THE WELFARE EFFECTS OF INTEGRATING AIDS TREATMENT WITH FOOD TRANSFERS

EVIDENCE FROM ZAMBIA

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The Welfare Effects of Integrating AIDS Treatment with Food Transfers:

Evidence from Zambia

DISSERTATION

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By

Juliana Nyasha Tirivayi

Supervisor:
Prof. Dr. Wim. Groot

Assessment Committee:
Prof. Dr. Henriette Maassen van den Brink (Chair)
Dr. Rob Baltussen, Radboud University Medical Center Nijmegen.
Prof. Dr. Bart van der Borne
Dr. Franziska Gassmann
Prof. Dr. Menno Pradhan, Free University Amsterdam

Preface

First, I thank God for granting me blessings and the opportunity to fulfill a lifelong aspiration. This thesis was the product of support, ambition, guidance and inspiration. There are many people I would like to thank who helped me in all those four tenets as I started and finished my PhD journey in three years.

I am deeply grateful to Robert Bauchmuller and Celine Duijsens who tirelessly helped me to settle my family in Maastricht. I will never forget their generosity and kindness which made our family's move to the Netherlands better than I expected. Also big thanks to Chris, Mindel and Franziska for not only selecting me to be a candidate but for fostering such a friendly academic environment at the Maastricht Graduate School of Governance. The school never felt like an ivory tower and became a home away from home. I cannot understate the incredible support and friendship I have received from the colleagues in my cohort- Cheng, Kwan, Siu-Hing, Dorcas, Sonila and Lenka. Cheng or shall I say Auntie Cheng, for becoming such a dear and close friend who practically became a member of my family. How can I forget the many days and weekends Cheng cooked at my house and the karaoke nights! And Sonila I really enjoyed your wonderful company when we shared the same office. Beyond my cohort, I also would like to acknowledge the support and friendship from Bianca (enjoyed our discussions), Treena (you always kept me on my toes!), Jinjing, Denisa, Irina, Metka, Maha, Victor, Florian T, Paula, Martin, Florian H and Melissa.

This thesis is the culmination of a research proposal which at first appeared quite ambitious in that I had to obtain external funding, collect primary data and write my thesis within two years of completing coursework. I must admit at one time, I appeared to be going backward rather than forward and the very thought of fieldwork was daunting. However, the convergence of providence, excellent supervision and external support made me achieve my ambition. The research ended up being funded by the World Health Organization (Regional office for Africa), Ford Foundation and the Poverty Reduction, Equity and Growth Network. I am especially thankful to the following individuals who took interest in my research proposal and assisted in obtaining funding- Dr Joses Muthuri Kirigia (World Health Organization-AFRO), Dr Carla Sutherland (formerly of Ford Foundation), and the selection committee at the Poverty Reduction, Growth and Equity Network (University of Kiel). I am deeply indebted to Calum McGregor (WFP Zambia) for backing my proposal and becoming a strong ally who facilitated the integral collaboration I received from World Food Programme in Zambia, where funds from UNAIDS contributed immensely to the survey operations. I would also like to thank the following people who assisted me in my fieldwork;

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This PhD is also the fulfillment of a lifelong aspiration cultivated by depth of support from my family. My family was the firewall and shield of strength during my PhD journey. In particular I need to thank my father and mother for having inspired me to love education. I have fond memories of growing up under the parentage of two trained teachers and how success was measured by the scale of educational achievements. From as young as I can remember, I was advised to go the furthest distance possible in academic accomplishments. I would have never been able to succeed without the profound support from my husband Allan and the inspiration from my son Mufaro. My son helped me relax and put all things into all perspective. Allan has been the wind beneath my wings and a sure, firm supporter of my goals. Dearest Allan, thanks for the love that I have with you, for standing in for me with Mufaro our son and for proof reading my papers.

Finally, I will end with a few words on how personal the topic of HIV/AIDS is to me. My interest in HIV/AIDS is based on a real passion for the HIV/AIDS cause and the inspiration from people I know or have met who live or lived with HIV/AIDS. I am greatly encouraged that we have come a long way, and have made progress in reducing the HIV/AIDS prevalence rates in Africa. I remember when HIV/AIDS was a mysterious disease in the late 1980s and early 1990s. In my country Zimbabwe, the lack of information, hard attitudes and lack of resources made the impact of HIV/AIDS so utterly devastating, changing the way we viewed life and death, and especially turning funerals from once being an infrequent revered event to a common everyday occurrence. I have personally lost a brother and cousins to the disease, and know of others who succumbed to it. However, I also know and have met courageous people infected with HIV but living normal lives. With the advent of AIDS treatment and the additional support in the form of food transfers, psychosocial counseling and home based care, the mystery of HIV/AIDS is all but gone. But the greatest inspiration of all comes from the resilience and the never surrender attitude of people living with HIV. I especially remember the words of one woman who boldly declared to me “The secret to my successful living is that I am the master of this virus and I will not let it become my master, otherwise it wins”. Behind the jarring statistics that we read of everyday, which show that more still needs to be done in the fight against HIV/AIDS, we must also realize that the statistics represent men, women and children who now have better options today than yesterday, in managing their health, diet and generating a positive outlook. I met some of them during my fieldwork in Zambia in what I will remember as a heartening experience. Indeed, we have indeed come a long way, for HIV/AIDS is no longer a death sentence.

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1. Introduction

1.1 Problem Statement

Sub-Saharan Africa is currently home to two thirds of the world's HIV infected population, with 22.4 million people currently living with HIV/AIDS. The interplay between HIV infection, malnutrition, poverty and chronic food insecurity in much of sub-Saharan Africa has made HIV/AIDS a uniquely devastating demographic and economic shock. Empirical evidence has documented the extensive socio-economic consequences of HIV/AIDS which include; adult and infant morbidity and mortality; loss of income from reduced labour supply and productivity; increased care burden for children, older people and women; food insecurity; consumption insecurity; lost or reduced investment in children's education and health and increased household poverty levels (Gill 2010, Salinas and Haacker 2006, Chapoto and Jayne 200, Fox et al.2004, Booysen 2003). AIDS treatment is increasingly becoming a realistic option to mitigate the negative impacts of HIV/AIDS. Nearly 44% of HIV infected individuals (adults and children) now have access to antiretroviral therapy (ART), the standard AIDS medication (UNAIDS 2009). Empirical evidence shows that AIDS treatment improves the infected patient's health and has broader welfare gains such as improved household labour supply, children's school attendance and household income (Graff-Zivin et al. 2009, Thirumurthy et al. 2008, Koenig et al. 2004, Morgan et al. 2002, Chhagan et al. (2008).

Yet, several arguments have been put forth supporting the integration of AIDS treatment with socio-economic support. One argument is that in impoverished regions, treatment without additional social assistance might not be enough to significantly improve the wellbeing of patients, their families and the community and that holistic approaches are required that provide not only health and psychosocial support but also economic support to re-establish their livelihoods (Wagner et al. 2007, Russell et al. 2007). Another argument is that in resource constrained settings; food insecurity, poverty and malnutrition hinder the achievement of optimal AIDS treatment outcomes and recovery from HIV/AIDS's detrimental effects on household welfare. For instance, low body mass index (BMI) at the time of ART initiation is a powerful and independent predictor of early mortality, while malnutrition significantly affects HIV disease progression (Johannessen et al., 2008; Stringer et al., 2006). The World Health Organization and other development agencies have also called for more holistic approaches in assisting AIDS patients and their families.

Consequently, several organizations are integrating ART with food transfers to improve the efficacy of ART and simultaneously boost household food security and welfare with food transfers acting as a social protection instrument. However, few studies have investigated the effects of integrating AIDS treatment with food transfers. The existing studies have mostly focused only on the clinical effects of such programmes and no studies have examined the possible household impacts. This dissertation intends to build upon the emerging clinical evidence while addressing the identified research gap on household welfare effects. The dissertation will determine the effects of integrating AIDS treatment with food transfers by comparing beneficiaries with non-beneficiaries. The dissertation specifically evaluates the outcomes of a food transfers programme in Zambia. The introduction is presented as follows. Section 1.2 presents an overview of the food transfers programme and database used in analysis. Section 1.3 states the research objectives while sections 1.4-1.7 describe the four chapters that address the research objectives. Section 1.8 outlines the dissertation structure.

1.2 Overview of Food Transfers Programme and Database

Zambia is a country in southern Africa with an estimated population of 12 million. The national HIV prevalence rate in Zambia is approximately 14% and well over 20% in the urban areas (ZDHS 2007). This rate puts Zambia within the top ten countries with the highest HIV prevalence rates in the world, and nine of these countries are in southern Africa like Zambia (UNAIDS 2009). Hence, due to this high HIV burden there have been increasing efforts to increase access to ART. In May 2009, there were 67 HIV care sites and 127,000 patients had started ART. However Zambia's food security status is fragile and continually threatened by recurrent droughts and floods, while an estimated 64% of the population lives below the poverty line (WFP 2010, Central Statistical Office 2006). The WFP country programme in Zambia aims to improve the food security and welfare of vulnerable populations through targeted food assistance programmes for people living with HIV/AIDS. Over 10,000 HIV-infected individuals and their households receive WFP food assistance under the national Nutrition Programme for Vulnerable Groups, NPVG.

This dissertation focuses on the programme as implemented in Lusaka, commencing in February 2009 and ending in December 2009. The targeting utilized a household food insecurity questionnaire which asked questions on HIV burden, household composition, asset ownership, employment status, income earnings, housing characteristics, child education and household dietary diversity. Answers to the questions were tallied into a composite socioeconomic score.

Patients were deemed vulnerable and eligible for food assistance when their score equaled or exceeded a numerical threshold. Anthropometric measurements were not utilized in the selection of recipients.

The programme was implemented in four clinics in the low income urban areas of Lusaka from January 2009 to December 2009. Four public-sector ART clinics distributed a standardized household food aid ration comprising maize grain (25kg), cooking oil (1.8 litres), pulses (4.5kg) and fortified blended corn and soya flour (6kg). The food rations were distributed each month to the recruited beneficiaries. Beneficiaries are assessed for after six to eight months on the programme to prepare them for weaning if they are found to have established secure livelihoods and improved their food security. The dissertation uses data based on a survey that I designed and conducted on participants of this programme. The survey was carried out in August 2009, after six months of implementing the food assistance programme. The data set covers 400 households with an identified patient on HIV treatment, with 200 beneficiary patients/households collecting food aid from the four food distributing clinics and 200 non-beneficiary patients/households randomly sampled from four similar control clinics. All clinics are situated in low income communities or residential areas of Lusaka, the capital of Zambia.

1.3 Research Objectives

The aim of the study is to determine the additional clinical and welfare benefit from providing food transfers together with AIDS treatment. This is broken down into the following objectives:

- To investigate and document the current evidence base on the impact of integrating AIDS treatment with food transfers
- To determine the effect of food transfers on the weight and adherence to AIDS treatment of HIV infected adult patients
- To examine the consumption responses to integrating AIDS treatment with food transfers
- To determine the intrahousehold labour supply effects from adding food transfers to AIDS treatment

The thesis only focuses on non-pregnant adult patients to ensure uniformity and because pregnancy and lactation induce substantial changes/fluctuations in some of the clinical measures used in the study (weight and body mass index). The research objectives are addressed separately in chapters adapted from working and conference papers. These chapters are described in the following sections 1.4-1.8.

1.4 Health and Welfare Effects of Integrating AIDS Treatment with Food Assistance in Resource Constrained Settings: Review of Theory and Evidence

Several initiatives that integrate AIDS treatment with food assistance (food transfers) are currently underway in sub-Saharan Africa. This chapter (Chapter two) reviews the theory and existing evidence base on the health and welfare effects of integrating AIDS treatment with food assistance. The chapter focuses on two types of effects; health since these interventions aim to address the potential effects of malnutrition on ART outcomes; and on welfare since the interventions also aim to alleviate the welfare declines from HIV/AIDS (food insecurity, labour inactivity and poverty) which threaten the effectiveness of ART. The chapter utilizes a narrative systematic review approach, which involves a literature search and methodological appraisal. Randomized trials are appraised for attrition bias, and whether there is allocation concealment, study protocol and blind outcome assessment. The quality of the quantitative studies is verified for validity especially assessing if there is a control group for comparison satisfying the counterfactual requirement in impact evaluation. The results of the systematic review may have important implications on policy making and programme design and implementation.

1.5 Description of Data and Research Methodology

Data and methodology are discussed in the third chapter of the dissertation. The chapter provides a short background to AIDS treatment in Zambia and a detailed description of the food transfers programme being evaluated. The geographic and individual targeting criteria that were used by the programme implementers are described at length. Chapter three also recounts the sample selection and survey implementation process of the study during August 2009 while also highlighting the secondary administrative data that were obtained for the study. The chapter concludes by previewing and justifying the each statistical method of analysis based on their applicability and limitations.

1.6 Food Assistance and its effect on the Weight and Antiretroviral Therapy Adherence of HIV Infected Adults: Evidence from Zambia

The fourth chapter of the dissertation examines the effects of food assistance on the weight and adherence to ART of HIV infected adults. There is established evidence that food insecurity and consequently malnutrition worsen the effects of HIV infection by exacerbating weight loss, possibly weakening immune response and adherence to medication, and compounding the side-effects of some antiretroviral therapy medications (Bukusuba & Kikafunda, 2007; De Pee & Semba, 2010). Thus, AIDS treatment's effectiveness can still be compromised by malnutrition and the continual threat of food insecurity in poverty stricken regions. The addition of food assistance to AIDS treatment programmes may help optimize health outcomes and also boost household food security and welfare. Food assistance is either provided as micronutrient supplements (e.g., vitamins or mineral supplements) or macronutrient supplements (i.e. supplementation in the form of staple foods as in most food assistance/aid programmes across sub-Saharan Africa or energy-dense specialized nutritional products used in therapeutic feeding programmes). In this chapter we assess the impact of the WFP household food assistance programme on the weight and antiretroviral therapy (ART) adherence of HIV infected adults over a period of 6 months. While the goals of the programme were the improvement of food security, welfare and effectiveness of ART, rather than direct nutritional rehabilitation, the intervention still provides an opportunity to assess its impact on weight change and ART adherence behaviour in a food insecure population.

Using survey data and clinical administrative data chapter four compares food assistance participants (intervention group) at four food distributing public-sector ART clinics with similar HIV-infected individuals at four matched non-participating ART clinics (control group). Single difference propensity score matching is used to examine the impact of food assistance on adherence to ART (cross-sectional data). OLS and IV regressions on the effects of food assistance on adherence to ART are also carried out and the sanalysis also determines whether the food assistance effect varies by length of days spent on ART. The chapter also utilizes difference in difference propensity score matching to assess the impact of food assistance on weight and body mass index. The difference in difference matching technique controls for bias from unobservable heterogeneity and from all time-invariant unmeasured factors between the treatment and control group. The findings of this chapter will contribute to the evidence base and provide insights on timing, design and nature of future programmes integrating AIDS treatment with food assistance.

1.7 Consumption Responses to Integrating AIDS Treatment with Food Transfers: Evidence from Zambia

Chapter five investigates the consumption responses to adding food transfers to AIDS treatment. There is documented evidence that HIV/AIDS is a major contributor to prime age adult morbidity and mortality in sub-Saharan Africa, leading to loss of income and labour supply by prime-age adults in an affected household and ultimately consumption insecurity, household welfare decline and increased poverty (Linnemayr 2010, Cogneau and Grimm 2008, Booysen, 2003). This convergence of food insecurity, poverty and HIV/AIDS has detrimental economic effects and also adversely affects AIDS treatment outcomes (Johannesen et al. 2008). Hence household consumption outcomes provide insight into whether the food transfer programme reduces the risk of food insecurity and welfare decline, which are threats to successful AIDS treatment. Chapter five seeks to answer several questions. Is there an additional welfare gain from providing food transfers together with AIDS treatment? What is the size of the transfer relative to normal household consumption? What is the marginal propensity to consume food from food transfers relative to that of cash income? What are the differential effects of food transfers on food consumption expenditures and marginal propensity to consume food by income level, decision making and HIV burden of the household? There are few studies that have investigated consumption outcomes in HIV-affected households nor estimated the marginal propensity to consume food out of food aid rations especially in a developing country.

The chapter identifies the consumption responses of integrating AIDS treatment with food transfers by analyzing food intake and diversity, and household consumption expenditures of households receiving food aid rations (participants) with households not receiving food aid rations (non-participants). Propensity score matching is used to estimate the average treatment effect of food transfers on food consumption expenditure, total household expenditure and a food consumption index (a measure of food intake, diversity and security). Additionally, OLS and IV regression methods are used to estimate the average impact of food transfers on the food consumption expenditure and the marginal propensity to consume food from food transfers. Both single difference estimators for cross sectional data and double difference estimators for panel data are used in propensity score matching and parametric estimation. Panel estimates use retrospective data and are thus interpreted cautiously due to the possibility of recall bias.

The results in this chapter will show whether the addition of food transfers reduces the risk of food insecurity and welfare decline, threats to the achievement of effective AIDS treatment outcomes. Another important finding would be the size of the transfer and the magnitude of the effect size on consumption growth (relative to cash income) which might have potential repercussions on other household behaviour (e.g. labour supply).

1.8 Labour Supply Responses to Integrating AIDS Treatment with In-Kind Transfers: Evidence from Zambia

Chapter six specifically examines the labour supply responses to integrating food transfers with ART. In the literature, there is still a debate on the impact of food aid on labour supply. On the one hand the earlier literature supports the neo-classical economic theoretical prediction that food aid is a disincentive to labour supply (Jackson and Eade 1982, Jean-Baptiste 1979). On the other hand recent empirical studies diverge from theory arguing that food aid rations are either too small to be a labour supply disincentive or that disincentive effects largely disappear when econometric specifications include control variables such as age, sex and education of head, land holdings, size and location (Abdulai et al. 2005, Hoddinott 2003). To my knowledge, no studies have analysed the labour supply responses in HIV-affected households to programmes integrating AIDS treatment with food transfers.

This chapter builds upon earlier chapters that were briefly discussed in 1.4, 1.6 and 1.7. The chapter intends to answer several questions. Does adding food transfers to AIDS treatment yield intrahousehold labour supply incentives or disincentives? How does the duration of AIDS treatment and household income influence the (dis)incentive effect of food transfers? This will be done in two ways; first, by determining the effect of the food transfers on labour supply and transitions to employment of patients and adult household members and second, by determining whether the (dis)incentive effect of food transfers varies by duration of AIDS treatment and household income level. Measures of labour supply include weekly hours worked and labour force participation rates. Panel data on labour force participation are used in the analysis of transitions to employment. The effects of food transfers on labour supply are estimated through single difference and double difference propensity score matching and the effects of food transfers on employment transitions are estimated via a Markov type model based on probit and bivariate probit (selection) regressions. The chapter also reports gender specific responses within the household. The results will show whether there are

diverse intrahousehold impacts which could help programme implementers refine programme goals and strategies.

1.8 Outline

The dissertation is structured as follows: Chapter two addresses the first objective of the study by compiling the theoretical and current empirical evidence on the health and welfare effects of integrating AIDS treatment with food transfers as discussed in section 1.4. Chapter three describes the data and research methodology utilized for the study. Chapter four addresses the second objective of the study by investigating the effects of food transfers on the weight and antiretroviral therapy adherence of HIV-infected adult patients as discussed in 1.6. Chapter five addresses the third objective by examining the consumption responses from integrating AIDS treatment with food transfers as discussed in 1.7, while chapter six addresses the fourth objective by determining the intrahousehold labour supply effects of adding food transfers to AIDS treatment as discussed in 1.8. The key findings and conclusions from all the chapters are presented in the concluding chapter seven, in the same order of the research objectives. The policy implications of the findings are discussed in the concluding chapter.

2. Health and Welfare Effects of Integrating AIDS Treatment with Food Assistance in Resource Constrained Settings: Review of Theory and Evidence[1]

2.1 Introduction

It has been established that the intersection between HIV/AIDS, poverty and hunger in resource limited settings is a constant threat to health and survival for patients, even those on anti-retroviral therapy (Rawat et al., 2010, Koethe et al., 2010). Several studies from Sub-Saharan Africa find that a low body mass index at the time of anti-retroviral therapy (ART) initiation is a strong predictor of early mortality (Johannessen et al., 2008, Stringer et al., 2006, Zachariah et al., 2006). Hunger can be a barrier to ART initiation and adherence when individuals fear taking drugs on an empty stomach (Agnarson et al 2007). Since ART outcomes can be compromised by malnutrition and the continual threat of food insecurity in poverty stricken regions, ART by itself may not be sufficient in alleviating the negative consequences of HIV/AIDS (Unge et al., 2008, Au et al., 2006). Consequently, there have been calls for a holistic approach that enhances ART use and mitigates the consequences of food insecurity and poverty (Agnarson et al., 2007, Russell et al., 2007, Wagner et al., 2007). Recently, many HIV/AIDS programs in sub-Saharan Africa have begun incorporating food assistance programs for malnourished ART patients including those vulnerable to food insecurity. The programs are aimed at improving household food security and welfare including the patient's nutritional status, adherence to ART and quality of life.

Little is known about the quantitative clinical outcomes from food assistance given to individuals on ART and the broader household effects of such programs (Ivers et al., 2009; Vanable et al., 2006). Recently three reviews evaluated the effectiveness of integrating food assistance with ART using empirical evidence available. One systematic review found evidence from randomized trials conducted mostly in developed countries (Mahlungulu et al., 2007). In their reviews, Koethe et al (2009) and Ivers et al (2009) highlight the shortage of empirical evidence from in resource

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limited settings. Koethe et al (2009) could only find two empirical studies while Ivers et al (2009) found one empirical study.

This chapter reviews current evidence to determine the health and welfare effects of integrating ART with food assistance. This chapter adds value to literature by including the latest studies and trials from resource constrained settings (from the years 2009 and 2010). The focus is on health, because such interventions aim to mitigate the potential effects of malnutrition on ART, and on welfare because of their aim to alleviate the economic consequences from HIV/AIDS (food insecurity, labor inactivity and poverty) which also threaten the sustained effectiveness of ART. Our systematic review differs from earlier efforts as it also provides a theoretical framework for understanding the possible pathways from food assistance to health and household welfare outcomes. Household outcomes such as household consumption and labor supply are helpful in guiding the transition of beneficiaries from food assistance to self-support (Fanta 2007). In response to the uncertainty surrounding the design of optimal food assistance interventions for people living with HIV/AIDS, we examine the study designs and empirical outcomes to understand the possible role of the targeting criteria and duration of food assistance in achieving outcomes. We also look for evidence on the post-intervention or persistent effects of food assistance as this knowledge can guide the formulation of transition and weaning strategies.

Predictions from the theoretical review suggest that food assistance can improve health and consumption, and has ambiguous effects on labor supply. There may also be diverse intrahousehold responses to food assistance. The empirical review found only four quantitative empirical studies from resource constrained settings that evaluated health effects and one qualitative study assessing both health and welfare effects. Findings from two studies suggest an improvement in nutritional status especially when food assistance is in the form of ready to use therapeutic feeding. However the studies in question had methodological flaws such as low sample size and the lack of valid control groups. One study found a positive association between food assistance and adherence. None of the studies found any other clinical benefits of food assistance. Only one study assessed the post intervention nutritional effects of food assistance. Most of the studies reviewed did not investigate the household impact of food assistance.

The chapter is organized as follows. Section 2.2 discusses theories that can be used to explain the effects of adding food assistance to ART. Section 2.3 presents the methods used to compile the review. Section 2.4 and 2.5 describes the empirical studies and the main findings, while section 2.6 distills the policy and research implications of these findings. Section 2.7 concludes the chapter.

2.2 Theory

In this section we identify health behaviour and economic theories that can be used to conceptualize the possible pathways through which food assistance affects the patient's health and household welfare. We begin with theories that can be used to predict health outcomes including adherence behaviour. We then identify theories that can be used to predict household outcomes such as consumption and labour supply.

The effect of food assistance on the patient's general health can be examined through the framework of the demand for health model by Grossman (1972). The demand for health model was the first formal economic model of the determinants of health and health care. In the model, health is a durable capital good requiring investment and individuals produce the commodity "health" through combining time, medical care and other social, economic and environmental inputs (Grossman, 1972; Pokhrel and Sauerborn 2004). Accordingly, a possible pathway to achieving optimal health in the Grossman model is through an input like ART. ART represents a valid input in the model especially in resource constrained settings where it is an integral part of medical care for patients. Chern (2002) extends the model to include food as an input. Several studies from resource constrained settings have extended the Grossman model to include food assistance as a proxy for diet and nutrition in analyzing the determinants of health (Fayissa and Gutema, 2005; Gbesemete and Jonsson, 1993). Therefore, one possible pathway from food assistance to good health is through food assistance as a nutritional input in the production of health. However, one of the limitations of the Grossman model, if applied in resource constrained settings, is that it does not consider health to be a family produced commodity. Recent studies highlight the importance of intrahousehold resource allocation to individual health and extend the Grossman model to consider family production of health (Bolin et al., 2001; Jacobson, 2000).

The effect of food assistance on adherence to ART can be predicted by the information, motivation and behavioral skills model (a theory from the health behaviour literature). According to the information, motivation and behavioral skills model, adherence-related information and motivation work through the patient's adherence-related behavioral skills to affect adherence to ART (Fisher et al., 2006). There is evidence that hunger can deter individuals from taking ART drugs on an empty stomach for fear of side effects, hindering adherence (Unge et al 2008, Au et al., 2006). Willig et al (2009) also finds that low weight and CD4+ values at ART initiation are associated with increased probability of regimen discontinuation due to toxicity and side effects such as nausea. Hence, a possible

pathway from food assistance to improved adherence to ART is through increased motivation for food insecure patients to take their drugs. An observational study in Zambia found a positive association between food assistance and adherence, especially when rations are distributed at clinics, providing motivation for patients to collect food assistance and medicine together (Cantrell et al., 2008). However the study's findings have not yet been replicated and confirmatory studies are needed. In the Grossman model more educated individuals invest more in their health compared to less educated individuals (Grossman, 1972). Thus another derivation from the model is that the education of ART patients may affect food assistance's impact on adherence to ART in resource constrained settings.

Determining the effects of food assistance on the labor supply of beneficiaries is the subject of a still contested debate in literature (Abdulai et al. 2005). The income-leisure choice theory has been the traditional economic model used to predict the effects of in-kind transfers like food assistance on labor supply. Food assistance, a form of non-monetary income is predicted to cause an income effect, reducing the incentive to work (Kanbur et al., 1994). Therefore one pathway from food assistance to decreased labor supply is through an income effect. A second pathway to decreased labor supply is through food assistance triggering dependency by crowding out pre-existing safety nets like labor supply, remittances or private gifts (Barett, 2006). Yet, empirical studies in resource poor settings have contradicted the income leisure choice theory's prediction which raises questions on its appropriateness. These studies find that food aid does not decrease labor supply in resource poor settings. These studies argue that purported food assistance is not a labor supply disincentive but that empirical studies may detect such negative effects if data analysis does not control for confounding effects like household demographics and wealth and if programs are poorly targeted by including, relatively wealthier recipients who would be more willing stop working (Barrett 2006, Abdulai et al. 2005; Barrett and Maxwell 2005, Hoddinott 2003). Another theory, the nutrition-based efficiency wage model contradicts the income-leisure choice theory by predicting that food consumption positively affects labor supply. Leibenstien (1957) postulated that malnutrition lowers the productivity of workers such that greater labor productivity is attained from improved nutrition at low levels of intake. Hence there a possible pathway from food assistance to improved labor supply is through improved calorie intake, nutrition and ultimately labor productivity. Several empirical studies from resource constrained countries like Brazil, Cote d'Ivoire, Sierra Leone, India and Brazil confirm the model's predictions (Thomas and Strauss 1997; Schultz and Tansel 1997; Deolalikar 1988; Strauss 1986). Another relevant theory is the intrahousehold resource allocation theory which recognizes that a household is not a unitary decision making unit but a collective decision making entity. It can be extended to predict the different labor supply outcomes from food assistance among patients and non-

patients within a household. For instance, if food assistance improves the patient's labor supply, the resulting income effect may discourage household members from working while on the other hand improved patient's health from food assistance can allow household members, especially females to shift from care work to productive work (Thirumurthy et al., 2008).

Neo-classical economic theory has been used to predict the effects of food assistance on household consumption. According to Engel's law poorer households spend a greater proportion of their expenditure on food, implying that the propensity to consume food from food assistance may be larger in the poorest households compared to relatively better off households. Southworth's model predicts that if food assistance is extramarginal (more than what the household normally consumes), it would lead to an income effect and a substitution effect that would increase consumption (Alderman, 2002; Ahmed, 1993; Fraker, 1990). If food assistance is 'inframarginal" (less than what the household normally consumes), it would have an income effect on consumption, the same as cash income (Castaneda, 2000). One limitation of Southworth's model is that does not consider the potential influence of intrahousehold dynamics in household consumption. Food assistance is usually shared within the household (Alderman et al., 1997). Food sharing and allocation within the household is influenced by the different demographic and socio-economic characteristics of the households, which could affect the impact of different types of food assistance e.g. therapeutic vs. general food aid rations (Ivers et al 2009). One influential household characteristic is the gender of the primary decision maker. There is a plethora of literature showing that women spend more on food compared to men, and that female-headed households have a greater propensity to consume food than male-headed households in resource constrained settings (Ezemenari et al. 2003; Duflo 2000; Lundberg et al. 1997). Therefore how the food assistance is consumed within the household and its effect on household consumption could vary depending on the gender of household head or gender of the primary patient.

The theoretical models discussed in this review can help lay the basis of a conceptual framework for understanding the different pathways from food assistance to health and household welfare. However, we have also shown the limitations of some of the theories which include the lack of empirical support (income-leisure choice theory) to not considering the influence of household decision making and resource allocation especially in resource constrained settings (Grossman model, Southworth model). In short, the reviewed theories come up with several predictions. First, food assistance can be a valid input in the household production of health, thus directly improving patient health outcomes. Second, food assistance can provide motivation for adherence to ART by patients. Third, food assistance may or may not be a disincentive for labor supply for the

patient and other household members. Fourth, food assistance's impact on household consumption depends on its size, whereby food assistance that is greater than the usual household consumption would increase food consumption. Finally, food assistance has intrahousehold impacts which are influenced by intrahousehold decision making.

2.3 Methods

2.3.1 Search strategy

A literature search for relevant empirical articles was carried out from October 2009 to August 2010. The following electronic databases and search engines were searched: PubMed, MEDLINE, Cochrane database of systematic reviews, Social Science Research Network, Economic Papers, Science Direct and the Google search engine. The search strategy used keywords such as "antiretroviral therapy", "randomized controlled trial", "impact" and "qualitative" in conjunction with the terms "food assistance", "food supplementation", "macronutrient supplementation", "ready to use therapeutic feeding", "nutrient supplementation" and "nutrition". Working papers and research reports were also considered. Our search found 14 articles including three earlier systematic reviews. Studies had to meet one or more of the following inclusion criteria: 1) They were randomized controlled trials or quasi-experimental studies. 2) Studies were descriptive or qualitative. 3) Setting of the study is in resource constrained settings (developing countries). 4) They focused on non-pregnant adult individuals. 5) They assessed outcomes for ART patients and their households. We excluded studies assessing the effects of micronutrient supplementation. We also excluded pregnant women and children due to the likely variability in metrics measuring nutritional status as children and pregnant women experience age related weight gain and pregnancy related weight gain respectively. Moreover, pregnant women in resource constrained settings are usually given medication to prevent mother-to-child transmission of HIV rather than slowing disease progression. Ndekha et al. (2009) was not included in the review as it was succeeded by a later study on the sample with a better design (van Oosterhout et al., 2009). After screening we identified five studies for the review, including four quantitative clinical studies and one interdisciplinary and qualitative study.

2.3.2 Outcome measures and framework for analysis

Welfare is defined as the "material standard of living of every individual in the household" (Nelson, 1993). Welfare is relevant because HIV/AIDS by its nature adversely affects the welfare of the patient and associated household through declines in patient's health, labor participation, household income, and

disinvestment in children's wellbeing. Integrating ART with food assistance is thus a form of social protection meant to mitigate the patient and household from the aforementioned welfare declines associated with the disease, thus there is a need to study welfare outcomes from such interventions. Studies will be assessed for household welfare outcomes such as labor participation and consumption based on the theoretical suggestions espoused earlier on. Primary outcomes for health are nutritional status, disease progression (according to WHO stages), viral load, immune response (CD4+ T-lymphocyte count), survival or mortality.

2.3.3 Methodology appraisal

We evaluated the methodological strength of randomized trials using four criteria; whether i) randomization was concealed from experimenters (allocation concealment); ii) the interventions followed the study protocol; iii) attrition bias was controlled for; iv) blind outcome assessment was used (Higgins and Green, 2009). The following scores for assessing the risk of bias were used; one (low), two (moderate) and three (high). Total methodological strength was assigned a maximum score of three. We also critically appraised the quality of all the studies by checking for the validity the control group and whether attrition bias was controlled for in observational prospective studies. We used a narrative systematic review since the study designs, interventions, outcome measures and statistical reporting among the studies chosen are diverse.

2.4 Description of Empirical Studies

2.4.1 Characteristics of studies

Table 2.1 describes the country, study population, nature and duration of the intervention and the health and/or welfare outcomes for each study. All studies targeted adult patients (over 16 years), whose majority are females (range from 60-77%). One study was nationally representative (Rawat et al., 2010), while two studies were urban (Van Oosterhout et al. 2010; Cantrell et al. 2008) and the other two were rural based (Bahwere et al. 2009; Byron et al. 2008). Three studies had a sample of patients initiating ART, while two studies had a mix of patients at varying lengths of time on ART (Rawat et al. 2010 and Byron et al. 2008). Three studies examined interventions based on generic food aid rations comprising maize meal, oil, pulses and corn soy blend flour (CSB) normally disbursed by the World Food Programme (Cantrell et al., 2008, Rawat et al., 2010 and Byron et al., 2008). Van Oosterhout et al. (2010) and Bahwere et al. (2009) studied interventions based on ready to use fortified spread to a CSB supplement and an observational control group. Nutritional status as measured by BMI and weight gain is the common outcome in all the studies. Cantrell et al., (2008) and Byron et al., (2008) assessed adherence behavior. Additional empirical outcomes include disease stage

(Rawat et al., 2010), CD4+ count (Cantrell et al., 2008), mid-upper arm circumference (Bahwere et al. 2009) and mortality and morbidity (van Oosterhout et al., 2010). Only one study went beyond examining clinical benefit to look at other welfare measures such as dietary diversity, food consumption and labor supply (Byron et al. 2008). One study assessed the post intervention effects of food assistance (van Oosterhout et al., 2010). Byron et al. (2008) discussed strategies for weaning and post intervention monitoring of weaned beneficiaries.

2.4.2 Methodological quality of the studies

Two quantitative studies followed a prospective panel design (Bahwere et al. 2009; Cantrell et al. 2008). The other quantitative studies, Rawat et al. (2010) and van Oosterhout et al. (2010) followed a retrospective design while the qualitative study, Byron et al. (2008) used a cross section design. Two studies had fewer than 100 respondents (Bah were et al., 2009; Byron et al., 2008). Bahwere et al. (2009) had a very small sample of ART patients receiving food assistance, which could have led to biased estimates. The duration of interventions ranged from three to 12 months. Most of the interventions were implemented on a monthly basis with the exception of one which provided rations on a daily basis (Bahwere et al., 2009). Only one study is a randomized trial (van Oosterhout et al., 2010). Two other studies are quasi-experimental (Cantrell et al. 2008; Rawat et al. 2010). The rest are strictly observational (Bahwere et al., 2009; Byron et al., 2008). A control group is vital for the validity of a study. Two studies had a valid control group (Cantrell et al., 2008; Rawat et al., 2010). The randomized trial did not have an equivalent randomized control group as they were not allowed to purposively deny food assistance to eligible recipients for ethical reasons; hence the study utilized an observational control group (Van Oosterhout et al., 2010). Byron et al (2008) also did not have a pure control group as eligible patients could not ethically be denied food assistance.

Statistical methods ranged from descriptive statistics, mean differences to regression models in the four quantitative studies. In three quantitative studies, it is clear that random selection was used, while in two studies-one quantitative and the other qualitative- it is unclear what method of sampling was used (Bahwere et al. 2009; Byron et al 2008). The randomized trial was given a methodological strength of two (moderate bias) due to the lack of a randomized control group, the proper counterfactual for validity in the trial. Van Oosterhout et al. (2010) rightly note the presence of unmeasured confounding from the use of the observational control group. However, allocation concealment and blind outcome assessment were carried out. Attrition in the prospective studies ranged from 15 to 35%. Only one study disclosed the statistical power used to detect effect size (Cantrell et al., 2008).

Table 2.1 Empirical studies: methodology and findings

Study	Country and Study Population	Intervention and length of follow up	Study design and methodological strength (if trial)	Findings on health	Findings on other welfare measures
ART and food assistance					
Rawat et al. 2010	Uganda National 1711 HIV-infected adults at varying lengths of ART, baseline weight 53.5 77% female	Intervention comprises monthly food aid ration-maize meal, vegetable oil, corn soy flour, pulses Intervention-556 Control-1155 Duration and follow up-12 months Intensity-monthly	Retrospective Panel Propensity score matching Quantitative Control group-1 Strength-1 No attrition	Weight gain-no significant difference between intervention group and control groups at 12 months (0.19kg mean difference) Change in disease stage-no significant effect (mean difference of 2.5%)	None
Van Oosterhout et al. (2010)	Malawi Urban 593 HIV-infected adults initiating ART, BMI <18.5 Kg/m^2. 60%female	Two intervention groups comparing ready to use fortified spread (peanut based RUFS) and corn and soya blend (CSB) 1. RUFS: 245 patients receiving RUFS (1360 kcal/day) 2. CSB: 246 patients (1360 kcal/day) Observational control group: 104 patients Attrition-34.8% whole sample Duration and Follow up-3.5 months Intensity-first 2 weeks, then monthly	Retrospective Randomized Trial(panel) Quantitative (means, Cox regression) Allocation concealment-1 Blinding-1 Protocol-1 Attrition bias-1 No randomized control-3 Strength-2	BMI- RUFS patients had higher BMI compared to CSB patients (2.2 ± 1.9 SD vs. 1.7±1.6 SD kg/m^2 , difference 0.5 kg/m^2 95% CI 0.2, 0.8), Control patients (1.2± 1.8 SD) Weight- RUFS mean weight gain at 5.6kg± 4.8 SD, CSB at 4.4kg ± 4.3 SD and control at 3.3kg ± 4.7 SD Linear regression-RUFS (16% increase in BMI compared to other groups) and CSB(15% increase in BMI compared to control group) Mortality, and morbidity (clinic event)- no significant difference Independent risk factors of	None

Study	Country and Study Population	Intervention and length of follow up	Study design and methodological strength (if trial)	Findings on health	Findings on other welfare measures
				mortality include low BMI, low CD4 12 weeks post intervention- no significant difference in any outcomes.	
Cantrell et al 2008	Zambia Urban 636 food insecure HIV-infected adults initiating ART BMI>19 65% female	Intervention group: 442 patients in 4 clinics on monthly individual ration of CSB and vegetable oil (970kcal.day), or household ration if patient is primary income earner of CSB, oil, maize meal and beans (1571 kcal/day). Control group: 194 patients in 4 control clinics Attrition- 17% (intervention) and 15% (control group). 6-12 months intervention, (subject to mid-program assessment), 12 months follow-up. Intensity-monthly. 19% statistical power to detect 1kg gain in weight	Prospective Pipeline comparison Panel Quantitative (regression, ANOVA) Protocol- approved Control group-1 Attrition bias-1 Strength-1	Adherence at 12 moths -70% of intervention group achieved adherence of 95% or greater compared to 48% in control group (Relative Risk 1.5; 95% CI 1.2 to 1.8. Weight gain-no significant difference between intervention group and control groups at 6 months (5.4 vs. 5.1 kg) or 12 months (6.3 vs. 5.4 kg) CD4 cell count + lymphocyte response - no significant difference at 6 moths (154 vs. 171 cells/mm3)	None
Bahwere et al. (2009)	Malawi, Rural 60 patients, 8 just started ART 63.3% female MUAC<210mm (pitting oedema)	Local made RUTF of 500g (chickpea sesame seed), 2600 kcal/day, 61.6 g protein and > 1 recommended daily intake in vitamins and minerals 3 months follow up Intensity-daily	Prospective panel Quantitative and descriptive (correlations, regression), No control group, Small sample size Strength-3	Weight gain- 4.8kg increase (p=0.001) MUAC-11.2 mm increase (p=0.05) BMI-2.04kg/m2 (p<0.001)	none

Study	Country and Study Population	Intervention and length of follow up	Study design and methodological strength (if trial)	Findings on health	Findings on other welfare measures
Byron et al (2008)	Kenya Rural 79 Patients on ART, varying lengths 77% female	Intervention -monthly household ration of maize, beans, corn-soybean blended flour, and vegetable oil, plus fresh farm Foods (eggs, vegetables) 40 (50%) on food assistance, 39 control Intensity-monthly, No follow up	Cross sectional Qualitative Control group	Self-reported improved adherence, fewer side effects, satisfaction of increased appetite. Self-reported weight gain, recovery of physical strength,	Reported improvements in resumption of labor activities Increased dietary diversity and food consumption

Notes: MUAC is mid upper arm circumference, BMI is body mass index. Strength of randomized trials based on; i) allocation concealment; ii) study protocol; iii) controlling attrition bias; iv) blind outcome assessment. .Scores for risk of bias are: one (low), two (moderate) and three (high). Total strength has score of three.

