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**MICROFINANCE EFFECT ON CHILD NUTRITIONAL STATUS:
AN EXAMPLE FROM WEST NILE, UGANDA**

INAUGURAL DISSERTATION

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ABBREVIATIONS

ASCA	Accumulating Savings and Credit Association
ANOVA	Analysis of Variance
BCG	Bacille Calmette-Guérin (antituberculosis vaccine)
BDIS	Bangladesh Institute of Development Studies
BootCI	Bootstrapped Confidence Interval
CBO	Community-Based Organisations
C-EXP	Community experimental design
CFI	Child Feeding Index
C.I.	Confidence Interval
C/H-EXP	Community & household experimental design
C/H-QEXP	Community & household quasi-experimental design
COEFF.	Coefficient
CFS	Committee on World Food Security
C-QEXP	Community quasi-experimental design
CwE	Credit with Education
DED	Deutscher Entwicklungsdienst / German Cooperation
DPT	Diphtheria, Pertussis and Tetanus Vaccine
EPI	Expanded Programme on Immunization
EXP	Experimental design
FAO	Food and Agriculture Organization of the United Nations
FINCA	Foundation for International Community Assistance
FNS	Food and Nutrition Security project
GMP	Growth-Monitoring Promotion
GB	Grameen Bank
GTZ	German Technical Cooperation
HAZ	Height-for-Age Z-score
HH	Household
IFPRI	International Food Policy Research Institute in Washington
IGA	Income Generating Activity
Interv.	Intervention
LRA	Lord Resistance Army
LS	Longitudinal Survey
MF	Microfinance
MTI	Microfinance Institution
MoH	Uganda Ministry of Health
MUAC	Mid Upper Arm Circumference
NRA	National Resistance Army
OECD	Organisation for Economic Co-operation and Development
OPM	Office of Prime Minister
ORS	Oral Rehydration Salt
PDI	Positive Deviance Inquiry
EXP	Quasi-experimental design
H-EXP	Household experimental design
H-QEXP	Household quasi-experimental design
SCS	Single Cross-sectional Survey
SD	Standard deviations
UBOS	Uganda Bureau of Statistics
UDHS	Uganda Demographic and Health Survey
RCS	Repeated Cross-sectional Survey
RNIS	Refugee Nutrition Information System
ROSCA	Rotating Savings and Credit Association
SACCO	Saving and Credit Cooperative

SE	Standard Errors of the unstandardised coefficient B
SPSS	Statistical Package for the Social Sciences
UNHCR	United Nations High Commissioner for Refugees
UNEPI	Uganda National Expanded Programme on Immunisation
UNLA	Uganda National Liberation Army
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
USH	Ugandan Shillings
WAZ	Weight-for-Age Z-score
WHZ	Weight-for-Height Z-score
WHO	World Health Organization
WFP	World Food Programme
WNBF	West Nile Bank Front
ZEU	Centre for International Development and Environmental Research

1 INTRODUCTION

1.1 BACKGROUND & PURPOSE

Two considerations have driven this research. The first consideration relates to child malnutrition and nutritionists' challenge to find integrative solutions that include socio-economic approaches. Malnutrition is defined as an "imbalance between nutrient requirements and intake that results in cumulative deficits of energy, protein, or micronutrients" (MEHTA ET AL., 2013). This disorder adversely affects human growth, development and mortality. It is generally addressed through the diet, care practices and health, which enhancements are interrelated with the underlying socio-economic factors (United Nations Children's Fund [UNICEF], 1990). Malnutrition is therefore not just a physiological problem. It also results from socio-economic challenges. Female empowerment or improvement in the economic status of households might lead to substantial benefits for pediatric malnutrition. It is thus necessary not to restrict nutritional practice to proximal resolutions but to also look for alternative and complementary strategies that address the social dimension of nutrition (BEAUMAN ET AL., 2005). This is particularly urgent as child malnutrition is still prevailing worldwide at unacceptable levels (UNICEF, WORLD HEALTH ORGANIZATION [WHO], & WORLD BANK, 2012).

The second consideration relates to microfinance as a potential poverty alleviation tool. Microfinance is generally understood as the delivery of small amounts of credits to the poor. It has become a popular strategy since the success of Grameen Bank, an institution launched in Bangladesh by the Nobel Peace Prize winner Muhammad Yunus in the 1980s. Behind the microfinance concept is the recognition that the poor generally have limited access to formal banks due to lack of collaterals; yet, endowed with endless potential. If given the opportunity to borrow, they could improve their earnings by setting up small enterprises and pull themselves as well as their households out of poverty (YUNUS & JOLIS, 1999). The Grameen model is collateral-free and incorporates group lending. It focuses on women and their empowerment. This innovative design has been replicated worldwide since then.

Considering that malnutrition has socio-economic roots and that the microfinance approach can induce positive socio-economic changes at household level, couldn't it be used to improve the nutritional challenge that households and children are facing? This research aims at examining the effect that microfinance can have on nutrition security. The purpose is ***to understand if, how and when does microfinance affect child nutrition. A particular attention is brought to the sex of the respondents as a potential moderator of microfinance effect.***

In fact, extensive research has been made on the socio-economic impact of microfinance (VAN ROOYEN, STEWART, & DE WET, 2012; DUVENDACK ET AL. 2011). But only few studies inquired about the relationship between microfinance and children's nutritional status. Some of these studies concluded that no correlation existed (DIAGNE, 1998); whereas others noted a relationship only under specific conditions. According to the latter studies, the gender of the microfinance participants tends to influence microfinance effect on nutritional status (SPEAR, 2001; HAZARIKA & GUHA-KHASNOBIS, 2008; PITT & KHANDKER, 2003; DOOCY, TEFERRA, NORELL, & BURNHAM, 2005). The effect seems to also be conditional on geographical contexts (MkKELLY & DUNFORD, 1998; MkKELLY & DUNFORD, 1999). The literature review suggests that microfinance effect on child nutritional status might be indirect but none of the studies really investigates the mechanisms underlying the potential contribution of microfinance to child nutritional status. Some studies examine the linkage between microfinance and specific potential outcome factors (MkKELLY & DUNFORD, 1998; KELLY & DUNFORD, 1999). Others include an analysis of the relation between child nutritional status and potential predictors. They rarely try to connect the potential mediating factors to both microfinance intervention and child nutritional status. There is thus a need for comprehensive studies which not only test the conditional effect of microfinance but also include an analysis of the different pathways through which microfinance participation is “converted” into a better child nutritional status.

The present study attempts to fill this gap. Testing “*if*” microfinance is effective in meeting nutritional household goals is essential to orient nutritionists in their search for integrative solutions that work. Assessing “*when*” nutritional outcomes of microfinance are positive and substantial offers guidance to check the appropriateness of the microfinance model in specific contexts and to define target groups. Understanding “*how*” microfinance outputs are transmitted to children gives practical indications on what to focus on while adjusting socio-economic instruments for nutritional purpose.

The study is based on a mediation and moderation analysis. The empirical data are from households living in refugee settlements in the West Nile region of Uganda. The choice of the area was guided by the observation that malnutrition is particularly widespread in such crises-affected settings and that the appropriateness of microfinance has to be tested in such contexts as well..

