDS and Development, 2006.
7. Masuku M.B., Sithole M.M. 2009. The Impact of HIV/AIDS on Food Security and Household Vulnerability in Swaziland. *Agrekon*, Vol 48, No 2. University of Swaziland.
8. Michael, C. 2011. CD4 Cell Count. Available at <http://www.aidsmap.com/CD4-cell-counts/pages/1044596/>
9. Michael, S. 2009. Social Cash Transfer and Pro-Poor Growth. OECD
10. MOH, Katete District. 2009. Health Information Management System
11. Nyasha Tirivayi, John Koethe and Wim Groot; Food Assistance and its effect on the Weight and Antiretroviral Therapy Adherence of HIV Infected Adults: Evidence from Zambia, 2010; PhD. Thesis
12. Nyasha, T., Wim, G. 2009. The Welfare Effects of Integrating HIV/AIDS Treatment with Cash or In Kind Transfers. Working Paper (WP007).
13. Ott, Lyman. An introduction to statistical methods and data analysis/R. Lyman Ott, Micheal Longnecker. 2001, 5th Ed. ISBN: 0-534-25122-6
14. Overseas Development Institute, 2008. HIV, Food and Drugs; Livelihoods, Nutrition and Anti-retroviral Therapy (ART) in Kenya and Zambia. Briefing Paper December 2008.
15. Sanjay P. Zodpey, Sample size and power analysis in medical research, *Indian J. Dermatol*, Vol 70, issue 2
16. Temin, M. 2010. HIV-Sensitive Social Protection: What Does the Evidence Say.

17. UNAIDS. 2010. UNAIDS Report on the Global AIDS Epidemic 2010.
18. UNICEF-ESARO. 2008. Social Cash Transfers to Mitigate the Impacts of AIDS in Eastern and Southern Africa
19. WHO 2003. Scaling-up Antiretroviral Therapy in Resource Limited Settings: Treatment Guidelines for a Public Health Approach. Geneva, available at <http://www.who.int/hiv/topics/treatment/en/index.html>
21. Yolanda M. Pacheco, Inmaculada Jarrin, Julia Del Amo, Santiago Moreno, Jose A. Iribarren, Pompeyo Viciano, Jorge Parra, Juan L. Gomez-Sirvent, Felix Gutierrez, Jose R. Blanco, Fransesc Vidal, Manuel Leal and CoRIS-MD. 2009. Risk Factors, CD4 Long-Term Evolution and Mortality of HIV-Infected Patients who Persistently Maintain Low CD4 Counts Despite Virological Response to HAART.

8.0 ANNEXES

Annex 1: Binary Logistic Regression of study outcomes by treatment type

Explanatory Variable	B	Wald	Sig.	Exp(B)	95.0% C.I. for EXP(B) Lower	Upper
Body Mass Index						
Baseline Food ^{RC}						
Cash	-0.293	1.202	0.273	0.746	0.442	1.259
Midline Food ^{RC}						
Cash	0.518	1.758	0.185	1.679	0.781	3.611
Final Food ^{RC}						
Cash	0.689	2.751	0.097	1.991	0.882	4.493
Household Dietary Diversity Score						
Baseline Food ^{RC}						
Cash	0.358	1.997	0.158	1.430	0.871	2.350
Midline Food ^{RC}						
Cash	0.255	1.096	0.295	1.290	0.801	2.078
Final Food ^{RC}						
Cash	0.446	3.540	0.060**	1.563	0.982	2.488
Adherence						
Baseline Food ^{RC}						
Cash	0.043	0.006	0.937	1.044	0.355	3.072
Midline Food ^{RC}						
Cash	0.806	0.901	0.342	2.238	0.424	11.809
Final Food ^{RC}						
Cash	16.233	0.000	0.996	11218575.447	0.000	.
CD4 Count						
Baseline Food ^{RC}						
Cash	-0.511	0.935	0.334	0.600	0.213	1.690
Midline Food ^{RC}						
Cash	0.364	1.695	0.193	1.440	0.832	2.492
Final Food ^{RC}						
Cash	0.027	0.014	0.907	1.028	0.650	1.624

RC=Reference Category

Significance level: ** at 0.1

8.1: Names of Research Assistants

No.	Name	Position
1	Penelope Mubita	Field Supervisor
2	Justina Tembo	Field Supervisor
3	Shapa Kabukabu	Research Assistant
4	Joseph Mbewe	Research Assistant
5	James Kalaluka	Research Assistant
6	Scolastica Phiri	Research Assistant
7	Zacharia Phiri	Research Assistant
8	Falesy Nkhowani	Research Assistant
9	Hope Chewe	Research Assistant
10	Jacob Nkhoma	Research Assistant
11	Aaron Sankwana	Data Entry Clerk
12	Mercy Mphofu	Data Entry Clerk
13	Peter Mulenga	Data Entry Clerk