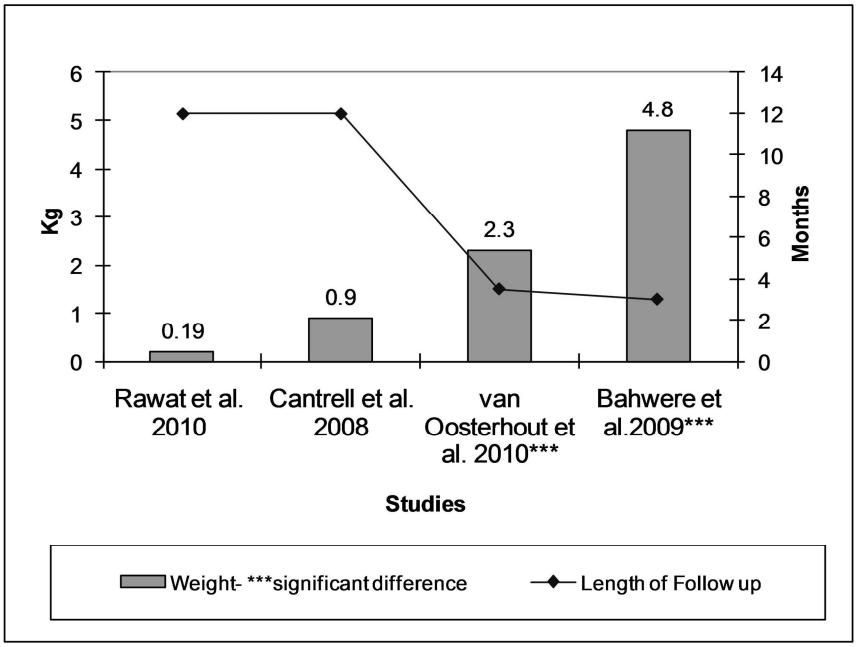
2.5 Findings

2.5.1 Clinical effects of integrating AIDS treatment with food assistance

The quasi-experimental studies find no significant effect of food assistance on the weight gain of non-malnourished ART patients in Zambia and Uganda (Cantrell et al. 2008; Rawat et al. 2010). This is in contrast with the findings of the randomized trial (Van Oosterhout et al., 2010). The trial found that at 3.5 months (14 weeks), the fortified spread led to a significant increase in mean BMI of 2.2kg/m2 and weight gain of 5.6kg, while the CSB led to a significant increase in mean BMI of 1.7kg/m2 and weight gain of 4.4 kg compared to the control group's increase in mean BMI of 1.7kg/m2 and weight gain of 3.3 kg. Linear regression showed that RUFS beneficiaries had a greater increase in their BMI than other groups while CSB beneficiaries had a greater increase in BMI than the control group. However the positive nutritional effect of food assistance did not persist 12 weeks after the trial had ended (26 weeks after starting ART). The other quantitative study from Malawi also found significant increases in weight (4.8kg), BMI (2.04kg/m2) and mid-upper arm circumference (11.2mm) from initiating malnourished ART patients receiving a form of RUTF (Bahwere et al., 2009). However these estimates could be biased since the sample size of ART patients was too small. Figure 2.1 illustrates the effect on weight gain by each quantitative study, based on the length of follow up.

Figure 2.1 suggests a significant effect of food assistance on weight gain when there is shorter duration of follow up and no significant effect with studies having longer follow-up. Yet, the positive effects on weight warrant caution in interpretation due to methodological concerns such as the lack of a randomized control group (van Oosterhout et al., 2010) and no control group at all plus a small sample size (Bahwere et al., 2009). The differences in effect sizes could also be the result of differences in design, nature and implementation of intervention.

Figure 2.1 Effects of food assistance on weight gain



Studies did not find any significant effects on disease stage or cd4+ cell count (Rawat et al., 2010; Cantrell et al., 2008). Van Oosterhout et al. (2010) found no significant effect of food assistance on mortality/survival or morbidity. Cantrell et al. (2008) found that after 12 months 70% of food assistance program participants were adherent to ART medication compared to only 48% of the control group. The qualitative study found that patients self-reported improved adherence, fewer side effects, and satisfaction of increased appetite, weight gain and recovery of physical strength from receiving food assistance (Byron et al., 2008).

2.5.2 Welfare effects of integrating AIDS treatment with food assistance

The only scant evidence on welfare outcomes comes from the qualitative study. Byron et al. (2008) found that patients self reported resumption of labor activities, increased dietary diversity and food consumption, with food rations being shared within the household with preferential allocation to the AIDS patient.

2.6 Discussion

2.6.1 Policy implications

We start by discussing the policy implications of the findings on nutritional status since this was the primary outcome in all the empirical studies. Current evidence on the effects of integrating AIDS treatment with food assistance suggests positive effects on weight gain, especially when provided in the form of energy dense RUTF compared to generic food aid rations. This may suggest that the composition of food assistance probably matters especially if the goal is nutritional rehabilitation. Nevertheless, there is insufficient evidence to conclusively assert that generic food aid rations have inferior nutritional benefits compared to RUTF interventions. Also the RUTF studies had methodological flaws such as low sample size and lack of a randomized control group. Furthermore, the studies did not investigate the role of dietary diversity or the consumption of low calorie foods on weight gain. Cantrell et al. (2008) speculates that the lack of effect on weight change by generic food aid rations to food sharing in the household and to the low statistical power of their sample size.

Still on the issue of weight gain, it seems that interventions targeting malnourished ART patients (BMI<18.5) found a positive effect on weight compared to interventions which targeted on average non-malnourished ART patients. This may also suggest that it could be easier to detect weight gain in interventions targeting clearly malnourished patients. Still, it is unclear from the current evidence what role the duration of ART has on the effect of food assistance on nutritional status as one study with initiating ART patients found no effect on weight gain while two others did. It is also unclear how calorie density of food assistance influences outcomes as there are varied responses to the different calories in the diverse supplements reviewed. From the empirical literature, there appears to be some relationship between a short length of follow up or duration of food assistance and a positive effect size as depicted in figure 1. However further insights are better revealed in future research that uses robust designs.

The empirical evidence base does not extensively discuss the appropriate indicators to use in evaluating nutritional rehabilitation especially in the context of long term survival of patients on ART. Van Oosterhout et al (2010) find that low BMI and low CD4 count were both independent risk factors mortality while food assistance had no effect on survival of malnourished ART patients. However, they did not assess whether BMI was more important to survival than other metrics like lean mass change. Further studies are needed to clarify what are the most effective

indicators for measuring nutritional rehabilitation as it relates to patient survival. The review also found limited empirical evidence to guide the design of an optimal food assistance ration. Byron et al (2008) present qualitative evidence on the seasonal demand for food assistance by patients, recommending that interventions increase the quantity of food rations in the dry season to meet the increased demand by the patients and their household. These findings however, have not been replicated. Therefore, while it would appear that food assistance is beneficial for improved nutritional status, there is still uncertainty on what the optimal level, form, duration and composition of a food assistance intervention should be to achieve the goal of nutritional rehabilitation.

Another crucial health outcome studied in the literature is adherence to ART. Food assistance's positive effect on adherence to ART as reported in one study (Cantrell et al., 2008) confirms earlier anecdotal evidence that a lack of food is a barrier to adherence (Au, 2006; Mshana, 2006; Marston, 2004). Cantrell et al. (2008) also highlight how placement of food assistance at clinics could motivate patients to collect their medicine and food together, consistent with the earlier theoretical review. Still, further research is needed before any generalizations can be made. With respect to the other health outcomes, the review found no other clinical benefits from food assistance. Currently there is no evidence that food assistance stalls disease progression, improves survival or boosts immunological response. It appears current studies have emphasized nutritional rehabilitation as the primary outcome over disease progression or immunity indicators, as it may be easier to link food assistance to nutritional status rather than other physiological indicators. Yet, the studies do not clarify whether nutritional rehabilitation above other clinical measures is the ideal indicator of the long term success of food assistance.

Other key issues which are important for programmatic design, implementation and sustainable development remain understudied in the current evidence base. Little attention has been paid to the household welfare effects of food assistance. Theoretical models predict that food assistance may affect household welfare, especially outcomes like household consumption and labor supply. These outcomes are vital in developing a sustainable recovery from HIV/AIDS's economic consequences, especially in the aftermath of a food assistance intervention. Currently, we only have qualitative evidence of the household welfare outcomes of integrating food assistance with ART (Byron et al., 2008). Studies have also not determined the potential unintended adverse effects of food assistance, especially among patients with severe HIV wasting. One such example is the refeeding syndrome highlighted where during refeeding patients might

experience potentially life threatening changes in fluid and electrolyte balance (Ivers et al., 2009).

The empirical evidence does not extensively discuss the role of targeting, which is vital for the management and allocation of program resources (Ivers et al. 2009). Some of the empirical outcomes on nutritional status hint at the importance of better targeting. Clearly malnourished patients initiating ART appear to respond positively to food assistance compared to non-malnourished patients. However this only occurs with RUTF interventions rather than generic food aid rations. We are left with several unanswered questions. Should targeting be based on patient's initial anthropometric measures or disease progression and immune recovery indicators? Or should programs rely on some type of means testing of households based on their vulnerability to food insecurity or poverty? Since the topic of food sharing has not been examined empirically and is currently a speculated reason for some of the results on nutritional status, further investigation is also required on how household sharing of food assistance affects the achievement of targeting goals (Ivers et al. 2009).

We also found limited empirical evidence to guide weaning or transition strategies. The qualitative study recommends weaning patients when they are productive enough to meet their food needs (Byron et al., 2008). They specifically argue against a short duration of food assistance like six months as patients may not have sufficiently established secure livelihoods, which could cause stress and anxiety. Another important policy issue concerns post intervention effects of food assistance. Post intervention monitoring of ex-beneficiaries' nutritional status and economic livelihoods can help determine appropriate duration of food assistance (Byron et al., 2008). One quantitative study, van Oosterhout et al. (2010) examined post-intervention effects of food assistance at 12 weeks after and found no significant persistent effect on weight, BMI or mortality. However, without an experimental control group in the trial, the validity of these findings is questionable. For this reason, it is still unclear from the empirical review whether the different types of food assistance interventions have a persistent effect, even after they have been terminated. The current evidence provides no guidance on the timing of transitioning and weaning, and on which types of patients and households would be easier to wean.

2.6.2 Research implications

The empirical review is based on a small but developing base of evidence with heterogeneous findings on the health effects of integrating ART with food

assistance. Anecdotal evidence points to possible increases in labor supply, dietary diversity, food consumption with intrahousehold food allocation processes preferential towards the patient (Byron et al., 2008). Three major methodological flaws were identified in this review. Firstly, there is only one randomized trial/experiment in the evidence base. Secondly, two studies (40% of the empirical literature) including the randomized experiment did not have a valid control group and are vulnerable to bias. Thirdly, only one study disclosed the statistical power of their sample size. Research gaps remain since current research primarily reports on the health outcomes, especially nutritional status and there is a lack of robust evidence on other household welfare measures which might guide livelihood support programs and lead to sustainable ART outcomes. There are still many unanswered questions regarding the role of calorie density, composition, targeting, and duration of food assistance. The duration of ART and its effect are not clearly examined as well, while the potential adverse effects of food assistance have not yet been considered. We recommend that future researchers diversify the range of outcomes and scope, utilize randomized trials and quasi-experimental designs and also consider time series analysis. For instance time series analysis could be useful in assessing whether patients are more responsive to food assistance during early or later periods of interventions. We are however optimistic that forthcoming research on the subject area will deal with some of the unanswered policy questions and research gaps identified by this review.

2.7 Conclusion

While theoretical predictions point to possible improvements in health, consumption and ambiguous effects on labor supply, the evidence base to prove theory is still developing. Current evidence suggests that integrating ART with food assistance improves nutritional status and adherence to treatment, especially when food assistance is in the form of ready to use therapeutic feeding. However because of methodological concerns, the positive effects of food assistance on weight gain warrant cautious interpretation. Furthermore, major research gaps exist as there are no rigorous evaluations of the household welfare effects of integrating ART with food assistance. The role of duration of ART on the effect of food assistance has not been explored, while there is still limited evidence or discussion of programmatic aspects like targeting, composition and duration of food assistance. There is especially a need for further research based on robust designs which investigates not only not only the health effects but household welfare effects as well.

3. Description of the Data and Research Methodology

3.1 Introduction

The data in this study are collected in Zambia. Zambia is a landlocked southern African country (see figure A3.1). It borders 8 countries namely Democratic Republic of Congo, Tanzania, Malawi, Mozambique, Zimbabwe, Angola, Namibia and Botswana. The country has an estimated population of 12 million and is rated among the world's poorest countries with an estimated annual nominal GDP per capita of US$1 132. Zambia is a rated 165th on the UN Human Development Index. An estimated 64% of the population lives below the poverty line (WFP 2010, Central Statistical Office 2006). It is estimated that 52% of the population is female, and 47% are children below the age of 15 years (CS1 2006). According to the latest central statistical office statistics, the overall unemployment rate is estimated to be around 14%, with 13% of the males and 15% of the females being unemployed. There are higher rates of unemployment in urban areas (32%) than in the rural areas (5%).

The national HIV prevalence rate in Zambia is approximately 14% and well over 20% in the urban areas (ZDHS 2007). This rate puts Zambia within the top ten countries with the highest HIV prevalence rates in the world, and nine of these countries are in southern Africa like Zambia (UNAIDS 2009). Hence, due to this high HIV burden there have been increasing efforts to increase access to ART.

3.2 AIDS Treatment in Zambia

The Zambian national programme for HIV care and treatment programme is funded by the US President's Emergency Plan for AIDS Relief (PEPFAR); the Global Fund to Fight AIDS, Tuberculosis, and Malaria; and other sources. In April 2004, the Zambian Ministry of Health launched an ART programme at clinics in the Lusaka Urban District (Stringer et al., 2006). The ART programme was expanded nationally and by May 2009 there were 67 HIV care sites and 127,000

[2]. GDP data from http://data.un.org/CountryProfile.aspx?crName=ZAMBIA#Economic. Accessed 30-10-2010

patients had started ART. ART and the necessary laboratory tests are provided free of charge.

Patients are enrolled on Highly Active Antiretroviral Therapy (HAART) which comprises at least three types of drug combinations; 2 Nucleoside Reverse Transcriptase Inhibitor (NRTI) + 1 Non Nucleoside Reverse Transcriptase Inhibitor (NNRTI); 2 NRTI + 1-2 Protease Inhibitors (PI); and 3 NRTI [3]. ART requires a life-long commitment and is intended to suppress the viral load to undetectable levels, boost immunologic function, prevent morbidity and mortality, and potentially prevents HIV transmission. However, since ART has side effects initiation has to be properly timed to avoid toxicity and resistance (early initiation) of morbidity and mortality (late initiation)[4]. Patients initiate ART based on disease stage or CD4 count evaluation[5]. Before beginning treatment patients are counselled on the importance of adherence for maintaining ART effectiveness.

HIV disease progresses from primary HIV infection to full-blown AIDS. This progression of symptomatic HIV disease for adults is categorized into four stages based on World Health Organization (WHO) guidelines, where each stage is defined by clinical symptoms/conditions of opportunistic infections. Different stage classifications are used for adults, adolescents and children. A summary of the standard stages of HIV disease is presented as follows:

- Stage 1: HIV disease is asymptomatic, not yet AIDS.
- Stage 2: clinical symptoms include moderate weight loss, mutaneous manifestations and recurrent upper respiratory tract infections.
- Stage 3: clinical symptoms include severe weight loss, chronic diarrhoea (more than one month), severe bacterial infections and pulmonary tuberculosis.
- Stage 4: clinical symptoms include HIV wasting syndrome, toxoplasmosis of the brain, candidiasis of the oesophagus, trachea, bronchi or lungs and Kaposi's sarcoma. This is now full blown AIDS.

The detailed staging system is presented in the chapter's appendix as table A3.1.

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[3] Ministry of Health of Zambia. 2007. Antiretroviral Therapy for Chronic HIV Infection in Adults and Adolescents: New ART Protocols. Report. Accessed from www.nac.org.zm at 30-10-2010.

[4] Ministry of Health of Zambia. 2007. Antiretroviral Therapy for Chronic HIV Infection in Adults and Adolescents: New ART Protocols. Report. Accessed from www.nac.org.zm at 30-10-2010.

[5] Current ART protocol for initiation based on CD4 count in Zambia is as follows: i) CD4<200, Initiation regardless of disease stage ii) CD4 between 200-350, initiation if there are stage 3 disease symptoms iii) CD4 >350, postpone initiation (Ministry of Health of Zambia).

3.3 Nutrition Programme for Vulnerable Groups

3.3.1 Overview

Food Insecurity in Zambia

The study follows the food security definition adopted at the 1996 World Food Summit in Rome which states that "food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life"[6].

Zambia's food security status is fragile with food supply levels continually threatened by recurrent droughts and floods. Furthermore, the reliance on rain fed agriculture, traditional hoe cultivation and subsistence farming often results in food shortages (WFP 2010). Rising food prices since the global financial crisis of 2008 have also increased the prevalence of food insecurity. Prevalence of chronic food insecurity and malnutrition is high as evidenced by an estimated 54.2 percent of children aged 3–59 months, who are stunted, with 47.8% in urban areas compared to 56.6% in rural areas (CSO 2006). In urban areas, HIV/AIDS is a major driver of poverty levels; hence the high prevalence of chronic malnutrition among children aged 3-69 months. The World Food Programme (WFP) in Zambia aims to alleviate hunger and food insecurity through targeted food assistance for vulnerable households including those affected by HIV/AIDS.

WFP's Nutrition Programme for Vulnerable Groups

The Nutrition Programme for Vulnerable Groups (NPVG) provides targeted family food rations to malnourished children, pregnant and lactating women, TB patients and ART patients. In February 2009, over 10,000 HIV-infected individuals and their households were enrolled in the NPVG programme nationwide including in the capital city Lusaka, the geographical focus of this study. Until December 2009, beneficiaries received a family ration. After December 2009, the programme changed to distributing food vouchers instead of actual food rations. The family ration comprised maize grain (25kg), cooking oil (1.8 litres), pulses (4.5kg) and fortified blended corn and soya flour (6kg) –also known as the high

[6] ftp://ftp.fao.org/es/ESA/policybriefs/pb_02.pdf

energy protein supplement (meant to be an individual ration for the patient[7]). The ration was intended to provide about one-third of the daily caloric requirement for a household of six people.

3.3.2 Geographic and Individual Targeting

Lusaka

Lusaka district has the highest population of any district in Zambia as it is home to the capital city with an estimated total population of over 2 million (CSO 2010). 70 per cent of the city population lives in unplanned settlements or residential areas (unplanned is the term used for squatter) (Nchito, 2007). There are more than 43 unplanned settlements, a result of limited land resources for the poor and most of them have poor living conditions (Nchito 2007). Only 60% of the city population has access to safe and clean drinking water and flush toilets (Mbili-Muleya 2008)

Targeting

Targeting of the programme for ART patients in Lusaka was done on two levels; geographic and individual. Geographic targeting focused on the selection of four public sector clinics located in certain low income residential areas or communities[8]. Low income residential areas in Lusaka are commonly known as compounds. Food assistance was distributed at the chosen clinics. The names of the clinics are synonymous with the names of the residential areas or settlements where the clinics are located. The participating clinics were selected by health officials based on the high HIV prevalence rates in the residential areas they service [9]. Table 3.1 and figure 3.1 show HIV prevalence rates recorded at the targeted clinics and selected controls between 2003 and 2006. The reason why four clinics were selected appears to be based on the observation that the majority of the rates at the food assistance clinics have not significantly changed over time compared to the majority of control clinics which show significant modest decline. Still the HIV prevalence rates are undeniably high in all the residential areas serviced by the clinics (above 18%), that we would expect similar macro-impacts of HIV/AIDS in these areas.

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[7] While the high energy supplement is meant for the patient, since it is given out together with the other family components and likely shared within the household (Cantrell et al. 2008), it will be counted as a component of the family ration

[8] There are 24 public sector clinics in Lusaka managed by the Lusaka District Health Management Team

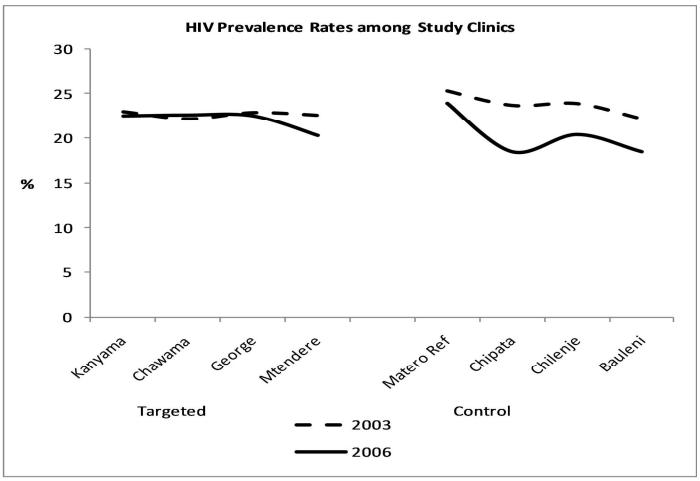
[9] HIV prevalence rate is always an aggregate variable and in Zambia, they keep track of local prevalence rates for residential areas in cities (high risk areas) to assist in city health planning and allocation of resources.

Table 3.1 HIV prevalence rates among targeted and control clinics between 2003 and 2006

	Type	2003 HIV prevalence rate %	2006 HIV prevalence rate %	Trend	P-value
Kanyama	Targeted	23	22.5	-1.60	0.109
Chawama	Targeted	22.2	22.6	1.65	0.099
George	Targeted	22.9	22.5	-0.78	0.439
Mtendere	Targeted	22.6	20.3	-2.08	0.037
Matero Ref	Control	25.3	23.9	-1.88	0.06
Chilenje	Control	23.7	18.5	-2.89	0.004
Chipata	Control	23.9	20.4	-4.29	<0.0001
Bauleni	Control	22.2	18.5	-2.18	0.03

Source: Stringer et al.2008. The figures are based on antenatal surveillance testing among young pregnant women, a proxy for HIV prevalence rates. Trend statistic is Z score derived from Cochran-Armitage test of quarterly prevalence data between 3rd quarter of 2002 and 4th quarter of 2006. A negative trend indicates declining prevalence over time.

Figure 3.1 Trends in HIV prevalence rates among targeted and control clinics between 2003 and 2006



Source: Calculations based on Stringer et al.2008

The individual targeting criteria for food assistance were based on a poverty and food insecurity screening questionnaire which asked questions on HIV burden, household composition, asset ownership, employment status, income earnings,

housing characteristics, child education and household dietary diversity. Clinic staff, community home based care volunteers, HIV support group members and AIDS treatment adherence support workers administered the targeting questionnaire to registered ART patients at each clinic. The questionnaire was intended for all registered ART patients. The questionnaires were administered through household visits. Responses to the screening questionnaire were tallied into a composite socioeconomic score. Patients were deemed vulnerable and eligible for food assistance when their socioeconomic score equaled or exceeded a numerical threshold of 20 (see appendix 9.5 for explanation on how socioeconomic score was computed). Anthropometric measurements were not utilized in the selection of recipients.

However other factors may have increased a beneficiary's likelihood of being screened and selected for enrolment in the food assistance programme which could have led to sample selection bias. For instance, the degree of patient contact or association with clinic staff and community volunteers who were involved in the targeting could have influenced inclusion into the programme. During targeting, not all registered ART patients and their families were reached especially those with residences far-away from a designated food distribution clinic. Therefore during the baseline month some eligible participants were likely excluded from the programme.

3.3.3 Targeting Performance

We could not obtain sufficient information on the targeting statistics and did not have sufficient resources to survey all registered ART patients in order to accurately estimate the exclusion error. However data collected from the study can be used to provide a preliminary assessment of whether the targeting instrument succeeded in recruiting vulnerable patients. The extent to which targeting recruited vulnerable patients and families is assessed using four vulnerability measures:

- World Bank's poverty line of US$37.5 per person per month based on US$1.25 per person per day. US$37.50 is approximately K187500;
- The nominal total and food basic needs basket (BNB) in Zambia[10]. In January total BNB was approximately K364 496.70 per capita per month (US$ 72.90) while food BNB was approximately K126 925 per capita per month (US$25.39)[11];

[10] Based on a monthly survey of the minimum cost of living for a family of six.

[11] http://www.jctr.org.zm/bnb/BNB%20Jan09%20-%20Lusaka.pdf. Total BNB for family of six for January was K 2 196 980, food BNB was K 761 500.

- WFP's asset poverty line which is used in vulnerability assessments. A household is defined as poor if it owns less than four of the following productive/non-productive assets[12]

An analysis of the targeting efficiency as reflected in the study's sample of beneficiaries is presented in table 3.2

Table 3.2 Targeting performance analysis

	WFP Asset Poverty line		World Bank Poverty line		Total Basic Needs Basket		Food Basic Needs Basket	
	Poor	Non-poor	Poor	Non-poor	Poor	Non-poor	Poor	Non-poor
Food assistance recipients	88,44	11,56	96,48	3,52	97,99	2,01	99,5	0,5

Source: WFP 2010, www.jctr.org.zm

As table 3.2 shows, it appears the targeting instrument was successful in recruiting vulnerable patients. Using the four vulnerability measures explained earlier, the inclusion error for the study sample ranges from 0.5% to 11.5%.

3.3.4 Exit from the programme

Patients and their families received a monthly ration for an initial six months of assistance but are generally eligible for the assistance for up to one year. It was intended that beneficiaries exit from the programme after a targeting assessment every six to eight months. In households where a patient died, a household received food assistance for one more month. Patients and beneficiaries were discharged based on the following criteria[13]:

- Household no longer met the eligibility criteria
- Household was enrolled in other food assistance programmes (special dispensation could be obtained for households enrolled in therapeutic

[12] Asset poor defined as owning less than 5 assets and asset medium/rich if owning more than 4 named assets The survey measured ownership of the following items: sofa/furniture, TV, radio, refrigerator, cell phone, kerosene stove (non-productive assets), bicycle, cultivator/ plough, wheelbarrow, sewing machine, ox-drawn cart, solar panel, vehicle (productive assets).

[13] WFP Zambia Country Programme 2007-2010. Activity Implementation Strategy 2007 -2008. WFP, Lusaka.

feeding programmes, or school feeding programmes where less than four children in the family receiving home rations[14]).

- Patient resumed employment with earnings worth at least US$50 per month or the prevailing minimum wage
- Employment of other household member with earnings worth at least US$50 per month or the prevailing minimum wage

3.4 Data Collection

This section describes the key steps in data collection from the study protocol to survey implementation. Appendix 8.1 briefly summarizes the practical manual followed in the field.

3.4.1. Ethical Approval

Approval of the study protocol and informed consent documents were obtained from the Ministry of Health and the University of Zambia Research Ethics Committee (reference 003-07-09) prior to participant recruitment and data collection.

3.4.2. Study Design

The study utilizes a retrospective design. No baseline survey was implemented.

3.4.3 Sampling strategy

The study is based on the food assistance distributed in the capital-city, Lusaka, in January 2009. Four public-sector ART clinics distributed a standardized household food assistance (described in 3.3.1). The food assistance programme did not cover all public sector ART clinics in the capital city due to supply limitations at the time.

<u>Selection of Clinics</u>

Four public-sector clinics not participating in the WFP program were selected as control clinics (i.e. 'control' sites). These clinics are located in the Lusaka district within low income settlements and each clinic is named after the community or locality (commonly known as compounds) it serves. To provide a rough equivalence between the intervention and control groups and to control for

[14] Please note that all participants and the control group in the sample were not participating in additional feeding programmes. Therapaeutic feeding consists of high energy supplements provided directly for the nutritional rehabilitation of severe malnourished individuals.

probable clinic effects, control clinics were selected and paired with intervention clinics according to three criteria: active patient population, duration of operation, and historical survival at 12 and 18 months post-ART initiation[15]. However, the study clinics share similar operational procedures. All clinics are under the management of the Lusaka District Health Management Team with standardized operating procedures, patient flow, ART treatment protocols, and other medical protocols. Equipment is provided through the Zambian Ministry of Health in accordance with the minimum needs of ART treatment. Additionally, clinics are staffed by clinical officers who completed a standardized educational training program certified by the Zambia Ministry of Health. All clinics provide ART drugs funded from the PEPFAR programme[16]. Administrative support and medical oversight are provided centrally by CIDRZ (Centre for Infectious Diseases Research in Zambia). The eight study clinics are described in Table 3.1 and Table 3.3.

Table 3.3 Characteristics of study clinics (August 2009)

Study clinic	Duration of operation (months)	Active ART patients	Patients receiving food aid (%)	Percent sampled		12 month survival†	18 month survival†
				Among clinic population	Among food assistance recipients		
Kanyama	64	4296	1600 (37%)	1.17%	3.13%	0.939	0.928
Matero Ref.	60	5355	n/a	0.934%	control	0.942	0.927
Chawama	41	3875	700 (18%)	1.29%	7.14%	0.910	0.900
Chipata	54	4543	n/a	1.10%	control	0.863	0.851
George	60	4097	680 (17%)	1.22%	7.35%	0.897	0.875
Chilenje	59	3273	n/a	1.53%	control	0.925	0.906
Mtendere	64	2896	708 (24%)	1.73%	7.06%	0.891	0.878
Bauleni	56	1400	n/a	3.57%	control	0.908	0.887

Adapted from Smart Care database. Food assistance clinics in bold italics; table stratified by study/control clinic pairs. † Kaplan-Meier estimate of the proportion of patients surviving at 12 and 18 months post-ART initiation.

[15] Data were not available to match clinics according to economic or social characteristics of the local population accessing care which could potentially be a source of an unobserved effect in the study. In later analysis locality/community dummies are included in regressions to try and control for unobserved community effects.

[16] Clinics are under ethical and legal obligation to meet the ART needs of patients. Hence it is highly unlikely that clinics run out of medicines. This is why retention in ART is primarily dependent on the adherence of the patient to monthly consultation appointments.

Each clinic services general populations ranging from 70,000 to 150,000. The number of active ART patients per clinic ranges from 1,400 to nearly 5,400. Table 3.3 shows that between 17 and 37% of the active ART patients at the food assistance clinics were enrolled in the food assistance program. The survival rates of the patients attending the paired clinics are comparable.

Selection of Patients and Households

The sampling frame targeted non-pregnant adult patients as the study is mostly looking at the treatment effects on the adult patient and associated household. All patients in the sample are on ART, at varying durations. However all are provided ART free of charge and receive the same treatment procedures and monitoring. The control group was selected through the same targeting criteria for the food transfers programme- a poverty and food insecurity questionnaire (see appendix 9.5).

Random sampling was used to select about 50 participants from eight public-sector clinics providing ART in Lusaka. Four clinics participated in the food assistance programme (Mtendere, Chawama, Kanyama, George), and the other four did not (Bauleni, Chipata, Matero Reference, and Chilenje). Throughout the dissertation, the food assistance recipients are referred to as the intervention group/beneficiaries/ treated group or participants. While the non-recipients are referred to as the control group or non-participants. The terms food assistance, food aid or food transfers are used interchangeably. Clinic registers detailing active participant and non-participant patients were obtained and used in the sample selection. Sampling intervals were calculated by dividing the total number of patients in each clinic by the number of patients to be interviewed (50 for each clinic).

The study was powered to detect a 10% difference in the change in body weight at 6 months between study arms (recorded at each clinic visit in the database in kilograms or tenths of a kilogram (depending on nurse entry into the paper chart) with 80% power and a 95% confidence level.

3.4.4 Primary Data

In the month of August 2009 a cross section household survey was carried out at the 8 clinics. The survey used a 24-page household questionnaire designed to capture patient characteristics and household data. The questionnaire format and data fields were based on previously validated research tools used to assess household welfare in similar settings. The questionnaire was refined through pre-

testing at two clinics, Bauleni and Chawama. The interviews were conducted with patients, spouses of patients or household heads. Written informed consent was obtained from all study participants prior to conducting the interview. They were carried out primarily at the clinic as many patients expressed discomfort with home interviews which they feared might inadvertently disclose their HIV status in the community. Individuals in the control group were screened for study inclusion using the same food security and vulnerability screening tool and a numerical score threshold applied to the intervention group.

Primary outcome variables related to household welfare were recorded on paper forms during the interview. The structured questionnaire captured household demographics and composition, consumption, employment status for all members in the household and asset data. The questionnaire also captured information on income sources, dwelling conditions, access to other social transfers, access to community assistance, perceived wellbeing and health and perceptions on HIV stigma, health seeking behaviour and illness in the household, HIV patient's characteristics (e.g. health seeking behaviour, demographics). Informed consent was obtained from all respondents. The survey was conducted from 21st to 31st August 2009. A total of 400 patients were interviewed, comprising 199 patients receiving food assistance since February 2009 and 201 patients not receiving food assistance. Unfortunately we could not obtain the data collected during targeting, an acknowledged limitation of this study. Hence the study design is retrospective.

3.4.5 Secondary Data

Clinical records in the Smart Care data system, specifically developed by the Zambian Ministry of Health in conjunction with the Centers for Disease Control and Prevention and the Centre for Infectious Disease Research in Zambia, were used for the study. The Smart Care data system is a government controlled nationwide electronic medical records system that is used to collect data from all patient visits at participating national health system clinics, in addition to research-specific information. Each patient visit generates a paper form; select data from that form are meant to be immediately entered by data entry staff at the end of the patient visit. Smart Care allows the tracking of patient visits, monitor programme growth, manage drug forecasting, and generate reports for funding agencies. Clinical variables collected at baseline level and complementing survey data include:

- Demographics
- CD4+ cell count
- Height/weight, body mass index

- Clinical HIV stage according to WHO guidelines
- Adherence based on pharmacy refill records

We also use pharmacy refill records to compute a measure for adherence as it was not feasible to carry out home visits and count the pills taken by the patients.

3.4.6 Data entry

The database was designed in SPSS Data Builder Format. Data entry was carried out from 8th to 21st September 2009 after the questionnaires had been verified and coded. Data were then entered into a computer database designed specifically for this study. National ART programme medical record numbers were recorded during the interview and used to retrieve patient-level data from the Smart Care database for the analysis of clinical outcomes.

3.5 Overview of Data Analysis Methods

The thesis utilizes various methods in assessing the impact of integrating AIDS treatment with food assistance on patients, households and adult household members. Table 3.4 presents an overview of methods used, unit of observation and outcomes analyzed per chapter.

Table 3.4 Unit of observation, methods and outcome measures for each chapter

Chapter	Unit of Observation	Methods	Sample size		Outcome measures
2	Articles	Systematic review	5		Weight, body mass index adherence, mortality, morbidity, labour supply, consumption
			Treated	Control	
4	Patients	Propensity score matching, OLS and IV regression	199 (147 with clinical data)	201 (148 with clinical data)	Weight, body mass index, adherence to ART
5	Households	Propensity score matching, Fixed effects and IV regression	199	201	Consumption: Food intake, food expenditures, total expenditures
6	Patients and Adult non-patient household members	Propensity score matching, Probit and Bivariate probit regression	473	532	Labour supply: weekly hours worked, employment status

Table 3.4 shows that the number of observations and sample sizes vary according to outcome. The patient analytical sample for chapter 4 is actually less than the full sample of patients interviewed due to missing laboratory values for some of the patients. The sampled households comprise around 1055 adults. There are over 924 (431 in control and 494 in treated households) children under the age of 18 in the sample households. Each chapter is meant to build upon previous chapters. In the first analytical chapter (chapter 4), clinical outcomes such as weight and adherence to ART are assessed. In the second analytical chapter (chapter 5), household consumption responses are examined while the final analytical chapter (chapter 6) labour supply responses by patients and other adult members in the household are assessed.

3.5.1 Justification of Analytical Methods

The design of the programme, especially the geographic targeting offers a good opportunity to construct a control group as counterfactual. Like many other similar food aid programs across sub-Saharan Africa, the non-random assignment of food assistance raises concerns about bias. Bias comes from two sources- endogenous programme placement and individual selection into the programme. Endogenous programme placement is the result of purposive targeting of the clinics to distribute the food assistance. Individual selection into the programme is the result of the targeting of individual beneficiaries within the residential areas (also referred to as communities or localities) serviced by the selected clinics. Individual targeting was also likely biased towards patient/families residing nearer to the clinics and patients known by HIV community support workers. Any impact evaluation must therefore correct for selection bias and endogeneity. To do so, the study utilizes propensity score matching, difference in differences and instrumental variables regression. First in each chapter propensity score matching is used as the first method in impact evaluation. Propensity score matching (PSM) has its advantages in that it draws attention to the problem of common support, which when absent diminishes the robustness of traditional regression methods (Bryson et al 2002). Moreover, unlike regression methods which usually impose a linear functional form on relationships between covariates and the outcome, PSM does not suffer from functional form restrictions (Dehejia and Wahba, 1998).

However, PSM has its limitations. Three of them are discussed here. First, since PSM relies on observable differences, unmeasured confounding or latent heterogeneity may still remain, leading to biased estimates of the treatment effects (Hill 2008). Second, PSM may also be sensitive to the number of observations available for analysis, and its efficacy is especially limited with small samples

(Bryson et al. 2002). The study's dataset is also hierarchical as it is possible able to analyse individual (patient's health, adult labour supply) and household level outcomes (consumption and food security) based on varying sample sizes (see table 3.4). Propensity score matching methods for hierarchical data are less explored in the literature with most methodological papers on the subject yet to be published (Arpino 2010 ; Aussems 2008 ; Kim and Seltzer 2007; Li 2009; Su 2008) . In the analysis, one propensity score model with both household level and community level characteristics to reflect the multilevel targeting of the food transfers programme is used for PSM. Third, PSM does not estimate the local average treatment effect (LATE) i.e. the average impact of the programme on those participants whose eligibility is affected by a change in targeting criteria (Bryson et al.2002). For instance, there is current consideration to shift from a poverty assessment targeting criteria to a clinically or anthropometric based targeting criteria for the food assistance programme. Hence instrumental variable (IV) techniques may be more applicable for programmes that experience revisions in targeting criteria (Bryson et al.2002). PSM is also better used in conjunction with conventional methods of analysis in observational studies like ours (D'Agostinho 1998).

In the study, IV techniques, and difference in differences methods serve as robustness checks and complement the weaknesses of PSM while also reinforcing on the sign or direction of effect. Instrumental variables control for reverse causality between food transfers and outcome variables, omitted variable bias and measurement error (e.g. for expenditures). The same instrumental variables are used consistently throughout the thesis in predicting participation in the food assistance programme. The instruments used are selected based on the information known about targeting criteria at clinic level and household level. The instruments are described as follows:

- Local HIV prevalence: Specifically local HIV prevalence is behind the selection of food assistance clinics and hence it is used as an instrument for participating in the food assistance programme. The prevalence rate used is an aggregate measure of HIV incidence within a residential area based on antenatal HIV tests of pregnant women at clinics (accepted proxy).
- Past receipt of food assistance: Past receipt of food assistance, a dummy variable is used as an instrument as it controls for inertia effects i.e. past food aid recipients are more likely to be targeted than others.
- Distance to Clinic: Discussions with staff who screened the participants and preliminary descriptive analysis showed that patients residing in areas near to the clinics were more likely to be targeted especially since

administering the targeting questionnaire required household visits. Distance to clinic is measured in minutes.

- Locality/community or residential area interactions with characteristics of eligibility criteria: Locality is the area where households reside. This is usually the same areas as the clinics. Dummy variables for locality are interacted with asset wealth or age dependency ratio, common factors used in food aid targeting (Yamano et al. 2000).