This thesis essentially argues that microfinance effect on child nutritional status is positive and significant in refugee settings of West Nile for both households with female or male microfinance participants. The effect is essentially mediated through improved household wealth and not through individual social-empowerment. At a proximal level, microfinance induces ameliorative changes for household diet and deteriorative changes for child feeding

practices. Yet what matters for child nutritional status is essentially household health security.

To the best of our knowledge, this is the first study to inquire the relationship between microfinance and child nutritional status in the specific context of refugee settings. It is also the first study applying statistical mediation and moderation procedures to understand mechanisms of nutritional contribution of microfinance at household level. It thus provides both substantial and methodological insights for the discipline.

1.2 CONTENTS OF THE DISSERTATION

Chapter two *Theoretical Framework* reviews the empirical studies linking microfinance and nutritional status in order to build a theoretical framework and hypotheses that will subsequently be tested on the ground.

Chapter three *Empirical Approach* describes the methodology applied for this research. The empirical approach is characterized by the selection of a study area affected by forced migration (refugee settlements of West Nile, Uganda), a cross-sectional household survey, a quasi-experimental design to capture the intervention variable (established versus incoming and non clients of the DED microcredit program), adequate height-for-age as outcome variable, individual socio-economic empowerment, household economic status and household food, health and care capacities as mediators, and a hierarchical, mediation and moderation analysis as statistical tool.

Chapter four *Empirical Evidence* describes the results of the bivariate and multivariate analyses in a hierarchical way. In a first section, the relationship between microfinance and child nutritional status is tested based on bivariate analyses and a logistic regression taking into account inherent variables at child and household levels. In a second section, the indirect effect of microfinance on child nutritional status through individual income and social power is assessed. The third section describes the analysis of household economic status as a potential mediator at an intermediate level. The fourth section tests household diet, health care and child feeding practices as potential mediators at a proximal level. The fifth section is a moderation analysis testing differences in microfinance effect between households with male or female microfinance participants.

Chapter five *Discussion* discusses the limits and strengths of the methodological approach applied for this research and presents the contributions provided through answering the research questions. In summary, this research has the following implications: firstly, it uses a

relatively new methodology in the field of either microfinance or nutrition security or gender studies: the moderation and mediation procedures. Secondly, it tests a hypothesis in a country and a context where it has not been used before. Thirdly, it provides substantial insights into nutritional processes in place at household level. These contributions and the importance of the research problem on several theoretical and practical grounds are justifications for this research.

1.3 DEFINITIONS

Table 1.3.1 summarises how key terms are defined and have to be understood in this dissertation.

Tab. 1.3-1 Definitions & terms

Term	Definition
Ameliorative Factor	Variable that positively influences outcome
Deteriorative Factor	Variable that negatively influences outcome
Impact	Positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended
Impact Analysis	Examination of the process through which an intervention produces an outcome
Mediation	Mechanism through which a predictor influences an outcome variable
Mediator	Variable through which a predictor influences an outcome variable
Microfinance	Delivery of small amounts of loans to the poor
Moderated mediation	Mediational model is significant only at certain levels of a moderator variable
Moderation	Mechanism by which a variable influences the strength or direction of a relationship between a predictor and an outcome
Moderator	Variable that influences the strength or direction of a relationship between a predictor and an outcome
Nutrition Security	"When all people at all times consume food of sufficient quantity and quality in terms of variety, diversity, nutrient content and safety to meet their dietary needs and food preferences for an active and healthy life, coupled with a sanitary environment, adequate health, education and care"
Nutritional Status	Imbalance between nutrient requirements and intake

Sources: CFS, 2012; MEHTA ET AL., 2013; OECD, 2002; ROSE, HOLMBECK, COAKLEY, & FRANKS, 2004.

2 THEORETICAL FRAMEWORK

Overall-aim of this research is to investigate the effect of microfinance on child nutritional status. The first step consisted in building a theoretical framework upon which the subsequent empirical research would be based. The present chapter exposes the theoretical framework. It summarises the conceptual approaches of microfinance (section 2.1) and of nutritional status (section 2.2) before focusing on the actual connection between both elements (section 2.3). The ultimate result of the review was the identification of a theoretical model and of hypotheses described in the last section (2.4).

2.1 MICROFINANCE & ITS SOCIO-ECONOMIC OUTCOMES

This section describes the theory of microfinance impact. It starts by presenting the main theoretical strands of microfinance effect and then explains the hypothetical paths of microfinance socio-economic impact on the household (SEBSTAD & CHEN, 1996; KARLAN, 2001).

2.1.1 Poverty Lending Approach of Microfinance

There are three main perspectives on microfinance: the poverty lending approach, the financial system approach and the outreach approach (HULME, 2000; ROBINSON, 2001).

Poverty lending approach

The poverty lending approach is also called the development approach, the household approach, the welfare approach or the intended beneficiary school (HULME, 2000). Welfarists put an emphasis on beneficiaries of financial services and on their development. They conceive microfinance as a mean to improve the life of households and communities, as a tool for poverty alleviation.

Financial system approach

Contrasting with this approach is an idea of microfinance as an end in itself, as an organization delivering specific types of financial services with the primary goal of making profits. The focus here is clearly on microfinance institutions. Households are of interest as they can contribute to the financial sustainability of the microfinance institutions. This view is more common among the so-called “institutionists”. Cost minimization and financial efficiency are the dominated objects of inquiry within this strand. This approach is variously referred to as financial system *approach*, financial sustainability approach, intermediary approach (HULME, 2000; ROBINSON, 2001) or ‘new’ microfinance paradigm (ROBINSON, 2001).

Outreach approach

Sometimes defined as a sub-approach within the financial sustainability school or as an independent strand between the household and the financial sustainability perspectives is the so-called “outreach approach”. Departure point here is also the microfinance institution. Yet microfinance is considered in a more beneficiary-oriented manner. The issue is to reach those considered as the target group of microfinance: the poor. The focus is on designing financial services so as to increase extent and depth of outreach. The outreach approach considers the social goal of microfinance institutions and assesses the social efficiency of microfinance. But it does not go as far as the poverty lending approach. The goal is to reach the maximum of poor and the most poor. Yet what happens with the financial services and what changes are induced at household level is not what primarily matters.

These three perspectives are still the subject of an ongoing debate but there seems to be a tendency towards a *converging and integrating concept of microfinance* which should theoretically be at the same time, financially sustainable, designed for reaching the poor and improving their life.

Microfinance improves lives at different levels and through different channels.

2.1.2 Individual Socio-Economic Empowerment as Outcome of Microfinance

At an immediate level, microfinance can lead to a socio-economic empowerment of the individual client, particularly when the client is female. In fact microcredits might serve as a capital for initiating or expanding a business and thus resulting in more individual income (DUVENDACK, PALMER-JONES, & COPESTAKE 2011; DUNFORD, 2012). Microfinance might also improve the psycho-social position of the individual by increasing self-confidence, decisional power within the household and social engagement in the community (MAYOUX, 1999). The low initial income and power of women contribute to make these effects more flagrant by female clients.

2.1.3 Household Economic Wealth as Outcome of Microfinance

At an intermediate level, microfinance might improve the economic status of the beneficiary household, particularly when households face shocks. In fact, the individual improvement of the socio-economic situation of the client might have some positive consequences for the poverty level of the household he/she is living in as he/she might use the profits of her/his business for improving consumption and accumulating assets for the whole family. This improvement might be particularly important when the household situation is compromised by unplanned negative events. In such case, taking a credit might serve as a strategy to smooth household income and consumption (ZAMAN, 1999).

2.2 CHILD NUTRITIONAL STATUS & ITS SOCIO-ECONOMIC DETERMINANTS

2.2.1 UNICEF Approach of Child Nutritional Status

Nutrition encompasses “processes leading to and involved with the utilisation of nutrients for growth, development, maintenance and activity” (UNICEF, 1990). There are two main approaches to malnutrition: the physiological approach and the broad approach.

Physiological Approach

The physiological approach focuses on biological disorders within the body and associates malnutrition with an imbalance between nutrient requirements and intake resulting in cumulative nutrient deficiencies. Clinical, anthropometric and laboratory analyses are involved in the diagnosis of these disorders, which are classified in two categories: macronutrient and micronutrient deficiencies (table 2.2.1). Macronutrient deficiencies have to do with an imbalance in protein and energy. The most common manifestations among young children are stunting, underweight, wasting and low upper arm circumference (REINHARD, 2000). Frequent micronutrient deficiencies are anemia and deficits in vitamin A. The type of malnutrition identified in individual cases and its prevalence range in a community are used as an orientation for public health action. The criteria have been defined by the World Health Organization (WHO) (ONIS & BLÖSSNER, 1997; BROWN & AKRÉ, 1998; ALLEN, DE BENOIST, DARY, & HURRELL, 2006).

Tab. 2.2-1 Classification of malnutrition as public health problem

Nutritional Disorder	Indicator	Severity of Public Health Problem			
		(% of population deficient)			
		Low	Mild	Moderate	Severe
Stunting	Low Height-for-Age z-score (<-2sd)	<20%	20-30%	30-40%	≥40%
Underweight	Low weight-for-age z-score(<-2sd)	<10%	10-20%	20-30%	≥30%
Wasting	Low weight-for-height z-score (<-2sd)	<5%	5-10%	10-15%	≥15%
Anemia	Low blood haemoglobin (< 110g/l)	<5%	5 -20%	20–40%	≥40%
Vitamin A Deficiency	Low serum retinol (< 0.70 µmol/l)	<2%	2-10%	10-20%	≥20%

Source : Own compilation based on ALLEN ET AL ,2006; BROWN & AKRÉ 1998; ONIS & BLOESSNER 1997

UNICEF Causal Approach

The UNICEF approach of malnutrition is broader than the physiological approach. It is based on the analysis of both biological and social causes of malnutrition as a basis for action. The predictive model takes into account the multi-sectoral and multilevel nature of the malnutrition problem. It does not only incorporate proximal causes of malnutrition but also considers more distal socio-economic factors at basic level. Public health programs are designed based on the identified causes. The UNICEF conceptual framework for the analysis of the causes of malnutrition in specific contexts is presented in figure 2.2.1.

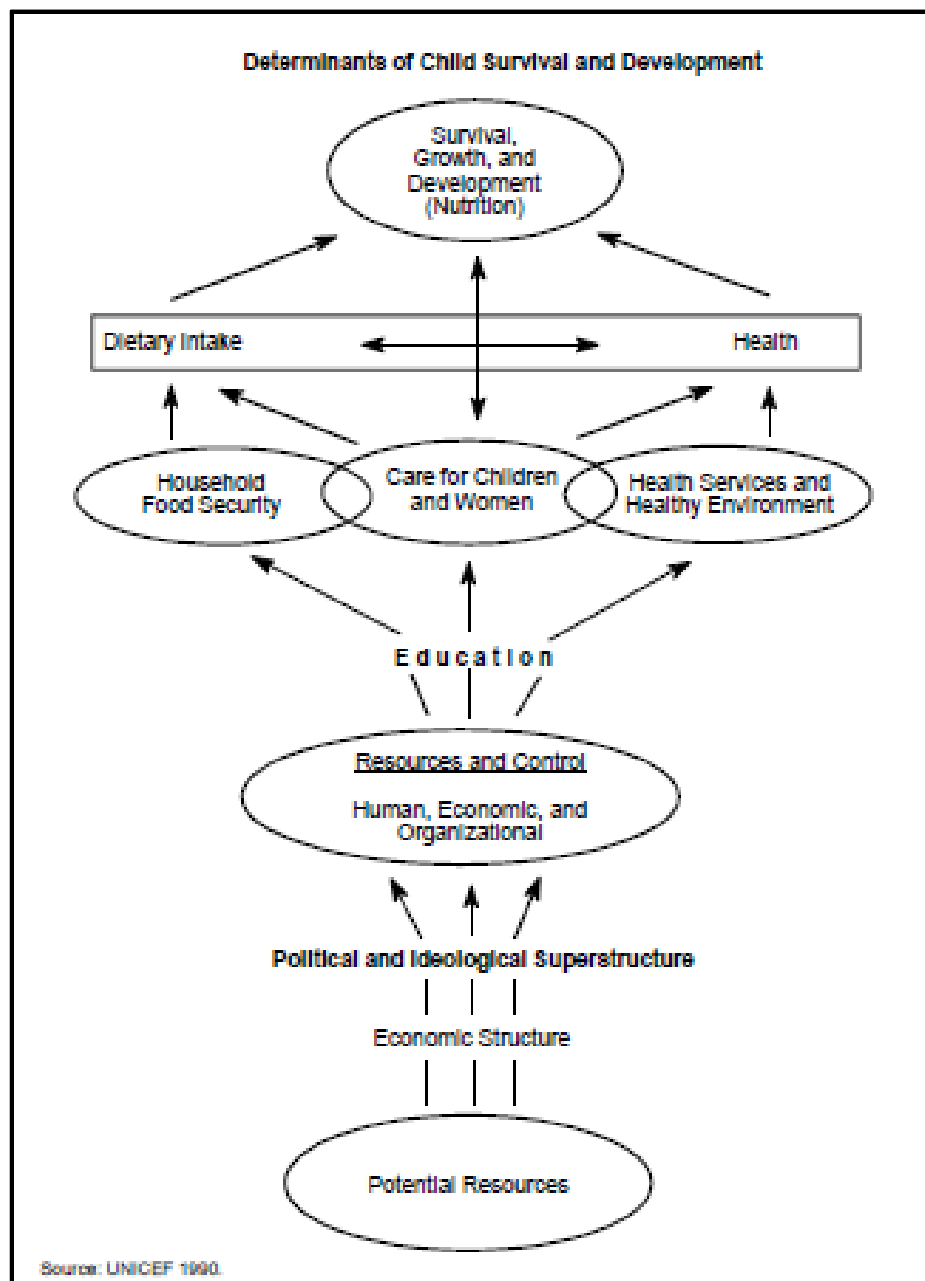


Fig. 2.2-1 UNICEF causal approach of malnutrition (Source: UNICEF, 1990)

2.2.2 Proximal Determinants of Child Malnutrition

The UNICEF framework indicates that the most immediate causes of child malnutrition are inadequate dietary intake and disease, which are themselves the result of the following household related factors: food security, health security and care (UNICEF, 1990). Accordingly, 'nutrition security' conceptually requires not only 'food security', but also non-food factors like 'health security' and adequate 'caring practices' (GLOBAL FORUM ON FOOD SECURITY AND NUTRITION, 2012: 8).