However IV estimators have been criticized lately due to their limitations and applicability to narrow questions (Deaton 2009; Heckman and Urzua 2010). IV estimators can be less efficient than OLS estimators and can still be biased in finite samples even if they are asymptotically consistent (Cameron and Triveldi 2005). This bias is magnified when weak instruments are used. The use of a single cross sectional data set raises questions on the validity of the exclusion restriction required by IV estimation. It is also not explicitly clear or easy to identify the sub-group for whom the LATE has been estimated. Heckman and Urzua (2010) also argue that IV is not robust to the choice of instrument as different instruments identify different parameters. Also IV can have the wrong sign on causal effect, thereby misleading policy. Hence IV is by no means the perfect approach. However we use IV in our analysis. IV is also used as a robustness check on the general direction or sign of effect and to see if it reinforces the sign of effect from PSM, and diagnostic tests are used to check for finite sample bias.

In this study difference in differences estimation is used and is also combined with propensity score matching where appropriate as it is useful in eliminating time invariant unobserved heterogeneity. However difference in differences estimation does not eliminate bias from time varying unobserved heterogeneity. This is because in many cases in developing countries, the counterfactual trend in outcomes may vary between treated and control units (failure of the parallel trend assumption) leading to an upward or downward bias in estimates (Ravallion 2007).

3.6 Conclusion

This chapter has discussed the background of AIDS treatment in Zambia and described the food assistance programme being evaluated. The programme which was implemented in 2009 was purposively targeted at clinic and individual/household level. The study utilizes secondary clinical data and primary

household data in analysis. A major limitation of the data collection process is the lack of baseline survey data. Sources of bias include the purposive geographic and individual targeting of the programme, necessitating the use of statistical tools in the creation of valid control groups. One such technique is PSM. However, the hierarchical nature of the data poses challenges to PSM, while its limitations in measuring unobserved differences motivates the use of additional techniques such as IV and difference in differences estimation.

Appendix A

Figure A3.1 Map of Zambia

Table A3.1 WHO clinical staging of HIV/AIDS for adults and adolescents

HIV/AIDS Disease Stages
Primary HIV infection
Asymptomatic
Acute retroviral syndrome
Clinical stage 1
Asymptomatic
Persistent generalized lymphadenopathy (PGL)
Clinical stage 2
Moderate unexplained weight loss (<10% of presumed or measured body weight)
Recurrent respiratory tract infections (RTIs, sinusitis, bronchitis, otitis media, pharyngitis)
Herpes zoster
Angular cheilitis
Recurrent oral ulcerations
Papular pruritic eruptions
Seborrhoeic dermatitis
Fungal nail infections of fingers
Clinical stage 3
Conditions where a presumptive diagnosis can be made on the basis of clinical signs or simple investigations
Severe weight loss (>10% of presumed or measured body weight)
Unexplained chronic diarrhoea for longer than one month
Unexplained persistent fever (intermittent or constant for longer than one month)
Oral candidiasis
Oral hairy leukoplakia
Pulmonary tuberculosis (TB) diagnosed in last two years
Severe presumed bacterial infections (e.g. pneumonia, empyema, pyomyositis, bone or joint infection, meningitis, bacteraemia)
Acute necrotizing ulcerative stomatitis, gingivitis or periodontitis
Conditions where confirmatory diagnostic testing is necessary
Unexplained anaemia (<8 g/dl), and or neutropenia (<500/mm3) and or thrombocytopenia (<50 000/ mm3) for more than one month
Clinical stage 4
Conditions where a presumptive diagnosis can be made on the basis of clinical signs or simple investigations
HIV wasting syndrome
Pneumocystis pneumonia
Recurrent severe or radiological bacterial pneumonia
Chronic herpes simplex infection (orolabial, genital or anorectal of more than one month's duration)
Oesophageal candidiasis
Extrapulmonary TB
Kaposi's sarcoma
Central nervous system (CNS) toxoplasmosis
HIV encephalopathy

Table A3.1 continued

Conditions where confirmatory diagnostic testing is necessary:
Extrapulmonary cryptococcosis including meningitis
Disseminated non-tuberculous mycobacteria infection
Progressive multifocal leukoencephalopathy (PML)
Candida of trachea, bronchi or lungs
Cryptosporidiosis
Isosporiasis
Visceral herpes simplex infection
Cytomegalovirus (CMV) infection (retinitis or of an organ other than liver, spleen or lymph nodes)
Any disseminated mycosis (e.g. histoplasmosis, coccidiomycosis, penicilliosis)
Recurrent non-typhoidal salmonella septicaemia
Lymphoma (cerebral or B cell non-Hodgkin)
Invasive cervical carcinoma
Visceral leishmaniasis
Source: WHO (2005)[17]. The UN defines adolescents as persons aged 10–19 years but, in the present document, the category of adults and adolescents comprises people aged 15 years and over for surveillance purposes.

[17] Accessed from http://whqlibdoc.who.int/hq/2005/who_HIV_2005.02.pdf.

Table A3.2 Definition of clinical variables

Variable	Definition
AIDS	Acquired Immuno Deficiency Syndrome. Caused by HIV. Ultimate result of lowered immunity in the body making it vulnerable to opportunistic infections and tumours
ART	Anti-retroviral therapy. Standard chemotherapy for AIDS patients.
CD4+ T cell count	Subgroup of lymphocyte cells located in the thymus. Main task is to activate or direct immune response by other cells. When infected by HIV, immunity response is compromised. Current ART protocol for initiation based on CD4 count in Zambia is as follows: i) CD4<200, Initiation regardless of disease stage ii) CD4 between 200-350, initiation if there are stage 3 disease symptoms iii) CD4 >350, postpone initiation (Ministry of Health of Zambia).
HIV	Human Immunodeficiency Virus, the virus that causes AIDS. Causes immune system to fail and contracted through body fluids such as blood, semen, pre-ejaculate, breast milk and vaginal fluid.
Disease stage	Category of HIV disease progression from infection to AIDS based on clinical symptoms

Notes: definitions adapted from various sources including WHO, wikipedia.org

4. Food Assistance and its effect on the Antiretroviral Therapy Adherence Weight and CD4 Cell Count of HIV Infected Adults[18]

4.1 Introduction

The overlap of HIV infection, malnutrition, and chronic food insecurity in much of sub-Saharan Africa has necessitated the need for more comprehensive approaches to health care. Malnutrition and the consumption of a diet that does not meet nutrient requirements in the setting of HIV infection has a negative impact on patients; it accelerates HIV-associated weight loss; compounds immunosuppression and may accelerate the progression to AIDS; potentiates the side-effects of some antiretroviral therapy medications; reduces the capacity for physical activity, decreases labour productivity, and negatively impacts the overall welfare of HIV affected household (Schaible and Kaufmann 2007; Bukusuba and Kikafunda 2007; WHO 2003; De Pee and Semba 2010). Empirical evidence also shows that individuals with untreated HIV disease have less capacity for physical labour, while affected households with chronically ill members report yearly income reductions of 30-35%, and in rural areas, HIV-affected families farm less land and have lower agricultural output (Mutangadura et al. 1999; Haddad and Gillespie 2001; Kwaramba1998). Hence there are vigorous efforts to improve the provision of antiretroviral therapy (ART henceforth) to infected patients to restore health and quality of life.

[18] This chapter is based on Tirivayi, N., Koethe, J.R., and W. Groot. 2010. Food Assistance and its effect on the Weight and Antiretroviral Therapy Adherence of HIV Infected Adults: Evidence from Zambia. Maastricht Graduate School of Governance Working Paper 2010/006. Paper version has been presented at the Measuring Results for Dutch Development Aid, Approaches and Future Directions Conference (Amsterdam 2010). Gratefully acknowledge funding from UNAIDS, World Health Organization (Regional office for Africa), Ford Foundation and the Poverty Reduction, Equity and Growth Network

However ART outcomes can still be compromised by malnutrition and the continual threat of food insecurity in poverty stricken regions. For instance, several studies from sub-Saharan Africa found that a low body mass index (BMI henceforth) at the time of ART initiation is a powerful and independent predictor of early mortality, and the role of malnutrition in HIV disease progression and poor clinical outcomes is significant and likely under-reported (Johannessen et al. 2008; Zachariah et al. 2006; Stringer et al. 2006). Furthermore ART medications are also powerful and could have serious side effects if taken on an empty stomach. Indeed, the potential for supplementary feeding to improve medication adherence, patient retention and household welfare has prompted some HIV programmes in sub-Saharan Africa to incorporate food assistance programmes for malnourished, food insecure patients including patients vulnerable to food insecurity (Mamlin et al. 2009). Consequently, several organizations are integrating ART programmes with food assistance to optimize health outcomes and simultaneously boost household food security and welfare and act as a safety net.

Food assistance is normally provided in the form of micronutrient supplements (e.g., vitamins or mineral supplements) or macronutrient supplements (i.e., supplementation in the form of staple foods as in most food assistance/aid programmes across sub-Saharan Africa or energy-dense specialized nutritional products used in therapeutic feeding programmes). While there has been substantial research on the role of micronutrient supplements in delaying HIV disease progression (Fawzi et al. 2004; Kaiser et al. 2006), there has been limited research to date on the clinical effects of macronutrient supplementation for HIV-infected adults in resource-constrained settings. A recent study by Rawat et al (2010) found no significant impact of food assistance on ART patients in Uganda, while there was significant weight gain for patients not receiving ART. Cantrell et al. (2008) reported a significant difference in ART adherence, but no difference in weight gain, CD4+ cell response (immune reconstitution), or mortality, among HIV-infected adults receiving food assistance rations compared to control patients not receiving rations after 12 months in an observational study in Lusaka, Zambia. A more recent trial in urban Malawi found a significantly greater increase in BMI after 3.5 months among those receiving food supplements, but no significant differences in survival, HIV-1 viral load, CD4+ lymphocyte count change, or quality of life (van Oosterhout et al. 2010). Other existing research, qualitative in nature, found positive impacts in self reported weight gain, recovery of physical strength and improved adherence to treatment (Byron et al. 2006).

This study assesses the impact of participation in a World Food Programme (WFP henceforth) household food assistance scheme on weight, BMI, CD4 cell count (lymphocyte count) and ART adherence over a period of 6 months among HIV-infected adults in Lusaka Zambia in 2009. The stated goals of the WFP food assistance programme were the improvement of individual, household food security and welfare of HIV-affected families and improvement of the effectiveness of ART, rather than direct nutritional rehabilitation of HIV-infected adults. However, the intervention provided a unique opportunity to assess the impact of macronutrient intervention on ART adherence and clinical health among a population of HIV-infected adults with pervasive food insecurity. The food assistance programme was initiated among patients who had already been on ART for a substantial length of time (median of 995 days).

This chapter compares food assistance participants (intervention group) at four food distributing public-sector ART clinics with similar HIV-infected individuals at four matched non-participating ART clinics (control group). We find that food assistance has no significant effect on weight, CD4+ lymphocyte count or BMI. However food assistance has a significant positive effect on ART adherence, and the findings suggest a potentially greater effect during the early stages of ART.

The chapter is organized as follows. The next section presents the data collection process used for the study. We then present the methodology used followed by a section presenting the results from propensity score matching and regression analysis. The penultimate section then discusses the results and their implications, and the limitations of the study. The final section presents the conclusion of the chapter and recommendations for further research.

4.2 Data[19]

4.2.1 Analytic Sample

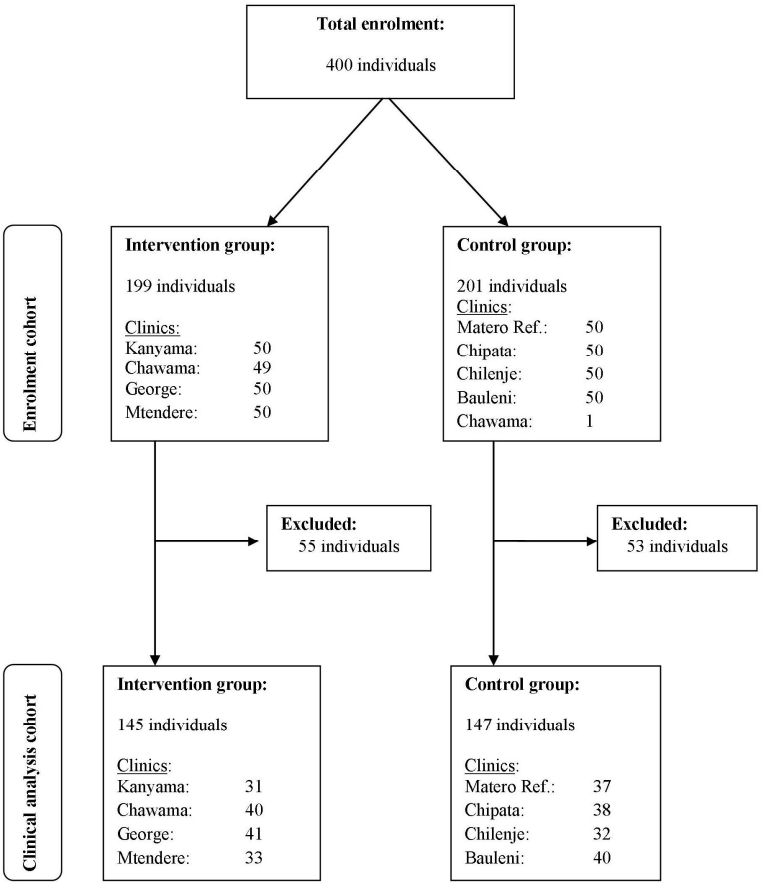
We use data from the survey and secondary data described in Chapter three. The survey which was carried out in August 2009 resulted in a hierarchical dataset at different units of observations: households, patients and other individuals. In this chapter we analyse patient outcomes. The analytic sample is based on an extract of socio-economic variables from the household survey and clinical variables from the electronic medical records. Socio-economic variables include patient demographics and employment status and household level variables such as house

[19] A detailed description of the data and research methodology is presented in chapter three.

ownership, number of HIV positive household members, number of disabled household members, household size, asset ownership and energy sources. Household data are retrospective. For clinical data, we use panel data from the Smartcare electronic medical record system, an administrative data source described in Chapter three. Four clinical measures are analyzed adherence to ART weight, BMI an CD4+ lymphocyte count. Our weight and height data were recorded in the database each time a patient visited a health facility, which in most cases was monthly. We also use pharmacy refill records to compute a measure for adherence as it was not feasible to carry out home visits and count the pills taken by the patients. We will refer to the food assistance programme participants as the intervention group and non-participants as the control group.

The medical record number recorded for each patient interviewed in the survey was checked against the programmatic database to confirm eligibility prior to inclusion in the analysis. Given that the household food assistance programme began in January 2009 and the primary household welfare questionnaire was performed in August 2009, we selected a six month period as most appropriate for the analysis. For inclusion in the calculations of weight change, adherence level and other clinical indicators like cd4 + lymphocyte count and stage of HIV disease, participants required the necessary values recorded in the Smart Care database within predefined window periods. For inclusion in the calculation of ART adherence (defined as the medication possession ratio), patients had to have a pharmacy visit within the window periods. For each variable, we included patients with an initial laboratory value or pharmacy visit within 60 days of 1st January 2009, and a subsequent value or visit 90 to 270 days from this date. For patients who initiated ART and enrolled in the household food assistance programme between 1st January and 1st March 2009 (defined as the study initiation period), we calculated the bounds of the 90 to 270 day window starting from the first recorded ART dispensation. This approach has been used by similar studies (Thirumurthy et al. 2008; Wools-Kaloustian et al. 2005). 105 patients were dropped because their laboratory clinical data were unavailable at the time of the survey. The final cohort for the analysis was reduced from 400 to 292 with 145 patients in the intervention group and 147 patients in the control group. Figure 4.1 illustrates the construction of the analytical sample.

Figure 4.1 Participant enrolment and final clinical analysis cohort



4.3 Methodology

The statistical analysis comprises two stages. The first stage comprises descriptive analysis of the raw sample. The second stage of analysis corrects for selection bias in the sample. Since the programme utilized geographic and community targeting, other factors may have increased a beneficiary's likelihood of being screened and selected for enrolment in the food assistance programme (e.g. the degree of patient contact with clinic staff and community volunteers who were involved in the

targeting or proximity to a food distribution clinic). We therefore estimate the average treatment effect of food assistance using propensity score matching combined with difference in differences matching. We are interested in the average treatment effect on the treated (ATT henceforth) which may be written as follows:

$$\text{ATT}=\text{E}\left(\Delta \mid \text{X},\text{D}=1\right)=\text{E}\left(\text{Y}^{1}_{t}-\text{Y}^{0}_{t} \mid \text{X},\text{D}=1\right)=\text{E}\left(\text{Y}^{1}_{t} \mid \text{X},\text{D}=1\right)-\left(\text{Y}^{0}_{t} \mid \text{X},\text{D}=1\right) \tag{1}$$

Where E represents expectation, D = 1 for exposure to a treatment or programme while D=0 indicates non-exposure, X is a vector of various pre-treatment or pre-programme characteristics, Y^{1} is the outcome for the intervention individuals and Y^{0} is the outcome for the control individuals and t is for period in time. We also combine difference in differences estimation with matching for panel data to remove any potential bias from unobservable heterogeneity and from all time-invariant unmeasured factors between the treatment and control group (Heckman et al.1997; Heckman et al.1998). The difference in differences estimator maybe written as follows (Gilligan and Hoddinott 2007):

$$\text{ATT}=\text{E}\left(\Delta_{t}-\Delta_{\tau} \mid \text{X}_{\tau},\text{D}=1\right)=\text{E}\left(\left(\text{Y}^{1}_{t}-\text{Y}^{0}_{t}\right)-\left(\text{Y}^{1}_{\tau}-\text{Y}^{0}_{\tau}\right) \mid \text{X}_{\tau},\ \text{D}=1\right)$$

$$=\text{E}\left(\text{Y}^{1}_{t}-\text{Y}^{1}_{\tau} \mid \text{X}_{\tau},\ \text{D}=1\right)-\text{E}\left(\text{Y}^{0}_{t}-\text{Y}^{0}_{\tau} \mid \text{X}_{\tau},\ \text{D}=1\right) \tag{2}$$

τ and *t* represent time periods before and after the implementation of the food assistance programme. Since we do not observe the counterfactual, we intend to solve our problem of causal inference by using propensity score matching. The propensity score is defined as P(*X)* = Pr (*D* = 1| *X)*. Propensity score matching enables us to statistically construct a control group by matching observed characteristics of food assistance participants to non-participants based on similar values of *P(X).* Unbiased inference from propensity score matching is based on the assumptions that the treatment and potential outcomes are independent conditional on a set of pre-programme characteristics *X* (Heckman et al. 1998) and that there exists common support for individuals in both groups (overlap) (Rosenbaum and Rubin 1983). It has been shown that propensity score matching

results are best comparable to results from experimental estimators and that propensity score matching also provides reliable and low-bias estimates of programme effects (Heckman et al. 1997, 1998).

As a robustness check, OLS and IV regressions on adherence are compared to matching estimates[20]. OLS regression is based on the following equation:

$$MPR_i = \alpha + \beta\ Foodtransfer + X\gamma + \varepsilon \quad (3)$$

Where MPR_i is the medication possession ratio (an indicator of adherence) for individual *i*; *Foodtransfer* is a dummy for receipt food assistance to household; γ is a vector that summarizes observed household characteristics. They include patient characteristics such as marital status of patient, gender, education, age, age squared; household characteristics such as total number of household productive and durable assets, household size, dependency ratio, sex and age of household head; locality dummies for the clinics/communities and ε is the unobserved idiosyncratic household error. The regional dummies are meant to control for unobserved community effects. IV regression corrects for the potential endogeneity of participating in the food assistance programme, by instrumenting food assistance receipt with characteristics that influence selection of the targeted clinics and rationale behind eligibility into the programme (see chapter three, section 3.5). In a two stage IV model, the first stage regression is based on the following equation:

$$Foodtransfer_i = \alpha + \beta\ Z + X\gamma + \varepsilon \quad (4)$$

Where *Foodtransfer* is a dummy for receipt food assistance to household; γ is a vector that summarizes observed household characteristics and locality dummies. Z represents the instrumental variables used to predict participation in the food assistance programme. We use HIV sero-prevalence rates for pregnant women as a proxy for actual HIV prevalence in the local residential areas serviced by the clinics

[20] In literature there is a plenty of discussion surrounding the inconsistencies and biases of IV (Deaton 2009, Heckman and Urzua 2010, Cameron and Triveldi 2005). Hence IV is by no means the perfect approach. We use IV as a robustness check on the general direction or sign of effect to see if it reinforces the sign of effect from PSM, and diagnostic tests are used to check for finite sample bias.

(Stringer et al. 2008)[21] and past receipt of food aid to reflect any inertia effects from food aid targeting i.e. whether a locality or individual receives food aid is influenced by having received it in previous years (Jayne et al.2002). In the instrumental variables (IV henceforth) regression, we test for the validity of our instruments using the Cragg- Donald Wald F test based on the rule of thumb that an instrument is strong if the critical value is above 10 (Stock and Yogo, 2005) and the Sargan statistic for overidentifying restrictions (Sargan 1988). All statistical analyses are carried out using the procedures for analysis in Stata version 10.

4.4 Results

4.4.1 Descriptive analysis

Baseline characteristics of participants in January 2009 (within a 60 day window for laboratory variables) are presented in table 4.1. The mean age for both groups is approximately 40 years. Both the intervention and control groups are overwhelmingly female (80% for intervention group and 71% for control group). The baseline median BMI is above 20 kg/m2 for both groups (20.1 kg/m2 for the intervention group versus 20.9 kg/m2 for the control group). The baseline median weight for the control group is significantly higher than the median weight for the intervention group (55.5 kg for control group versus 53 kg for intervention group). The baseline mean CD4+ lymphocyte count for both groups is above mean cells/mm^3. A significantly higher proportion of the intervention group was in stage 3 or 4 of HIV disease (stages are according to World Health Organization guidelines) compared to the control group (41% for intervention group versus 18% for control group). A significantly higher proportion of the intervention group lived near a public sector/government clinic (95% for intervention group versus 83% for control group) and received support from community home based care volunteers (61% for intervention group versus 28% for control group). Community home based volunteers are usually fellow patients or community support groups for people living with HIV/AIDS.

[21] See section 3.3.2 and 3.5.1 in chapter 3 for the justification of the use of clinic HIV prevalence in geographic targeting and as an instrument for receiving food assistance. Clinic HIV prevalence rates represent local HIV prevalence rates. In our study we use antenatal surveillance prevalence rates as a proxy for the local HIV prevalence rates.

Table 4.1 Baseline characteristics of patients, unmatched sample

		Intervention Group (N=145)	Control Group (N=147)	Significance
Age, mean (CI)		41 (39.6,43)	40 (38.7,41.6)	
Sex	Female	80%	71%	*
	Male	20%	29%	
WHO Stage	I or II	59%	82%	***
III		35%	16%	
IV		6%	2%	
CD4+ lymphocyte Count				
Median cells/mm^3 (IQR)		333 (201, 502)	352 (243, 485)	
Mean cells/mm^3, CI		367(325, 409)	366(327, 405)	
Weight				
Overall Median kg (IQR)		53(48,59)	55.5(50,61)	**
Female		52.5(46,59)	55(49.7,61)	
Male		54.5(50.5,59)	58(52,64)	*
Weight-Overall Mean, CI		54.5(52.8,56.3)	56.(54.9,58.9)	
Female		54.4(52.3,56.6)	56.2(53.8,58.6)	
Male		54.8(52.3,57.3)	59.0(55.7,62.4)	*
ART days				
Overall Mean, CI		777 (692.5,863.4)	864(782.1,946.5)	
Body Mass Index				
Median kg/m^2 (IQR)		20.1 (18.3,23.1)	20.9 (19.0,23.6)	**
Female		20.6 (18.6,23.4)	21.5 (19.1,23.9)	*
Male		18.9 (18.1, 21.1)	19.9 (19.0,21.7)	*
Mean, CI		20.6(20.0, 21.3)	21.5(20.8,22.2)	
Female		21.1(20.3, 21.8)	21.9(21.1,22.8)	
Male		19.1(18.3, 20.0)	20.3(19.4 ,21.3)	*
Other characteristics				
No education		14%	12%	
Primary education		48%	41%	
Secondary education		30%	40%	*
College education		2%	3%	
Married		43%	47%	
Divorced or separated		14%	15%	

Table 4.1 continued

	Intervention Group (N=145)	Control Group (N=147)	Significance
Widowed	38%	34%	
Never married	5%	3%	
Time to reach public sector clinic is less than 1 hr	95%	83%	***
Patient is unemployed	76%	64%	*
Disabled household members	8%	5%	
Local area population, mean (CI)	116037 (111982, 120093)	103694 (99468, 107919)	***
All HIV positive members in household , mean (CI)	1.5(1.4, 1.7)	1.5(1.4, 1.7)	
Household size, mean (CI)	5.4(5.3, 5.5)	5.4(5.3,5.5)	
Number of durable assets owned, mean (CI)	1.8(1.4, 2.2)	2.2(1.8, 2.5)	

Notes: * = p<0.10; ** = p<0.05; *** = p<0.01. Abbreviations: CI, confidence interval; IQR, interquartile range; WHO, World Health Organization. Sample size limited by available data (sampling period +/- 60 days from 1st January, 2009). Number of observations vary for each variable e.g. (intervention/control); WHO stage: n=100/102 as of 1st January, 2009, BMI: n=129/109, Weight: 135/119. ART days-overall median is 995 days. (Durable assets refer to the following; bicycle, farm implements, mobile phone, household furniture, stove and refrigerator and vehicles.

4.4.2 Propensity score matching estimates: effect of food assistance on adherence to ART

Table 4.2 presents results of the probit model used to create the propensity score for matching intervention patients and control patients. The 21 conditioning variables used in the probit model to create propensity scores for the matching algorithm are obtained from household survey data and are based on theoretical and empirical grounds of association with participation in the food assistance programme, and these include age, gender and education level of patient, employment status, household size, and asset ownership (Gilligan and Hoddinott 2007). We also include additional variables based on our knowledge on how the food assistance programme targeting criteria were actually implemented and factors which may have affected the degree of patient contact with clinic staff and, by extension, the likelihood of being screened for enrolment in the assistance programme. Such variables are the number of HIV positive household members or the number of disabled household members (unique indicators of vulnerability in HIV affected households), distance from the patient's residence to the clinic and

the severity of illness of patient at the time of enrolment (i.e. stage 3 or 4 of disease). We also include local area population as a community level covariate[22].

The major aim of the propensity score model is to find a propensity score that balances treated and control cases; hence we do not use this model for causal inference or place emphasis on the statistical significance of the probit models (Heckman and Navarro-Lozano 2004)[23]. The propensity score distribution and common support range is shown in a histogram in figure B4.1 (at the end of the chapter). Accordingly participants whose estimated propensity score is above the maximum or below the minimum propensity score for the control group did not have "common support" in the control group and are dropped from the matched sample (Smith and Todd 2005).

Single difference matching estimates are computed for adherence to ART. We match patients using the kernel algorithm[24]. For the robustness check and sensitivity analysis we compare kernel matching estimates with the nearest neighbor (with replacement[25]) matching and kernel matching trimming 2.5% of the treated cases where propensity score density of the control cases is lowest. The matching estimators are implemented using Leuven and Sianesi's method (Leuven and Sianesi, 2003). The balancing property is satisfied after testing for the equality of means for each characteristic included in the probit model. None of the characteristics remained significantly different between the two groups either using the before matching or Dehejia and Wahba test (Dehejia and Wahba 2002, see table B4.1b) after matching t-test in mean differences for each covariate (see table B4.1).

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[22] Dummy variables for the clinics were dropped from the probit model after encountering a problem of quasi-separation. This is because the values for clinic variable (categorical) overlap or are tied at a single or only a few values of the variable indicating receipt of food transfers. For instance, half the categories in the variable are identical to either the 0 or 1 of the dummy variable for receipt of food transfers. Therefore, the model failed to converge. However we include clinic/locality dummies in regressions to check for any unobserved locality effects.

[23] Significant predictors for receiving food assistance include proximity to a food distribution clinic patient diagnosis of being in the latter WHO stages of HIV disease, not owning a house, patient completed primary education only and patient being a widow(er) .

[24] We use the default bandwidth of 0.06 for the kernel algorithm in psmatch2 software.

[25] Matching with replacement leads to smaller bias than matching without replacement especially when there are fewer controls which are similar to treated units (limited overlap) (Dehejia and Wahba 2002). Hence one control unit is matched to treated units more than once.

Table 4.2 Probit estimates for receiving food assistance or participating in the food assistance programme

	Coefficient	S.E	
Patient characteristics			
Body mass index at baseline	-0.014	0.029	
Age	-0.103	0.094	
Age squared	0.001	0.001	
Female	0.137	0.242	
College education	-0.459	0.943	
Primary education level	0.429	0.227	**
Secondary education level	0.033	0.231	
Divorced or separated	0.158	0.546	
Widowed	0.723	0.312	**
Never married	0.542	0.502	
Time to reach public sector clinic less than 1 hr	1.104	0.452	**
WHO stage 3 and 4 of HIV disease at baseline	0.543	0.029	**
Patient is unemployed	0.125	0.241	
Household characteristics			
Household does not own a house	0.449	0.240	**
Number of HIV positive household members	0.053	0.072	
Number of disabled household members	0.363	0.390	
Household size	-0.063	-0.820	
Number of durable assets owned	-0.001	-0.062	
Household uses charcoal as fuel source	0.177	0.279	
Locality characteristics			
Total population in locality/area served by clinic	0.00003	0.00004	
Total population in locality/area served by clinic squared	-1.76e-10	2.12e-10	
Constant	-2.158	2.881	
Number of observations = 178			
LR chi2 (21) = 40			
Prob > chi2 = 0.0074			
Pseudo R2 = 0.1670			

Notes: Dependent variable equals one if household received food assistance in January 2009, and zero otherwise. Patient and household characteristics are from January 2009. * = p<0.10; ** = p<0.05; *** = p<0.01. Propensity score within common support range is (0.03, 0.85)

Table 4.3 shows the matching estimates on adherence to ART. Medication possession ratio (MPR) estimates the amount of time the patient has the ART medication available during the 6 months of the food assistance programme. Following Cantrell et al (2008) we computed the MPR by dividing the number of days late for pharmacy refills by total days on ART in 6 months and then subtracting the percentage from 100%.

Table 4.3 The impact of food assistance on adherence at six months: single difference matching estimates

Adherence (MPR)	Kernel	Kernel trim (2.5%)	NN
Intervention Group	98.3%	98.3%	98.3%
Control group	88.8%	89.3%	88.1%
Difference in outcome ATT	9.5%***	9%***	10.2%**
	(0.062)	(0.054)	(0.053)

Notes: * = p<0.10; ** = p<0.05; *** = p<0.01. Bootstrapped standard errors in parentheses. NN-Nearest Neighbor matching. Probit model for propensity scores covers only 178 observations. N for the intervention (61) and control group (107) is further reduced after imposing common support on propensity score matching and final sample size is the result. One treated unit is matched to more than one control unit.

The result is a significant and positive ATT in adherence. The average impact of treatment ranges from 9% (caliper) to 10.2% (nearest neighbour) depending on the matching algorithm used. Regression estimates on adherence are comparable to the positive effect reflected in the matching estimates in table 4.3[26]. The results are presented in table B4.2[27] (appendix at the end of chapter). The overall food

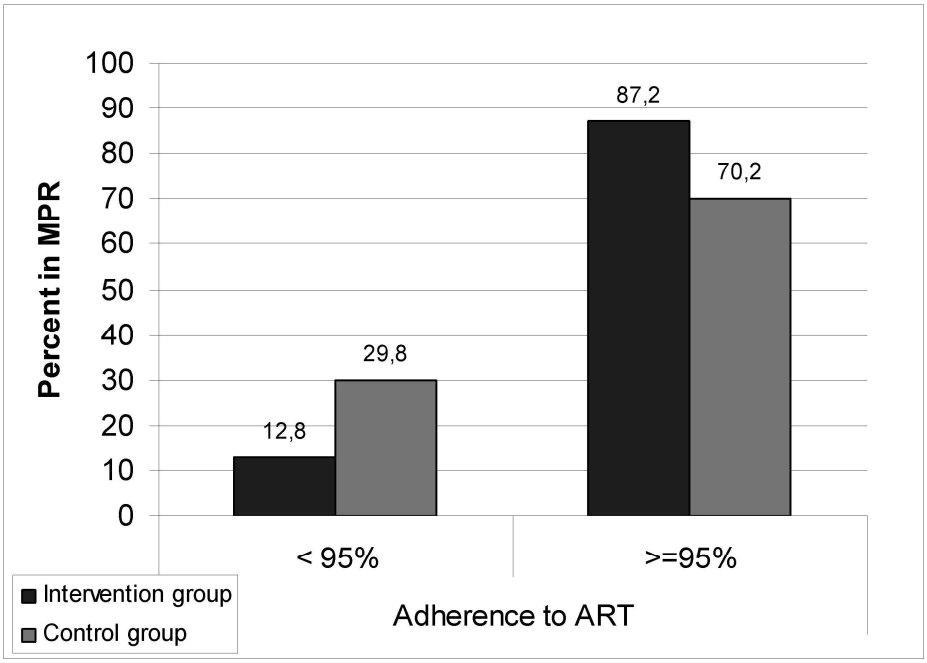
[26] For IV regression estimates, the Hausman test for endogeneity is not significant. Diagnostic tests for instruments reject the null hypothesis that the IV model is weakly identified. The F statistic seems to indicate minimal finite sample biases of the IV estimates. The Sargan test accepts the null hypothesis that the IV model satisfies overidentifying restrictions and that the instruments are valid.

[27] Variables excluded did not have a significant effect and they include age, gender, education level, patient's unemployment status, divorce, or widow status of patient, WHO stage 2 and 4 of HIV disease, distance to public sector clinic, not owning a house, number of productive assets owned, disability, sum of all HIV positive members in household, use of charcoal as a fuel, local area population served by the public sector clinic. Positive predictors of adherence in the regressions are household size and initial BMI of patient. Negative predictors are being unmarried and being in stage 2 and 3 of HIV disease relative to stage 1 and experiencing any stigma.

assistance effect is about 6% in OLS regression (with locality dummies) and about 8% in the IV regression.

Several studies have demonstrated that 95% adherence may be required for one to be at lower risk of virologic failure and the development of ART resistance compared to those with suboptimal adherence (Goldman et al. 2008; Maggiolo et al. 2007; Gardner et al., 2009). Matching estimates show that the intervention group has optimal adherence (98%) while the control group has suboptimal adherence (88%). Figure 4.2 illustrates the proportions (from matched samples) with optimal and suboptimal adherence for both groups. About 87% of the intervention group optimally adhere to ART (>=95%) compared to only 70% of the control group. Nearly 30% of the control group has suboptimal adherence compared to 13% of the intervention group.

Figure 4.2 Optimal and suboptimal adherence at 6 months: matched sample



We assess the relationship between duration of ART and the effect size associated with food assistance. Ideally we would have preferred to focus only on patients

who began treatment at the time the food assistance programme commenced. However, only a tiny group of patients began ART at about the same time as the food program (14 patients). Most of the patients were already established on ART when the program began, as indicated by the median duration on ART of 995 days. We therefore compare patients below and above the median value and results are presented in tale 4.4. The results show that food assistance has a larger effect on adherence for patients who had been on ART for less than the median (995 days), compared to the full sample estimates in table 4.3. The treatment effect ranges from 13.6 to 16%. Regression estimates also show a comparable positive effect of 12% (OLS) and 12.7% (IV[28]). The results are shown in table B4.3[29].

For patients who had been on ART for more than the median of 995 days, food assistance appears to have no significant effect. Regression estimates also show no significant effect of food assistance. The results are presented in table B4.3[30] (appendix at the end of chapter).

[28] For IV regression estimates, the Hausman test for endogeneity is not significant. Diagnostic tests for instruments reject the null hypothesis that the IV model is weakly identified. The F statistic seems to indicate minimal finite sample biases of the IV estimates. The Sargan test accepts the null hypothesis that the IV model satisfies overidentifying restrictions and that the instruments are valid.

[29] It would appear that unobserved regional or locality effects have a minor effect hence, our matching estimates are reliable. Similar to table B4.2, variables not reported did not have a significant effect in OLS and they include age, gender, education level, patient's unemployment status, divorce, or widow status of patient, WHO stage 2 and 4 of HIV disease, distance to public sector clinic, not owning a house, number of productive assets owned, disability, sum of all HIV positive members in household, use of charcoal as a fuel, household size local area population served by the public sector clinic, regional dummies., BMI. Negative predictors are being unmarried, facing any stigma and being stage 2and 3 of HIV disease relative to stage 1.

[30] Variables not reported did not have a significant effect and they include gender, education level, patient's unemployment status, divorce, or widow status of patient, WHO stage 2, 3 and 4 of HIV disease, distance to public sector clinic, not owning a house, number of productive assets owned, disability, sum of all HIV positive members in household, use of charcoal as a fuel, household size local area population served by the public sector clinic. Positive predictors include local area population. Age is a negative predictor.

Table 4.4 The impact of food assistance on adherence by ART duration: single differences matching estimates

Adherence (MPR) conditional estimates	Kernel	Kernel trim 2.5%	NN
ART<995 days			
Intervention Group	98.4%	98.4%	98.4%
Control group	83.9%	84.8%	82.3%
Difference in outcome ATT	14.5%*** (0.042)	13.6%*** (0.048)	16.1%* (0.084)
ART>995 days			
Intervention Group	96.7%	97.95%	97.8%
Control group	97.8%	97.97%	96%
Difference in outcome ATT	-0.2% (0.012)	-0.02% (0.013)	1.8% (0.018)

Notes: * = p<0.10; ** = p<0.05; *** = p<0.01. Bootstrapped standard errors in parentheses. NN-Nearest Neighbor matching. Probit model for propensity scores covers only 178 observations. For ART<995 days, N for the intervention (37) and control group (53), further reduced after imposing common support. For ART>995 days, N for the intervention (31) and control group (53), further reduced after imposing common support. One treated unit is matched to more than one control unit.

4.4.3 Matching estimates: effect of food assistance on weight, BMI and CD4+ lymphocyte count

We combine matching with difference-in-differences estimation for weight, BMI, CD4+ lymphocyte count outcomes. Table 4.5 shows the difference in differences matching estimates for the average treatment effect on the treated (ATT) for weight, BMI and CD4+ lymphocyte count. The ATT for weight, BMI and CD4+ lymphocyte count in all matching algorithms is not statistically significant.

Further analysis of the effect of food assistance stratified by the duration or time spent on ART shows no significant estimates either[31].

[31] Results available on request.

Table 4.5 The impact of food assistance on weight, BMI and CD4+ lymphocyte count: difference-in-differences matching estimates

	Kernel	Kernel trim (2.5%)	NN
Weight in kg			
Intervention Group	0.440	0.520	0.440
Control group	0.639	1.060	0.867
Difference in average outcomes ATT	-0.199	-0.54	-0.427
	(0.807)	(0.873)	(1.048)
Body Mass Index in kg/m^2			
Intervention Group	0.182	0.217	0.182
Control group	0.251	0.414	0.328
Difference in average outcomes ATT	-0.069	-0.197	-0.146
	(0.351)	(0.265)	(0.457)
CD4+ Cell count			
Intervention Group	2.714	-0.71	2.714
Control group	-28.005	-29.79	3.357
Difference in average outcomes ATT	30.719	29.08	-0.643
	(37.75)	(40.496)	(51.97)

Notes: * = p<0.10; ** = p<0.05; *** = p<0.01. N.B. ATT for weight and BMI not significant. Bootstrapped standard errors in parentheses. NN-Nearest Neighbor matching. Probit model for propensity scores had only 178 observations. Matching uses only 154 observations as there are 24 missing observations for weight and BMI data. N for the intervention (48) and control group (90) is further reduced after imposing common support on propensity score matching (16 treated cases not on support). Final sample size is the result of one to many matching, where more than one control unit is matched to one treated unit.

4.5 Cost Comparison

Direct costs of the food assistance programme as a share of total program costs is approximately 70%. The approximate total direct and indirect cost of one food assistance ration per month is US$37.53 (including transport, logistics, and direct and indirect staff support costs). This would translate to about US$1.25 per day and based on the average household size in our data of four persons, US$ 9.40 per

individual/patient per month[32]. In comparison Ndekha et al (2009) found that an individual corn-soy blend ration (without maize grain, pulses or cooking oil) costs US$5.40 per patient per month in Malawi, while a therapeutic feeding fortified spread was three times as much at US$16 per patient per month. Hence it appears that the food assistance programme is relatively cheaper than other macronutrient supplementation programmes in a similar country like Malawi.

Further comparison of the food assistance programme with a cash transfer programme in Zambia (Kalomo district), shows that the food assistance programme costs about US$37.53 per household per month compared to US$8.75 per household per month for the cash transfer programme[33].