Inadequate household food security can lead to child malnutrition. Dietary inadequacies at the child level might be the result of an inadequacy of the household diet. In fact, families might offer a diet of poor quality, which does not include a variety of food categories. The poor diet diversity can lead to nutrient deficiencies. But the problem might also be one of quantity since some families do not achieve to eat several times per day or to offer the adequate food ratio. A diet must at the same time be fully-balanced and present the minimum meal frequency to meet the nutrient requirements (WHO, 2008).

Inadequate household health security can lead to child malnutrition. Inadequate access to water and environmental sanitation does not only influence health. It also directly affects general hygiene, food production and preparation (UNICEF, 1990). Poor access to water has also indirect effects on nutrition by increasing the work-load of women and reducing the time available for child care. Access and use of health services for treatment of illnesses, immunization, antenatal care and sensitization can prevent malnutrition.

Inadequate care can lead to child malnutrition. Care refers to «behaviors performed by caregivers that affect nutrient intake, health, and the cognitive and psychosocial development of the child » (ENGLE, MENON & HADDAD, 1999). Care practices include in particular breastfeeding and feeding of very young children that have a direct impact on dietary intake and occurrence of infections. Optimal child feeding practices include an early breastfeeding initiation, exclusive breastfeeding for six months, introduction of complementary foods at six months and prolonged breastfeeding (WHO, 2008).

2.2.3 Basic Determinants of Child Malnutrition

Each proximal factor has its roots in the socio-economic conditions prevailing at household and community levels.

Poverty leads to child malnutrition as economic resources directly affect the proximal determinants of nutritional status and particularly access to food, health services and sanitation infrastructures.

Demographic Characteristics influence Child Malnutrition. Inherent characteristics of the child,(age, sex), of the household (education, household size, shocks), and of the community influence child malnutrition.

2.3 MICROFINANCE EFFECT ON CHILD NUTRITIONAL STATUS: EMPIRICAL REVIEW

Extensive research has been made on the socio-economic impact of microfinance (VAN ROOYEN, STEWART, & DE WET, 2012; DUVENDACK ET AL. 2011). But only few studies inquired the relationship between microfinance and child nutritional status. An overview of such studies is given in table 2.3.1.

Tab. 2.3-1 Previous studies on microfinance effect on child nutritional status

	Survey Period	Country	Microfinance Institution	Data Collection		Nutritional Status	SOURCE
1	1985-86	Bangladesh	GB	RCS	H-QEXP	+	RAHMAN 1987 ¹
2	1988-90	Bangladesh	Various	LS	C/H-EXP	+/-	FOSTER 1995
3	1991-92	Bangladesh	Various		C-QEXP	+/-	PITT 2003
4	1992	Bangladesh	GB	SCS	H-EXP	+/-	TODD 1996 ¹
5	1993	Mali	CwE	LS	C/H-QEXP	0/-	DE GROOTE 1996
6	1992-93	Ghana	Various			+/-	KENNEDY 1994 ¹
7	1992-95	Bangladesh	BRAC	RCS	C-QEXP	+/-	KHATUN 1998
8	1994-95	Bangladesh	Various	RCS	QEXP	0	ZELLER 2001
9.1						+/-	DIAGNE 1998
9.2	1995	Malawi	Various	RCS	QEXP	+/-	SPEAR 2001
9.3						+/-	HAZARIKA 2008
10	1993-96	Ghana	CwE	RCS	C/H-QEXP	+/-	MKNELLY 1998
11	1994-97	Bolivia	CwE	RCS	C/H-QEXP	-/0/+	MKNELLY 1999
12	1993-2000	Indonesia,	Various	RCS	C-QEXP	+	DELOACH 2011
13	2000	Papua NZ	ROSCAs	SCS		+	IMAI 2008
14	2003	Ethiopia	WISDOM	SCS		+/-	DOOCY 2005
15	2002-04,	Bangladesh	CFPR/TUP	LS	H-QEXP	+/-	AHMED 2005
16	2007-08	West Bengal	SHGs	SCS	H-EXP	+	DE 2011
17	2007-08	Peru	CwE	SCS	C/H-EXP	0	HAMAD 2011
18	2011	Ghana	CwE	SCS	C/H-EXP	+	MARQUIS 2012

H-QEXP=Household–Quasi-experimental design; H-EXP=Household–experimental design; C-QEXP; Community-Quasi-experimental design; C-EXP: Community Experimental design; RCS: Repeated Cross-sectional Survey; SCS: Single Cross sectional Survey; LS: Longitudinal Survey, CwE: Credit with Education; GB (Grameen Group), +: positive effect; -: negative effect; 0: no effect

¹ Original work was unavailable: RAHMAN, 1987 as cited in QUANINE 1988; TODD, 1996 as cited in ASHRAFI, 2012; KENNEDY 1994 as cited in DE GROOTE et al., 1996.

The geographical focus of most studies is Asia and particularly *Bangladesh*, where the Grameen Bank and similar microfinance institutions were launched in the 1980s. One of the earliest studies was a survey on children younger than nine years of age conducted in 1985-86 by the Bangladesh Institute of Development Studies (BIDS). The Grameen Bank was determined to have a positive effect as 50 percent of the children of bank members had normal weight-for-height compared to 30 percent for non-bank members' children (RAHMAN, 1987 as cited in QUANINE, 1989). In 1988, Bangladesh was hit by a severe flood and an aid flood assessment was carried out in two rounds by the USAID (U.S. Agency for International Development). FORSTER (1995) used a data subset on the weight of more than 1,000 children aged six to 36 months to assess the effectiveness of existing mechanisms in reducing the impact of the flood on child weight. The analysis showed that both landless and landowning households used credits to meet consumption needs during the post-flood period. These mechanisms were partially effective for protecting children's nutritional status in the landowning households. In contrast, children from landless households were especially vulnerable to the flood due to higher costs of borrowing. In 1991-92, a survey was undertaken by the World Bank with the aim of assessing the effect of the three major group-based microcredit programs of Bangladesh: Grameen Bank, BRAC and BRDB. In this study, female credit is found to have a significant impact on the arm circumference and height-for-age of both boys and girls younger than 15 years old, but not on their body mass index (BMI). Men's credit has no statistically significant impact (PITT, 2003). An anthropological study run in 1992 among clients of the Grameen bank also included an anthropometric module. Children of Grameen borrowers were found to be somewhat taller and much heavier than children of non-borrowers and the average Bangladeshi child (TODD, 1996 as cited in ASHRAFI, 2012). A repeated cross-sectional survey undertaken in Bangladesh in 1992 and 1995 indicated a significant decline in the prevalence of severe malnutrition as measured by MUAC, among children whose mothers participated in the BRAC credit program in comparison to those of non-members (KHATUN, BHUIYA, & CHOWDHURY, 1998). A longitudinal survey conducted in Bangladesh after 18 months of operation of the CFPR/TUP microcredit program concluded that the nutritional status of children from intervention households improved better over time than that of children from control households, when considering indicators of severe MUAC and severe wasting. They did not perform better for severe underweight or stunting (AHMED & RANA, 2005).

The International Food Policy Research Institute in Washington (IFPRI) conducted a multi-country project in order to provide guidance for designing food security strategies. Anthropometric data were collected in seven of the nine countries surveyed between 1992 and 1995 but the results on the impact of access to credit on nutritional status were only

available for Bangladesh, Malawi and Mali (ZELLER & SHARMA, 1998). In Bangladesh, the repeated cross-sectional study found no statistically significant difference in children height-for-age, weight-for-age and weight-for-height between microfinance participants and nonparticipants (ZELLER, SHARMAR, AHMED, & RASHID, 2001). The Malawi data have been analyzed thrice. IFPRI found no statistically significant differences in the acute and chronic malnutrition of preschoolers in credit program member and noncurrent member households (DIAGNE, 1998). SPEAR (2001) found that male formal access to credit had no impact on child nutritional status. Female formal access to credit showed signs of positive influence on girl nutritional status in specific versions of the statistical model. HAZARIKA and GUHA-KHASNOBIS (2008) confirmed no effect of men's access to credit on child nutritional status. Women's access improved the height-for-age of girls; but did not impact that of boys and the weight-for-height of either girls or boys.

The IFPRI study in Mali was undertaken in cooperation with the USAID, which also supported several studies on the impact of "Credit with Education" (CwE), a new approach integrating financial services and nutrition-related education. In Mali, there was some evidence of a positive association between CwE and female income, which was in turn related to better children weight-for height (DE GROOTE, KENNEDY, PAYONGAYONG, & HADDAD, 1996). Two other studies were implemented by the international NGO Freedom from Hunger. In Ghana, the weight-for-age and the height-for-age z-scores of participants' children were significantly improved between the years compared to children living in the control communities (MCKNELLY & DUNFORD, 1998). In Bolivia, women's participation in the *Credit with Education* program did not impact the weight-for-age, height-for-age and weight-for-height of their children. The results suggest an even negative effect on children weight-for-age (MCKNELLY & DUNFORD, 1999). The education component of a Credit with Education program was evaluated in Peru and found no changes in anthropometric measures (HAMAD, FERNALD, & KARLAN, 2011). In Ghana, an integrated approach of microcredit and nutrition education was evaluated in 2011 conjointly by the Canadian's School of Dietetics and Human Nutrition of McGill University and the Departement of Nutrition and Food Science of the University of Ghana. The study demonstrated much lower underweight and wasting prevalence rates in the intervention communities than in other areas in the regions (MARQUIS & COLECRAFT, 2012).

The issue of microfinance and nutritional status has been also analyzed in Ethiopia, Indonesia, Papua New Guinea and West Bengal. In May 2003, data were collected in Ethiopia by the Department of International Health, Johns Hopkins School of Hygiene and Public Health with the objective of assessing the impact of the WISDOM Microfinance institution on nutritional status and well-being. Considering the sample as a whole, the data

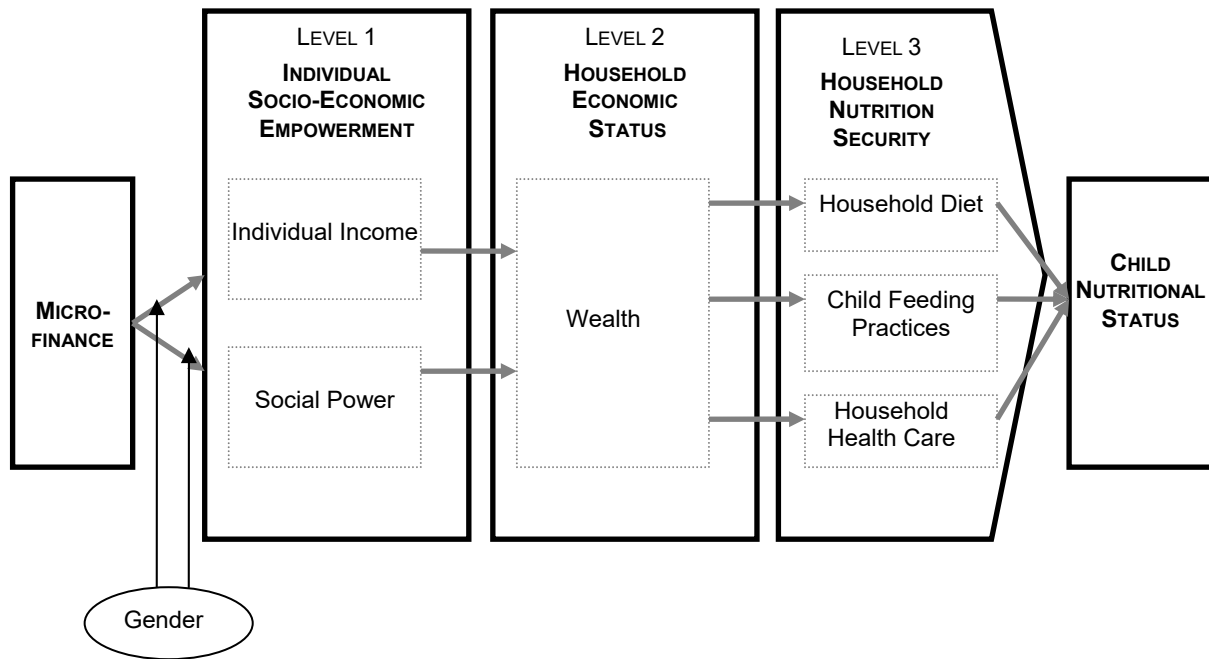
analysis indicated that the participation in the WISDOM microcredit program did not have a significant effect on child nutritional status. But in Sodo, one of both Ethiopian survey sites, children of female clients had significantly greater odds of acute malnutrition than children of both male clients and community controls (DOOCY ET AL., 2005). Data collected in 1993, 1997 and 2000 in Indonesia showed that the height-for-age of children living in communities with microfinance institutions improved significantly compared to those living in communities which lost access to these institutions (DELOACH & LAMANNA, 2011). The School of Social Sciences of the University of Manchester drew upon survey data from 2000 to show that autonomous women's community-based organisations in Papua New Guinea were more efficient in improving child weight-for-age than those externally supported (IIMAI & ELKLONG, 2008). In West Bengal, a study conducted in 2007-2008 by the Centre for Economic Studies of Kolkata found that mother's earnings from saving and credit had positive and significant effect on the weight-for-age for the children of women belonging to self-help groups (DE & SARKER, 2011).

In summary, the studies showed some evidence of an impact of microfinance on child nutritional status. The impact seems to depend on specific conditions. Gender seems to play an important moderating role. It is yet worth mentioning that most of the studies are from Bangladesh. The studies outside Bangladesh are testing either the "Credit with Education" approach or general access to formal credits or informal microfinance (Rotating Savings and Credit Associations, Self-Help Groups). There has only been one study outside Bangladesh that evaluated the impact of a specific microfinance institution (DOOCY ET AL., 2005).

2.4 THEORETICAL FRAMEWORK

2.4.1 Theoretical Model

The framework guiding this study is depicted in the following diagram (Model 0). The mediational model was an integration of the poverty lending approach of microfinance impact and of the UNICEF causal approach of child malnutrition. The model also implied a gender perspective.



Model 0 : Theoretical model

2.4.2 Hypotheses

In order to solve the research problem, it has been necessary to define the following specific hypotheses:

- H1. Microfinance has a positive and significant total effect on child nutritional status.
- H2: At a distal level, microfinance influences child nutritional status through individual socio-economic empowerment;
- H3: At an intermediate level, microfinance influences child nutritional status through higher household economic status;
- H4: At a proximal level, microfinance influences child nutritional through better household diet, health care and child feeding practices;
- H5: Microfinance's positive effect on child nutritional status is stronger, when the microfinance participant is female.