4.6 Discussion

Our analysis of clinical data from food assistance participants and an equal number of non-beneficiary patients in Lusaka, Zambia finds no significant effect of food assistance on weight change or CD4+ lymphocyte recovery over a six month period following programme commencement in January 2009. This is in line with previous findings (Rawat et al. 2010, Cantrell et al. 2008). The lack of a significant effect on weight gain could be explained by several factors. First, the food assistance programme targeting criteria were based on household food insecurity and vulnerability rather than poor nutritional status of the HIV-infected individual. Second, food assistance participants were not severely malnourished and had been on ART for a prolonged period prior to programme enrolment and demonstrated strong immune reconstitution, as evidenced by a baseline median CD4+ lymphocyte count above 300 cells/mm^3. Third, the food commodities provided were mainly maize flour, lentils and oil augmented with fortified blended corn and soya flour, rather than the energy-dense ready to use therapeutic feeding products provided in prior randomized trials (van Oosterhout et al 2010; Ndekha et al. 2009). Lastly, the probable sharing of food rations within the family was likely high, and the actual intake by the HIV-infected individual may have been highly variable. The lack of positive effect on weight gain or immune recovery does not imply that food assistance to ART patients cannot improve health outcomes, but it does

[32] Based on http://one.wfp.org/operations/current_operations/project_docs/104470.pdf. Projected total costs for component 2 (NPVG) of WFP Zambia programme from 2007-2010 is US$18 370 809 for 18111 tonnes of food aid.

[33] Cash transfer estimate based on http://www2.gtz.de/dokumente/bib/05-0542.pdf. Annual cost of Kolomo cash transfer scheme is projected at US$21 million for 200000 households.

suggest that individual health improvements should not be assumed as a collateral benefit of household-level assistance programs.

Propensity score matching and regression estimates demonstrate a statistically significant effect of food assistance on the MPR (our metric of ART adherence), supporting recent data on the effect of macronutrient supplementation on adherence to ART (Cantrell et al., 2008). As mentioned earlier, several studies have demonstrated that 95% adherence may be required for optimal ART outcomes and reduce the likelihood of ART resistance compared to those with less than 95% adherence (Goldman et al. 2008; Maggiolo et al. 2007; Gardner et al. 2009). In our cohort, matching estimates show that the intervention group has optimal adherence while the control group has sub-optimal adherence. Other positive predictors of adherence include household size, while negative predictors include being unmarried, having a lower education level, and having a prior diagnosis of stage 3 HIV disease. The placement of food distribution at the clinics where patients receive their medication appears to work as an incentive for adherence to ART by enabling patients to collect food rations and their medicine together.

We also find that among patients on treatment for less than the sample median of 995 days, enrollment in the food assistance programme has a significant and larger positive effect size compared to the full sample estimates. However, food assistance does not appear to increase adherence among patients who had been on ART for more than the median of 995 days. This suggests that food assistance has a greater effect on adherence among patients recently started on ART. However, caution is warranted in interpreting these results given the small sample size and the unclear clinical significance of small variations in the MPR.

Our study had several limitations. Firstly, the methodology was observational, non-randomized, and the sample size may have been too small to detect differences in some endpoints. Participants in the intervention group were significantly more likely to live within one hour of the food distribution clinic, and be enrolled in community home based care, which may indicate a selection bias. To reduce confounding, we include these variables as conditioning variables in the model for predicting the propensity score and also use instrumental variables in regression. Study clinics were matched according to duration of operation, active patient population, and 18-month mortality rate, but data were not available to match clinics according to economic or social characteristics of the population accessing care. Finally, our clinical data were collected from a programmatic database, as opposed to a research database, which may be more likely to include

erroneous values. However, the Zambian national ART database has been the source for multiple prior published analyses of ART and nutritional outcomes, and widespread errors have not been previously reported.

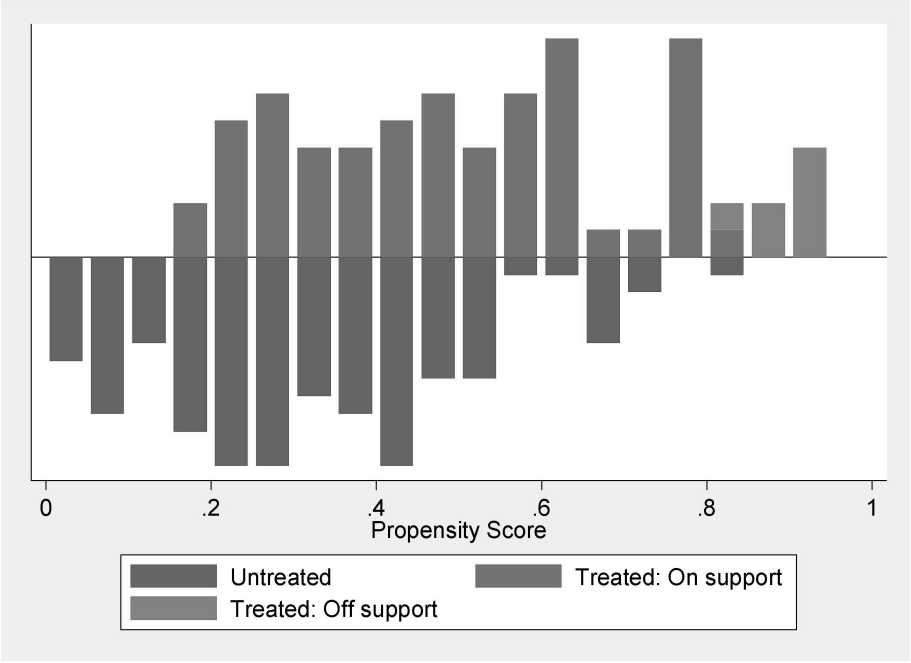
While our study did not demonstrate a significant effect of food assistance on an HIV patient's weight or nutritional status, food assistance could have had an impact on other outcomes. Beyond individual health effects, a high prevalence of HIV infection in a household is a multifaceted phenomenon with broad economic, social, and political impact. At the level of the family, the burden of morbidity conferred by HIV disease may have widespread effects on income, labour supply, food consumption, stability and the ability to provide and care for dependants. As mentioned earlier, HIV has negative consequences on household income, farming activity and agricultural output (Haddad and Gillespie, 2001; Mutangadura et al. 1999; Kwaramba 1998). Therefore there are other potential socio-economic effects of food assistance especially at household or community level.

4.7 Conclusion

Our study uses rigorous quasi-experimental analysis and shows that food assistance significantly improved adherence to ART. While for this food assistance programme, duration of ART and clinical characteristics were not part of the targeting criteria, our results hint at a likely greater impact of food assistance on adherence during the earlier phase of ART rather than later, indicating that duration of ART does influence the effect of food assistance. Hence programmes that integrate food and nutritional support with treatment of HIV at earlier stages of treatment could enable patients to take up treatment and promote initial adherence, which could potentially support managing side effects, improving treatment success, clinical health and nutritional recovery. Our findings suggest that the immediate effects on body weight and immune recovery are minimal in the absence of clinical malnutrition, especially when the selection of eligible patients and composition of foods provided was tailored towards improving food security and the welfare of HIV-affected families rather than direct nutritional improvement.

Appendix B

Figure B4.1 Histogram of region of common support and propensity score distribution



Notes: Propensity score distribution for the treated and untreated cases.

Table B4.1 Balancing property: t-test of mean differences after matching

Covariate	Mean		T-test of Mean Differences P-value
	Treated	Control	
Body mass index at baseline	21.043	20.578	0.515
Age	43.23	40.907	0.211
Age squared	1973.5	1772	0.222
Female	0.738	0.767	0.708
College education level	0.131	0.082	0.383
Primary education level	0.557	0.459	0.281
Secondary education level	0.22951	0.262	0.677
Divorced or separated	0.066	0.033	0.418
Widowed	0.197	0.144	0.443
Never married	0.066	0.092	0.596
Time to reach public sector clinic less than 1 hr	0.984	0.975	0.731
WHO stage 3 and 4 of HIV disease at baseline	0.508	0.553	0.622
Patient is unemployed	0.721	0.780	0.453
Household does not own a house	0.705	0.689	0.852
Number of HIV positive household members	2.885	2.931	0.873
Number of disabled household members	0.098	0.167	0.271
Household size	4.803	4.358	0.153
Number of durable assets owned	1.885	1.954	0.837
Household uses charcoal as fuel source	0.852	0.843	0.885
Total population in locality/area served by clinic	97157	98838	0.705
Total population in locality/area served by clinic squared	1.0e+10	1.0e+10	0.689

Table B4.1a Dehejia and Wahba balancing test (before matching)

****
Step 2: Test of balancing property of the propensity score
****
The balancing property is satisfied

This table shows the inferior bound, the number of treated and the number of controls for each block

Inferior of block of pscore	Controls	Treated	Total
0. 0289386	27	3	30
0.2	41	20	61
0.4	27	22	49
0.6	8	18	26
0.8	1	8	9
Total	104	71	175

Note: the common support option has been selected

****
End of the algorithm to estimate the pscore
****

Table B4.2 Regression estimates of the effect of food assistance on adherence at six months

Dependent Variable: Medication Possession Ratio	OLS	IV
Food assistance	0.063 **	0.076**
	(0.029)	(0.030)
Household size	0.011*	0.011**
	(0.007)	(0.005)
Never married	-0.146***	-0.146***
Referent: married	(0.044)	(0.039)
WHO stage 2 of HIV disease		-0.056*
Referent: WHO stage 1 of HIV disease		(0.03)
WHO stage 3 of HIV disease	-0.062**	-0.065***
Referent: WHO stage 1 of HIV disease	(0.026)	(0.024)
If patient experiences any stigma		-0.002*
		(0.001)
BMI	0.006**	0.006**
	(0.003)	(0.003)
Locality dummies	Yes	Yes
Constant	1.131***	1.190***
	(0.287)	(0.262)
N	122	122
R-squared	0.297	0.296
Durbin Wu-Hausman chi-square test	0.822	
Cragg-Donald Wald F statistic		139.249
Sargan statistic		0.015

Notes: * = p<0.10; ** = p<0.05; *** = p<0.01. Figures rounded off to 3 d.p. Standard errors in parentheses. Variables excluded did not have a significant effect and they include age, gender, education level, patient's unemployment status, divorce, or widow status of patient, WHO stage 2 and 4 of HIV disease, distance to public sector clinic, not owning a house, number of productive assets owned, disability, sum of all HIV positive members in household, use of charcoal as a fuel, local area population served by the public sector clinic. Instruments are local HIV prevalence and past use of food assistance. Durbin-Wu-Hausman Test checks for endogeneity in the OLS model, Cragg Donald Wald F test for weak instruments and Sargan statistic for overidentifying restrictions.

Table B4.3 Regression estimates of the effect of food assistance on adherence by ART duration

	ART Duration			
Dependent Variable: Medication Possession Ratio	*< median (995 days)*	*> median (995 days)*	*< median (995 days)*	*> median (995 days)*
	OLS	*OLS*	*IV*	*IV*

Food assistance	0.122**	-0.003	0.127**	-0.005
	(0.051)	(0.014)	(0.047)	(0.011)
Never married	-0.337***		-0.337***	
	(0.092)		(0.074)	
Experiencing any stigma	-0.005*		-0.005**	
	(0.003)		(0.003)	
WHO stage 2 of HIV disease	-0.093*		-0.094**	
Referent: WHO stage 1	(0.055)		(0.044)	
WHO stage 3 of HIV disease	-0.092**		-0.093**	
Referent: WHO stage 1	(0.045)		(0.036)	
Household size				0.005*
				(0.003)
Age		-0.012*		-0.012***
		(0.006)		(0.004)
Local area population		1.28e-06*		1.37e-06**
		(7.13e-07)		(5.40e-07)
Locality dummies	Yes	Yes	Yes	Yes
Constant	1.44***	1.091***	1.467***	
	(0.516)	(0.153)	(0.429)	
N	67	54	67	54
Durbin Wu-Hausman chi-square test statistic	0.053			
Cragg-Donald Wald F statistic			59.688	
Sargan statistic			1.159	
R-squared	0.485	0.60	0.485	0.22

Notes: * = p<0.10; ** = p<0.05; *** = p<0.01. Figures rounded off to 3 d.p. Standard errors in parentheses. It would appear that unobserved regional or locality effects have a minor effect hence, our matching estimates are reliable. Similar to table B4.2, for ART< 995 days, variables not reported did not have a significant effect they include age , gender, education level, patient's unemployment status, divorce, or widow status of patient, WHO stage 2 and 4 of HIV disease, distance to public sector clinic, not owning a house, number of productive assets owned, disability, sum of all HIV positive members in household, use of charcoal as a fuel, household size, local area population served by the public sector clinic, BMI. For ART> 995 days, variables not reported did not have a significant effect and they include gender, education level, patient's unemployment status, divorce, or widow status of patient, WHO stage 2, 3 and 4 of HIV disease, distance to public sector clinic, not owning a house, number of productive assets owned, disability, sum of all HIV positive members in household, use of charcoal as a fuel, household size local area population served by the public sector clinic.

5. Consumption Responses to Integrating AIDS Treatment with Food Transfers[34]

5.1 Introduction

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

[34] This chapter is based on earlier version available as Tirivayi, N and W. Groot. 2010. In-Kind Transfers, Household Spending Behaviour and Consumption Responses in HIV Affected Households. Maastricht Graduate School of Governance Working paper 2010/009. Gratefully acknowledge funding from UNAIDS, World Health Organization (Regional office for Africa), Ford Foundation and the Poverty Reduction, Equity and Growth Network.

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

This chapter examines the consumption responses of the food aid programme for ART patients and their households as described in chapter three. In chapter four we find that the food transfers have a positive effect on adherence to AIDS treatment by patients. In view of the constant threat of food insecurity and poverty which could adversely affect AIDS treatment outcomes and household welfare, we seek to answer the following questions. Is there an additional welfare gain from providing food transfers together with another welfare improving intervention like AIDS treatment? What is the size of the transfer relative to normal household consumption? What is the marginal propensity to consume (MPC) food from food transfers relative to that of cash income? What are the differential effects of food transfers on food consumption expenditures and marginal propensity to consume food by income level, decision making and HIV burden of the household? We assess food consumption outcomes like food diversity and food consumption expenditures as a way of determining whether the programme improves short term food security and welfare. Determining the size of the total transfer relative to usual household consumption is important in testing theoretical predictions and interpreting household behavioural response to the food transfers. Interpreting the effect size relative to the size of the transfer could help programme implementers use this information in the design and targeting of future programmes and in the allocation of resources.

Since all households in the study have a patient receiving treatment, to measure the effects of the food aid ration, we compare households receiving food aid rations with households not receiving food aid rations. We shall use the terms "participants" and "non-participants" to describe the treated and control households respectively. We also use the terms food transfers and programme

interchangeably. Participants began receiving food transfers during the month of February 2009. We measure the programme's effects on household consumption expenditures and food intake. We use data collected in August 2009 during a follow up survey to measure the effect of the food aid on consumption. Our study takes place after 6 months of the ongoing monthly food aid programme. The data set covers 400 households with an identified patient on HIV treatment, randomly sampled from 8 clinics located in low income residential areas of Lusaka, the capital of Zambia. The survey also captured pre-programme data on household consumption, wealth and employment, retrospectively. We acknowledge the limitations of such data especially the greater prospects of higher recall bias. We therefore interpret all panel estimates cautiously.

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

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

law predicts. Still, despite the small size of the transfer, the magnitude of the effect size on consumption outcomes (relative to cash income or an equivalently valued cash transfer), has potential repercussions on other household behaviour (e.g. labour supply).

The chapter is organized as follows. In the next section, we briefly explain our theoretical foundations. The following section discusses the estimation strategy for measuring the effects of the food transfers. Section 5.4 describes the data. Section 5.5 presents the estimation results and section 5.6 concludes the chapter by discussing the implications of the estimation results and the limitations of the chapter.

5.2 Theoretical Framework

Traditional neo-classical theories have influenced the study of food transfers and their effects on household consumption. This chapter will test predictions from Engel's law which states that a poor household devotes a higher proportion of its total expenditure on food. We also test Southworth's theoretical predictions using empirical evidence (Southworth 1945). Southworth's traditional neo-classical economic hypothesis on consumer choice regarding a food stamp transfer has been the major theoretical foundation for most studies seeking to compare the marginal effects of food transfers compared to cash income (Fraker 1990). According to the theory, there are two types of transfers depending on their size. If an in-kind transfer programme is "extramarginal" i.e. it is greater than the amount the household would have consumed without the transfer, then the transfer would cause both an income effect and a substitution effect that makes the good cheaper hence will increase the consumption of that good (Alderman, 2002). The substitution effect would only occur where there is no resale of the transfer (Sharma, 2006; Ahmed and Shams, 1994). If an in-kind transfer is 'inframarginal" i.e. it is less than the amount the receiving household would have consumed without the transfer, the in-kind transfer would have an income effect on expenditures, the same as a similar sized cash transfer or cash income (Castaneda 2000). The majority of the literature which focuses on food stamps finds that the marginal propensity to consume food out of food stamps is two to ten times higher than out of cash income and surprisingly even for inframarginal transfers (Fraker 1990). However Hoynes and Schanzenbach (2009)'s findings on inframarginal food stamps are consistent with Southwork's theory.

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

The chapter is also influenced by modern household economic theory which highlights the importance of intrahousehold decision making in household spending behaviour, particularly the gender of who controls or makes decisions on how the transfer is used. There is substantial empirical evidence that women tend to spend more on food and child welfare compared to men, and that female-headed households have a greater marginal propensity to consume food than male-headed households (Attanasio and Mesnard 2006, Ezemenari et al. 2003, Lundberg et al. 1997). Another factor to take into consideration is that our data were collected after 6 months of a food aid programme that was officially expected to continue for another 6 months[35]. However our beneficiaries are aware of past food aid programmes that continued for as long as 3 years and the programme that we study in this chapter was not terminated but transitioned to a food voucher programme which is currently operational. Consequently, following the permanent income hypothesis food transfer recipients could be making spending decisions based on a rational assessment of anticipated future income which would include the food transfer (Friedman 1957). In addition to analysing spending levels, it is important to determine if actual food consumption is affected by the food transfer since studies have shown that food aid rations increase food security and total calories consumed by a household (Ahmed et al. 2009, Sharma 2005, Alderman 2002).

Our empirical strategy includes analysing the average impacts of the food transfer on household consumption expenditures and food diversity through matching food transfer recipients and eligible non-recipients. We also analyse food

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

consumption expenditure levels before and after 6 months of food transfer receipts and compare the marginal propensity to consume food out of a food transfer with that from cash income.

5.3 Estimation Strategy

5.3.1 Propensity score matching

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

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

i)

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

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

ii)

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

5.3.2 Non-Parametric Analysis

We use kernel-weighted local polynomial regression to analyse the food consumption expenditure of the households by income level. Log per capita monthly food expenditure is the indicator for food consumption expenditure while we use log per capita total consumption expenditures as a proxy for household income. We analyse food consumption expenditure before and after six months on the food aid programme. The non-parametric analysis is not corrected for endogenous programme take-up. Kernel density estimations are also used to

estimate the probability density function of food consumption expenditure before and after six months on the food aid programme.

5.3.3 Parametric analysis

We use parametric estimation to determine the effects of food transfers on food consumption expenditure, results which could be compared to results from propensity score matching. We are also interested in estimating the marginal propensity to consume food out of food transfers and compare these with the marginal propensity to consume food out of general cash income. We include a dummy for receipt of food transfers and family cash income as covariates in the specifications (Hoynes and Schanzenbach 2007). Household cash income is proxied by total cash expenditures. In our specifications expenditure values are logged to normalize values especially in case of skewed distributions and to stabilize variances. Since we have follow up data and panel data, we use two parametric specifications of the data. The first specification focuses only on the cross sectional data (data from the follow up survey). We use a double log specification:

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

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

A valid concern in our specification is the measurement error in per capita expenditures which could potentially be serious since our data are from a developing country (Kedir and Girma 2007, Deaton 1997). Measurement error in expenditures would bias our estimates through regression error correlation or endogeneity. One source of measurement error in expenditure data from developing countries is that it can be correlated with household size. For instance a respondent from a larger household is more likely to find it difficult to recall food purchases than a respondent from a smaller household. The measurement error can be corrected for by using non-food expenditures as an instrument (Deaton, 1997). Non-food expenditures are less likely to be correlated with household size and easier to recall as they are purchased infrequently (Gibson 2002). Non-food expenditures as an instrumental variable are an inconsistent estimator, however

with precise estimates (Subramanian and Deaton 1996). Non-food expenditures were the only valid instrument available for the model. Hence, we instrument log per capita total expenditures with log per capita non-food expenditures (Schady and Rosero 2008). Another concern arises from the fact that the food transfers programme was not randomly assigned to "treatment" and "control groups", therefore we expect participation in the food transfers programme to be endogenous. We correct for the potential endogeneity of participating in the food transfers programme, by instrumenting food transfers receipt with variables based on the targeted clinics and rationale behind eligibility into the programme (vulnerability to food insecurity)[36]. Hence we use clinic or local HIV sero-prevalence rates[37], distance or proximity to clinic (distribution point), past receipt of food aid to reflect any inertia effects from food aid targeting[38] (Jayne et. al.2002) and the interaction of locality (sections residential areas within the city) with asset holdings and age dependency ratio. We test for the validity of our instruments using the Kleibergen-Paap Wald F statistic (Kleibergen and Paap 2006) and Hansen's J statistic (Hansen 1982) respectively.

For panel data analysis, we employ the difference in differences estimator through fixed effects regressions while correcting for potential endogeneity. The specification is in double differences:

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

Where $\log W_{ict}$ measures the per capita food expenditure of household i in locality c at time t. *Foodtransfer*R2* is a dummy that takes the value of 1 if the household receives food transfers at the follow up survey R2 , logincome_{ict} represents the changes in the log per capita cash income (proxy is log per capita total expenditure). X_{ict} is a vector that summarizes observed household characteristics; female household head, work status, gender, age, education level and marital status, household size, dependency ration, marital status, total number of females,

[36] There is plenty of discussion surrounding the inconsistencies and biases of IV (Deaton 2009, Heckman and Urzua 2010, Cameron and Triveldi 2005). Hence IV is by no means the perfect approach. We use IV as a robustness check on the general direction or sign of effect to see if it reinforces the sign of effect from PSM, and diagnostic tests are used to check for finite sample bias.

[37] See section 3.3.2 and 3.5.1 in chapter 3 for a discussion of the reasoning the use of clinic HIV prevalence in geographic targeting and as an instrument for receiving food assistance. Clinic HIV prevalence are actually local HIV prevalence rates, an aggregate measure. In our study we use antenatal prevalence rates as a proxy for the local HIV prevalence rates.

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

total number of males. U_{ict} are all household-level and locality level fixed effects i (also implicitly controlling for locality effects). ε_{ict} is the unobserved idiosyncratic household error. The use of retrospective data in this case, is fraught with concerns of recall bias since the reference period was quite high (6 months). We nevertheless proceed with longitudinal analysis, while exercising extreme caution in interpreting the results. Finally in all regressions we calculate robust standard errors. All the αs, γs and βs are unknown parameters and ict denotes household i in locality c at time t.

5.4 Data and Descriptive Statistics

Our analytical sample is derived from the survey data described in chapter three. As described in Chapter three, the cross section survey carried out in August 2009 resulted in a hierarchical dataset at different units of observations: households, patients and other individuals[39]. In this chapter we analyze household level outcomes. To answer the questions posed in the introduction of this chapter, we analyse two key measures, food diversity and frequency (indicator of food security), food consumption expenditures (indicator for food consumption).

Aggregate monthly food consumption expenditures were obtained by recall from each household based on food consumed by the households from all sources (outside the home, food transfers and from home production). Other expenditure data were collected for various items; fuel, clothing, health, personal hygiene items, education, social events, transportation, entertainment, rentals and durables. The survey questionnaire included retrospective questions on consumption and wellbeing before the food transfer programme began. The consumer price index for Zambia was used to deflate or compute real values of expenditure based on the food basket prices of the pre-programme period (Central Statistical Office, Zambia 2010). Additional data used in the analyses include demographic information for the head of the household and the patient, number of patients on treatment in the household, dwelling conditions, productive and durable assets owned, access to other social transfers, access to community assistance, The analytical sample comprises 400 households and is divided into two groups, food transfer programme participants (199) and non-participants (201).

[39] Reminder: The food aid rations comprise of staple and fortified blended food (25kg maize grain, 4.5kg pulses, 6kg corn and soya blend, 1.8Kg oil).. Primary distribution sites for the programme are government/public sector clinics where patients receive AIDS treatment (Anti-retroviral therapy or ART).

We use descriptive statistics to describe the household socio-economic characteristics and the characteristics of the patients on AIDS treatment that were central to the recruitment of the households into the programme. Descriptive statistics show that both groups of households and the patients live below the poverty line, are asset poor and there is high unemployment amongst the respondents (see table 5.1).

The majority of patients in the households are female; more than 70% among both groups. The average age for the majority of the patients is 40 years. Approximately 42% of the patients among the participants are married compared to 48% among non-participants. Around 48% of the patients in both groups have primary education. While a large majority of the patients in both groups are unemployed, 66% of the patients among participants are unemployed, higher than the 57% among non-participants.

Over 43% of the non-participants had a female head compared to 56% participants. Both groups have a high age dependency burden with nearly 97% of the participants and 73% for the non-participants, a sign of potential vulnerability to income shocks like AIDS and food security. Households in both groups have an average of approximately two durable or productive assets. The monthly per capita pre-programme expenditures for the non-participants is K87576 (US$17.52[40] or US$0.58 per person per day) higher than the K 59084 (US$11.82 or US$0.38 per person per day) for the programme participants. However these expenditure levels show that household members for both groups live on less than the US$1.25 per person per day (World Bank poverty line).

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

Table 5.1 Characteristics of sample at baseline

	Participants (N=199)	Non-Participants Group (N=201)
Patient Characteristics		
Age, mean (se)	41.46 (0.75)	39.78 (0.61)
Female,%	77.39	73.63
Male ,%	22.61	26.37
No education, %	11.44	12.56
Primary education, %	48.74	48.76
Secondary education, %	38.81	31.66
College education, %	1.01	2.49
Married, %	42.21	48.75
Divorced or separated,%	13.57	15.42
Widowed, %	38.19	31.34
Never married, %	6.03	4.48
Patient unemployed at baseline %	76.19	64.06
Support from community home based care volunteers , %	58.29	34.83
Member of HIV support group, %	61.30	64.06
Stage of HIV disease, by WHO standards is 3 or 4 %	73.37	60.70
Household Characteristics		
Food distribution point/clinic is less than 1 hr , %	94.97	82.59
Disabled household members , %	7.04	4.98
Female headed household, %	56.22	43.78
Household uses charcoal as fuel source,%	88.94	77.61
Household does not own a house,%	61.69	70.85
Total number of females, mean (se)	2.6 (0.09)	2.46 (0.10)
Total number of males, mean (se)	2.08 (0.09)	2.23 (0.08)
HIV positive household members, mean (se)	1.55 (0.05)	1.57 (0.05)

Table 5.1 (continued)

	Participants (N=199)	Comparison Group (N=201)
Members on ART, mean (se)	1.4 (0.05)	1.39 (0.04)
Household size, mean (se)	5.38 (0.05)	5.36 (0.05)
Durable or productive assets owned[41], mean (se)	1.84 (0.16)	2.10 (0.14)
Age dependency ratio, mean (se)	96.88 (7.47)	72.56 (5.39)
Child dependency ratio, mean (se)	93.83 (0.07)	71 (0.05)
Clinic HIV sero-prevalence rates, mean (se)	21.97 (0.07)	20.35 (0.16)
Monthly per capita food expenditure, baseline, mean (se)	23653.94 (1415.19)	31740.24 (1960.65)
Monthly per capita total expenditure, baseline mean (se)	59084.6 (4820.17)	87576.05 (7324.50)
Monthly per capita cereal expenditure, baseline mean (se)	35430.65 (4317.54)	55835.81 (6125.53)
Monthly per capita pulses expenditure, baseline mean (se)	1797.91 (211.96)	2148.22 (194.90)
Monthly per capita vegetable oil expenditure, baseline mean (se)	2183.01 (171.32)	3270.07 (290.63)
Monthly per capita non food expenditure, baseline mean (se)	35430.65 (4317.54)	55835.81 (6125.53)
Log monthly per capita food expenditure, baseline mean (se)	9.78 (0.06)	10.03 (0.07)
Log monthly per capita total expenditure, baseline mean (se)	10.55 (0.07)	10.92 (0.07)
Log monthly per capita non-food expenditure, baseline mean (se)	9.71 (0.09)	10.15 (0.10)

Source: Own calculations from collected data

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

5.5 Results

5.5.1 Propensity Score Matching Estimates

We use the propensity score model used in chapter four (table 4.2). This model includes 21 conditioning variables obtained from household survey data which are based on theoretical and empirical grounds of association with participation in the food assistance programme, and these include age, gender and education level of patient, employment status, household size, and asset ownership (Gilligan and Hoddinott 2007). Other additional variables which may have affected the degree of patient contact with clinic staff and, by extension the likelihood of being screened for enrolment in the assistance programme include the number of HIV positive household members or the number of disabled household members (unique indicators of vulnerability in HIV affected households), distance from the patient's residence to the clinic and the severity of illness of patient at the time of enrolment (i.e. stage 3 or 4 of disease). We also include local area population as a locality level covariate[42]. Our main goal with the propensity score model is to satisfy the balancing property.

The propensity score distribution and common support range is shown in a histogram in figure B4.1 (at the end of the chapter four). Accordingly participants whose estimated propensity score is above the maximum or below the minimum propensity score for the control group did not have "common support" in the control group and are dropped from the matched sample (Smith and Todd 2005).

[42] Cluster dummy variables for the clinics were dropped from the probit model after encountering a problem of quasi-separation. This is because the values for clinic variable (categorical) overlap or are tied at a single or only a few values of the variable indicating receipt of food transfers. For instance, half the categories in the variable are identical to either the 0 or 1 of the dummy variable for receipt of food transfers. Therefore, the model failed to converge.

Table 5.2 Probit estimates for receiving food transfers or participating in the food transfers programme

	Coefficient	S.E	
Patient characteristics			
Body mass index at baseline	-0.014	0.029	
Age	-0.103	0.094	
Age squared	0.001	0.001	
Female	0.137	0.242	
College education	-0.459	0.943	
Primary education level	0.429	0.227	**
Secondary education level	0.033	0.231	
Divorced or separated	0.158	0.546	
Widowed	0.723	0.312	**
Never married	0.542	0.502	
Time to reach public sector clinic less than 1 hr	1.104	0.452	**
WHO stage 3 and 4 of HIV disease at baseline	0.543	0.029	**
Patient is unemployed	0.125	0.241	
Household characteristics			
Household does not own a house	0.449	0.240	**
Number of HIV positive household members	0.053	0.072	
Number of disabled household members	0.363	0.390	
Household size	-0.063	-0.820	
Number of durable assets owned	-0.001	-0.062	
Household uses charcoal as fuel source	0.177	0.279	
Locality characteristics			
Total population in locality/area served by clinic	0.00003	0.00004	
Total population in locality/area served by clinic squared	-1.76e-10	2.12e-10	
Constant	-2.158	2.881	
Number of observations = 178			
LR chi2 (21) = 40			
Prob > chi2 = 0.0074			
Pseudo R2 = 0.1670			

Notes: Dependent variable equals one if household received food assistance in January 2009, and zero otherwise. Patient and household characteristics are from January 2009. * = p<0.10; ** = p<0.05; *** = p<0.01. Propensity score within common support range is (0.03, 0.94)

As part of sensitivity analysis, we also present alternative results from local linear matching (trimming 10% of treatment observations where the propensity score density of comparisons is lowest). We employ propensity score matching on cross sectional data and use difference in differences matching on panel data to remove any potential time invariant sources of bias. We use bootstrapped standard errors for all the matching estimators. The matching estimator is implemented using Leuven and Sianesi's method (Leuven and Sianesi 2003). The balancing property is satisfied after testing for the equality of means for each characteristic included in the probit model and none of the characteristics remained significantly different between the two groups before (Dehejia and Wahba test, see table B4.1b, chapter four) and after matching (see table B4.1 for t-test in mean differences for each covariate, chapter four).

5.5.1.1 Estimated Effect of Food Transfers on Food Intake and Diversity

We first analyse the effect of food transfers on food diversity, frequency and intake. We use the food consumption score (FCS) as a measure of food intake, diversity and security. This is a frequency-weighted diet diversity score calculated using the frequency of consumption of 14 different food groups consumed by a household during the 7 days before the survey (Wiesmann et al. 2008, WFP 2008). All household respondents were interviewed within a two week period during the survey (August 2009). Hence these data are cross sectional. The foods are maize (staple), cereals, roots and tubers, sugar, pulses, nuts, vegetables, fruits, beef, poultry/eggs, fish, oil, milk and corn-soya blend. Each food is assigned a weight based on nutrient density, a term which describes food quality based on caloric density, macro-micronutrient content and quantities eaten. Higher weights are attached to meat and fish. The weights and the reasoning behind them are displayed in the appendix of this chapter (table C5.1). Thresholds for the food consumption score that we use are 0-28 for poor food consumption, 28-42 for borderline food consumption and >42 for acceptable food consumption[43]. Wiesmann et al. (2008) find that the food consumption score is a useful indicator of food security and is significantly associated with calorie consumption per capita. We are mainly interested in finding out the food diversity and intake levels from the provision of food transfers. The food consumption score is calculated using follow-up data only.

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

Table 5.3 shows propensity score matching results on the outcome food consumption score. The difference is 9 units (while sensitivity analysis shows a difference of 8.8 units). At first glance, both groups appear to have acceptable food diversity or intake (above the required threshold). This increase in food intake and diversity could be explained by seasonal patterns in food prices. The follow up survey was carried out during the post harvest season when food prices are low. However the participants have a significantly higher diet diversity and food consumption than the non-participants. This finding suggests that the food transfers have a positive average effect on the participants. The food consumption score for the non-participants is also just above 42 (borderline consumption/food security) compared to participants. Thus the non-participants appear to be at risk of food insecurity compared to the participants.

Table 5.3 Single difference matching estimates for the food consumption score

Average Treatment Effect on the Treated	Local Linear Regression Matching	Local Linear Regression matching (Trimmed 10% of treated cases)
Participants, mean	50.79	51.20
Non-participants, mean	41.70	42.40
Difference (ATT)	9.09 (4.55)**	8.80 (3.99)**

Source: Own calculations from collected data. Notes: * = significant at the 10 percent level; ** = significant at the 5 percent level; *** = significant at the 1 percent level. Bootstrapped standard errors in parentheses. Trimmed 10% treatment observations where propensity score density of comparisons is lowest.

5.5.1.2 Estimated Effect of Food Transfers on Household Consumption Expenditures

We then proceed to analyse the effect of food transfers on food consumption expenditures including other selected household consumption expenditures. Estimates from using follow up data only, show a significant and positive average impact of the food transfers on per capita total monthly household and food consumption expenditures. We find that the per capita expenditures for participants are significantly higher than that for the non-participants. The estimated treatment effect is K21745.23 (US$4.35) for food expenditures, a K18642.45 (US$3.73) for cereal expenditures. At the time of the follow up survey, there are no significant differences in total, pulses, vegetable oil and non food

expenditures between the two groups (see table 5.4). Sensitive analysis from trimming the sample also confirms the results from local linear matching.

Table 5.4 Single difference matching estimates for household consumption expenditures

Average Treatment Effect on the Treated	Local Linear Regression Matching	Local Linear Regression matching (Trimmed 10% treated cases)
Monthly total expenditure per capita	16281.91	12716
	(12606.6)	(13852.93)
Monthly food expenditure per capita	21745.23**	19327.35**
	(4715.54)	(9626.53)
Monthly cereal expenditure per capita	18642.45***	18697.48***
	(3117.111)	(2911.94)
Monthly pulses expenditure per capita	1233.07	1214.80
	(994.38)	(974.23)
Monthly vegetable oil expenditure per capita	-3778.92	-3960.10
	(4323.85)	(4233.48)
Monthly non food expenditure per capita	-5463.33	-6610.91
	(4218.72)	(4294.07)

Source: Own calculations from collected data. Notes: * = significant at the 10 percent level; ** = significant at the 5 percent level; *** = significant at the 1 percent level. Bootstrapped standard errors in parentheses. Trimmed 10% treatment observations where propensity score density of controls is lowest.

We estimate the effect of food transfers on the 6 month change in per capita household consumption expenditures using difference in differences matching. Our findings, presented in table 5.5, show a significant and positive average impact of the food transfers on change in per capita monthly total household and food consumption expenditures. The results show an estimated treatment effect of K29746.4 (US$5.95) for total expenditures, K21905.21 (US$4.38) for food expenditures, K18122.42 (US$3.62) for cereal expenditures. The estimated treatment effect for per capita non-food expenditures, pulses and oil expenditures is not statistically significant.

Table 5.5 Difference in differences matching estimates for household consumption expenditures

Average Treatment Effect on the Treated	Local Linear Regression Matching	Local Linear Regression matching (Trimmed 10% treated cases)
Change in monthly total expenditure per capita	29746.4***	17765.27*
	(12146.96)	(10300.87)
Change in monthly food expenditure per capita	21905.21***	20002.02***
	(8033.552)	(9298.38)
Change in monthly cereal expenditure per capita	18122.42***	18249.11***
	(3896.79)	(3130.69)
Change in monthly pulses expenditure per capita	-28.65	-271.07
	(680.84)	(716.99)
Change in monthly vegetable oil expenditure per capita	-155.11	-3235.24
	(1195.82)	(4931.89)
Change in monthly non-food expenditure per capita	25755.12	5874.45
	(14633.9)	(14492.37)

Source: Own calculations from collected data. Notes: * = significant at the 10 percent level; ** = significant at the 5 percent level; *** = significant at the 1 percent level. Bootstrapped standard errors in parentheses. Trimmed 10% treatment observations where propensity score density of comparisons is lowest.

The key takeaway from the matching estimates is that the food transfers have a significant and positive average effect on total expenditures and food consumption expenditures. Since the counterfactual per capita food expenditure at follow up is K43551.27 (US$ 8.7) and the approximate average per capita value of the food transfers is K16892.93 ($3.4), our results suggest that the food transfer is inframarginal (see appendix, table C5.2)[44]. Both single difference and double difference matching estimates show that the food transfers have a large impact as the per capita increase in food consumption expenditures is greater than or near equivalent to the approximate per capita value of the transfer. Alternative matching estimators also confirm the results from local linear matching.

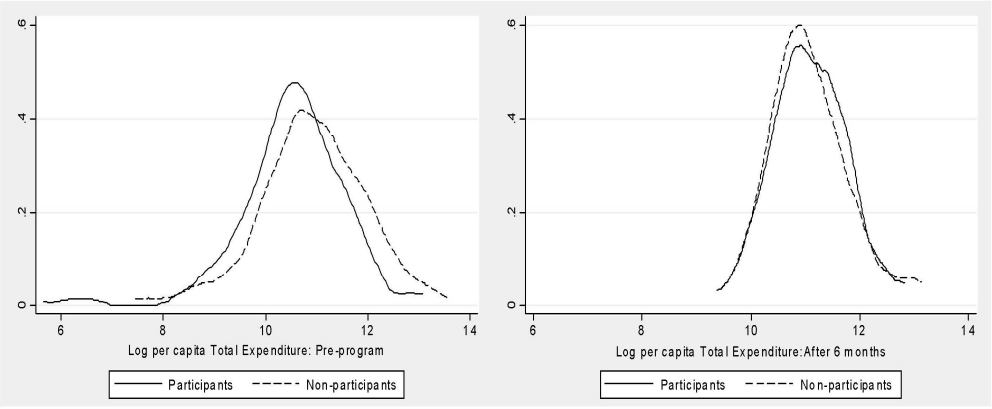
5.5.2 Non-Parametric Analysis

Non-parametric results from kernel density estimations seem to reinforce a positive effect of the food transfer programme on the participants. A comparison of the pre-programme total expenditure kernel density functions, shows a rightward skew of the distribution for the non-participants with higher means than the non-participants (see figure 5.1).

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

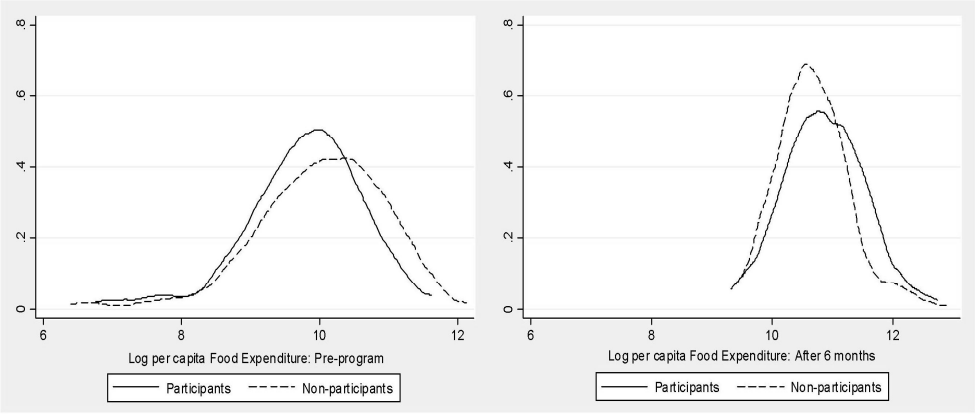
The graph also shows a modest rightward shift of the distribution for the participants from pre-programme to after 6 months, an indication of a somewhat modest increase in total consumption expenditures.

Figure 5.1 Kernel densities of log per capita total expenditures-before and after



Source: Own calculations from collected data

Figure 5.2 Kernel densities of log per capita food expenditures –before and after

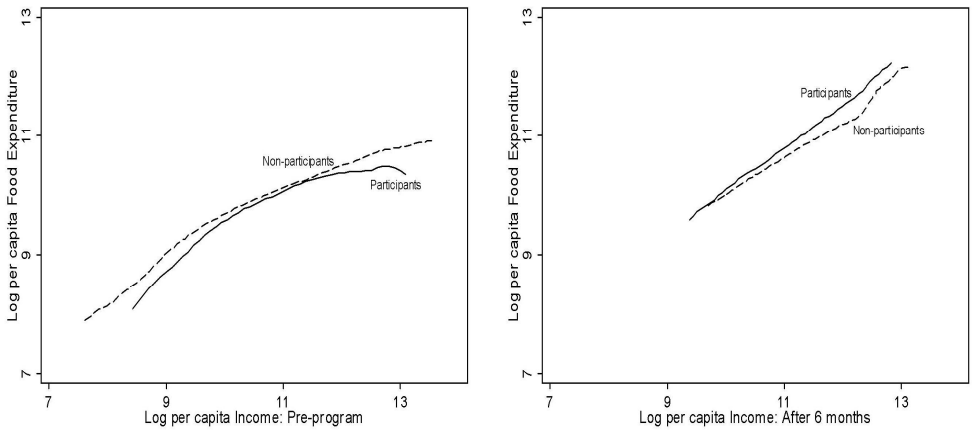


Source: Own calculations from collected data

Figure 5.2 shows a modest rightward shift of the distribution for the participants from pre-programme to after 6 months, an indication of a modest increase in total food consumption expenditures. Both graphs also show a leftward shift for food consumption expenditure of the non-participants.

The results from the kernel weighted local polynomial regression are based on a double-log Engel functional form (log per capita food expenditures regressed against log per capita income (proxied by total expenditures). The expenditures for this analysis were not corrected for measurement error, which we expect especially since our expenditure data are from a developing country (Kedir and Girma 2007, Deaton 1997). The pattern of the pre-programme curve presented in figure 5.3, while not exactly linear, shows that food expenditures for the food beneficiaries were lower than those for the non-participants. However the fact that the pre-programme expenditure data were obtained by recall after 6 months, makes us offer a guarded interpretation of the pattern of the curves. Figure 5.3 also shows the food expenditures regressed on income at follow up, and participants appear to have greater food expenditures than the non-participants, with the curve for the participants higher than that for the non-participants at every point. This is a different pattern from what we find for the pre-programme. At the baseline, curves for both groups had their starting point (intercept) below 9 on the y-axis (K8103,08) but at follow up both groups have their intercepts above 9 showing that food expenditures increased for both groups. However, figure 5.3 seems to suggest that food transfers led to a greater increase in food consumption expenditures for participants than the non-participants.

Figure 5. 3 Local polynomial regressions of food expenditures on income –before and after



Source: Own calculations from collected data

It is clear from the non-parametric analysis and matching estimates that the food transfers led to participants increasing their household food consumption

expenditures. Despite the food transfers being inframarginal in size, all indications from the results so far are that the food transfers have an income effect and possibly a substitution effect. A substitution effect since food consumption has actually increased, as shown by the increased food expenditures, and the increased food intake and diversity as measured by the food consumption score.

5.5.3 Parametric Results

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

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

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

For the cross sectional data, we carry out single difference estimations through a double log specification with a dummy variable which is equal to one if a household is a programme participant. The double log refers to log per capita food expenditures (dependent variable) and the log of per capita cash income (one of the covariates).

Results for four specifications are presented in table 5.6. The first three specifications are ordinary least squares. The first specification only has the dummy variable with no controls. The second specification includes log per capita cash income (proxied by log per capita total cash expenditures). The third specification includes a vector of demographic controls. In the fourth and final specification the log per capita expenditures are instrumented with the log of non-

food expenditures, while the dummy for receipt of food transfers is instrumented with local HIV sero-prevalence rates, past receipt of food aid and the interactions of locality (sections of the municipality where the households reside) with proximity to clinic/food distribution point, asset holdings and age dependency ratio. The test for weak instruments as measured by the Kleibergen-Paap Wald F statistic (Kleibergen, and Paap 2006), rejects the null hypothesis that the IV model is weakly identified. The F statistic appears to indicate minimal finite sample biases of the IV estimates. The Hansen's J statistic (Hansen 1982) accepts the null hypothesis. The test for endogeneity in the third specification unsurprisingly shows the presence of endogeneity in the OLS specification; hence all interpretations for parametric analysis are based on the fourth specification. The elasticities are calculated at the means of log per capita food expenditures and log per capita income for the participants.

The results from the four different specifications show that adding demographic controls slightly improves overall fit for the model, while instrumenting for log per capita income reduces the magnitude of the coefficient and the elasticity. The results from the single difference estimations are presented in table 5.6. The single difference estimates show that food transfers have a positive effect with a difference of around 44% in food expenditures between participants and non-participants. The results are consistent with the significant and positive estimates from propensity score matching and non-parametric analysis. The results are also in line with findings from similar empirical literature on commodity transfers (Del Ninno and Dorosh 2002). The elasticity for food consumption expenditure with respect to food transfers is 0.55 for the participants. The coefficient for the log of cash income estimates an elasticity of food consumption expenditure with respect to income of 0.38.

Table 5.6 Marginal propensity to consume food out of food transfers: single difference estimates

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

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

The results from the double difference estimations are presented in table 5.7. The four specifications for the double difference estimations are similar to the single difference specifications with the exception that they all include time effects and locality effects (for specifications 3 and 4). The results from the double difference estimations show that participants increased their food consumption expenditures by 37% compared to non-participants. The pattern of increased food expenditures is consistent with the propensity score matching estimates and findings from non-parametric analysis. The elasticity for food consumption expenditure with respect

to food transfers for the participants is 0.42. The coefficient for the log of cash income estimates an elasticity of food consumption expenditure with respect to income of 0.02, which is not significant. Hence over the six months of the food transfers programme, there is a significant MPC food out of food transfers while it seems that there is no food expenditure from cash income which appears to be almost entirely replaced by the food transfer.

Table 5.7 Marginal propensity to consume food out of food transfers: double difference estimates

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

Source: Own calculations from collected data. Notes: * = p<0.10; ** = p<0.05; *** = p<0.01. Robust standard errors are in parentheses. Food transfer dummy =1 if household is a recipient of food transfers. Demographic controls include dummies for education, marital status, gender and age of patient, gender and age of household head, household size, work status of patient and if household owns less than four productive assets. Locality effects are dummies for the different areas of the city, where the households reside in. Test for endogeneity is the Durbin-Wu-Hausman test, and test for weak instruments is the Kleibergen-Paap F test. The Hansen J statistic is the test for overidentifying restrictions. Yes denotes inclusion. FE denotes fixed effects. MPC_f Food Transfers refers to the marginal propensity to consume food out of food transfers, based on elasticity. MPC_f Income refers to the marginal propensity to consume food out of cash income, based on elasticity.

An alternative linear model was also developed for robustness checks and sensitivity analysis (see appendix, table C5.3). The linear model's single difference specifications show the MPC food out of food transfers to be 0.32, which is larger than the MPC food out of cash income of 0.22. The linear model's double difference specifications show the MPC food out of food transfers is 0.36 while cash income appears to have no effect on food consumption expenditures. The results show households receiving food aid together AIDS treatment having greater food consumption than households receiving AIDS treatment only.

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

We proceed to analyse the MPC food with respect to intrahousehold decision making and vulnerability or economic disadvantages. We should caution however that by restricting the sample into several groups our estimates are likely to be less precise. Table 5.8 presents the results on the effects of the programme on a sample restricted separately into female-headed households and male-headed households[45].

[45] About 82% of the patients are heads of households. Restricting the sample by gender of patient or by whether patient was the household head yielded unstable estimates especially for the male sample and it was hard to find a valid instrument. Hence we cannot directly whether the patient has actual control or power over food consumption decisions within the household and if this would vary by gender of the patient.

Table 5.8 Marginal propensity to consume food out of food transfers by gender of household head

Dependent Variable: Log per capita Monthly Food Expenditure	Female-headed Households		Male-headed Households	
	Single Difference IV	Double Difference IV	Single Difference IV	Double Difference IV
Food transfers	0.466***	0.356***	0.267***	0.543
	(0.084)	(0.164)	(0.083)	(0.380)
Income	0.413***	-0.043	0.326***	0.155*
	(0.029)	(0.084)	(0.035)	(0.087)
Demographic controls	yes	yes	yes	yes
Locality and time effects		yes		yes
MPC_f Food Transfers	0.59	0.41	0.30	Not significant
MPC_f Income	0.41	Not significant	0.33	0.16
N	236	450	159	296
R-squared	0.80	0.65	0.78	0.63
Durbin-Wu-Hausman chi square statistic	61.48***	45.52***		
Kleibergen-Paap rk Wald F statistic	24.073	32.362	18.092	21.229
Hansen's J statistic	2.789	0.293	1.904	2.991

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

Single difference estimates show that female-headed households which are participants have significantly greater food consumption than similar non-participants, with a difference of 47% while for male headed households the difference was 27%. Panel estimates show that participating female headed households increased their food consumption expenditures by 36%, while participating male headed households saw no significant change. Single difference

estimates also show that the MPC food out of food transfers for the participating female headed households is greater than the MPC food out of cash income, while for participating male headed households, the MPC food out of food transfers is slightly lower or nearly equivalent to that out of cash income. Double difference estimates show that the MPC food out of food transfers for participating female headed households is 0.41 compared to no significant MPC food out of food transfer for participating male headed households, who however have a significant MPC food out of cash income of 0.16. The results are consistent with the empirical literature which has shown that female headed households spend more on food compared to male-headed households (Attanasio and Mesnard 2006, Ezemenari et al. 2003, Lundberg et al. 1997). Furthermore, it is highly likely that female headed households are also more vulnerable or disadvantaged than male headed households in a developing country like Zambia.

We also carried out further sub-group analysis by restricting the sample by number of AIDS patients per household. Table 5.9 shows that participants with more than one sick patient have significantly greater food consumption expenditures than similar non-participants for both single difference and double difference estimates (45% and 64% respectively). In contrast in households with only one sick patient there are modest effects on food consumption expenditure as shown by both single and double difference estimates (37% and 41% respectively). The MPC food out of food transfers for participants with more than one sick patient is much larger than the MPC food out of cash income (in all estimates), compared to the MPC food out of food transfers for participants with only one sick patient.

Table 5.9 Marginal propensity to consume food out of food transfers by HIV burden

Dependent Variable: Log per capita Monthly Food Expenditure	One Patient on AIDS treatment		More than one patient on AIDS treatment	
	Single Difference IV	Double Difference IV	Single Difference IV	Double Difference IV
Food transfers	0.374***	0.414**	0.452***	0.638***
	(0.077)	(0.187)	(0.120)	(0.313)
Income	0.378***	-0.074	0.376***	0.227***
	(0.028)	(0.080)	(0.047)	(0.083)
Demographic controls	yes	yes	yes	yes
Locality and time effects		yes		yes
MPC_f Food Transfers	0.45	0.49	0.56	0.80
MPC_f Income	0.38	Not significant	0.38	0.23
N	262	498	133	258
R-squared	0.80	0.62	0.80	0.68
Durbin-Wu-Hausman chi square statistic	73.106***	55.414***	36.258***	24.421***
Kleibergen-Paap rk Wald F statistic	29.688	30.825	12.661	23.745
Hansen J statistic	4.402	1.467	1.435	0.111

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

Table 5.10 shows the estimated MPCs by expenditure quantile. We only use two quantiles to avoid restricting our analysis into small sample sizes. Hence we compare the programme effects for households below and above the median per capita expenditure.

Table 5.10 Marginal propensity to consume food out of food transfers by 2-quantile expenditures

Dependent Variable: Log per capita Monthly Food Expenditure	Bottom quantile (below median)		Upper quantile (above median)	
	Single Difference IV	Double Difference IV	Single Difference IV	Double Difference IV
Food transfers	0.253***	0.671***	0.238	0.196
	(0.079)	(0.208)	(0.248)	(0.239)
Income	0.093	0.035	0.176*	-0.125
	(0.057)	(0.080)	(0.094)	(0.175)
Demographic controls	yes	yes	yes	yes
Locality and time effects		yes		yes
MPC_f Food Transfers	0.28	0.91	Not significant	Not significant
MPC_f Income	Not significant	Not significant	0.19	Not significant
N	196	358	199	388
R-squared	0.33	0.58	0.52	0.65
Durbin-Wu-Hausman chi square statistic	62.404***	45.717***	51.070	37.676***
Kleibergen-Paap rk Wald F statistic	26.676	46.676	16.160	12.216
Hansen J statistic	3.059	1.507	1.829	3.737

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

Results show that participants in the bottom quantile have significantly greater food consumption expenditures than similar non-participants for both single difference and double difference estimates (25% and 67% respectively). In contrast participants in the upper quantile who have no significant programme effects on food consumption expenditure. The MPC food out of food transfers is only estimated for the lower quantile since for the upper quantile there is no significant programme effect. However there is a significant MPC food out of cash income for

the upper quantile (single difference) while for the lower quantile there is no significant MPC food out of cash income in all estimates.

Summarily tables 5.8-5.10 show that for the more economically disadvantaged households the MPC food out of food transfers is larger than the MPC food out of cash income, suggesting that they are constrained by the in-kind nature of the programme (Hoynes and Schanzenbach 2009, Whitemore 2002). As mentioned earlier, it is also probable that the households may perceive food transfers as a more permanent source of income compared to earnings since at the time of the survey the food aid programme was expected to continue for another 6 months.

5.6 Conclusion

In this chapter we present empirical evidence on the effect of a targeted food aid programme on the spending behaviour and food consumption in households with patients on AIDS treatment. We test theoretical predictions of consumer behaviour towards in-kind transfers. Using recently collected data, we find that the food transfers are inframarginal and have a significant and positive effect on total expenditures, food consumption expenditures and actual food intake, as evidenced by the propensity score matching estimates, non-parametric analysis and parametric estimates. Food consumption expenditure is higher for households below the median per capita expenditure consistent with Engel's law which states that poorer households devote a greater proportion of income to food. Our findings contradict Southworth's hypothesis on inframarginal in-kind transfers (Southworth 1945) but are consistent with empirical literature on effects of food stamps (Fraker 1990). Programme participants have a larger MPC food out of food transfers than MPC food out of cash income, despite the transfer being inframarginal. Furthermore, for the more economically disadvantaged (poorer) households the MPC food out of food transfers is larger than the MPC food out of cash income. There are four possible explanations for these findings. Firstly, the food transfers might be leading to an income effect from the food transfers as shown by the significant and positive effect of the food transfers on total expenditures (a proxy for income) and food consumption expenditures. Secondly, despite the food aid rations being inframarginal it's likely that participants' choices are constrained by in kind transfers, resulting in them possibly altering their consumption preferences (Hoynes and Schanzenbach 2009, Leonesio 1988). Thirdly, we posit that the participants (and moreso the most economically disadvantaged), may perceive food transfers as a more regular source of income

compared to their irregular earnings, especially since at the time of the follow up survey the food aid programme was expected to continue. Fourthly, we speculate that the substantial effects on consumption, despite the small size of the transfer suggest possible savings or multiplier effects of the food transfers in the household (Gilligan and Hoddinott 2007). Results also show that the participants have greater food diversity than non-participants, a possible reason for the consumption growth. Finally our findings are consistent with empirical literature on the gender differences in intrahousehold decision making on social transfers, as female-headed households in our study spend more on food compared to male headed households. Furthermore, despite some studies showing positive welfare gains from AIDS treatment alone, our findings show that integrating AIDS treatment with food transfers leads to greater significant and positive effects on income and food security compared to AIDS treatment alone.

A major limitation of our study is the lack of prospective panel data, since we could not obtain or collect data before the programme was implemented. Our retrospective data are therefore liable to recall bias. Hence we present single and double difference estimates for each outcome. Another limitation concerns our use of multiple instruments which identify different parameters and might have increased bias of our IV estimates. Our conclusion on the effect of food transfers on household consumption comes with a caveat. It is possible that food transfers have effects on labour supply which could affect family income levels. The double difference estimates for MPC food out of food aid in the Engel specifications did not change much with or without income as a regressor in the model. However, for the single difference estimates, the food aid coefficient is lower without income in the regression (possibly capturing the labour supply effects after 6 months); hence these estimates could be biased. Despite these shortcomings, the chapter is still an important contribution to the literature evaluating the impacts of food transfer programmes. This chapter offers new insights into consumption and spending patterns in HIV affected households benefiting from the integration of AIDS treatment with food aid. Results show that the food transfer programme is achieving its goal of reducing the risk of food insecurity and household welfare declines, which may well support the achievement of effective AIDS treatment outcomes. Yet, despite the small size of the transfer, the magnitude of the effect size on consumption growth (relative to cash income or an equivalently valued cash transfer), has potential repercussions on other household behaviour (e.g. labour supply) and raises questions on whether the food transfers are crowding out other coping mechanisms and income sources. The findings also raise questions on whether the positive consumption response to food transfers is

persistent and whether participants will be worse off or better off in the aftermath of the food transfers, especially if they have not managed to establish secure livelihoods. We would however recommend further research on other possible reasons for the consumption growth from the food transfers and the effects of food transfers on other household behaviour, especially since programmes integrating AIDS treatment and food transfers are multiplying in sub-Saharan Africa.

Appendix C

Table C 5.1 Aggregate food groups and weights to calculate the food consumption score

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

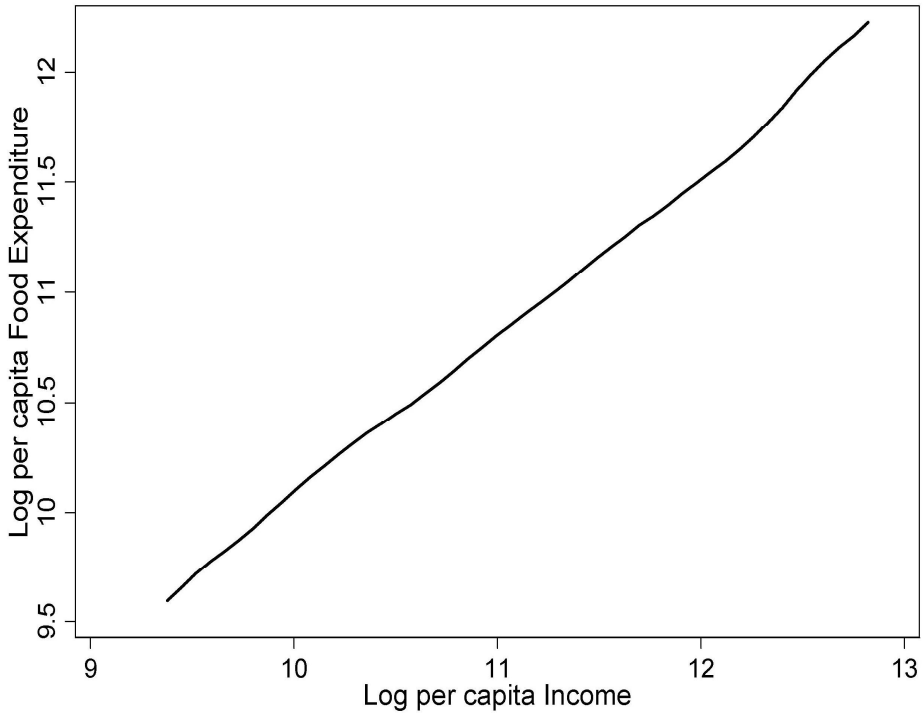
Source: World Food Programme (2007, 17ff.).

Table C 5.2 Expenditures of matched sample

Matched Sample	Participants (N=185)	Non-Participants (N=183)
Pre-programme expenditures		
Monthly per capita food expenditure, mean	24224.27	24384.25
Monthly per capita total expenditure, mean	51007.10	82756.98
Monthly per capita cereal expenditure, mean	8618.59	8098.55
Monthly per capita pulses expenditure, mean	1648.04	2174.86
Monthly per capita vegetable oil expenditure, mean	1963.16	2654.21
Monthly per capita non food expenditure, mean	26782.83	58372.73
Expenditures at follow up, 6 months		
Monthly per capita food expenditure, mean	71296.50	43551.27
Monthly per capita total expenditure, mean	86673.90	70391.99
Monthly per capita cereal expenditure, mean	39183.43	20540.98
Monthly per capita pulses expenditure, mean	7512.54	6279.47
Monthly per capita vegetable oil expenditure, mean	4993.64	8772.56
Monthly per capita non food expenditure, mean	15377.40	20840.73

Source: Own calculations from collected data.

Figure C 5.1 Local polynomial regression of food expenditure on income combined-before and after 6 months



Source: Own calculations from collected data.

Table C 5.3 Marginal propensity to consume food: sensitivity to alternative functional form

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

Table C5.3 notes

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

6. Labour Supply Responses to Integrating AIDS Treatment with In Kind Transfers[46]

6.1 Introduction

Sub-Saharan Africa is still home to two thirds of the world's HIV infected population, with 22.4 million people currently living with HIV/AIDS. Nearly 44% of HIV infected individuals (adults and children) now have access to antiretroviral therapy (ART), the standard AIDS medication (UNAIDS 2009). Clinical studies have expansively proven that ART reduces morbidity, mortality and improves weight gain (Wools-Kaloustian et al.. 2006, Koenig et al. 2004, Coetzee et al. 2004) and recent empirical studies find positive labour responses to ART such as increased job search, labour force participation and labour supply, and reduced absenteeism by infected patients (Larson et al. 2008, Thirumurthy et al. 2008, Coetzee 2008 and Habyarimana et al. 2010). Thirumurthy et al. (2008) also finds intra-household spillover effects in western Kenya where young boys (age 8-18 years) and women working less, young girls (age 8-18 years) and men not changing labour supply, after the patient begins treatment.

However in resource constrained settings food insecurity, poverty and malnutrition hinder the achievement of optimal ART outcomes and recovery from HIV/AIDS's detrimental effects on household welfare. Recent and emerging policy responses to the HIV/AIDS pandemic now include integrating ART with food transfers (food aid rations) to improve the efficacy of ART and improve the welfare of infected individuals and their families by acting as an income transfer and safety

[46] This chapter is based on a conference paper (with Wim Groot) selected for the 5th Annual AIID Economics of HIV/AIDS Workshop, Dec20-21 2010, Amsterdam and paper selected for the fifth annual PopPov conference on Population, Reproductive Health, and Economic Development, January 19-21, 2011, Marseille, France,. Gratefully acknowledge funding from UNAIDS, World Health Organization (Regional office for Africa), Ford Foundation and the Poverty Reduction, Equity and Growth Network.

net (Slater 2004). In this chapter we focus on food transfers similar in composition to the normal food aid given to generally vulnerable populations in Sub-Saharan Africa. There is still a debate on the impact of food aid on labour supply. Earlier literature supports the neo-classical economic theory that food aid is a disincentive to labour supply (Jackson and Eade 1982, Jean-Baptiste 1979). However, several recent studies disagree with the theory by pointing out that earlier studies on the topic used anecdotal evidence rather than empirical, and that food aid rations are simply too small to be a labour supply disincentive and cause aid dependency (Barrett and Maxwell 2005, Little 2008). Abdulai et al. (2005) and Hoddinott (2003) find that when appropriate econometric controls are included in analysis such as age, sex and education of head, land holdings, size and location, disincentive effects from food aid disappear. Most studies evaluating the impact of food aid focus on the broader vulnerable population whereas our focus is on HIV/AIDS affected households, which are a specific and unique type of vulnerable population. To our knowledge there is no published research on the labour responses to programmes integrating food transfers with ART in HIV-affected households.

This chapter examines the labour supply responses of the food aid programme for ART patients and their households as described in chapter three. The chapter builds on the evidence from the previous chapters of the dissertation which found that the food transfers are inframarginal and they have positive and incentive effects on patient's adherence to ART and positive and large effects on food security and household consumption expenditures (Tirivayi et al. 2010, Tirivayi and Groot 2010). It has also been established that HIV/AIDS undermines livelihoods, especially labour supply by adult individuals in an affected household (Chapoto and Jayne 2008, Fox et al. 2004). In the context of the food transfer programme's goals of improving household welfare through food security, income relief and participation in economic activities, the chapter seeks to answer several questions. Does adding food transfers to ART yield intrahousehold labour supply incentives or disincentives? How does the duration of ART and household income influence the (dis)incentive effect of food transfers? Answering these questions would provide information on whether combining food transfers with ART would help patients and their fellow household members re-establish their livelihoods, necessary for sustainable ART and welfare outcomes and hence reducing vulnerability to HIV/AIDS. We answer these questions in two ways; first, by determining the effect of the food transfers on the labour supply and transitions to employment of patients and household members and second, by determining whether effect of the food transfers on labour supply and transitions varies by duration of ART and household income level.

The chapter makes use of the hierarchical dataset described in chapter 3 (section 3.5). Outcomes are analysed at individual level. The focus of the chapter is on the 1005 adult individuals from 199 beneficiary households with an identified patient on ART and 201 control households with a patient on ART. Patients include those already established on ART for a long time and those who were initiating treatment when the food transfers programme began. For adult individuals residing in households receiving a food aid ration we shall term "participants" and individuals residing in households not receiving food aid rations we refer to them as "non-participants". The pre-programme status will be referred to as the "baseline" and to other adult members of the household beside the patient as "adults" or "non-patient".

The effects of food transfers on weekly hours worked and labour force participations rates of patients and non-patient adults (as a group) are estimated through single and difference in differences propensity score matching. The effects of food transfers on employment transitions are estimated using probit models, propensity score matching and a bivariate probit (selection) model. In all analysis we compare the differential effects of food transfers on patients and non-patient labour supply, and the gender specific responses of non-patient adults in the same household. The results indicate a consistent disincentive effect for patient participants both in weekly hours worked, labour force participation and probability of making a transition into employment. However we are careful not to over-interpreting these results, since other underlying factors could be contributing to these effects; a) patient behaviour could have been temporary considering the high job to non-job mobility in the local (informal) labour markets and/or seasonal change; and b) possible HIV stigma and discrimination in the local labour markets could lower labour market entry. The results also show an overall positive but non-significant effect on hours worked, employment rates and transitions to employment for non-patient adults. However gender specific responses vary by income and duration of ART. Food transfers are generally a labour supply incentive for male non-patient adults especially at low household income levels, while for female non-patient adults this is conditional on higher income levels and the patient having spent a longer time on AIDS treatment. The disparity in labour responses between the patient and non-patient adults can be attributed to intrahousehold decision making, bargaining and resource allocation processes.

The chapter is organized as follows. In the section 6.2, we briefly explain our theoretical framework. Section 6.3 discusses the estimation strategy for measuring the effects of the food transfers on labour supply and employment transitions. Section 6.4 describes the data. Section 6.5 presents the estimation results and section 6.6 concludes the chapter by discussing the implications of the estimation results and the limitations of the chapter.

6.2 Theoretical Framework

As mentioned earlier, in the research design, all individuals are from households with a patient on ART, therefore the effect of the food transfers is the sole focus of our analysis (the terms food aid and food transfers are used interchangeably). The income-leisure theory predicts that when leisure is a normal good, transfers can cause an income effect which in turn reduces labour supply (Kanbur et al. 1994). However the size of an in-kind transfer matters. If an in-kind transfer is inframarginal, there would be no differences in the predicted labour supply disincentive effects of an in-kind transfer or a similar valued cash transfer (Gavhari 1994; Leonesio 1988). Gahvari (1994) demonstrates that an in kind transfer increases labour supply under the following conditions: in kind transfers and leisure are Hicks substitutes, leisure is a normal good, and in-kind transfers are "extramarginal" (overprovided).

Lentz et al. (2005) provide another perspective in explaining whether food aid has labour supply disincentive effects. They postulate that food aid flows can have two types of effects: an insurance effect before the flow and a transfer effect after the flow where both effects can change incentives and can trigger negative dependency. In this perspective anticipating food transfers can cause changes in behaviour, for instance food aid provides insurance to those who are uninsured but may also crowd out informal pre-existing safety nets (e.g. remittances, private transfers or labour supply) leaving individuals and households highly vulnerable to a future crisis (Barett 2006). Extending this reasoning to our chapter, food transfers could have a crowding out effect leading to a constant anticipation of food transfers. This anticipation is especially heightened by the simultaneous or sequential multiple shocks on the household caused by the HIV illness (beginning with morbidity, then mortality, reduced labour supply, loss of income and consumption insecurity). Food transfers could also be an income transfer that mitigates the effects of experienced shocks. The anticipation of food transfers can also induce risk-taking behaviour, however poor households often choose low risk, low return activities and inferior technologies leading to a state of chronic

vulnerability (Dercon 2004, Dercon and Krishnan 1996). This can also be explained as a poverty trap where an individual's productivity is directly dependent on past consumption and there is a threshold on consumption above which productivity increases (Ravallion (2003).

The (dis)incentive effects of food transfers could also vary according to the eligibility conditions of the transfer. Targeting for the food aid programme in question relied on criteria assessing the food insecurity and vulnerability of the patient and household based on measures like income, unemployment, child school drop out and asset poverty. After 8 months, programme participants are then evaluated to determine if they should continue receiving the food aid based on assessment of vulnerability to poverty. Knowledge of the requirements for continued eligibility could yield perverse incentives or encourage moral hazard behavior by influencing patients and households, to remain unemployed to maintain eligibility to the food aid programme. However, there have been arguments that there is little or no evidence on whether food aid has moral hazard effects (Barrett 2006).

In recent years several studies have argued against the notion that food aid causes labour supply disincentives. One explanation based on empirical evidence has been that the disincentive effects of food aid could be the result of poor targeting where the inclusion of relatively wealthier recipients magnifies the labour market disincentive effects, since wealthier recipients appear more willing to turn transfers into leisure instead of increasing food consumption (Barett 2006, Barett and Maxwell 2005). Another explanation has been that earlier studies failed to control for confounding effects like household characteristics such as age, sex and education of head, land holdings, size and location, which if controlled for, food aid's supposed disincentive effects disappear (Abdulai et al. 2005, Hoddinott 2003). Another theory, the nutrition-based efficiency wage model predicts that food consumption positively affects labor supply. Leibenstien (1957) hypothesized that malnutrition lowers the productivity of workers such that if they improved nutrition at low levels of intake, they would attain greater labor productivity. Several empirical studies in developing countries like Brazil, Cote d'Ivoire, Sierra Leone, India and Brazil confirm the model's predictions (Thomas and Strauss 1997; Schultz and Tansel 1997; Deolalikar 1988; Strauss 1986).

Another important focus of the chapter is the potential intrahousehold impact of food transfers in HIV affected households. This is due to the nature of intra-household decision making or resource allocation in response to income received

from a social transfer (Alderman, et al. 1997; Strauss et al., 2000). Intrahousehold time allocation or re-allocation is a consumption smoothing mechanism utilized in resource-constrained countries where households adjust time allocated to employment, leisure or household chores by both adults and children (Thirumurthy et al. 2008). The (dis)incentive effects of food transfers could differ by gender or age or, by whether one is a patient or not, a key distinction in our chapter. These effects can be contradictory; on the one hand the income effect from the patient's improved labour supply may discourage household members to work while on the other hand improved patient's health reduces the care burden on household members giving them more time to work and leisure (Thirumurthy et al. 2008).

Our empirical strategy includes analysing the average impacts of the food transfers on labour supply. We follow Thirumurthy et al. (2008) by using weekly hours worked in income generating activities as our measure of labour supply. We also analyse the effects of the food transfers on transitions to employment by patients and non-patient adults. Our study takes place in a developing country where it is estimated that 88% of employment is through informal labour market activities (CSO 2007). Therefore, we are mindful of the ease of entry and exit or high job to non-job mobility characteristic of the informal sector. In this chapter we define employment as participation in an economic or income generating activity, whether formal or informal. Since previous studies also show ART yielding labour supply incentive effects, results on whether food transfers would yield disincentives and dependency effects in our chapter require stratification by duration of ART, careful analysis and interpretation.

6.3 Estimation Strategy

6.3.1 Propensity Score Matching

We use propensity score matching to estimate the average treatment effect on the treated of food transfers on labour supply as measured by weekly hours worked and the labour force participation rate. Propensity score matching (PSM) allows us to control for observable heterogeneity between participants and non-participants. A logit regression on observed characteristics is used to obtain propensity scores on the probability of receiving food transfers (Rosenbaum and Rubin 1983). We then derive the average impact of the food transfer programme from the average treatment effect on the treated (ATT). The ATT when food transfer programme participants are matched to non-participants is written as follows:

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

Where *ATT* is the average treatment effect on the treated, n_1 is the total number of participants (treated), Y_{1i} is the outcome for the participants and Y_{0i} is the outcome for the non-participants, I_i and I_0 denote the set of participant group and non-participant group respectively, S represents the region of common support, and the term *W (I, j)* are the weights used to calculate the counterfactual outcome for each participant. The ATT is estimated using the kernel matching algorithm and for sensitivity analysis is compared nearest neighbour matching. Common support is imposed in all estimates.

We use single difference estimates for cross sectional data on weekly hours worked and labour force participation rate. To address the problem of latent heterogeneity in any single-difference estimators, non-participants were selected using the same targeting criteria applied to the participants (Ravallion 2007). We use double difference estimates for panel data on the labour force participation rate to control for any differences in time-invariant unobservables. All PSM cross section estimates are computed in Stata using the Pscore command by Becker and Ichino (2002) while kernel based double difference matching estimates are estimated using the diff command by Villa (2010).

6.3.2 Markov Transition Model

We seek to determine the effect of food transfers on the probability of transition to employment. We use first order Markov models to determine the probability of entry into employment i.e. the probability of being employed at time t if unemployed in prior state. The first order Markov process assumes that one's outcome at time t is a function of prior state and covariates (Beck et al. 1998). We only estimate transitions into employment, since the larger part of the sample (over 60%) were unemployed before the food transfers programme began. The sample for transitions into unemployment is small and liable to imprecise estimates.

We estimate the transition to employment from unemployment (or labour market entry) in a two-state model as follows:

$$P(Y_{i,t} = 1 \mid Y_{i,t-1} = 0) = f(\alpha_1 + X_1\beta_1 + \mathrm{FT_i}\delta + \mathrm{u}_1) \qquad 2)$$

Where $P(Y_{i,t} = 1 | Y_{i,t-1} = 0)$ is the probability of being employed at time t conditional on being unemployed at time t-1 for adult individual *i*. In our study time t is 6 months after the food transfers programme and t-1 is the pre-programme or baseline state. FT denotes recipient of food transfers and X_1 is a vector that summarizes individual and observed household and community characteristics. Individual characteristics include age, gender, level education and marital status for individuals. Household characteristics include household size and total number of adults who are not educated, total number of adults formally employed, total number of adults self employed, wealth characteristics (house ownership, number of durable and productive assets). Community characteristics refer to a dummy indicating the proximity of community to industrial area, in order to control for differences in industrial labour market access. U denotes the unobserved idiosyncratic error. Adults of working age are defined as being from 18 years up to 64 years of age (Thirumurthy et al. 2008).

We use probit estimations and PSM to estimate equation 2). We estimate equation 2) for two groups of working age adults in the households; HIV patients receiving ART and non-patient adults. We also present gender specific estimates for non-patient adults. Due to the small number of male patients (112) in the sample, we do not analyse gender differences for patients as the smaller samples might produce imprecise estimates. There are 112 male patients compared to 288 female patients. A further breakdown of male patient group shows that there are 50 male patients in the treatment group compared to 62 in the control raising concerns for imprecise estimates in modelling, especially when samples are stratified by income and duration of ART, making the sample sizes much smaller.

Both probit estimations and PSM control for differences in observed characteristics. However, since food transfers were not randomly assigned there is likely to be selection bias and effects of unobservables. We also consider the likely endogeneity of initial conditions since individuals at risk of entering employment could be a non-random sample of the population (Heckman 1981). Yet, our data are from a very short panel, and we lack data on the prior employment/unemployment spell for individuals. Additionally, finding a valid instrument for initial conditions which satisfies the exclusion restrictions required for model identification proved difficult. Consequently, we only control for the endogeneity of the food transfers and do not employ a dynamic model. The probability of participating in the food transfers programme is written as follows:

$$P(FT_i = 1) = f(\alpha_2 + X_2\beta_2 + u_2) \qquad 3)$$

Where FT= 1 indicates a participant, and X2 comprises all variables which might predict participation in the food transfer programme including instruments. We allow for a correlation between equations 2) and 3), denoted by $\rho_{12} = COV(u_1, u_2)$, and followed by a test whether the correlation coefficient between the residuals of each of the equation 2) and 3) is statistically significant.

Equations (2) and (3) are estimated using a bivariate probit model. The estimations are computed in Stata through the mvprobit command developed by Cappelari and Jenkins (2003). The marginal effects of the bivariate probit selection model are estimated using the meffcon and meffdum commands written by Jones et al. (2007). The model is estimated via the Maximum Simulated Likelihood (MSL) method using a Geweke-Hajivassiliou-Keane (GHK) simulator. The selection model includes two instruments in the selection equation. These instruments were chosen because they were part of the targeting criteria for the food transfer programme[47]. Two instruments are mainly used in all regressions from a choice of the following variables- local HIV prevalence rates and/or locality interacted with age dependency ratio, or asset holdings[48] (Tirivayi and Groot 2010, Tirivayi et al. 2010). To our knowledge there is still no formal test for instrument validity for bivariate probit model. Following Cappelari and Jenkins, we test for instrument relevance i.e. whether the instruments were statistically significant in the selection equation, and not statistically significant in the transition equation. Wald tests are used to test for relevance. Secondly, we use the Hansen-J over-identification tests from the linear analogs of the bivariate probit specifications (linear probability models) for validity. Hansen-J tests have their own limitations, they can reject the null of orthogonality and provide misleading results, but they are still informative (Koedel 2008).

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[47] There is plenty of discussion surrounding the inconsistencies and biases of IV (Deaton 2009, Heckman and Urzua 2010, Cameron and Triveldi 2005). Hence IV is by no means the perfect approach. We use IV as a robustness check on the general direction or sign of effect to see if it reinforces the sign of effect from PSM, and diagnostic tests are used to check for finite sample bias.

[48] See section 3.3.2 and 3.5.1 in chapter 3 for a discussion of the reasoning the use of clinic HIV prevalence in geographic targeting and as an instrument for receiving food assistance. Clinic HIV prevalence are actually local HIV prevalence rates. In our study we use antenatal prevalence rates as a proxy for the local HIV prevalence rates.

6.4 Data and Descriptive Statistics

Our analytical sample is derived from the survey data described in chapter three. In the hierarchical dataset produced from the survey carried out in August 2009, we observe labour supply responses at individual level in the household. To answer the questions posed in the introduction of this chapter (see 6.1), we analyse three indicators; weekly hours worked, labour force participation rates and transitions to employment. In our analytical sample we have 1005 adults of working age where 400 are patients and 605 are non-patient adults. Among the patients, food transfer programme participants are 199 and non-participants are 201. For non patient adults there are 274 participants and 331 non-participants[49].

Key variables used in the analysis were captured using the survey questionnaire. They include cross section and retrospective data on employment status as measured by engagement in income generating activities e.g. formal job, casual work, non-farm self employment (family business, vending, petty trade etc), farm work and domestic work. Cross sectional data on weekly hours worked in economic activities such as farm work, casual labour, self employment and formal work are also used to measure labour supply response. Additional variables used as controls or covariates in our estimation strategy include household size, household composition and level of education completed, marital status, gender of individuals, dwelling conditions and proximity to industrial area.

Descriptive statistics are used to describe the characteristics of the patients, non-patient adults and households in the sample at baseline (except for weekly hours worked, collected only after 6 months). More than 70% of the patients in the households are female; while the average age for the patients is 40 years (see table 6.1). Around 48% of the patients in both groups have primary education. 66% of the patients among participants were unemployed at baseline, higher than the 57% among non-participants. Participating patients also work fewer hours than non-participants, unconditional on being in the labour force (8 hours compared to 15 hours) and conditional on being in labour force (25 hours compared to 33 hours).The average duration by patients on ART at baseline was 777 days for participants and 867 days for non-participants.