3 EMPIRICAL APPROACH

Chapter two exposed a theoretical framework, which is worth being tested on the ground. The present chapter describes the methodology used to gather data and to analyze them. It is organised around five major topics: study area, data collection, sampling, indicators and data analysis.

3.1 STUDY AREA

After the definition of the hypotheses, the next step was to define a study population to verify them empirically. Four main criteria guided our choice while selecting the location for the case study: a critical prevalence of children malnutrition, the presence of microfinance institutions, a context of crises and the availability of institutional partners willing to materially support the research project. These conditions were fulfilled for the population living in the *refugee settlements of Arua District in Uganda*. This section depicts the selection steps as well as the study population in terms of socio-economic characteristics, nutritional situation, microfinance landscape, and crises exposure.

3.1.1 An Area located within Arua District in the West Nile Region of Uganda

The geographical focus of the research section in which this thesis is embedded is Africa (LEONHÄUSER, 2013; LEONHÄUSER, DRESCHL-BOGALE, LEMKE, YEO, & PETERMANN, 2005). It was clear from the beginning that the study area would be localized somewhere in Africa. The selection of the country started with the identification of institutional partners for supporting the research project. After hesitating between Côte d'Ivoire, Mali and Uganda, it became apparent that Uganda would provide more opportunities to see the realization of the research project. A one-week journey was organised² which was fruitful as it allowed to identify the West Nile Food and Nutrition Security Project (FNS) as a partner willing to logistically support the survey and to provide a workplace during the research. The FNS project is a project initiated by the German Cooperation (GTZ) with the aim of improving the nutritional situation and the stability of the West Nile region in Uganda. It is operating in the refugee-hosting sub-counties of Arua and Yumbe district in Northern Uganda. Once on the ground, the decision was made to focus our study on the three refugee settlements of the Arua District: Madi-Okollo, Imvepi and Rhino Camp (figure 3.1.2).

Uganda lies in East Africa over an area of 241,038 square kilometers. The country was divided into 56 districts at the time of the survey. The Arua district is located in the North Western part of Uganda (West Nile region) 520 km from the main town Kampala (figure

² Yeo, A.E. (2004, June). *Contribution of microfinance to nutrition security in the context of crises : An example from Uganda* (Unpublished report on the field mission in Uganda from 5th- to 13 June 2004). Gießen: ZEU. 25p..

3.1.1). It borders Sudan and the Yumbe district to the north, the Democratic Republic of Congo to the west, Nebbi in the south and Gulu in the southeast. The district was administratively sub-divided into seven counties, 36 sub-counties, 241 parishes and 2026 villages. It hosted three refugee settlements distributed between five sub-counties.



Fig. 3.1-1 Location of Arua District

Table 3.1.1 describes the population of the district at the time of the survey.

Tab. 3.1-1 Population figures in the study area, End 2004

	Total	Aged <5	Aged >18	Female aged >18
Arua District ^a	921 274	188 861	412 730	213 738
Refugee settlements ^b	59 693	10 736	22 267	11 385
<i>Rhino Camp</i>	26 735	5 080	9 892	5 259
<i>Imvepi</i>	25 513	3 572	9 695	4 572
<i>Madi-Okollo</i>	7 445	2 085	2 680	1 555
DED Participants ^c	855	NA	855	512
<i>Rhino Camp</i>	570	NA	570	360
<i>Imvepi</i>	245	NA	245	139
<i>Madi-Okollo</i>	40	NA	40	13

Source: Own compilation based on ^apopulation projections for 2004 estimated from 2002 Uganda Population and Housing Census (UBOS, 2002) ; ^brefugee population figures for december 2004 (UNHCR, 2005); and ^cDED Client Database from November, 2004 ; NA: Not Available.

In 2002, Arua had a population of 855,055 inhabitants (Uganda Bureau of Statistics [UBOS], 2002). The yearly growth rate over the period 1991-2002 was 3.8 percent. The predicted population size in 2004 was thus approximatively 921,274. This population was distributed in 153,701 households with an average of 5.5 members. Some 20.5 percent of the population was under five (175,287). Arua population was characterized by a sex ratio of 93.1 males to 100 females and a population density of 153 inhabitants per square kilometres. The rural population represented 91.2 percent of the district population.

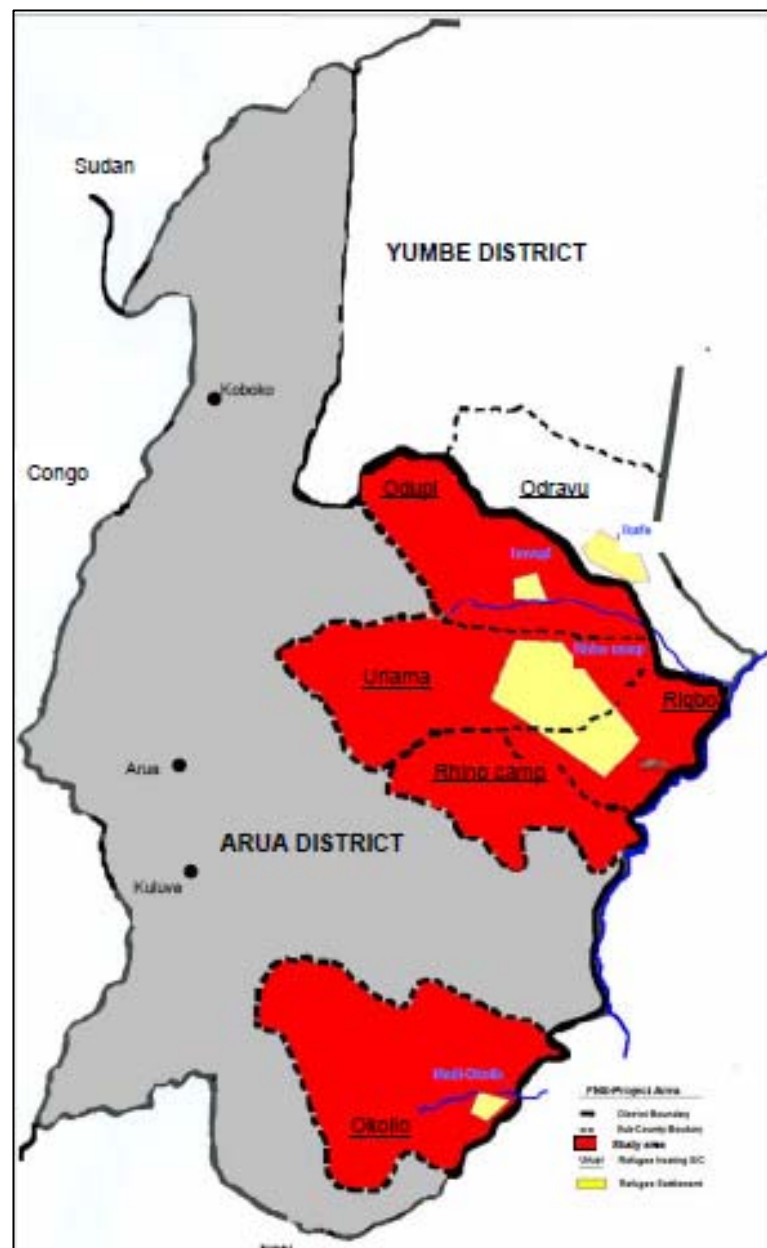


Fig. 3.1-2 Map of the study area

3.1.2 An Area affected by Conflicts & Refugee Movements

Conflict & Refugees Movements in West Nile

The West Nile region of Uganda has a long history of collective conflict which occurred with various degrees of severity since 1971 (GERSONY, 1997). Nearly every change of political regime has set off a new phase in the conflict (figure 3.1.3³).

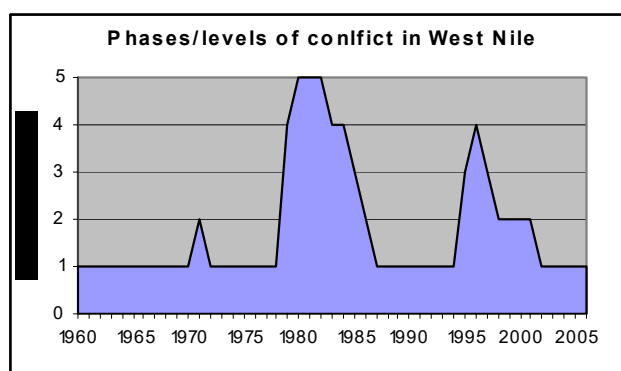


Fig. 3.1-3 Conflict in West Nile

As Uganda got its independence from the United Kingdom in 1962, Obote Milton became its first president. 1971, Obote was militarily overthrown by Idi Amin, a native from Arua District. West Nilers were said to be prominently represented in Amin's army. From 1962 under the Obote I regime and then from 1971 to 1979, the West Nile region enjoyed a peaceful situation. This relative stability was interrupted by the invasion of the Tanzanian army which achieved pacification of the West Nile in mid-1979. During 1980, the Tanzanian occupying forces were replaced by the Uganda National Liberation Army (UNLA) reconstituted by Obote. The UNLA engaged in violent repressions against the West Nilers, who had to flee to southern Sudan and Congo. The massive population displacements that took place from West Nile in the early 1980 lasted until the end of the Obote II regime in 1985. In 1986, the National Resistance Army (NRA) led by Museveni came to power. Repatriation of the Ugandan refugees in the region and almost one decade of peace followed. 1995 saw the emergence of the West Nile Bank Front (WNBF) which activities intensified in 1996 and affected the security of West Nile. The WNBF rebels were demobilized in 1997 and reintegration programs of the former were still in place at the time of the survey.

³ The graph was constructed by the author based on a conflict analysis according to the USAID model for five levels of conflict (Samarasinghe, Donaldson & McGinn 2001): Level 1: Peaceful Stable Situation; Level 2: Political Tension Situation; Level 3: Violent Political Conflict; Level 4: Low-Intensity Conflict; Level 5: High-Intensity Conflict. A conflict timeline was produced for the West Nile region on the basis of events reported in the literature.

Conflict in Sudan & Refugee Movements into West Nile

Parallel to the movements of the Ugandan population from and back to West Nile, there were also some refugee movements into the district. In August 1993, refugees arrived from the Equatorial Province in southern Sudan and were first accommodated in transit camps in Koboko County. By the end of 1996, 101,000 refugees were distributed between Rhino Camp, Imvepi, Koboko and Ikafe (Yumbe district). In March 1997, half of the refugees in Arua district spontaneously returned to their home areas. Most of the remaining caseload (little more than 50,000) remained in Koboko Town and was then transferred in Rhino Camp and Imvepi. The movement of the refugees has continued since then with an influx of a total of some 2,000 new arrivals in 1999 and over 3,000 in 2000. In 2004, Rhino Camp accommodated 26,735 refugees (UNHCR, 2005) on 225 km². The settlement was allocated in 1992 66 km east of Arua town. It straddles Odupi sub-county in Terego county and Rigbo in Madi-Okollo sub-county. Imvepi was allocated in 1995 76 km northeast of Arua Town. It accommodates 25,513 refugees on 120 km².

The Madi-Okollo refugee settlement was set up in September 2003 in order to re-locate Sudanese Acholi refugees. These refugees were displaced from the Acholi-pii settlement in Pader district in July 2002 after the camp was attacked by the LRA. There were temporally settled in Kiryandongo refugee camp, Masindi district before being moved to Madi-Okollo (Arua district) and Ikafe (Yumbe district). In December 2004, 7,445 of them were living in Madi-Okollo (UNHCR, 2005).

About one third of the district's refugees are adults (37 percent). The proportion of women in the adult refugee population tends to be around 50 percent, except for Madi-Okollo where women are over-represented (58 percent). Some 63 percent of the refugees are children under the age of 18, whereas 18 percent are under the age of five (table 3.1.1). The proportion of children under five varies greatly, depending on the refugee settlement. This age group represents 28 percent of the whole population of Madi-Okollo settlement and only 14 and 19 percent of the population of Imvepi and Rhino Camp, respectively.

3.1.3 An Area with a Critical Malnutrition Prevalence

Was child malnutrition a public health problem in the study area? This section is an attempt to answer this question and get a picture of the nutritional context in which the empirical study is embedded. Malnutrition statistics at national, regional and local level are evaluated against the criteria defined by the World Health Organization (WHO) to assess the severity of a nutritional situation (ONIS & BLÖSSNER, 1997; BROWN & AKRÉ, 1998; ALLEN ET AL., 2006). The WHO criteria are based on prevalence ranges which differ for each form of malnutrition. They are summarised in table 2.2.1.

Child Nutritional Status in Uganda

At national level, malnutrition statistics can be derived from the *Uganda Demographic and Health Surveys* (UDHS). These surveys are conjointly undertaken by the Ugandan Bureau of Statistics (UBOS) and Macro International approximatively every five years (MOH & MACRO, 1989; STATISTICS DEPARTMENT UGANDA & MACRO, 1996; UBOS & ORC MACRO, 2001; UBOS & MACRO, 2007). UBOS is a semi-autonomous body providing statistics on the national socio-economic developments. It was originally called The Uganda Bureau of Statistics and stood under the umbrella of the Ministry of Finance, Planning, and Economic Development (MoFPED). Macro International is an Initiative of the U.S. Agency for International Development (USAID) which aims at providing data to monitor health and nutrition programs in developing countries. In Uganda, it has assisted four nutrition surveys since 1988. UDHS surveys have the advantages of producing nutritional data that are publicly available and nationally representative. They include information on the prevalence of stunting, underweight, wasting, anemia and vitamin A deficiency among children. The sampled population is aged between 6 and 59 months for the statistics on anemia and between 0 and 59 months for the other forms of malnutrition. The indicators are those defined in table 2.2.1.

Figure 3.1.4 gives an overview of the prevalence of malnutrition in Uganda in 2006. The prevalence rates of stunting, underweight, wasting, anemia and vitamin A deficiency are classified along a severity scale extrapolated from the WHO criteria for public health severity defined in table 2.2.1 on page 7.