[49] There are also about 890 children in the households where 418 are in the control group and 472 are in the participants' group.

Table 6.1 Characteristics of sample at baseline

	Participants (N=473)	Non-Participants (N=532)
Patient Characteristics		
Total number of patients	199	201
Age, mean (se)	41.46 (0.75)	39.78 (0.61)
Female,%	77.39	73.63
Male ,%	22.61	26.37
No education, %	11.44	12.56
Primary education, %	48.74	48.76
Secondary education, %	38.81	31.66
College education, %	1.01	2.49
Married, %	42.21	48.75
Divorced or separated,%	13.57	15.42
Widowed, %	38.19	31.34
Never married, %	6.03	4.48
Patient unemployed at baseline %	76.19	64.06
ART duration at baseline, mean (se)	777.97 (43.23)	867.45 (41.74)
Hours worked, unconditional on working (after 6 months), mean (se)	7.67 (1.09)	15.48 (1.59)
Hours worked, if working (after 6 months), mean (se)	32.75 (2.31)	25.03 (2.37)
Non-Patient Adults Characteristics		
Total number of non-patients	274	331
Age, mean (se)	32 (0.76)	30.87 (0.67)
Female,%	44.89	46.65
Male ,%	55.11	53.35
No education, %	14.83	15.31
Primary education, %	50	43
Secondary education, %	34.32	37.79
College education, %	0.85	3.91
Married, %	23.22	25.08
Divorced or separated,%	3.75	3.02
Widowed, %	10.86	9.06

Table 6.1 continued

	Participants (N=473)	Non-Participants (N=532)
Never married, %	62.84	62.17
Unemployed at baseline %	71.53	68.88
Hours worked, unconditional on working (after 6 months), mean (se)	11.22 (1.19)	12.85 (1.48)
Hours worked, if working (after 6 months), mean (se)	41.27 (2.32)	41.77 (2.94)
Household Characteristics		
Located near industrial area %	25.13	24.88
Household uses charcoal as fuel source,%	88.94	77.61
Household does not own a house,%	61.69	70.85
Household percentage of educated adults, %	70.45	64.47
Household has at least one formally employed adult at baseline, %	33.62	57.52
Household has at least one self employed adult at baseline, %	23.77	26.69
HIV positive household members, mean (se)	1.55 (0.05)	1.57 (0.05)
Household size, mean (se)	5.38 (0.11)	5.36 (0.11)
Durable or productive assets owned are less than 4,%	88.94	82.59
Age dependency ratio, mean (se)	96.88 (7.47)	72.56 (5.39)
Clinic HIV sero-prevalence rates, mean (se)	21.97 (0.07)	20.35 (0.16)

Source: Own calculations from collected data. * = significant at the 10 percent level; ** = significant at the 5percent level; *** = significant at the 1 percent level. Results rounded off to 2 d.p.

As shown in table 6.1, non-patient adults are mostly around 30 years of age, with more than 50% being male in both groups. Around 59% of the non-patient adults in the participating households have primary education compared to 43% in the non-participating households. Nearly 72% and 69% of non-patient adults were unemployed at baseline respectively. Participating non-patient adults work similar hours as non-participants, unconditional on participating in the labour force (13 hours compared to 11 hours) and conditional on participating (42 hours compared to 41 hours). Fewer participating households have at least one self or formally employed adult compared to non-participating households (24% to 27% and 34% to 58% respectively). More adults in participating households have some form of education compared to non-participating households (70% compared to 65%). 72%

of participating non-patient adults were unemployed at baseline compared to 69% of non-participants. Nearly 25% of the households in both groups are located within 5km of an industrial area. Both groups have a high age dependency burden (97% of the participants and 73% for the non-participants) and over 80% of the households in both groups own less than four productive assets.

6.5 Results

6.5.1 Propensity Score Matching Estimates

Since the programme was targeted at household level, we use the propensity score model used in chapter four (table 4.2). We run a probit regression and use the model results to estimate the propensity score for the matching algorithms[50]. Matching is then done at individual levels. Results showing that the balancing property was satisfied are shown in the appendix of chapter four (table B4.1 and B4.1b). As shown in table 6.2, we find that the probability of participating in the food transfer programme increases if a household is located close to a food distribution clinic at baseline, the patient was diagnosed as being in latter stages of HIV disease, a household does not own a house, the patient completed primary education only and patient is a widow. However, the main goal of the propensity score model was to balance covariates between treated and control households rather than causal inference.

We use the nearest neighbour matching estimator and for sensitivity analysis, compare with results from the kernel matching estimator (epanechnikov function). Observations outside the common support range are dropped from the matched sample (Smith and Todd 2005). The ATT estimation was carried out using bootstrapped standard errors (100 replications). The resultant matched sample for analysis had 178 patients (67 participants and 101 non-participants) and 278 adults (102 participants and 176 non-participants).

[50] Dummy variables for the clinics/localities were dropped from the probit model after encountering a problem of quasi-separation. This is because the values for clinic variable (categorical) perfectly collinear with the treatment indicator. Therefore, the model failed to converge.

Table 6.2 Probit estimates for receiving food transfers or participating in the food transfers programme

	Coefficient	S.E	
Patient characteristics			
Body mass index at baseline	-0.014	0.029	
Age	-0.103	0.094	
Age squared	0.001	0.001	
Female	0.137	0.242	
College education	-0.459	0.943	
Primary education level	0.429	0.227	**
Secondary education level	0.033	0.231	
Divorced or separated	0.158	0.546	
Widowed	0.723	0.312	**
Never married	0.542	0.502	
Time to reach public sector clinic less than 1 hr	1.104	0.452	**
WHO stage 3 and 4 of HIV disease at baseline	0.543	0.029	**
Patient is unemployed	0.125	0.241	
Household characteristics			
Household does not own a house	0.449	0.240	**
Number of HIV positive household members	0.053	0.072	
Number of disabled household members	0.363	0.390	
Household size	-0.063	-0.820	
Number of durable assets owned	-0.001	-0.062	
Household uses charcoal as fuel source	0.177	0.279	
Locality characteristics			
Total population in locality/area served by clinic	0.00003	0.00004	
Total population in locality/area served by clinic squared	-1.76e-10	2.12e-10	
Constant	-2.158	2.881	
Number of observations = 178			
LR chi2 (21) = 40			
Prob > chi2 = 0.0074			
Pseudo R2 = 0.1670			

Notes: Dependent variable equals one if household received food assistance in January 2009, and zero otherwise. Patient and household characteristics are from January 2009. * = p<0.10; ** = p<0.05; *** = p<0.01. Propensity score within common support range is (0.03, 0.94).

6.5.1.1 Estimated Effect of Food Transfers on Labour Supply

We estimate the average treatment effect on the treated of food transfers on weekly hours worked, Weekly hours worked in income generating or economic activities (unconditional on work status) are one of our measures of labour supply. We could not obtain retrospective data on the weekly hours worked at baseline, thus we only use cross sectional data obtained 6 months after the programme was commenced. Single difference estimates of weekly hours worked are used for causal inference. ATT is computed for patients, all non-patient adults, female non-patient adults and male non-patient adults to show the extent of intra-household impacts.

Table 6.3 Single difference matching estimates for weekly hours worked

ATT	Nearest Neighbour	Kernel
Patients	-7.324***	-7.324***
	(2.118)	(2.125)
All Non-Patient Adults	0.970	0.970
	(2.126)	(2.177)
Male Non-Patient Adults	4.418	4.418
	(2.930)	(3.312)
Female Non-Patient Adults	-4.834	-4.834
	(3.140)	(2.201)

Source: Own calculations from collected data. * = significant at the 10 percent level; ** = significant at the 5percent level; *** = significant at the 1 percent level. N: patients (169), non-patient adults (263), female non-patient adults (126), male non-patient adults (137). Robust standard errors in parentheses.

Table 6.3 shows that there is a difference of just over 7 hours worked by patients who are participants (7.68hrs), compared to non-participants (15 hrs). There are no significant differences in weekly hours worked by all non-patient adults, while gender specific estimates show a marginally significant positive effect of food transfers on male non-patient adults and no statistically significant effect on female non-patient adults. Both the nearest neighbour and kernel matching estimators produce the same results, with the only difference in standard errors. For purposes of brevity, further results from propensity score matching are only presented for the kernel matching estimator[51]. Further decomposition of the samples by duration of patient's ART duration and household income quantiles reveals interesting results, shown in table 6.4. However due to the small sub-sample sizes, estimates maybe imprecise. ART is a proxy for patient's health and we use household

[51] Further results from nearest neighbour matching are available on request.

expenditures as a proxy for income. For patients (who are participants) there is a persistent decrease in hours worked regardless of ART duration or income quantiles, ranging from 5.8 to 9.3 hours.

Table 6.4 Single difference matching estimates for weekly hours worked by ART duration and income

ATT	Lower ART quantile	Upper ART quantile	Lower income quantile	Upper income quantile
Patients	-5.830***	-9.314***	-6.116**	-8.112***
	(2.519)	(3.160)	(3.374)	(2.458)
All Non-Patient Adults	-1.763	1.945	0.960	0.974
	(2.605)	(2.601)	(2.349)	(3.112)
Female Non-Patient Adults	-6.789**	-1.764	-7.524**	2.229
	(2.957)	(2.865)	(3.359)	(2.287)
Male Non-Patient Adults	6.080	3.793	8.851**	-0.133 (4.866)
	(7.482)	(3.874)	(4.061)	

Source: Own calculations from collected data. * = significant at the 10 percent level; ** = significant at the 5 percent level; *** = significant at the 1 percent level. Bootstrapped standard errors in parentheses.

Overall there are no significant effects of food transfers on all non-patient adults regardless of ART duration or income quantiles. Still, food transfers appear to decrease the hours worked for female adults (-7.5 hours) in a household where the patient is in the lower quantile of ART duration while there is no significant negative effect on female non-patient adults in a household with a patient in the upper quantile of ART. With females usually being the carers of the sick patient, it would appear, a disincentive effect is present if the patient is in early stages of ART (who likely require more home care). Food transfers have no significant effect on hours worked by male non-patient adults regardless of ART quantile. With respect to income, results show significant negative and positive effects of food transfers for female and male non-patient adults respectively in the lower income quantile, while there is no significant effect for either group in the upper income quantile. Consequently it appears with increases in household income, the disincentive effects for female non-patient adults vanish while for male non-patient adults, the lower the income the higher the incentive effects with no significant effects in the upper income quantile. It is also important to note that the single difference estimates used to measure programme effects on weekly hours (cross sectional data) do not control for unobservable heterogeneity which could have implications on inferences.

Accordingly we carried out double difference estimations on labour force participation rates to control for time invariant unobservable heterogeneity. The kernel based double difference matching estimates are estimated using the diff command by Villa (2010).The results are presented in table 6.5.

Table 6.5 Difference in differences mMatching estimates for labour participation rate: overall, by ART duration and income

ATT	Overall	Lower ART quantile	Upper ART quantile	Lower income quantile	Upper income quantile
Patients	-0.097**	-0.074	-0.173***	-0.069	-0.156*
	(0.047)	(0.061)	(0.004)	(0.056)	(0.005)
All Non-Patient Adults	-0.031	0.045	-0.015	0.045	0.005
	(0.039)	(0.045)	(0.048)	(0.052)	(0.067)
Female Non-Patient Adults	-0.019	0.057	-0.026	0.011	0.016
	(0.055)	(0.064)	(0.079)	(0.06)	(0.008)
Male Non-Patient Adults	-0.042	0.042	-0.006	0.075	-0.002
	(0.055)	(0.055)	(0.066)	(0.071)	(0.093)

Source: Own calculations from collected data. * = significant at the 10 percent level; ** = significant at the 5percent level; *** = significant at the 1 percent level. Bootstrapped standard errors in parentheses.

Difference in differences matching estimates presented in table 6.5 show a significant negative effect of food transfers on the overall employment/labour participation rate of patients of about -9.7% (baseline rate was 34.2%, so total percent decline is 28%). Patients from households in the upper quantile of ART duration saw a decline in their employment rate by 17% (baseline rate was 41.7%, so total percent decline is 42%) while there was no significant decline for patients in the lower quantile of ART duration. Patients in the upper income quantile saw a borderline significant decline in employment of approximately 16% while there was no significant decline for patients in the lower income quantile. All non-patient adults experienced no significant disincentive effects on employment rates. To reconcile table 6.5 with tables 6.3 and 6.4, results reveal a consistent disincentive effect for patients both in labour supply and in employment. While there are no significant declines in employment rates for non-patient adults over time, there are mixed effects on weekly hours worked for females (disincentive effect with a decline in household income and with a lower patient ART duration) and males (incentive effect with a decline in household income).

6.5.2 *Markov transition model estimates*

We compute the raw transition probabilities for participants and non-participants (see table 6.6). Initially we intended to also look at transitions from employment to unemployment but the sample size for the employed at baseline was quite small raising concerns for imprecise estimates. Only 68 patients, 27 female non-patients and 51 male non-patients were employed in the beginning. Hence we only focus on transitions to from unemployment to employment.

Table 6.6 Transition probability matrix from raw sample

	Participants			Non-participants	
Employment status at t-1	Employment status at t %			Employment status at t %	
Patients	Unemployed	Employed		Unemployed	Employed
Unemployed N=131	93.13	6.87	Unemployed N=115	81.74	18.26
Employed N=68	41.18	58.82	Employed N=86	27.91	72.09
All Non-Patient Adults					
Unemployed N=196	81.63	18.37	Unemployed N=228	85.09	14.91
Employed N=78	30.77	69.23	Employed N=103	15.53	84.47
Female Non-Patient Adults					
Unemployed N=100	84.38	15.63	Unemployed N=106	88.33	11.67
Employed N=51	40.74	59.26	Employed N=69	21.21	78.79
Male Non-Patient Adults					
Unemployed N=96	79	21	Unemployed N=120	81.13	18.87
Employed N=27	25.49	74.51	Employed N=33	13.04	86.96

Source: Own calculations from collected data.

As shown in table 6.6, among patients, the raw entry probabilities are higher for non-participants (18.27%) compared to participants (6.87%), while the reverse is true for exit probabilities. Entry probabilities for non-patient adult participants, including gender specific probabilities, are comparable to those of non-participants. For all non-patient adults, whether male or female, the raw exit probabilities are lower for non-participants compared to participants. More patients and non-

patient adults were unemployed at baseline than employed for both participants and non-participants.

6.5.2.1 Estimated Effect of Food Transfers on Transitions to Employment

We estimate the transitions to employment (entry) in two ways. Firstly we estimate equation 1), i.e. the probability of entry conditional on being unemployed at baseline through simple static probit regressions and PSM[52]. We analyse transitions for four groups-patients, non-patient adults, male non-patients and female non-patients (adults). The probit regressions do not control for initial conditions. The probit estimates are presented in table 6.7 while PSM estimates are shown in table 6.8. For brevity, we only present marginal effects for food transfers. Detailed estimates for the probit model are in the appendix (table D6.2).

Table 6.7 Probability of entry if unemployed at t-1: Probit estimates

	Probit Marginal Effects			
	Patients	Non-Patient Adults	Male non-patient Adults	Female non-patient adults
Food transfers	-0.092**	0.043	0.023	0.051
	(0.037)	(0.037)	(0.059)	(0.043)
Individual and household controls	yes	yes	yes	yes
N	246	422	206	216
Pseudo R-squared	0.181	0.066	0.074	0.158
Wald chi-square statistic	41.96***	27.70***	15.26*	30.53**
Log likelihood	-74.715	-177.09	-95.238	-71.701

Source: Own calculations from collected data. * = significant at the 10 percent level; ** = significant at the 5percent level; *** = significant at the 1 percent level. Robust standard errors in parentheses. Individual controls are gender (male), married, completed primary education, incomplete primary education, complete secondary education, incomplete secondary education. Household controls are household size, no own house, number of adult members who were formally employed at t-1, number of adult members self employed at t-1 and number of adult members with no education and proximity to industrial area.

[52] We have chosen to exclude the variable duration of ART from the models as it enables us to include more observations in the regressions. In all regressions which included this variable, the coefficients were insignificant.

The results show that the probit and PSM estimates are similar. From the results, food transfers have a significant negative effect on patients (participants compared to non-participants). Food transfers lower the probability of entry into labour market by a range from 9% (probit, marginal effect) to 14.6% (PSM).

Table 6.8 Probability of entry if unemployed at t-1: PSM estimates

	PSM Nearest Neighbor Estimates			
	Patients	Non-patient Adults	Male non-patient Adults	Female non-patient adults
Food transfers	-0.146**	0.105	-0.53	-0.054
	(0.051)	(0.156)	(0.360)	(0.159)

Source: Own calculations from collected data. * = significant at the 10 percent level; ** = significant at the 5 percent level; *** = significant at the 1 percent level. N: patients (72), non-patient adults (100), female non-patient adults (52), male non-patient adults (50).Robust standard errors in parentheses.

Probit and PSM estimations control only for observables but we are also concerned with the likely endogeneity of food transfers and omitted variable bias. Therefore we estimate a bivariate probit selection model. Before running the selection model, we examined the relevance and validity of the instruments. Table D6.3 in the appendix indicates that the instruments are separately and jointly relevant in all four models for transitions to employment the transition equation, both separately and simultaneously, as indicated by the statistically significant Wald tests. According to the Hansen-J overidentification tests, the instruments are also valid (p-values are above the 10% significance level).

The results, presented in table 6.9, show that food transfers lower the probability of entry into the labour market by 33% for patients, which is more than twice the magnitude of the PSM and probit estimates. The bivariate probit model confirms the positive but non-significant effect of food transfers on the entry probabilities for all non-patient adults, whether male or female. The selection model also rejects the exogeneity of food transfers in the regression for patients. The cross equation correlation coefficients for non-patient adults, including male or female are not significant indicating that the food transfers equation can be estimated independent of the transition equation.

Table 6.9 Selection model for probability of entry controlling for endogeneity of food transfers and initial conditions

	Bivariate Probit Model Marginal Effects			
	Patients	Non-Patient Adults	Male non-patient Adults	Female non-patient adults
Main equation: employment				
Food transfers	-0.333***	0.105	0.043	0.029
	(0.126)	(0.037)	(0.015)	(0.017)
Individual and household controls	yes	yes	yes	yes
Food transfer equation	yes	yes	yes	yes
N	242	411	199	216
Wald chi-square statistic	156.04***	112.25***	60.71***	65.70***
Log likelihood	-208.038	-415.748	-202.95	-199.588
P12	0.669***	-0.172	-0.066	0.114
	(0.195)			
P12 =0	4.419***	0.301	0.030	0.075
Random draws	50	100	50	50

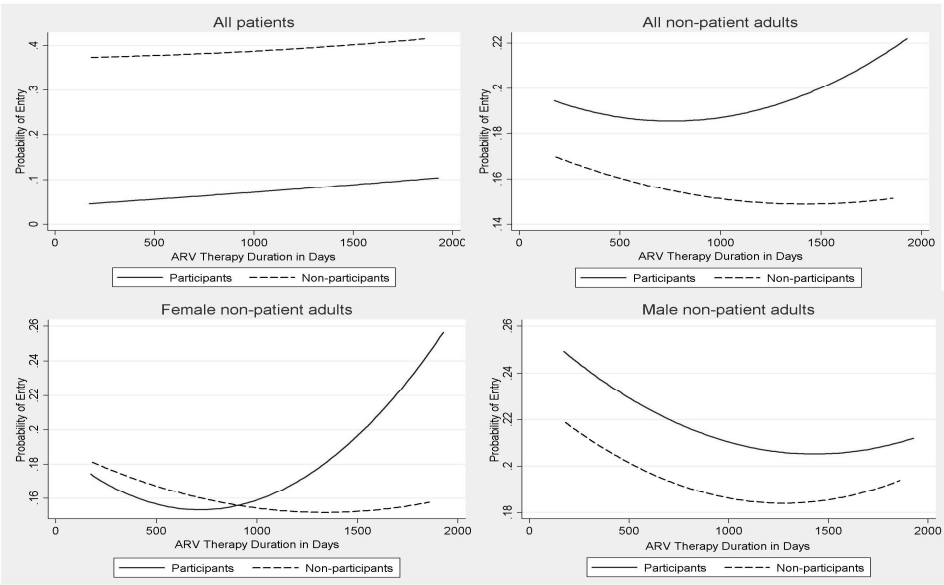
Source: Own calculations from collected data. * = significant at the 10 percent level; ** = significant at the 5 percent level; *** = significant at the 1 percent level. Robust standard errors in parentheses. Instruments in all models are locality interacted with dependency ratio and HIV prevalence rates, except in the model for female non-patient adults, were dependency ratio is replaced by asset holdings. Individual controls are gender (male), married, completed primary education, incomplete primary education, complete secondary education, incomplete secondary education. Household controls are household size, no own house, number of adult members who were formally employed at t-1, number of adult members self employed at t-1 and number of adult members with no education and proximity to industrial area.

A consistent pattern of results seem to confirm that food transfers are a labour supply disincentive for patients, but not for non-patient adults. Participating patients appear to be slower in returning to the labour market compared to non-participants, despite taking antiretroviral therapy (empirically proven to boost labour supply among patients, Thirumurthy et al. 2008). It is interesting that food transfer is not a disincentive for non-patient adults, a probable outcome of intrahousehold decision making and bargaining within the household. Detailed estimates for the bivariate probit model are in the appendix (table D6.4).

The simulated probabilities of entry into employment are regressed against household income and duration of patient's ART and we compare the predicted

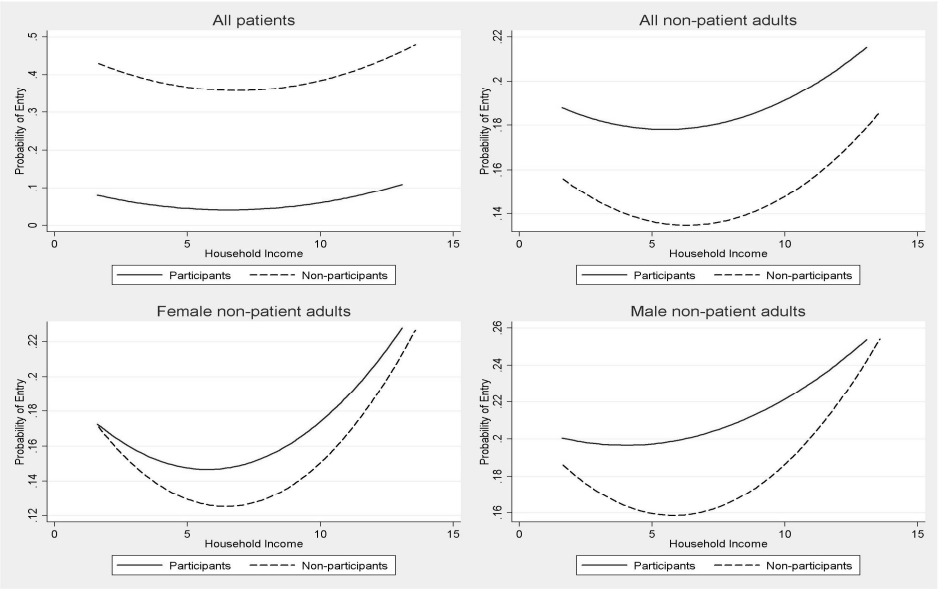
probabilities for participants and non-participants. The probabilities are evaluated at the same values as the marginal effects. Figure 6.1 shows four graphs plotting the labour market entry probabilities against the patient's duration on ART using regression fit. Participating patients have lower labour market entry probabilities than non-participants. All non-patient adults who are participants have higher entry probabilities than non-participants at all points of ART duration. Male non-patient adults have higher probabilities of entry than non-participants, but together with non-participants, the probabilities decline as patient's duration on ART increases. For female non-patient adults, entry probabilities of participants are lower than those for non-participants in households with a patient at the beginning of the ART. But after 850 days of the patient's ART, entry probabilities for participating female adults increase sharply to go higher and above probabilities on non-participants. Figure 6.2 shows four graphs plotting the entry probabilities against household income. The entry probabilities for participating patients are lower than those for the non-participants at every level of income. The entry probabilities for all participating non-patients and female non-patients are higher than the control group and increase with as income increases. For participating male adults, entry probabilities are higher at most points of income than the probabilities for non-participants.

Figure 6.1 Entry probabilities by ART duration



Source: Own calculations from collected data

Figure 6.2 Entry probabilities by household income



Source: Own calculations from collected data

6.6 Conclusion

In this chapter we present empirical evidence on the labour responses of individuals participating in a food transfer programme. We use recently collected data on 400 patients and 655 non- patient adults. Our analysis also examines gender differences in labour outcomes among non-patient adults. We should point out that while our study contradicts recent food aid studies which conclude that food transfers have no disincentives, our study sample is uniquely different from the few existing empirical studies. Empirical literature has mostly focused on the larger food aid programmes targeted to a broader poor population within a country. To our knowledge, our study is the first to investigate labour supply disincentive effects of food aid in HIV-affected households (with a patient on AIDS treatment) that are usually among the most vulnerable in any population.

While the food transfer is inframarginal (Tirivayi and Groot 2010), our study finds it has diverse intrahousehold labour (dis)incentives. Our findings reveal a consistent adverse effect for participating patients both in weekly hours worked, labour force participation and probability of transition to employment, which is consistent with theoretical predictions. The findings also show an overall positive

but non-significant effect on hours worked, employment rates and transitions to employment for non-patient adults[53]. However gender specific responses vary by income and duration of ART. The effect of food transfers on female non-patient adults' weekly hours is negative at low household income level and shorter duration of ART (a proxy for improved patient's health) but this vanishes as income level and duration of ART increases, while the overall effect of food transfers on male adults' labour supply is positive, but greater as household income levels decline. After the patient has been on treatment for 850 days, the probability of transiting to employment increases by up to 10% for female adults, possibly due to declines in time spent in patient care and household work. Therefore it appears that food transfers are a labour supply incentive for female non-patient adults conditional on the household having a higher income level and the patient having spent a longer time on AIDS treatment.

There are several possible explanations for the findings. Firstly, food transfers could be having an income effect on patients who choose to work less as household income increases. Secondly, patients could be reducing labour supply, in constant anticipation of future food transfers (at the time of data collection, the programme was officially set to continue for another 6 months, but participants are aware of past programmes that had weak exit rules resulting in a longer period of receiving food transfers). We also surmise that there is a crowding out effect on existing informal insurance systems, especially informal insurance that had been targeted towards assisting the patient's health recovery. Thirdly, the eligibility conditions for the food aid programme could be producing perverse incentives for or encouraging moral hazard behavior by patients who choose to remain unemployed to maintain eligibility for the programme. Fourthly, the intrahousehold impacts highlight the tradeoff between home care, household chores, leisure and productive work as shown by increases in female labour supply and entry probabilities in response to likely improved patient's health (from longer AIDS treatment) and household income, where it appears the substitution effect (leisure for work) dominates the income effect. The labour supply for participating male non-patient adults is greatest at low household income levels, where it appears the substitution effect dominates the income effect.

[53] There appears to be consistent negative labour supply effect for patients. We did not study the extent to which this labour supply effect influences household cash income. This seems to confirm our earlier caution concerning the potential bias from using cash income as a regressor in the Engel models in chapter five.

Overall, the results in this chapter suggest that potential negative supply side effects of the programme w.r.t patients could hinder the re-establishment of patients' livelihoods necessary for sustainable ART and welfare outcomes. The negative effects on the patients compared to the other household members, need to be considered in any future programme design and implementation. The varied intrahousehold labour supply effects of the food transfers could have implications on the weaning strategy. Currently participants are weaned or discharged from the programme if there is evidence of the patient or related household member regains employment. Programme implementers could consider weaning off the other household members and continue with an individual ration for patients for a temporary period of time. Alternatively, a gradual withdrawal or reduction of food rations components until the end of the designated length of the intervention. It may also be necessary to revise and exclude the employment clause during targeting or institute strong transitioning mechanisms like job training or linking beneficiaries to microcredit facilities.

Nevertheless, we are not quick to conclude that patients are dependent on food transfers because we only analyzed the first half of the programme's implementation period and it is beyond our capacity to predict whether patient behavior is persistent or it is simply opportunistic or temporary especially considering the high job to non-job mobility associated with the informal labour markets that most of the patients engage in. Additionally, demand-side factors beyond the scope of this study could also be contributing to the disincentive effect of the food transfer. Factors such as stigma or discrimination towards HIV patients at workplaces and in the community could be a deterrent for patients' labour force participation, while seasonal changes in local labour markets could affect the differences in weekly hours. A major positive conclusion that we arrive at is that overall, there are no significant disincentive effects of food transfers on the labour supply of other adult members of the household, and hence the integration of food transfers with ART is not a threat to their establishment of livelihoods. The disparity between patient and non-patient adults is likely a reflection of the intrahousehold decision making, bargaining and resource allocation processes. Another important result is that the effect of food transfers on females in the household is conditional on whether the patient has spent a longer time on treatment, when it is likely easier for them to transit from care work to employment. This result reinforces the importance of intrahousehold impacts, which policy makers and programme implementers could use to refine programme goals e.g. a goal of empowering females in the HIV affected households would likely require providing food transfers when the patient has

spent a longer time on treatment, when it is likely easier for females to transit from care work to employment

A major limitation of our study is the lack of prospective panel data, since we could not obtain or collect data before the programme was initiated. Despite this shortcoming, the chapter is still an important contribution to the literature on labour supply in HIV affected households and the evaluation of food transfers. We would however recommend further research on this subject especially through prospective panel studies.

Appendix D

Table D6.2 Full probit models for transition to employment

	Probit Coefficient (se)			
	Patients	Non-Patient Adults	Male non-patient Adults	Female non-patient adults
Food transfers	-0.574 **	0.186	0.089	0.309
	(0.234)	(0.159)	(0.228)	(0.248)
Age	0.002	0.007	0.015*	-0.008
	(0.011)	(0.006)	(0.008)	(0.009)
Male	0.695***	0.302**		
	(0.263)	(0.149)		
Household size	-0.01	-0.032	-0.015	-0.075
	(0.093)	(0.059)	(0.089)	(0.082)
Completed primary education	-0.128	-0.114	-0.334	0.187
	(0.317)	(0.224)	(0.309)	(0.342)
Incomplete primary education	-0.224	-0.042	-0.216	0.272
	(0.400)	(0.234)	(0.325)	(0.365)
Complete secondary education	-0.611*	-0.003	-0.096	0.063
	(0.365)	(0.249)	(0.331)	(0.411)
Incomplete secondary education	0.077	-0.263	-0.202	-0.694
	(0.344)	(0.258)	(0.327)	(0.452)
Married	0.189	0.008	-0.315	0.373
	(0.263)	(0.177)	(0.268)	(0.248)
Household does not own house	-0.076	0.001	-0.076	-0.066
	(0.234)	(0.156)	(0.214)	(0.243)
Total number of adult household members with no education	-0.117	-0.282**	-0.225**	-0.410**
	(0.119)	(0.075)	(0.087)	(0.159)
Total number of adult household members self employed	0.923***	0.114	-0.086	0.539**
	(0.266)	(0.120)	(0.139)	(0.228)
Total number of adult household members formally employed	0.059	0.135**	0.129	0.163
	(0.117)	(0.061)	(0.079)	(0.101)
Proximity to industrial area dummy	-0.335	-0.064	0.247	-0.506*
	(0.277)	(0.173)	(0.240)	(0.285)
Constant	-1.11	-1.127**	-0.978	-0.686
	(0.682)	(0.460)	(0.657)	(0.654)
N	246	422	206	216
Pseudo R-squared	0.1809	0.066	0.074	0.158
Wald chi-square statistic	41.96***	27.78**	15.26	30.53***
Log likelihood	-74.715	-177.086	-95.238	-71.701

Source: Own calculations from collected data. * = significant at the 10 percent level; ** = significant at the 5percent level; *** = significant at the 1 percent level. Robust standard errors in parentheses.

Table D6.3 Instrument relevance and validity

	Transitions to Employment			
	Patients	Non-Patient Adults	Male non-patient Adults	Female non-patient adults
Instrument Relevance Chi-square test				
Clinic HIV prevalence rates	28.81***	46.88***	23.79***	21.94***
Locality*asset holdings		35.26***		19.50***
Locality*dependency ratio	12.15 ***		16.52***	
Joint significance	31.50 ***	52.10***	27.03***	26.05***
Instrument Validity				
Hansen-J over identification test p-value (LPM)	0.2608	0.7048	0.1905	0.8102

Table D6.4 Full multivariate probit selection models for transition to employment

	Multivariate Probit Coefficient (se)			
	Patients	Non-Patient Adults	Male non-patient Adults	Female non-patient adults
Main Equation				
Food transfers	-1..503***	0.231	0.167	0.143
	(0.348)	(0.405)	(0.629)	(0.650)
Age	0.004	0.007	0.014*	0.008
	(0.01)	(0.006)	(0.009)	(0.010)
Male	0.496***	0.299**		
	(0.236)	(0.151)		
Household size	0.01	-0.033	-0.008	-0.077
	(0.085)	(0.059)	(0.091)	(0.083)
Completed primary education	-0.086	-0.114	-0.361	0.184
	(0.297)	(0.223)	(0.309)	(0.344)
Incomplete primary education	0.074	-0.035	-0.247	0.243
	(0.389)	(0.239)	(0.332)	(0.382)
Complete secondary education	-0.485	0.004	-0.135	0.030
	(0.334)	(0.254)	(0.332)	(0.428)
Incomplete secondary education	-0.016	-0.261	-0.329	-0.701
	(0.302)	(0.260)	(0.338)	(0.449)
Married	0.345	0.010	-0.301	0.364
	(0.243)	(0.177)	(0.268)	(0.244)
Household does not own house	0.024	-0.004	-0.124	-0.047
	(0.220)	(0.159)	(0.221)	(0.241)
Total number of household members with no education	-0.093	-0.280***	-0.204***	-0.412**
	(0.103)	(0.077)	(0.091)	(0.159)
Total number of adult household members self employed	0.783***	0.117	-0.092	0.538**
	(0.257)	(0.123)	(0.155)	(0.226)
Total number of adult household members formally employed	-0.073	0.139**	0.155	0.149
	(0.120)	(0.071)	(0.110)	(0.115)
Proximity to industrial area dummy	-0.059	-0.066	0.230	-0.507*
	(0.276)	(0.1175)	(0.247)	(0.287)
Constant	-0.705	-1.143**	-1.016	-0.601
	(0.700)	(0.482)	(0.691)	(0.746)
Food Transfers Equation				
HIV prevalence rate	0.009***	0.007***	0.006***	0.006*
	(0.002)	(0.002	(0.002)	(0.003)
Locality interacted with dependency ratio	0.0004*		0.001***	0.089*
	(0.0002)		(0.0004)	(0.051)
Locality interacted with asset holdings		0.068**		
		(0.035)		
Age	0.005	0.009*	-0.006	0.008
	(0.009)	(0.005)	(0.007)	(0.006)

Table D6.4 continued

	Multivariate Probit Coefficient (se)			
	Patients	Non-Patient Adults	Male non-patient Adults	Female non-patient adults
Male	-0.325	0.246*		
	(0.228)	(0.136)		
Household size	0.028	0.059	0.052	0.019
	(0.063)	(0.051)	(0.081)	(0.070)
Completed primary education	0.105	0.038	0.217	-0.040
	(0.259)	(0.199)	(0.321)	(0.262)
Incomplete primary education	1.047***	-0.370*	-0.024	-0.541*
	(0.366)	(0.219)	(0.341)	(0.296)
Complete secondary education	-0.010	-0.436*	-0.090	-0.594*
	(0.283)	(0.237)	(0.344)	(0.342)
Incomplete secondary education	-0.324	-0.207	-0.037	-0.303
	(0.272)	(0.230)	(0.349)	(0.330)
Married	0.518**	-0.095	-0.222	0.065
	(0.202)	(0.158)	(0.238)	(0.212)
Household does not own house	0.228	0.234*	0.206	0.239
	(0.192)	(0.138)	(0.209)	(0.195)
Total number of household members with no education	0.057	-0.086**	-0.035	-0.092
	(0.084)	(0.062)	(0.085)	(0.094)
Total number of adult household members self employed	-1.165	0.230**	-0.322	-0.062**
	(0.240)	(0.112)	(0.145)	(0.194)
Total number of adult household members formally employed	-0.363**	0.263**	0.310	-0.220**
	(0.111)	(0.062)	(0.094)	(0.085)
Proximity to industrial area dummy	-0.142***	-0.345**	-0.207**	-0.397
	(0.233)	(0.179	(0.263)	(0.255)
constant	-1.32	-1.239***	-1.044	-0.971*
	(0.534)	(420)	(0.634)	(0.587)
N	242	422	199	216
Wald chi-square statistic	156.04***	-119.43***	60.71***	65.70***
Log likelihood	-208.038	-422.301	-202.953	-199.587
P_{12}	0.669***	-0.03	-0.066	0.114
	(0.195)	(0.253)	(0.393)	(0.389)
$\rho_{12} = 0$ chi square	4.1924**	0.012	0.029	0.075
Draws	50	100	50	50

Source: Own calculations from collected data. * = significant at the 10 percent level; ** = significant at the 5percent level; *** = significant at the 1 percent level. Robust standard errors in parentheses.

7. Conclusion

This study has explored the clinical and household welfare effects of integrating AIDS treatment (ART) with food transfers in low income urban areas of a developing country, Zambia. The non-experimental design of the study is addressed by using a variety of techniques which include a selection model and quasi-experimental impact analysis methods like difference-in-difference estimators, propensity score methods and instrumental variables methods. Several conclusions are reached in the various chapters.

A systematic review of theoretical and empirical literature shows that there is limited and conflicting evidence on the health effects of integrating AIDS treatment with food transfers. While theoretical predictions point to possible improvements in health, consumption and ambiguous effects on labour supply, there are few empirical studies that use robust designs and there is no evidence on household welfare effects. In the reviewed empirical evidence, food transfers appear to have positive effects on weight gain, only when provided in the form of ready to use therapeutic feeding (RUTF) and when patients are clearly malnourished while no effects are found when food transfers comprises usual food aid rations and if patients are not malnourished, which suggests that the composition of food transfers probably matters and that the effects would possibly be easier to detect in interventions targeting clearly malnourished patients in these interventions. However it is unclear from the reviewed evidence what role the duration of antiretroviral therapy has on the effect of food transfers, and what would be the ideal calorie density or composition of food transfers and whether the duration of food transfers or AIDS treatment matters.

In the empirical research, we find no evidence of an effect of food transfers on the weight of patients. In line with findings from the systematic review, the immediate effects on body weight are negligible due to the following number of probable reasons; a) the absence of clinical malnutrition among participants at baseline; b) targeted food transfers is generally tailored towards improving food security rather than direct nutritional rehabilitation; c) the food commodities provided were not as calorically dense as ready to use therapeutic feeding programmes (RUTF), which possibly would have had different outcomes; d) since

food rations are also meant for household consumption, possible sharing of food transfers in the household could deprive the patient of an adequate supplement enough to achieve weight gain. The findings have several implications on programme design and implementation. Programme implementers might need to target more clearly malnourished patients and utilize calorie dense foods if their goal is simply to improve weight. Still, we conclude that the lack of positive effect of food transfers on weight gain does not imply that food transfers to ART patients are not beneficial. Food transfers remain a critical necessity, given that all participants were food insecure and are at risk of malnutrition which compromises ART effectiveness, and ultimately the patient's health. We do find that the addition of food transfers for HIV-infected adults already receiving ART may improve medication adherence and by extension the effectiveness of ART and hence HIV-related health outcomes, with likely greater effects at earlier stages of treatment. Thus the duration of ART likely affects the efficacy of food transfers. The placement of food distribution at the clinics where patients receive their medication could be an underlying incentive for adherence to ART by enabling patients to collect food rations and their medicine together, signifying that the design of the food transfers programme also matters.

The results also show that food transfers significantly increase food intake and diversity, food consumption expenditures and total expenditures, with the marginal propensity to consume (MPC) food out of food transfers greater than MPC for food out of cash income. Consumption growth is largest among economically disadvantaged households i.e. those with greater HIV burden, headed by a female or with low income levels confirming Engel's law on how poorer households devote a greater proportion of income to food. Despite the food transfers being inframarginal, the substantial effect size relative to cash income departs somewhat from Southworth's hypothesis but is consistent with empirical literature on the effects of food stamps. There are several possible explanations for this effect size; a) a substantial income effect from the food transfers, b) possible savings or multiplier effects of food transfers in the household, c) food transfers are perceived as regular income compared to own irregular earnings (transitory) and since participants are aware of historically weak exit from the programme, they make rational decisions based on anticipated future income, and d) participants' consumption behaviour is still constrained by the in kind nature of the food transfers. A substantial effect size like this raises questions on whether the food transfers are crowding out other coping mechanisms, household informal safety nets and income sources and whether participants will be worse off in the aftermath of the food transfers. The overall improvement in food security and

consumption from adding food transfers may complement or boost effective AIDS treatment outcomes. This effect size could have repercussions on other forms of household behaviour e.g. labour supply.

Finally, the study finds evidence that food transfers are not a labour supply disincentive for non-patient adults in the household, whereas gender specific incentive effects vary according to income and duration of patient's AIDS treatment. However, findings reveal a persistent disincentive effect of food transfers on the labour supply of HIV infected patients, which is consistent with theory. The disparity in labour supply responses between the patient and non-patient adults can be attributed to a variety of reasons; a) intra-household decision making, bargaining and resource allocation processes and this is demonstrated by food transfers becoming a labour supply incentive for female non-patients in response to likely improved patient's health (from longer AIDS treatment) and increased household income, while for participating male non-patient adults, the incentive effect is greatest at low household income levels, b) an income effect on patients who choose to work less as household income increases, or patients simply reducing labour supply, in constant anticipation of future food transfers, c) a crowding out effect on existing informal insurance systems, especially informal insurance (e.g. private transfers) that had been targeted towards assisting the patient's health recovery, causing patients to work less, d) the conditions of targeting for the food aid programme could be encouraging moral hazard behaviour or producing perverse incentives for patients who choose to remain unemployed to maintain eligibility for the programme.

The disincentive effect of food transfers on patients has potential implications for policy and programme design and implementation especially when dealing with the weaning of beneficiaries from the food aid programme. The findings also reinforce the significance of intrahousehold impacts, which policy makers and programme implementers could use to refine programme goals e.g. a programme with a goal of empowering females in the households would likely add food transfers when the patient has spent a longer time on treatment, when it is likely to be easier for females to transit from care work to employment. Nevertheless, the labour supply reduction by HIV infected patients receiving food transfers should be interpreted with caution as there could be other underlying causal factors. First, only the first half of what was an ongoing 12 month programme was analysed hence it is unclear whether patient behavior was temporary or not and this is compounded by the high job to non-job mobility associated with the informal labour markets that most of the patients engage in. Second, demand-side factors

beyond the scope of the study such as stigma or discrimination towards HIV patients at workplaces or in the community or seasonal changes in local labour markets could also be contributing to the labour supply reductions by patients.

Overall, the conclusion of the thesis is that food transfers potentially have greater benefits than disincentives in households and could improve the effectiveness of AIDS treatment. Food transfers appear to boost adherence to AIDS treatment, improve food security and consumption thus reducing the risk of malnutrition, while having no substantial disincentive effects on the labour supply of non-patient household members.

7.1 Policy Implications

The findings of the thesis have several policy implications. The findings from chapter four seem to reinforce the view that if programme goals are exclusively patient focused, i.e. improving a patient's weight or adherence, then the design and targeting of the food transfers programme matters. For instance, the thesis has shown that there is a negligible weight gain if targeted food insecure patients are not clinically malnourished. While placement of food aid rations at clinics where patients collect their medicine might encourage adherence. Interestingly, chapter four confirms findings from two other similar studies where the type of transfer is the generic food aid ration and it has no effect on ART patients' weight (Rawat et al.2010, Cantrell et al.2008). This certainly provokes further debate on what would comprise the optimal food transfer for nutritional rehabilitation. Still, the debate could be resolved if future research compares generic food aid rations and therapeutic feeding, and also the different targeting criteria (means tested food insecurity and poverty assessment or clinical malnourishment).

The thesis analyses welfare effects just before the weaning assessment period began. The evidence provided by the thesis on the welfare outcomes (as presented in chapters five and six) makes this study the first one to extend current literature beyond clinical effects of integrating ART with food transfers. The consumption responses to the food transfers appear to be large enough to improve food security in the targeted households. This effect is largest among the most vulnerable households including female headed households. That the food aid ration is inframarginal and yet it produces a substantial effect size could influence future programme design, implementation and especially allocation of food resources. Yet, this effect size should be cautiously welcomed by programme implementers especially as household behavior to this effect size might complicate weaning

strategies. If food transfers have a substantial effect on consumption, they could crowd out other informal or private transfers in the households. For instance, the disincentive effect of the food transfers on patient labour supply could likely be due to moral hazard behavior or the crowding out of informal transfers.

The labour supply response by patients and other household members to the food transfers draws attention to the issues of transitioning mechanisms and weaning strategies of such programmes. Current beneficiaries of the programme evaluated in this thesis are weaned based on the successful return to the labour market by the patient or another household member or not meeting the required threshold of food insecurity or poverty. Yet, intrahousehold labour supply responses to the food transfers may complicate the implementation of abrupt weaning. In chapter six we propose several approaches that may ease the transition of households from participation to exit. They include strengthening transition mechanisms such as job or vocational training or providing access to microcredit. If the diverse intrahousehold responses are considered then other options for weaning would include gradual reduction of the ration, or switch to an individual ration for the patient after a certain period of time on the household ration. This ultimately leads to a discourse on what should be the optimal duration of a food transfers programme for HIV affected households. Many development and income transfer programmes aim to empower women. Results from chapter five highlight the importance of intrahousehold responses and how a policy or programme might yield opposing effects in the household. In chapter five we find that a positive female labour supply response to food transfers are dependent on improved patient's health and rising household income. Any programme intention to empower women in these households to establish secure livelihoods, would need to consider the role of the HIV patient's health and the relative wealth of the household.

The findings in the thesis also appear to suggest that the duration of ART influences behavioural outcomes. Adherence to ART is probably greater at early stages of ART (chapter four). While a patient in their early stages of ART could require more care such that food transfers might delay women's participation in the labour market, who probably stay at home until patient is better.

7.1 Study Limitations

This study has several limitations. Firstly, this was an observational study as participants were not randomized to receive the food transfers. As such there was

need to correct for selection bias and endogeneity of the programme using varying units of observations and sample sizes. And the use of IV or PSM is fraught with its own limitations. Secondly, it is likely that in some instances (fourth chapter on weight and adherence) the study uses a small sample and limited follow up which could lead to imprecise estimates. Thirdly, the study lacks prospective panel data, since it was not possible to collect data at baseline. The retrospective data are liable to recall bias; nonetheless the best result possible had to be produced with the data obtained that is why where possible single difference estimates are presented together with double difference estimates.

7.2 Further Research

In light of the limitations faced, further research is recommended that; a) uses larger sample sizes b) exploits a randomized prospective design c) exploits a longer period of follow up (12 months). Further studies would strengthen the nascent body of evidence on this subject matter. More evidence based on robust designs would not only satisfy academic interests but provide valuable information and insights for policy makers and programme implementers. Some issues remain speculative and were beyond the scope of our study. There are several questions which future research can further clarify. First, on the topic of nutritional status when is the greatest effect of adding food transfers to AIDS treatment, is it when foods provided have high calorie density or when targeted patients are malnourished or when both conditions are present? Second, does a substantial effect size from a small sized transfer actually crowd out other coping mechanisms, household informal safety nets, income sources? Third, is the positive consumption effect of the food transfers persistent? Are participants worse off or better off in the aftermath of receiving food transfers? Fourth, what role does HIV stigma or discrimination play in labour markets and what is the interaction between stigma, AIDS treatment and food transfers? Fifth, what are the child outcomes to the food transfers? Sixth, would a change from poverty-based to anthropometric targeting have different nutritional, adherence, consumption and labour supply impacts? Finally, a cost effectiveness analysis was beyond the scope of this study due to data limitations. However, preliminary cost comparisons show that the generic food aid rations examined in this thesis are relatively cheaper than therapeutic feeding, raising an open question whether integrating ART with food transfers is cost effective?

Despite its shortcomings, the dissertation is still an important contribution to the empirical literature on HIV affected households, the effects of AIDS treatment and

the evaluation of food transfers. To our knowledge this is the first study to comprehensively consider the diverse effects of integrating AIDS treatment with food transfers. This is achieved by not only focusing on clinical effects but other household welfare effects such as household consumption outcomes and labour supply responses, which are vital in reducing risks that compromise the effectiveness of AIDS treatment and inform on which areas require long term and sustainable investment. Hence this dissertation fills a major research gap. Hopefully, the findings of this thesis not only set the stage for additional research but also help in the design, implementation, monitoring and evaluation of future programmes.

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9. Appendix

9.1 Data Collection

9.1.1 Selection of Respondents

Sampling Unit

The primary sampling unit was the HIV affected household. The target respondents include the household heads, spouse or household adults who can either be a treated patient or non-patient in a household with treated patients. patient requests) or when they come for treatment or to receive the food assistance.

Sample Size Calculation

For a hypothesis that there would be a 20% increase in food consumption from food transfers, at 80% power, 95% confidence level, would need a sample size of needed 199 patients/households, calculated online at http://hedwig.mgh.harvard.edu/sample_size/js/js_associative_quant.html. This was increased to 400 households (200 participating and 200 control).

Sampling strategy

Patient/Household lists detailing beneficiary and non-beneficiary patients were obtained from the clinics and the food distribution committees at the clinics. Sampling intervals for beneficiary and non-beneficiary groups were calculated by dividing the total number of patients in each clinic by the number of patients to be interviewed (50 for each clinic). A random number between 1 and the value of the sampling interval (this can be done by using a calculator that has a random function or simply by asking a colleague to give a number in the range) was generated to give the point at which to begin the selection process.

For instance household number 1 would correspond to the random number (for instance 4) then move down the list, choosing every beneficiary patient at the interval corresponding to the sampling interval, until 50 names are selected. In the example above, count one patient starting from patient number 4. This will give household numbers 4, 8, 12, 14, 18, 22, 26, 30, 34, 38, on the beneficiary list.

9.1.2 Research Tools and Personnel

Questionnaire

A structured questionnaire was used to capture information such as household demographics, total household expenditures (both food and non-food), asset wealth, and meals and foods eaten per week, household coping strategies, migration and remittances, self reported health, labour supply, self reported side effects by patients, children's nutritional status and education enrollment, and ART patient self reported adherence to treatment. Pre-testing of the questionnaire was done three days before the actual survey was implemented.

9.1.3 Human subjects and ethical requirements

There are ethical challenges associated with collecting HIV/AIDS data, primarily the stigma associated with being HIV-positive that may result in participant discrimination or harm. Thus this research made efforts to ensure that all participants in data collection activities were protected and safe from harm. No biological specimens were collected from the study participants. Study protocol and consent documents were reviewed by the University of Zambia Research Ethics Committee and any relevant IRBs at sponsoring universities. Human subject protections involved the following efforts:

- *Informed Consent*: The level of risk associated with this research is expected to be minimal. Written informed consent was obtained from all study participants prior to conducting the interview. This protocol and the informed consent document and any subsequent modifications was reviewed and approved by the Institutional Review Boards or Ethics Committees responsible for oversight of the study.
- *Subject Confidentiality*: The confidentiality of all study records was safeguarded to the extent legally possible. All reports, study data collection forms, process, and administrative forms were identified by a coded number only, to maintain participant confidentiality. Forms, lists, logbooks, appointment books, and any other listings that link participant ID numbers to other identifying information were stored in a separate, locked file. Hard copies of data forms for data entry and analysis were stored in a locked file when not in use. Clinical information with individual identifiers was not released without the written permission of the participant.
- *Protocol Compliance*: The study was conducted in full compliance with the protocol.

9.2 Informed Consent Form

Title: The Welfare Effects of Integrating HIV Treatment with Social Transfers in Zambian Households.

Investigators:

Nyasha Tirivayi, WFP Consultant Maastricht University Maastricht Graduate School of Governance P.O. Box 616 6200 MD Maastricht The Netherlands Telephone: +31 (0)43 38 84695 E-mail: nyasha.tirivayi@maastrichtuniversity.nl	Lusako Sichali Monitoring and Evaluation Focal Point World Food Programme P.O. Box 31966, Lusaka, Zambia Phone: +260 1 253 845 Fax: +260 1 252 955 Lusako.Sichali@wfp.org

Sponsor: The World Food Programme

Introduction:

You are invited to enroll in a research study to find if providing food and nutrition assistance might improve the health of patients receiving ART and the health of their families. You are asked to participate in this study because you are currently enrolled in the Zambian national ART programme. You will not receive any food assistance by directly participating in this study, but the information you provide will be used to try to improve the health of patients on ART in Zambia. You are being asked to take part in an interview, at your home or at the health clinic, and you will be asked several questions about your health, your family's health and your family's economic and social experiences. You may also be asked to keep a diary of your health and what you eat at home with your family. The interview and questionnaire will take approximately 30 minutes to complete.

This is a consent form for participation in this study. It gives you information about this study. The study staff will talk with you about this information and the study. We want you to know the purpose of the interview and the possible risks and benefits. You may ask questions about your participation in this study at any time. If

you decide to continue to take part in this study after it has been fully explained to you, we will ask you to sign this consent form or make your thumbprint in front of a witness. You may keep a copy of the consent form if you like. This process is called "informed consent."

Please note that:

1. Your continued participation in this research is entirely voluntary.
2. You may decide to withdraw from the study at any time without losing the benefits of your standard medical care.

Purpose of the study:

This study is being conducted to determine if giving people on ART extra food can improve their health and the health and welfare of their family.

Study procedures:

The study is taking place at 8 clinics in the Lusaka district. All study participants are receiving the standard HIV treatment which is offered in Zambia. At some clinics, study participants are also receiving food assistance from a programme administered by the World Food Programme and the Zambian Ministry of Health.

The study consists of an interview and a questionnaire. The questionnaire will be read to you by a trained Zambian interviewer. You may also be given a notebook and asked to record your meals at home for a few weeks.

Your medical chart, which contains information on your health and treatment decisions made by you and your health provider, may be reviewed by study staff to determine if food assistance improves a person's health. Any review of your chart will be done by trained study staff only. Your name will not be recorded on any study forms. Your will be identified by a coded number only.

There are no extra blood draws or medical tests required to participate in this study.

Possible Risks:

There are no blood draws or medical tests required in this study. The primary risk of participating in this study is you will be asked to reveal your medical history and personal details of your family to a trained medical interviewer. This information will be kept strictly confidential.

Potential Benefits:

There is no guarantee of a direct benefit to you from being in this study. However, taking part in this study will provide information about food assistance. Knowledge gained from this study may in the future help others who suffer from the HIV infection.

Withdrawal from the study:

If you choose not to continue as a participant in this study, it will not affect the health care you get in any way. There is no penalty if you do not continue in the study.

Alternatives to this study:

You may choose not to participate in this study. If you choose not to continue you will still receive treatment for your disease at this clinic.

Costs to You:

There will be no cost to you to participate in this study. Your ART medications will be provided through the clinic and will not be provided as part of this study.

Confidentiality:

Your research records will be confidential to the extent permitted by law. If you choose to not participate in the study for an extra 18 months, your research records will continue to be confidential. You will be identified by a code, and personal information from your records will not be released without your written permission. You will not be personally identified in any publication about this study. However, your records may be reviewed, by the Zambian Ministry of Health, the United Nations World Food Programme (WFP), and the Centre for Infectious Disease Research in Zambia (CIDRZ), the Zambian Research Ethics Committee (REC), study staff, and study monitors.

Persons to contact for problems or questions:

If you have any problems or questions about the study there are people you can contact. The study counsellors at the clinic and other staff can help you contact the right person to answer any questions you have.

For study questions, contact:
Calum McGregor
World Food Programme
P.O. Box 31966, Lusaka, Zambia

Phone: +260 1 253 845

For questions about your rights as a research subject:
Dr. E. M. Nkandu
Chairperson, Research Ethics Committee
Department of Physiotherapy, UTH
Lusaka, Zambia
Tel: 252-641; Mobile: 0977-796-839

Legal rights:
You are not giving up any of your legal rights by signing this informed consent document.

Statement of consent:

You will receive a copy of this informed consent.
If you have read the informed consent or had it read and explained to you and you voluntarily agree to participate in this study, please sign your name or make your mark below. If there is any part of this form that is unclear to you, be sure to ask questions about it. Do not sign until you get answers to all your questions. By signing this consent form you agree to continue to participate in this study.

I agree to participate in this study.

_____ _____ _____

Participant's Name (print) Participant's Signature/thumbprint Date

I have observed the participant sign or make his/her mark above and I believe he/she has understood and knowingly gives consent for participation.
.

_____ _____ _____

Witness' Name (print) Witness' Signature Date

I have explained the purpose of this study to the participant. He/She had the form read to him/her, was given the chance to ask questions, accepted the answers, and signed to enroll in the study.

_____ _____

Study Staff's Name (print) Study Staff's Signature Date

Note: This consent form with original signatures must be retained on file by the principal investigator. A copy must be offered to the volunteer.

9.3 Survey Questionnaire

Could you please spare some time (around 40 minutes) for the interview?

Module 1: Household Demographics and Health

Section 1A ART Patient Identification

1A01	Date of interview |__|__| |__|__| |__|__| *Day Month Year*
1A02	*Name of Interviewer*----------
1A03	Name of Supervisor_____
1A04	District_____
1A05	Household Number:
1A06	Name of patient :
1A07	Site name_____ Site Number_____
1A08	Are you a food assistance beneficiary or not? 1-yes 0-no
1A09	If on food assistance what was your enrolment date for food programme ----------
1A10	Patient ID/unique number:
1A11	Place of Residence 1.Compound _____ 2. Ward_____ 3. Plot no____
1A12	Who is the person answering these questions? 1. Patient 2. Spouse 3. HH head (if they are not the patient)
1A13	Respondent's gender 1 = male 2= female
1A14	RELIGION 1. CHRISTIAN 2. MUSLIM 3. TRADITIONAL 4. OTHER

Section 1B Household Roaster: start with ART patient

HH1 Name of household member	01 Relationship of household member to patient 1. Self 2. Spouse 3. Child 4. Father/mother 5. Brother/sister 6. Grandparent 7. Uncle/Auntie/Cousin 8. Niece, Nephew, Grandchild 9. Adopted/foster child 10. Step-child 11. No relation 12. Other relative	02 Who is the head of hh? 1. Self 2. Spouse 3. Child 4. Father/mother 5. Brother/sister 6. Grandparent 7. Uncle/Auntie/Cousin 8. Niece, Nephew, Grandchild 9. Adopted/foster child 10. Step-child 11. No relation 12. Other relative	03 age	04 sex 1-male 2-female	05 marital status of hh member 1-married-monogamy 2- married-polygamy 3-separated 4-single 5-divorced 6-widowed 7-N/A	06 HIV status 1. positive and on ART 2. positive and not on ART 3. negative 4. unknown	07 If female, are they pregnant? 1. Yes 0. no 98. not applicable

08 If female, are they lactating (breastfeeding)? 1. Yes 0. no 98.not applicable	09 Children in household 0-59 months old	10 6+ years only Was this person engaged in any activities that earn money for the household in the past 6 months? 1 = Yes, currently 2 = Yes, but no longer 3 = No/Never	11 6+ years only What is the Primary Economic Activity for this person? 0. No occupation 1. Gov. employee 2. Private sector employee 3. Informal trader 4. Commercial sex worker 5. Formal trader 6. Artisan/handicraft 7. Agriculture 8. NGO employee 9. Unpaid domestic work 10. Paid domestic work 11. Daily labourer 12. Pensioner 13.Student 14.House wife 15. Other (Specify)	12 Above 6 years Level of education completed 0=baby class-preschool 1=None/ Didn't attend school 2= grade 1-4 junior primary 3=grade 5-7 upper primary 4= grade 8-9 junior secondary 5= grade 10-12 senior secondary 6=College/ University 7=sub A and sub B	13 School enrolment for household members 6 to 17 years only 1 = Currently enrolled and attending 2 = Enrolled but absent more than 1 week in past month 3 = Dropped out of school this year 4 = Dropped out before this school year 5 = Primary/Secondary Completed 6 = Never Enrolled	14 6 to 17 years only Primary reason for Absence, Not Enrolment or Dropping Out of school 1 = illness 2 = work for food or money 3 = help with family work 4 = care for ill family member 5 = care for younger sibling 6 = not interested in school 7 = distance to school far 8 = hunger 9 = no money 10= too young 11= pregnancy/marriage 12 = incapable of continuing

Section 1C: Individual Health History of ART Patient

		Answers
1	Relationship of Patient to Household Head 1. Self 2. Spouse 3. Child 4. Father/mother 5.Brother/sister 6.Grandparent 7. Uncle/Auntie/Cousin 8.Niece, Nephew, 9. Grandchild 10.Adopted/foster child 11.Step-child 12.No relation 13.Other relative	
2	Marital Status 0-unmarried 1-married-monogamy 2-seprated 3-divorced 4-widowed 5-Living with partner 6-married-polygamous	
3	Gender *Male = 1 Female= 2*	
4	Age *In years.* Birth Year	
5	Current physical status 1.strong with stamina 2.weak or sickly 3.bedridden If answer is 1 or 2 go to 7.	
6	If bedridden, How long have you been bed-ridden? (please choose one) 1.One week 2.Two weeks 3.A month 4.For quite sometime now	
7	Were you not able to work for at least 3 months over the past 12 months due to illness 0 = No 1 = Yes If yes answer question 8, if no proceed to question 9.	
8	What were the main illnesses preventing you from working? 1=TB 2=Meningitis 3=Malaria 4=Diarrhea 5=Pneumonia 6=Headache 7 = mentally/physically disabled due to accident 8 = mentally/physically disabled since born 9 = Back Ache 10 =other _____ 11=Don't know	
9	Where do you usually go for health care? 1= public/govt health facility 2. private clinic/hospital 3. Traditional healer 4. NGO facility	
10	Health facility used for ART 1= public/govt health facility 2. private clinic/hospital 3. Traditional healer 4. NGO facility	
11	Time required to travel to ART health facility 1= less than 30mins, 2 more than 30 mines but less than 1 hr, 3- greater than 1 hr	
12	Is money required to access health facility services	

	1-yes 0-no	
13	If you were sick and did NOT get Formal health care, what was the MAIN reason? 1 = No money to pay for treatment 2 = No transport, too far 3 = Poor quality of service 4 = Religious or cultural reasons 5= did not need formal health care 6 = Do not believe in modern health care 7=Shortage of health workers 8 = Other reasons (Specify)	
14	Have you been regularly receiving the following basic support in the past preceding the survey? (multiple response) Any one-off support should not be included 1. Medical assistance 2. School fees 3.Scholastic material 4.House rent 5. Member of support group 6.Credit scheme 7. Food	
15	Disability 0.= not disabled 1 = physically disabled 2 = mentally disabled 3 = Both physically and mentally	

16. What has been your physical status during past 12 months 1-strong with stamina 2-weak or sickly 3-bedridden Answer----------	17. What has been your main sickness in past 12 months 1=TB 2=Meningitis 3=Malaria 4=Diarrhoea 5=Pneumonia 6=Headache 7 = mentally/physically disabled due to accident 8 = mentally/physically disabled since born 9 = Back Ache 10 =other _____ 11=Don't know Answer _____

Section 1D Adherence History of ART Patient

1. Reported Adherence (For patients currently taking ARVs) In the past week: a. On how many days did you miss at least one pill? □0 □1 □2 □3 □4 □5 □6 □7 b. On how many days did you miss <u>all</u> of your pills? □0 □1 □2 □3 □4 □5 □6 □7 c. How many doses did you miss altogether? _____ d. How many <u>extra</u> pills did you take? _____ e. In the last month how many doses did you miss? _____	
2. Everyone misses taking their medication sometimes for various reasons. Do you have any trouble of this kind? 1. Yes 0. no	_____
3. Reasons for skipping ARV medication: multiple response 1 Forgetting 2 Couldn't get to health center to get the medicine 3 Didn't know how to take the medicine 4.I didn't know it was important; 5. ARVs not useful, I am going to die anyway so I didn't take them, etc. 6. Too sick to take medication 7. Side Effects (the medicine was making me sick or weak) 8. I was feeling better and didn't think I needed them	_____

9. I was afraid someone would see me take the medicine; etc. 10 I decided to use traditional herbs instead 11 God would heal me without the medicine; a faith healer prayed for me and I believed I was healed 12 Other reasons			
4. Time required to travel to health facility to get refill of ARVs 1= less than 30mins, 2= more than 30 mins but less than 1 hr, 3 = more than 1 hr Answer_____	5. How much do you pay for transport to come to clinic (one way)? _____	6. By how many days did you miss last clinic appointment for refill? _____	

Section 1E Family Sickness/Health History

Weight and Height Data for Patient (do not weigh pregnant women)			
Weight_____	Height_____		
Weight and Height Data for children 0-5 years old	*If there is no child 0-5 yrs old, skip to 7*	Weight in Kg Height in cm	
1. Name of Child 1 _____	2. Age of Child 1 (months) _____	3. HIV status of child 1 1. positive and on ART 2. positive and not on ARV 3. negative 4. unknown _____	3.1 Weight of child 1____ 3.2 Height of child 1_____
4. Name of Child 2 _____	5. Age of Child 2 (months) _____	6. HIV status of child 2 1. positive and on ART 2. positive and not on ARV 3. negative 4. unknown _____	6.1 Weight of child 2____ 6.2 Height of child 3_____

7. Have any of your household members died in the past 6 months? 1. yes 0.no If yes, answer q8, if no proceed to q9	8. Did a main income earner die? 1. yes 0.no If yes answer q9, if no proceed to q10	9. Was this person/main income earner chronically ill before dying? 1. yes 0.no
10. number of HIV positive household members ____ 0- none 98-unknown	11. number of household members on ART___	How many members of the family are: 12. physically disabled _____ 0- none 98-unknown 13. mentally disabled _____ 0- none 98-unknown 14. Both _____ 0- none 98-unknown
15. How many members of the household were too sick to work or do normal activities for at least 3 months _____ 0- none 98-unknown If none skip to section 2A		16. What were their main sicknesses? (Multiple response) 1=TB 2=Meningitis 3=Malaria 4=Diarrhea 5=Pneumonia 6=HIV/AIDS 7=Headache 8 = mentally/physically disabled due to accident 9 = mentally/physically disabled since born 10 = Back Ache 11 =other 12=Don't know _____

17. Where did the sick go for health care? 1= public/govt health facility 2. private clinic/hospital 3= traditional healer 4. NGO facility _____	18. If the sick did NOT get Formal health care, what was the MAIN reason (one answer only, circle the answer)? 1 = No money to pay for treatment 2 = No transport, too far 3 = Poor quality of service 4 = Religious or cultural reasons 5= did not need formal health care 6 = Do not believe in modern health care 7=Shortage of health workers 8 = Other reasons (Specify)	19. Have the sick been receiving the following basic support in the past before this survey? (multiple response, circle the answers) 1 = Health Care Support 2 = Emotional Support 3 = Social Support, including material support 4 = food commodities 5 = cash 6 = other …….. 9=None

Module 2 Economic Factors

Section 2A Food Consumption and expenditure

- *Over the last seven days, how many days did you consume the following foods?*

What was the main source(s) of the food?		
Source codes:	1 = Own production	2 = Casual labour
	3 = Borrowed	4 = Gift
	5 = Purchases	6 = Food assistance
	7 = Barter	8 = Hunting/gathering/catching

	Number of days (0 to 7)	Source(s)	
1. Maize, maize porridge	|__|	|__|	|__|
2. Other cereal (rice, sorghum, millet, bead, pasta etc)	|__|	|__|	
3. Roots and Tubers (cassava, potatoes, sweet potatoes)	|__|	|__|	
4. Sugar or sugar products	|__|	|__|	
5. Beans and peas	|__|	|__|	|__|
6. Groundnuts and cashew nuts	|__|	|__|	
7. Vegetables (including relish and leaves)	|__|	|__|	
8. Fruits	|__|	|__|	
9. Beef, goat, or other red meat and pork	|__|	|__|	
10. Poultry and eggs	|__|	|__|	
11. Fish	|__|	|__|	
12. Oils/fats/butter	|__|	|__|	|__|
13. Milk/yogurt/other dairy	|__|	|__|	

14. Heps	|__|	|__|

	Fill in Codes (Score) for each type of food and its source as appropriate. Sum up scores and write total in the right hand column						
Number of times a type of food was eaten yesterday in the household 0=three times 1=two times 2=Once 3=Never/seldom	Meat/Fish	Oil seeds (g/nuts)	Cereals	Pulses	Vegetables/Fruits	Tubers (Sweet potatoes, Cassava, etc)	Total

15. Number of meals taken in a day by adults (15 yrs and older) 0. Four & More 1. Three meals 2. Two meals 3.One meal Answer ----------	16. Number of meals taken in a day by children (6 to 15 yrs) 0. Four & More 1. Three meals 2. Two meals 3.One meal Answer ----------	17. Number of meals taken in a day by children (0-5yrs) 0. Four & More 1. Three meals 2. Two meals 3.One meal Answer----------	18. What is your main source of food? 1 = Own production 2 = Casual labour 3 = Borrowed 4 = Gift 5 = Purchases 6 = Food assistance 7 = Barter 8 = Hunting/gathering/catching Answer ----------

Food Coping strategies						
In the past 30 days, how frequently did your household resort to using one or more of the following strategies in order to have access to food? SELECT ONE ANSWER PER STRATEGY.						
		Never	Seldom (1-3 days/month)	Sometimes (1-2 days /week)	Often (3-6 days a week)	Daily
19	Skip entire days without eating?	1	2	3	4	5
20	Limit portion size at mealtimes?	1	2	3	4	5

21	Reduce number of meals eaten per day?	1	2	3	4	5
22	Borrow food or rely on help from friends or relatives?	1	2	3	4	5
23	Rely on less expensive or less preferred foods?	1	2	3	4	5
24	Purchase/borrow food on credit?	1	2	3	4	5
25	Gather unusual types or amounts of wild food / hunt?	1	2	3	4	5
		Never	Seldom (1-3 days/month)	Sometimes (1-2 days /week)	Often (3-6 days a week)	Daily
26	Harvest immature crops (e.g. green maize)?	1	2	3	4	5
27	Send household members to eat elsewhere?	1	2	3	4	5
28	Send household members to beg?	1	2	3	4	5
29	Reduce adult consumption so children can eat?	1	2	3	4	5

30	Rely on casual labour for food?	1	2	3	4	5

31	Has your household experienced any household/homestead theft in the past 6months?	0 = No	1 = Yes
32	Have you sold any household assets to buy food?	0 = No	1 = Yes
33	Have you sold any household assets to pay for health care/medical expenses?	0 = No	1 = Yes

Food Expenditure

Food Expenditure in Past 7 days			
Type of food	Did you or your household members purchase any of these foods in the past 7 days? 1. Yes 0. no	If you purchased the food, did you purchase in cash or in kind? 0. in kind 1. Cash 2. Both	Cost of the food in kwacha (also estimate for in kind purchases)
30.1 Cereals (maize, maize flour, rice, etc.)			
30.2 Roots and tubers (yams, potatoes, etc)			
30.3 Bread/buns/fritters			
30.4 Legumes (beans, peas, groundnuts)			
30.5 Fruits & vegetables			
30.6 Fish/Meat/Eggs/poultry			
30.7 Oil, fat, butter			
30.8 Milk			
30.9 Sugar/Salt			
Food Expenditure in Past 30 days			

Type of food	Did you or your household members purchase any of these foods in the past 30 days? 1. Yes 0. no	If you purchased the food, did you purchase in cash or in kind? 0. in kind 1. Cash 2. Both	Cost of the food in kwacha (also estimate for in kind purchases)
30.1 Cereals (maize, maize flour, rice, etc.)			
30.2 Roots and tubers (yams, potatoes, etc)			
30.3 Bread/buns/fritters			
30.4 Legumes (beans, peas, groundnuts)			
30.5 Fruits & vegetables			
30.6 Fish/Meat/Eggs/poultry			
30.7 Oil, fat, butter			
30.8 Milk			
30.9 Sugar/Salt			

Food Expenditure in January 2009

Type of food	Did you or your household members purchase any of these foods in January 2009? 1. Yes 0. no	If you purchased the food, did you purchase in cash or in kind? 0. in kind 1. Cash 2. Both	Cost of the food in kwacha (also estimate for in kind purchases)
30.1 Cereals (maize, maize flour, rice, etc.)			
30.2 Roots and tubers (yams, potatoes, etc)			
30.3 Bread/buns/fritters			
30.4 Legumes (beans, peas, groundnuts)			
30.5 Fruits & vegetables			
30.6 Fish/Meat/Eggs/poultry			

Food Expenditure in Past 7 days			
Type of food	Did you or your household members purchase any of these foods in the past 7 days? 1. Yes 0. no	If you purchased the food, did you purchase in cash or in kind? 0. in kind 1. Cash 2. Both	Cost of the food in kwacha (also estimate for in kind purchases)
30.7 Oil, fat, butter			
30.8 Milk			
30.9 Sugar/Salt			

Section 2B Non-Food Expenditure

January 2009

	Did you spend money on the following items during January 2009? *If none, write 0 and go to next item*	Cash 0-no 1-yes	In Kind 0-no 1-yes	Estimated Cost *Kwacha* (also estimate for in kind purchases)
1	Milling			
2	Cigarettes and Tobacco			
3	Soap & HH items			
4	Hiring labour for household services (not for house repair/construction)			
5	Cinema/Entertainment			
6	Alcohol			
7	Food and Beverages consumed outside home			
8	Medical expenses, health care			
9	Clothing, shoes			
10	Transport			
11	Fuel (wood, paraffin, etc.)			
12	Telephone			
13	Electricity			
14	Newspapers or Magazines			
15	Gasoline/Motor Oil			
16	Haircuts, hair dressing, beauty parlours			

Past 30 days expenditure

Did you spend money on the following items during the past 30 days? *If none, write 0 and go to next item*		Cash 0-no 1-yes	In Kind 0-no 1-yes	Estimated Cost *Ksh*
1	Milling			
2	Cigarettes & Tobacco			
3	Soap & HH items			
4	Hiring labour for household services (not for house repair/construction)			
5	Cinema/Entertainment			
6	Alcohol			
7	Food and Beverages consumed outside home			
8	Medical expenses, health care			
9	Clothing, shoes			
10	Transport			
11	Fuel (wood, paraffin, etc.)			
12	Telephone			
13	Electricity			
14	Newspapers or Magazines			
15	Gasoline/Motor Oil			
16	Haircuts, hair dressing, beauty parlours			

Past 6 months-Non-Regular Expenditure

	In the past 6 months how much money have you spent on each of the following items or service? *Use the following table, write 0 if no expenditure.*	
		Estimated expenditure in Local Currency
1	Equipment, tools, seeds, animals	
2	Construction, house repair	
3	Remittances to relatives and friends living outside this household	
4	Donations to churches, mosques	

5	Repairs- household and farm assets, vehicle, bicycle	
6	Household machines and appliances purchases(radios, Bicycles, refrigerators, sewing machines, etc.)	
7	Watches, jewellery, and other valuables	
8	Debt repayment	
9	Education, school fees, uniform, etc	
10	Ceremonies (births, weddings, funerals, etc	
11	Dowries of household members	
12	Government taxes/licences	
13	Payments to clubs, organizations, etc.	
14	Boarding and Lodging while travel	
15	Household furniture and kitchenware	
16	Other	

Section 2C Household income and assets

1. Main source of income 0. None 1. Permanent employment 2. temporary employment/casual labour 3. Farming and gardening 4. Own business 5. vending and petty selling 6. Remittances 7. In kind gifts from relatives/friends 8. cash gifts from relatives/friends 9. Social assistance from government or NGO 10. borrowing	answer----------

Income Received -Now obtain estimated values for all sources of income for the hh, including the main source indicated in 1.

Source	Was it in Cash or in kind 0-cash 1-in kind 2-Both	Estimated value *past 30 days* Kwacha	Estimated value *January 2009* Kwacha
2. Permanent employment/salary			
3. Temporary/casual work			
4. own business			
5.garden and farming			
6.Remittances/cash from non-resident family members			
7.Cash gifts from neighbours, community, friends			
8.in kind gifts from relatives/friends - food for example clothing, free transport, kitchenware			
9.Social assistance –cash, food aid from NGO, government			
10.Loan			
11.Vending and petty selling (e.g. household goods, other goods)			
12. Others sources			

Housing, Loans and Land

13. During the past 6 months, what main support have you received from relatives and friends? 0=none 1=money 2=food 3=clothing 4=farm inputs 5=loans Answer----------	14. During the past 6 months, did you or any member of your HH borrow money? 1-yes 0-no Answer---------- If answer is no, skip 15, 16, 17 and go to q18	15. What was the main use of the largest loan taken in the last 6 months? 0=no use 1= agricultural inputs 2= food purchases 3= construction other than house 4= health emergency 5= business investment 6= bride price / wedding 7= land purchase 8= funeral 9= house purchase or construction 10= medicines for chronically ill family member 11= home improvement include furniture 12 = other, specify Answer---	16. How much money did you get in loan over the past 6 months? Answer----------

		----------	
17.From whom did you borrow? 1= family / friends in country 2= micro-finance institution 3= family / friends outside country 4= bank/formal lending institution 5= informal savings group 6= shopkeeper /traders 7= NGO 8= money lender 9= other Answer---------	18. Do you have any cash savings? 1-yes 0-no Answer---------- If answer is no, skip q19, go to q20.	19. How much do you have in cash savings?. Answer--------	20. Productive land owned by household 0= none 1= less than 1.5 acre 2= greater than 1.5 acre Answer----------

21. What is the total land area that you cultivated in the 2008/9 agricultural season: 0 = Did not cultivate 1 = less than 0.5 ha 2 = 0.5 to 1 ha 3 = 1 to 2 ha 4 = 2 or more ha Answer----------	22. What was your main reason for not cultivating in the 2008/9 agricultural season? 1 = Planned fallow 2 = Weather-related causes 3 = Could not access land 4 = Lack of seed 5 = Lack of fertilizer 6 = Lack of labour/insufficient labour 7 = Pest problems 8 = Rented out 9 = illness in the household 10 = lack of draught power/no money to hire tractor 11= lack of financial means to enable hh 12 = Other Answer---------

23. What is the total land area that you plan to cultivate in the 2009/10 agricultural season: 0 = will not cultivate 1 = < 0.5 ha 2 = 0.5 to 1 ha	24. Do you stay in your own house 1-yes 2-rent/lease 3-no rent with owner consent 4-no rent, squatting	25. What is the type of house you reside in? 1-Permanent 2.Semi-permanent 3. temporary	26.Main material of roof 1-tiles 2- concrete 3-Asbestos sheets 4-Corrugates iron roof 5-Tin cans 6-Grass/ thatch/makuti 7-other (specify)

3 = 1 to 2 ha 4 = 2 or more ha Answer----------	Answer----------	Answer ----------	Answer----------
27. Does your HH have electricity? 1-yes 0-no Answer----------			28. Source of drinking Water Piped inside house Pipe yard/ public Borehole/ Protected well Unprotected river/stream/dam/well Other-specify Answer----------
29. What type of toilet facility does your household use? 1 = Flush/pour flush 2 = Pit latrine 3 = Ventilated Improved Pit latrine (VIP) 4 = Open pit 5 = None (bush or field) Answer----------		30. Which Kind of fuel do you mainly/commonly use for cooking? Give one answer Electricity/ Gas Paraffin Charcoal Firewood Other- specify Answer----------	

Assets currently owned

Type of asset	Quantity	Value as of today (per unit) Zambia Kwacha
Cattle		
Pigs		
Chicken (or other poultry)		
Goats or sheep		
Radio		
Television		
Bicycle		
Mobile phone		
Fixed telephone		
Rental houses	Skip quantity!	
Sewing machine		
Kerosene stove		
Plates i.e. crockery	Skip quantity!	
Ox drawn cart		
Solar panel		
Wheelbarrow		
Cultivator		
Motorcycle or scooter		
refrigerator		
Vehicle- car, truck, tractor		
Sofa set		

55	Have you sold or bartered any sheep, goats or pigs in the past 3 months?	0 = No (Skip to 56)	1 = Yes
	Codes for 55.1, 56.1 and 57.1	1 = No longer needed	2 = Pay daily expenses
		3 = Buy food for HH	4 = Pay medical expenses
		5 = other emergency	6 = Pay debt
		7 =- Pay social event	8 = pay funeral
		9 = pay school costs	10 = other
		11 = No second reason	98= not applicable

55.1	If yes, why?	*Reason 1* |__|__|	*Reason 2* |__|__|	
56	Have you sold or bartered any poultry in the past 3 months?		0 = No (Skip to 57)	1 = Yes
56.1	If yes, why?	*Reason 1* |__|__|	*Reason 2* |__|__|	
57	Have you sold or bartered any cattle in the past 3 months?		0 = No (Skip to 2D)	1 = Yes
57.1	If yes, why?	*Reason 1* |__|__|	*Reason 2* |__|__|	

Section 2D Weekly Labour Hours Worked by All household Members including children

Ask each household member the following questions. If household member is absent, ask household head or other knowledgeable adult present to give you their work hours- start with patient

L1 Name of household member	01 Relationship of household member to patient 1. Self 2. Spouse 3. Child 4. Father/mother 5. Brother/sister 6. Grandparent 7. Uncle/Auntie/Cousin 8. Niece, Nephew, Grandchild 9. Adopted/foster child 10. Step-child 11. No relation 12. Other relative	02 Age	03 Sex 1. male 2. female	04 HIV status 1. positive and on ART 2. positive and not on ARV 3. negative 4. unknown	05 Number of hours spent in own or someone's farm, field, garden and herding in the past 7 days	06 Number of hours spent on household chores in the past 7 days	07 Number of Hours spent on formal/permanent job per day
	1.						

08 Number of hours spent on casual/temp work in the past 7 days	09 Number of hours spent on care giving for the sick and disabled in the last 7 days	10 Number of hours spent on care giving for young children (under 5) in the last 7 days	11 Number of hours spent on care giving for the elderly (over 65) in the last 7 days	12 Number of hours spent on own business/vending work in the past 7 days	13 Number of hours spent on unpaid work outside hh in the past 7 days

Section 2E Employment Status: Interviewer, make sure answers correspond to same names as above

E1 Name of household member	01 Relationship of household member to patient 1. Self 2. Spouse 3. Child 4. Father/mother 5. Brother/sister 6. Grandparent 7. Uncle/Aunt	02 Employment status 1=Paid employee-permanent 2=paid employee-temp 3= self employed with own employees 4= self employed, no employees 5=unpaid family worker 6=domestic employee	03 If paid employee, how much was last payment for the month in Kwacha?	04 What were you doing in January 2009? 1.Worked for pay 2.On leave 3.Working for family/own business 4.Working on own/family farm, cropping plot 5.Seeking work	05 What were you mainly doing in the past 7 days 1.Worked for pay 2.On leave 3.Working for family/own business 4.Working on own/family farm, cropping plot 5.Seeking work	06 On how many days did you work (paid and unpaid) in the past 30 days?	07 On how many days did you work (paid and unpaid) in January 2009

	ie/Cousin 8. Niece, Nephew, Grandchild 9. Adopted/foster child 10. Step-child 11. No relation 12. Other relative	7=unemployed 8=other specify		6.Doing nothing 7.Retired 8.Household chores 9.Full time student 10.Bedridden/sick 11. out of season 12.retrenchment 13. temporary lay off 14. business closed 15.too young/ too old 16. Other-specify	6.Doing nothing 7.Retired 8.Household chores 9.Full time student 10.Bedridden/sick 11. out of season 12.retrenchment 13. temporary lay off 14. business closed 15.too young/ too old 16. Other-specify		

Section 2F Social assistance received in the Household: Ask the patient

1) What type of social assistance have you obtained in the past 12 months? Select main 3 types 1 = Food aid 2 = food for work 3= Clothing 4 = Farm inputs 5 = Loans 6 = Agricultural skills training 7 = Cash 8 = Other skills training 9 = Educational support 10 = Other If receiving food aid, answer q2 to 30 If receiving cash assistance answer 1.1 and go to q31-36 If receiving other social assistance, answer 1.1 go to 37	1.1) If you have not received food assistance, why have you not received any food assistance? 1. I am eligible but am afraid of what community might say about me 2. I am eligible but do not believe/like in handouts 3. not eligible and food secure 4. did not know about the food programme 5. eligible but not enough food	
2) If receiving food assistance, how long have you been receiving food aid? months _____	3)How many Kg of food assistance do you get per month? _____ Use conversion table provided for reference.	4)How many times do you get food assistance? 1. Twice per month 2. Once a month 3. Once per three months 4. Once in six months 5. once per year

5)Where did you get your food ration from? Multiple response 1 = government 2 = WFP/PUSH 3 = CBO 4= other NGO 5 = Traditional leader 6= church/mosque/temple 7= other source	6)What is the main reason you are receiving food assistance? 1.lack of food and income 2.low cd4 count 3.malnourishment 4.weak physical condition 5.other 6.1) How did you join the food programme? Write answer. _____ _____	7) If you have not received the food ration regularly, what are the reasons? Multiple response 1. I am eligible but am afraid of what community might say about me 2. I am eligible but do not believe/like in handouts 3. food secure 4. not enough food 5. delays at clinic	8) What was the gender of the recipient who went and collected the last food ration? 1. Male 2. female
9) How much time does it take to reach the distribution point from your home? (Probe to make sure it was direct) 1 = less than 1 hour 2 = between 1 and 2 hours 3 = between 2 and 4 hours 4 = 4 hours or more	10) How much do you pay for transport to get to the food distribution point? _____	11)Who in your household makes decisions about how food assistance is used? 1 = Men 2 = Women 3 = Both	12) What commodities did you receive in your most recent household ration? Multiple response 1 = maize 2=vegetable oil 3=HEPS 4= pulses

13)Does everyone in the household eat the food assistance? 1. Yes 0. no	14)Who eats most of the food assistance in the household? 1=ART Patient enrolled in food programme 2=Other adult HIV patients in the household 3=Other child HIV patients in the household 4=non-HIV adult members 5=non-HIV children	15)Did you sell or barter any food aid last month? 1. Yes 0. no	16)If you sold food aid, how much did you sell in kg? _____ _____ ____
17)Which type of food aid did you sell? select all that apply- 1 = Cereals 2 = Pulses 3 = Oil 4 = CSB	18)How much cash did you get for selling this food aid? _____ ____	19)Did you share/give away any food aid to people outside your household last month? 1. Yes 0. no	20)If yes, how much in kg? _____ _____ _
21)Which people did you share the food aid with? Multiple response 1. Extended family 2. Neighbours 3. Charity organization 4. Friends 5. chief/village head 6. other-specify		22)Which type of food aid did you share? select all that apply 1 = maize 2=vegetable oil 3=HEPS 4= pulses	
23)For how many days did your most recent ration of maize last? _____ days	24)Is the duration of 12 months receiving food assistance enough for you? 1. Yes 0. no	25)What do you plan to do after you are weaned off the programme? 1=supplement food through gardening and farming 2=supplement food through returning to work 3=supplement food though borrowing 4=supplement food through selling household items 5=supplement food through	

		begging 6=not sure what to do/no plans	
26)Are you afraid of the community finding out you collect food assistance or of showing your food ration to the community? 1. yes 0.no If no, skip 27 go to 29	27)If you are afraid of the community, how do you go to collect the food assistance to avoid community talking about you? 1=prefer to collect early morning 2=prefer to collect towards evening 3=I send a household member to collect on my behalf 4= other- specify	28)If you are afraid, what do you do when you collect the food assistance at the distribution site 1. hide the food ration 2. put the food ration it into different package/containers 3. consume some of it at distribution point 4. carry it openly 5. other-specify	
29)Do you receive other nutritional supplement? 1= yes 0=no	30)What level of satisfaction did you have with the aspects of your ration? 1. very satisfied 2.satisfied 3.not satisfied		
31) If you receive cash, how long have you been receiving this assistance? Months _____	32) How much cash do you get per month? _____	33)Where did you get your cash assistance from? 1 = government 2 = NGO 3 = CBO 4 = Traditional leader 5= church/mosque/temple 6= other-specify	34)What is the main reason you are receiving cash assistance? 1=lack of food and income 2=high medical bills 3=to pay education fees 4=to buy clothing 5=to buy agricultural inputs 6= other-specify

35) If you are receiving cash assistance, who in your household makes decisions about how cash assistance is used? 1 = Men 2 = Women 3 = Both	36)What was the gender of the recipient who went and collected the cash assistance? 1. Male 2. female	37)If you could choose between food or cash assistance or a combination of both of equal value, which would you prefer? 1 = Food 2 = Cash 3 = Both	38)If you prefer food what is the main reason you prefer food? 1 = Satisfies HH food shortages 2 = Difficult to steal food 3 = Food prices are high 4 = Food prices are unpredictable 5 = Better for children 6 = Easier to share with family/friends 7 = Better managed by women 8 = Market supply of food unpredictable 9 = Difficult to access market 10= other-specify
39) If you prefer cash what is the main reason you prefer cash? 1 = Can purchase food and other items 2 = Food prices are low 3 = Can purchase a variety of foods 4 = Easy to transport/no costs 5 = Can save part of the cash 6 = Can purchase agricultural inputs 7 = Can be used for other expenses 8 = We have good access to markets 9 = There is plenty of food for sale 10= other-specify		40) What are the main reasons you prefer both food and cash? Select all that apply 1 = With both, we can meet seasonal needs 2 = Safer than just cash (theft) 3 = Can be controlled by both men and women 4 = Ability to cope is improved 5 = Other (specify) _____	

Section 2G Shocks experienced in Household before February 2009

Shocks: Has the household been negatively affected by the following events before February 2009		02) Rank the 3 most important shocks	03) When did this shock occur (date)? Write only for the 3 important shocks
	01) 1 Yes 0 No	1 Most severe 2 severe 3 least severe	example- may 2008
S1)Death of working household member			
S2)Chronic or severe illness of working household member			
S3)Chronic or severe illness of household member (who does not work, too old or too			
S4)Drought or flood			
S5)Crop disease or pests			
S6)Livestock died or stolen			
S7)Business failure or loss of job			
S8)End of regular assistance- aid, from			
S9)End of remittances from outside the household			
S10)Large fall in prices for crops			
S11)Large rise in food prices			
S12)Large rise in agricultural input prices			
S13)Birth in the household			
S14)Theft of household goods, food, money or household member victim of crime			
S15)Other (specify)			

Section 2H Remittances- ask about money received from household members no longer leaving in the household

1) How many members of the household are no longer living here, who have migrated/moved somewhere else? If none skip rest of questions and go to next section	2) What main type of remittance or help do you receive from household members who have migrated? 1 Cash 2 Foodstuff 3 Agricultural inputs 4 Education fees 5 Other	3)When do you receive these remittances 1 Once a week 2 Once a month 3 Several times per year 4 Once a year 5 Once in a while	4) Estimate value of amount received from migrated hh members each time (in Kwacha) Including the value of non-cash items!	5) How does the household receive or send money from or to the migrated person (most Important)? 1 By the migrant 2 Bank transfer 3 By a relative 4 Post office 5 By a friend 6 Public trans port 7 By a workmate of migrant 8 Other	6) How reliable is his mode of receiving money by this person or service?) 1 Reliable 2 Moderately reliable 3 unreliable

Section 2I Subjective Welfare of Household members

Taking all things together, how would you say things were in January 2009? *Tick only one box.*

Would you say you were:	Very happy	Fairly happy	Not too happy
W1) Household head	□1	□2	□3
W2)ARV patient (if not household head)			
W3)Spouse of the household head	□1	□2	□3
W4)Other member	□1	□2	□3
W5)Other member	□1	□2	□3

W6)Other member	☐1	☐2	☐3
W7)Other member	☐1	☐2	☐3
W8)Other member	☐1	☐2	☐3
W9) Other member	☐1	☐2	☐3

Would you say you were in:	Excellent health	Good health	Poor health
H1) Household head	☐1	☐2	☐3
H2)ARV patient (if not household head)			
H3)Spouse of the household head	☐1	☐2	☐3
H4)Other member	☐1	☐2	☐3
H5)Other member	☐1	☐2	☐3
H6)Other member	☐1	☐2	☐3
H7)Other member	☐1	☐2	☐3
H8)Other member	☐1	☐2	☐3
H9) Other member	☐1	☐2	☐3

Taking all things together, how would you say things are now, August 2009?
Tick only one box.

Would you say you are:	Very happy	Fairly happy	Not too happy
W1) Household head	☐1	☐2	☐3
W2)ARV patient (if not household head)			
W3)Spouse of the household head	☐1	☐2	☐3
W4)Other member	☐1	☐2	☐3
W5)Other member	☐1	☐2	☐3
W6)Other member	☐1	☐2	☐3
W7)Other member	☐1	☐2	☐3
W8)Other member	☐1	☐2	☐3
W9) Other member	☐1	☐2	☐3

Would you say you are in:	Excellent health	Good health	Poor health
H1) Household head	☐1	☐2	☐3
H2)ARV patient (if not household head)			
H3)Spouse of the household head	☐1	☐2	☐3
H4)Other member	☐1	☐2	☐3
H5)Other member	☐1	☐2	☐3
H6)Other member	☐1	☐2	☐3
H7)Other member	☐1	☐2	☐3
H8)Other member	☐1	☐2	☐3
H9) Other member	☐1	☐2	☐3

Module 3 Side effects and stigma

Section 3A Side Effects January 2009	
1) In January 2009 Did you experience side effects to ARVs? 1=yes 0. No Answer_____ if answer is no, skip 2 and 3 and go to 4	2) Did the side effects make you change drug regimen? 1=yes 0. No Answer_____
3)What was the extent of side effects in January 2009? Codes: 0. Do not have 1.Moderate 2.Severe 1=headache, feeling dizzy or light headed _____ 2= numbness or tingling in the hands and feet _____ 3=Nausea or vomiting_____ 4=Diarrhoea or loose bowel movements_____ 5= Skin problems, such as rash, dryness or itching_____ 6=Cough or trouble catching your breadth_____ 7=Bloating, pain or gas in your stomach_____ 8=Muscle aches or joint pains _____ 9=weight loss or wasting_____ 10=Dry mouth_____ 11=Hair loss or changes in the way you hair looks_____ 12=Anaemia_____ 13=Hepatitis_____ 14=Fatigue or loss of energy_____ 15=Fever, chills or sweats_____	
August 2009	
4) Are you currently experiencing any side effects to ARVs? 1=yes 0. No Answer_____ if answer is no, skip 5 and 6 and go to next section	5) Did the side effects make you change drug regimen? 1=yes 0. No Answer_____
6)What is the extent of the side effects currently being experienced? Codes: 0. Do not have 1.Moderate 2.Severe	

1=headache, feeling dizzy or light headed _____ 2= numbness or tingling in the hands and feet _____ 3=Nausea or vomiting_____ 4=Diarrhoea or loose bowel movements_____ 5= Skin problems, such as rash, dryness or itching_____ 6=Cough or trouble catching your breadth_____ 7=Bloating, pain or gas in your stomach_____ 8=Muscle aches or joint pains _____ 9=weight loss or wasting_____ 10=Dry mouth_____ 11=Hair loss or changes in the way you hair looks_____ 12=Anaemia_____ 13=Hepatitis_____ 14=Fatigue or loss of energy_____ 15=Fever, chills or sweats_____			
Section 3B Home Based Care – circle the answer			
1) Who in the family mostly looks after you when you are sick? (please choose one) 1=wife 2=husband 3=girl children 4=boy children 5=Aunt 6=Uncle 7=grandmother 8=grandfather 9=Whoever is free gives a hand 10=Other	2) What do you use for pain relief? 1. drugs- over the counter 2. drugs from community volunteers 3. drugs from clinic/hospital 4. Borrow drugs from friends and family 5. drink water 6. nothing 7. other	3) Which family members are trained in home based care? Multiple response 1. wife 2. husband 3. girl children 4. boy children 5. other female relatives 6. other male relatives	4) Do you get help from home based care community volunteers? 1. Yes 0. no 4.1 Gender of community HBC volunteers 1. Male 2. Female 3. male and female
5) What elements of home based care do you obtain? Multiple response 1. Pain relief, 2. symptom control, 3. psychosocial support, 4. counselling, 5. information	6)What is your chief source of nutrition counselling 1. community Home based care volunteers 2. Clinic/hospital 3. Community health worker 4. HIV support group 5. traditional healer	7) From where do you obtain emotional/psycho social counselling and support? Select 3 main sources 1. community Home based care volunteers 2. pastor/church group 3. Clinic/hospital 4. Community health worker 5. HIV support group 6. traditional healer 7. family 8. neighbours 9. other 10 .none	8) Which HIV support group do you belong to? 1=people living with HIV support group 2=HIV support group including HIV negative people 3=none

6. welfare assistance 7. other-specify	6. family 7. neighbours 8. TV/Radio 9. Other 10. none		

Section 3C Stigma and Social Support	
1) Have you disclosed your HIV status to anyone? 1= Yes 2=No If answer is no, skip 2, go to 3	2) If yes, whom have you disclosed your status to? (Multiple responses possible. After respondent answers, probe by asking for any others). Do NOT read out answers. 1) Partner / spouse …….. 2) Parent ……. 3) Sibling …….. 4) Other Relatives ……. 5) Friends …….. 6) Neighbours / community members …… 7) Friends / Roommates ……. 8) Other (specify)_____
3) Does the community or your neighbours know that you are on ART? 1. Yes 0. No	4) If you are on food support, does the community or your neighbours know that you are receiving food support? 1. Yes 0. No
Stigma Scale – now ask the patient if they agree with the following statements. Explain to the choices of answering from strongly disagreeing to strongly agreeing.	strongly disagree = 1 disagree = 2 agree = 3 Strongly agree = 4.

Personalized stigma	P1) I have been hurt by how people reacted to learning I have HIV.	
	P2) I have stopped socializing with some people because of their reactions of my having HIV.	
	P3) I have lost friends by telling them I have HIV.	
Disclosure	P4) I am very careful who I tell that I have HIV.	
	P5) I worry that	

	people who know I have HIV will tell others.	
Negative Self-image	P6) I feel that I am not as good a person as others because I have HIV.	
	P7) Having HIV makes me feel unclean.	
	P8)Having HIV makes me feel that I'm a bad person	
Public Attitudes	P9) Most people think that a person with HIV is disgusting.	
	P10) Most people with HIV are rejected when others find out.	

9.4 Targeting Instrument-Poverty and Food insecurity Questionnaire

This questionnaire asks questions on HIV burden, household composition, asset ownership, employment status, income earnings, housing characteristics, child education and household dietary diversity. Responses to the screening questionnaire are tallied to a maximum score. Scores above 20 mean eligibility for the food transfers programme.

For Patients not Receiving Food

Rapid Recall of Household food security during December 2008/January 2009

- For patients on ART only. Tell them this questionnaire is for the state things were in December 2008/January 2009
- From question no.14, circle the appropriate response, but do not score any marks in front of the client Scores are bracketed next to each response option.
- Scoring will be done in the office.
- If the client answers yes to Question 15, please continue the evaluation to the very end.
- Information in Question 17 may be existing in the Partner records, but this will serve in verifying the available information
- In Question 19, the percent is based on those in school over the ones supposed to be in school.
- In question 29 the scores are averaged in proportion to the number of members in the household to give a better representation.
- In Question 30, the valuable assets may be owned or the client has full user rights over the asset.
- The higher the score, the more vulnerable the person is.

INTEVIEWER'S NAME Date :	
General Information	
1. Surname First name Other names	
2. Patient ID 3. Clinic	
4. Age of client … 5. Sex: ……..	
6. Marital status in January 2009 (Tick): i) Married – monogamous ii) Married – polygamous iii) single iv) Widowed v) Cohabiting vi) Divorced/separated	
7. PROGRAMME (Tick): Height (in cm)…….. Weight (in kg)…… ART…….. TB ……..… HBC……. OTHERS (specify)……..	
Place of residence	
8. District……. 9 Ward…….	
11. Compound …….. 12. Plot No.……	
13. Education level i) Never been to school ii) Primary Education iii) Secondary School Education iv) Diploma Holder v) University Degree	
NOTE: If the client is below the age of 14 years on the day of the evaluation all further questions should be addressed to the client's care provider. The client should remain with the care provider at all times and reflect the conditions in which the client is currently living	
Score numbers from 16 till the end of the questions	SC OR

	E
Data on Household members –please ENSURE this is information from the way things were in January 2009	

No.	Name (First, Last)	Sex	Age	Occupation	Relationship	HAART (tick)
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						

14. If a household member other than the client is receiving HAART, please specify from which clinic ……

15. If yes, is that household member(s) currently receiving food assistance from WFP?

i) yes ii) no

16. Number of Household members in January 2009 (Tick) Refer to the table of HH data above:

i) None (0) ii) 2-4 (1) iii) 5-8 (3) iv) More than 8 (4)

17. Occupation during January 2009 (Tick): Self Employed (1) ii) Employed (2)

iii) Student (2)

Commercial Farmer (0) Peasant (2). Petty Trade (3) Unemployed (4)

18. Health status during January 2009 (Tick): Non bed ridden (2) Bed ridden (4).	
Household Information	
19. Head of Household (Tick): Male/Female (1) Single parent (2) MALE……FEMALE…….. Grandparent (3) MALE……FEMALE…… Child (4) MALE……FEMALE……	
20. Number of Children of school going age in January 2009 …… (e.g.5)	
21. Number of Children attending school in January 2009 …… If not all children of school going age are attending school, please give reasons…… Scoring percent: please calculate using: Qn 19/Qn18x100; I) (100%)=0, II) 75>99%=1, III) 50>75%=2, IV) 25>49%=3, V) <24%=4	
Social and economic status	
22. Household Income during January 2009 (from salary, rental income, vending)	
i) Over K500,000 (0) ii) K200,000 – 500,000 (1) iii) K100,000-199,999 (2) iv) less than K99,999 (3)	
23. Main source of income in January 2009 (Tick): i) Casual works/Piece works (1) ii) Petty selling (2) iii) Farming/Gardening (3) …… iv) Formal employment (0) …… v) Major trading (1) ……	
24. Number of meals (breakfast e.g. porridge included) taken in a day during January 2009 (Tick): i) One meal (4) ii) Two meals (2) iii) Three meals (1) iii) Four & More (0)	
25. Fill in Table as appropriate:	

Household food consumption during January 2009	Fill in Codes (Score) for each type of food and its source as appropriate. Sum up scores and write total in the right hand column (RESULTS MUST BE DIVIDED BY 3)					
Number of times a type of food was consumed in household per week during January 2009	Meat/Fish	Oil seeds (g/nuts)	Cereals	Pulses	Veg/Fruits	Tubers (Sweet potatoes, Cassava, etc)
26.Frequency (weekly): i) Never/seldom (3) iii) Once toTwo times week (2) iv) Three to Five times (1) v) Six or daily (0)						

27. Did you stay in your own house in January 2009?

i) Yes (0) ii) Rented (2) iii) Accommodated (3)

28. Type of house in January 2009
i) Permanent (1)
ii) Semi-permanent, including grass (2)
iii) Temporary (3)

29. Source of Water in January 2009
i) Piped inside house (0) ii) Pipe yard/ public (1)
iii) Borehole/ Protected well (1) iv) Unprotected river/stream/dam/well (2)

30. Which Kind of fuel did you mainly/commonly use for cooking in January 2009? Give one answer
i) Electricity/ Gas (0) ii) Paraffin (1)
iii) Charcoal 2) iv) Firewood (3)

31. Where did you usually go for health care in January 2009
i) Private health facility (1) ii) Public health facility (3)
iii) Traditional (3) iv) NGO/free service (3)

32. Valuable assets owned in January 2009
i) accessibility to productive asset (-1) eg land, House on rent, motorbike ii) Bicycle (-1)
iii) Sewing machine (-1) iv) Livestock(Specify) (-1)
v) none of the above (0) vi) Mobile phone (-1)

33. What support/services did you receive in before February 2009?

Medical assistance……(-1) School fees……(-1) Scholastic material…….. (-1) House rent……..(-1) Member of IGA…….(-1) Credit scheme……..(-1) Food……..(-1) Any one-off support should not be included	
Total Score	
Name of interviewer	
Designation of interviewer	
Signature of interviewer	
Date	

Summary

AIDS treatment is increasingly becoming a realistic option to mitigate the negative impacts of HIV/AIDS. Empirical evidence shows that AIDS treatment (Antiretroviral Therapy or ART) improves the infected patient's health and has broader welfare gains such as improved household labour supply, children's school attendance and household income. Yet, there are concerns that in impoverished regions treatment without additional social assistance might not be sufficient to significantly improve the economic and social wellbeing of patients and their families, while the interplay between food insecurity, poverty and malnutrition may hinder the effectiveness of ART and recovery from HIV/AIDS's detrimental effects on household welfare. Consequently, several organizations are integrating ART with food transfers to improve the efficacy of ART and simultaneously boost household food security and welfare with food transfers acting as a social protection instrument.

This study's main aim is to determine the additional clinical and welfare benefit from providing food transfers together with ART. This is achieved through fulfilling the following objectives; investigate and document the current evidence base on the impact of integrating AIDS treatment with food transfers; determine the effect of food transfers on the weight and adherence to AIDS treatment of HIV infected adult patients; examine the consumption responses to integrating AIDS treatment with food transfers; and determine the intrahousehold labour supply effects from adding food transfers to AIDS treatment. This was done by comparing the outcomes of 200 beneficiaries of a food transfers programme in Zambia with 200 non-beneficiaries, using survey data collected after 6 months of programme implementation. All of the respondents are households with an identified HIV infected patient on ART. Each month the beneficiaries received a household food aid ration comprising maize grain (25kg), cooking oil (1.8 litres), pulses (4.5kg) and fortified blended corn and soya flour (6kg). The non-experimental design of the study is addressed by using a variety of techniques which include a section model and quasi-experimental impact analysis methods like difference-in-difference estimators, propensity score methods and instrumental variables methods.

A systematic review of theoretical and empirical literature, presented in the second chapter of the thesis, shows that there is limited and conflicting evidence on the health effects of integrating ART with food transfers. While theoretical predictions point to possible improvements in health, consumption and ambiguous effects on

labour supply, there are few empirical studies that use robust designs and there is no evidence on household welfare effects. Empirical research is used to build upon the emerging clinical evidence while addressing the identified research gap on household welfare effects. Empirical findings from the third chapter, suggest that food transfers boost adherence to ART by patients and by extension its effectiveness and hence HIV-related health outcomes, with likely greater effects at earlier stages of treatment. Nearly 88% of the patient beneficiaries were adherent compared to only 66% of the non-beneficiaries. There is no evidence of an effect of food transfers on the weight of patients, which is probably due to the patients not having been clinically malnourished when the programme began. However the lack of effect on weight gain does not imply that food transfers to ART patients are not beneficial, given that all participants were food insecure and are at risk of malnutrition which compromises ART effectiveness, and ultimately the patient's health. The results from the fourth chapter show that while the food transfers are inframarginal, they significantly improve food security and consumption (by a range from 37 to 44%) thus reducing the risk of malnutrition. The marginal propensity to consume (MPC) food out of food transfers is greater than MPC for food out of cash income, which is especially largest among economically disadvantaged households confirming Engel's law on how poorer households devote a greater proportion of income to food. In the fifth chapter, the study finds evidence that food transfers have no substantial disincentive effects on the labour supply of non-patient household members, while gender specific incentive effects vary according to income and duration of patient's AIDS treatment e.g. food transfers increase labour supply for female non-patients in response to likely improved patient's health (from longer AIDS treatment) and increased household income. However, there is a persistent disincentive effect of food transfers on the labour supply of HIV infected patients. For example the labour force participation rates of patients generally declined by 24%, with larger declines of 59% for patients in low income households. The disparity in labour supply responses between the patient and non-patient adults can be attributed to a variety of reasons among them; an income effect on patients, intra-household bargaining and resource allocation processes, crowding out of existing informal insurance systems and patients possibly choosing to remain unemployed to maintain eligibility for the programme. Yet, other factors could be contributing to the disincentive effect on patients; such as stigma and discrimination towards HIV patients and high job to non-job mobility associated with the informal labour markets that most of the patients work in.

Overall, the conclusion of the thesis is that food transfers potentially have greater benefits than disincentives in households and could improve the effectiveness of AIDS treatment. However, if goals of the food transfers are exclusively patient focused, i.e. improving a patient's weight or facilitate their return into the labour market then the design and targeting of the food transfers programme matters. For instance, the thesis shows that there is a negligible weight gain if targeted food insecure patients are not clinically malnourished and that food transfer programme eligibility which includes patient's unemployment status as part of the criteria could encourage patients to delay their return to the labour market in order to remain eligible. The findings highlight the significance of intrahousehold impacts, which policy makers and programme implementers could use to refine programme goals e.g. a programme with a goal of empowering females in the households would likely add food transfers when the patient has spent a longer time on treatment, when it is likely to be easier for females to transit from care work to employment.

In light of the limitations faced in obtaining prospective panel data, further research is recommended that; a) uses larger sample sizes b) exploits a randomized prospective design c) exploits a longer period of follow up (12 months). There are several questions which future research can clarify. Firstly, when is the greatest weight gain achieved, is it when foods provided have high calorie density or when targeted patients are malnourished? Secondly, does a substantial effect size from a small sized transfer actually crowd out other coping mechanisms, household informal safety nets and income sources? Thirdly, are participants worse off in the aftermath of receiving food transfers? Fourthly, what role does HIV stigma or discrimination play in labour markets and what is the interaction between stigma, AIDS treatment and food transfers?

Despite its shortcomings, this thesis is still an important contribution to the empirical literature on HIV affected households, the effects of AIDS treatment and the evaluation of food transfers. To our knowledge this is the first study to comprehensively consider the diverse effects of integrating AIDS treatment with food transfers. This is achieved by not only focusing on clinical effects but other household welfare effects such as household consumption outcomes and labour supply responses, which are vital in reducing risks that compromise the effectiveness of AIDS treatment and inform on which areas require long term and sustainable investment. Hence this dissertation fills a major research gap. Hopefully, the findings of this thesis not only set the stage for additional research

but also help in the design, implementation, monitoring and evaluation of future programmes.

Samenvatting

AIDS-behandeling is in toenemende mate een reële optie voor het verzachten van negatieve effecten van HIV/AIDS. Uit empirische studies blijkt dat AIDS-behandeling (Antiretrovirale Therapie of ART) de gezondheid van de patiënt verbetert en ook bredere welzijnsgerelateerde voordelen heeft, onder andere op het arbeidsaanbod van huishoudens, schoolbezoek van kinderen en het huishoudinkomen. Toch zijn er zorgen dat in arme gebieden behandeling zonder additionele bijstand niet toereikend is om het economische en sociale welzijn van patiënten en hun gezinnen voldoende te verbeteren. Voedselonzekerheid, armoede en ondervoeding kan de effectiviteit van ART en het herstel van HIV/AIDS's verhinderen en nadelige gevolgen hebben voor het welzijn van het huishouden. Een aantal organisaties combineert derhalve ART met voedselhulp om de effectiviteit van ART en tegelijkertijd de voedselzekerheid en het welzijn van het huishouden met voedselhulp – wat dient als een sociaal beleidsinstrument – te verbeteren.

Het hoofddoel van deze studie is het bepalen van de additionele klinische en welzijnsgerelateerde voordelen ten gevolge van het verstrekken van voedselhulp samen met ART. Dit wordt verwezenlijkt door: het bestuderen en documenteren van de huidige evidentie met betrekking tot het effect van het combineren van AIDS-behandeling met voedselhulp; het vaststellen van het effect van voedselverstrekking op het gewicht van en de naleving van de AIDS-behandeling door volwassen HIV-patiënten; het bestuderen van consumptiereacties op het integreren van AIDS-behandelingen met voedselhulp; het bepalen van het effect van de aanvulling van de AIDS-behandeling met voedselhulp op het arbeidsaanbod van huishoudens. Hiervoor hebben wij de uitkomsten van een enquête – die zes maanden na de implementatie van het programma was gehouden – onder 200 begunstigden van een voedselpakkettenprogramma in Zambia vergeleken met data van 200 niet-begunstigden. Alle respondenten zijn huishoudens met een geïdentificeerde HIV-patiënt die ART ondergaat. Iedere maand ontvangen de begunstigden een voedselpakket voor het huishouden wat bestaat uit maïs (25 kg), keukenolie (1,8 liter), peulvruchten (4,5 kg) en versterkte tarwe- en sojameel (6 kg). Er wordt rekening gehouden met de niet-experimentele onderzoeksopzet door het gebruik van verschillende technieken waaronder een selection model en quasi-experimental impact analysis methoden zoals difference-in-differences schatters, propensity score methoden en instrumental variable methoden.

Uit een systematisch overzicht van de theoretische en empirische literatuur, die beschreven wordt in het tweede hoofdstuk van dit proefschrift, blijkt dat er beperkte en tegenstrijdige evidentie is met betrekking tot de gezondheidseffecten van het combineren van ART met voedselhulp. Hoewel theoretische voorspellingen wijzen op mogelijke verbeteringen in de gezondheid en consumptie en ambivalente effecten op het arbeidsaanbod, zijn er weinig empirische studies met een robuuste onderzoeksopzet en is er geen evidentie voor welzijnseffecten op het huishouden. Empirisch onderzoek wordt gebruikt om verder te bouwen op de voortschrijdende klinische evidentie en aandacht te schenken aan het gebrek aan onderzoek naar welzijnseffecten op het huishouden.

Empirische bevindingen uit het derde hoofdstuk wijzen erop dat voedselhulp de naleving van ART door patiënten bevordert en daardoor de effectiviteit van ART en de HIV-gerelateerde gezondheidsuitkomsten verbetert, met waarschijnlijk grotere effecten in de beginnende fases van de behandeling. Bijna 88% van de begunstigden leefden de behandeling na tegenover 66% van de niet-begunstigden. Er is geen evidentie dat voedselhulp invloed heeft op het gewicht van patiënten, wat waarschijnlijk komt doordat patiënten niet klinisch ondervoed waren toen het programma begon. Niettemin betekent het gebrek aan effect op het gewicht niet dat voedselhulp voor ART patiënten niet nuttig zou zijn, omdat alle participanten in voedselonzekerheid verkeerden en risico liepen op ondervoeding, wat de effectiviteit van ART en uiteindelijk de gezondheid van de patiënt nadelig beinvloedt.

De resultaten van het vierde hoofdstuk laten zien dat hoewel voedselhulp inframarginaal is, deze de voedselzekerheid en consumptie significant verbetert (van 37% naar 44%) en derhalve het risico op ondervoeding beperkt. De marginal propensity to consume (MPC) voor voedsel afkomstig van voedselhulp is groter dan de MPC voor voedsel verkregen uit geldelijk inkomen. Dit verschil is het grootst onder economisch achtergestelde huishoudens, wat Engel's wet dat armere huishoudens een groter deel van het inkomen besteden aan voedsel bevestigt.

In het vijfde hoofdstuk, duiden de onderzoeksbevindingen erop dat voedselhulp geen substantiële ontmoedigingseffecten heeft op het arbeidsaanbod van leden van het huishouden die geen patiënt zijn. Geslachtspecifieke effecten variëren afhankelijk van het inkomen en de duur van de AIDS-behandeling van de patiënt. We vinden bijvoorbeeld een toename van het arbeidsaanbod van vrouwelijke niet-patiënten als gevolg van voedselhulp als reactie op de verbeterde gezondheid van patiënten (door een langere AIDS-behandeling) en een hoger huishoudinkomen.

Niettemin is er een langdurig ontmoedigingseffect van voedselhulp op het arbeidsaanbod van HIV-patiënten. De arbeidsparticipatie van patiënten nam over het geheel genomen af met 24%, met een grotere daling (van 59%) voor patiënten uit huishoudens met een laag inkomen. Het verschil tussen de arbeidsaanbodreacties van volwassen patiënten en niet-patiënten kan aan verschillende redenen worden toegeschreven, waaronder een inkomenseffect voor patiënten; onderhandelingsprocessen binnen het huishouden en processen met betrekking tot de verdeling van middelen; het verdringen van bestaande informele verzekeringssystemen en patiënten die mogelijk kiezen om werkloos te blijven om aan de criteria te blijven voldoen voor deelname aan het programma. Niettemin kunnen andere factoren ook een rol spelen in het ontmoedigingseffect op patiënten, zoals stigma en discriminatie jegens HIV-patiënten en hoge 'job to non-job' mobiliteit wat in verband staat met de informele arbeidsmarkt waar de meeste patiënten werken.

Over het geheel genomen is de conclusie van dit proefschrift dat voedselhulp mogelijk meer voordelen dan nadelen heeft voor huishoudens en de effectiviteit van AIDS-behandeling kan verbeteren. Als de beoogde doelen van voedselhulp exclusief gericht zijn op de patiënt, m.a.w. het verhogen van het gewicht van de patiënt of het vergemakkelijken van zijn/haar terugkeer naar de arbeidsmarkt, dan is de opzet en het bereik van het voedselhulpprogramma van belang. Het proefschrift laat bijvoorbeeld zien dat er een verwaarloosbare gewichtstoename is als de deelnemende, voedselonzekere patiënten niet klinisch ondervoed zijn en dat criteria om in aanmerking te komen voor een voedselhulpprogramma, zoals het criterium dat een patiënt werkloos dient te zijn, patiënten kan aanmoedigen om de terugkeer naar de arbeidsmarkt uit te stellen om in aanmerking te blijven voor ondersteuning. De bevindingen benadrukken de intrahuishoudelijke effecten die beleidsmakers en programmaïmplementeerders kunnen gebruiken om programmadoeleinden te realiseren. Een programma met als doel de empowerment van vrouwen in huishoudens zou bijvoorbeeld voedselhulp kunnen inzetten wanneer de patiënt langere tijd in behandeling is; dit is namelijk de periode waarin het waarschijnlijk makkelijker is voor vrouwen om de transitie van mantelzorg naar betaald werk te maken.

Gezien de beperkte mogelijkheden tot het bemachtigen van prospectieve panel data, wordt voor toekomstig onderzoek aanbevolen om a) grotere steekproeven te gebruiken; b) gebruik te maken van een gerandomiseerde prospectieve onderzoeksopzet; c) een langere follow-up periode te onderzoeken (twaalf maanden). Er zijn een aantal vragen die in toekomstig onderzoek beantwoord kan

worden. Ten eerste, wanneer kan gewichtstoename het beste worden bereikt; is dit wanneer calorierijk voedsel wordt gegeven of wanneer deelnemende patiënten ondervoed zijn? Ten tweede, verdringt een substantiële effect size van beperkt voedselhulp andere copingmechanismen, informele veiligheidsnetwerken van huishoudens en inkomstbronnen? Ten derde, zijn er deelnemers die slechter af zijn na het ontvangen van voedselhulp? Ten vierde, welke rol speelt HIV-gerelateerde stigma of discriminatie op de arbeidsmarkt en wat is de relatie tussen stigma, AIDS-behandeling en voedselhulp.

Ondanks de beperkingen, levert dit proefschrift een belangrijke bijdrage aan de empirische literatuur over door HIV getroffen huishoudens, het effect van AIDS-behandeling en de evaluatie van de effecten van voedselhulp. Voor zover ons bekend is dit de eerste studie die uitgebreid de diverse effecten van het combineren van AIDS-behandeling met voedselhulp heeft bestudeerd. Dit is verwezenlijkt door ons niet alleen te richten op klinische effecten maar ook op welzijnseffecten op huishoudniveau zoals arbeidsaanbodreacties, die van vitaal belang zijn voor het reduceren van risico's die de effectiviteit van AIDS-behandeling verminderen en informatie verschaffen over welke gebieden langdurige en duurzame investeringen vereisen. Hopelijk zullen de bevindingen van dit proefschrift niet alleen leiden tot meer onderzoek maar ook de opzet, implementatie, en monitoring en evaluatie van toekomstige programma's verbeteren.

Biography

Nyasha Tirivayi was born in 1979 and grew up in Zimbabwe. In 2000, she graduated with a B. Sc Honours in Agricultural Economics degree from the University of Zimbabwe with distinction and a first class award. Nyasha pursued a Master of Science degree in Agricultural Economics after receiving a scholarship from SACCAR-GTZ (German Organization for Technical Co-operation). In 2002 she graduated top of her M.Sc class and was awarded the University Book Prize.

Between 2002 and 2007, Nyasha worked in the private sector as a lead data analyst and research consultant on high profile education research projects sponsored by the World Bank and IDRC (Canada). She also worked as a researcher and programme officer at an NGO for women's empowerment in Zimbabwe

In 2007, Nyasha joined the PhD programme in Public Policy and Policy Analysis at Maastricht Graduate School of Governance (MGSoG) as a Marie Curie Fellow. Her PhD research evaluated the welfare effects of integrating AIDS treatment with food transfers utilizing an interdisciplinary approach and quasi-experimental techniques in assessing clinical and household economic outcomes. The study was based on primary data collected in Zambia from a survey she independently designed and implemented.

During her PhD research, Nyasha attended summer schools including one at the survey research centre, University of Michigan. She also assisted in the teaching of economics, health policy and assisted in the training of UNICEF personnel in evidence based policy making in child protection. She also supervised one Master of Science thesis and examined progress in three other theses. Other research projects she has engaged in include an Oxfam-Novib sponsored survey of remittances send to Africa by African migrants in the EU. Nyasha has also consulted for the United Nations World Food Programme by leading an impact evaluation of a food aid programme.

Nyasha currently works as a postdoctoral researcher at the Teachers' Academy/ Top Institute for Evidence Based Education Research (TIER) at Maastricht University. She is involved in a project researching the impact of team rewards for teachers on student achievement.

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