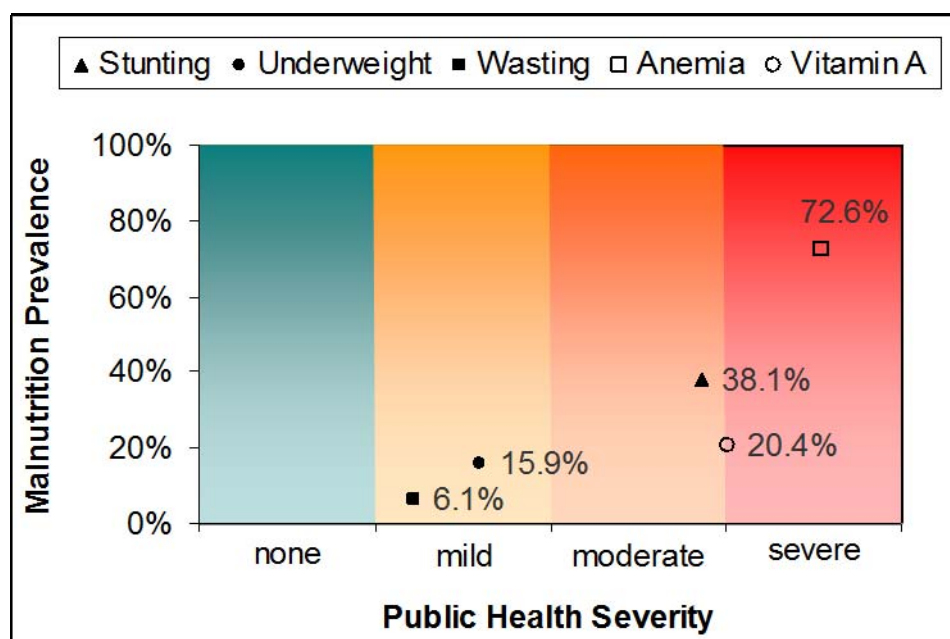


Fig. 3.1-4 Prevalence & public health severity of child malnutrition in Uganda, UDHS 2006⁴

⁴ Diagram built from the author based on figures from UDHS, 2006

The graph shows that in Uganda malnutrition was a public health problem for all forms of malnutrition. The prevalence of macronutrient and micronutrient deficiencies was above the critical level over which they can be considered as a serious public health concern. Within these critical prevalence range, there were however different degrees of severity according to the type of malnutrition. Micronutrient deficiencies represented the most severe problems. A total of 72.6 percent, i.e almost three fourth of the children population suffered from anemia. This is huge if we remind that a prevalence of five percent is already considered as critical (table 2.2.1). The vitamin A status of the Ugandan children was also alarming. The prevailing prevalence of 20.4 percent was up ten times that so-called “trigger-level” which is defined at two percent. Macronutrient deficiencies, especially in the form of stunting reached appalling prevalence levels too. A total of 38.1 percent of the children had a low height for age. This level corresponds to a public health problem with a severity estimated to be at the limit between high and very high. In fact a stunting prevalence ranging between 30 and 40 percent is considered as moderate while we already face a severe situation by prevalence over 40 percent. The other macronutrient deficiencies, namely underweight and wasting had prevalence ranges which also call for action but at a less severe level. Underweight was present among 15.9 percent of the children while wasting prevailed among 6.1 percent of them.

Our survey thus took place in a country where child malnutrition was an actual and persistent problem. In fact, nutritional surveys undertaken in the 1950s confirm that nutritional deficiencies already prevailed among Ugandan children at that time (RUTISHAUSER, 1971). An observation of national trends since 1989 has also shown alarming levels of malnutrition over the years, especially for stunting. Although there have been some improvements between 1989 and 1995, stunting prevalence remains at critical high levels since then. Underweight showed a high prevalence until 1995 but the situation improved in 2006. In contrast, wasting which was low in 1989 has risen to a public health problem of mild importance over the years. Statistics on anemia and vitamin A indicated that the nutritional situation has worsened for anemia while it has improved for vitamin A between 2001 and 2006.

Child Nutritional Status in the West Nile Region, Uganda

Regional data on children's nutritional status could be obtained from the UDHS survey of 2006 which compiled nutritional statistics for the West Nile region⁵ (UBOS & MACRO, 2007).

⁵ The survey was designed to be nationally representative and the sample size equals only 156 children for West Nile. Proper representative results are thus not necessarily ensured at the regional strata level.

As for the national statistics, the malnutrition prevalence was judged against the criteria for public health severity (table 2.2.1) and portrayed as a graph (figure 3.1.5).

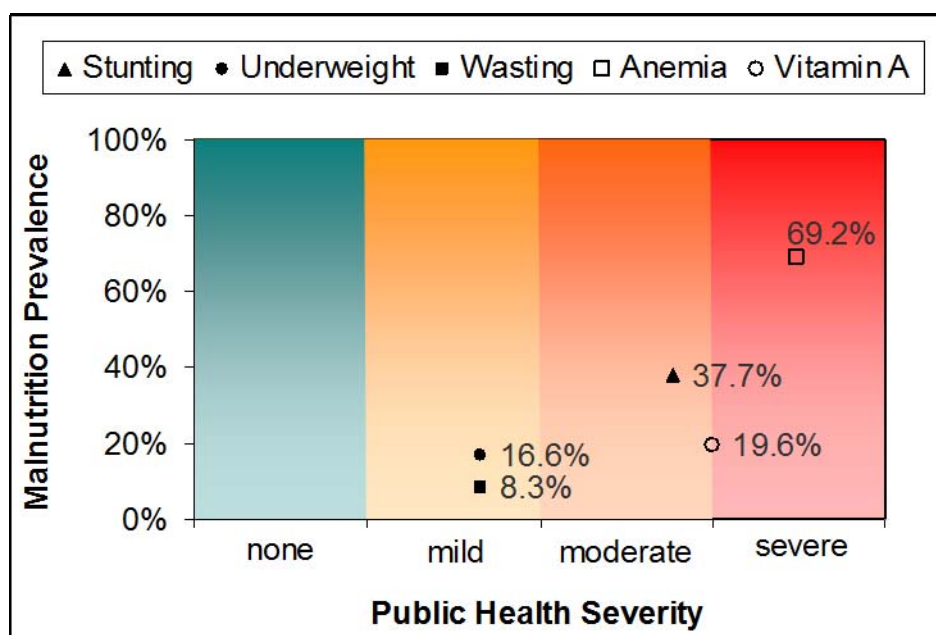


Fig. 3.1-5 Public health severity of child malnutrition in West Nile/ Uganda, UDHS 2006⁶

Malnutrition appeared to be at critical levels in the study region. The degree of public health severity followed similar patterns as for the whole country. In fact, anemia was the most severe deficiency and affected 69.2 percent of the children in West Nile, It was followed by vitamin A deficiency and stunting which are of less importance than anemia but tended to reach extremely high prevalence levels. Some 19.6 percent of the children had a low vitamin A status and 37.7 percent were stunted. Underweight and wasting represented public health problems of moderate magnitude. They affected 16.6 percent of the children for underweight and 8.3 percent for wasting.

A comparison with the national data reveals that anemia, stunting and vitamin A deficiencies showed slightly lower prevalence in West Nile than the national average. For underweight and wasting, the picture was rather worse in West Nile with a higher proportion of affected children than in Uganda as a whole.

⁶ Diagram built from the author based on figures from UDHS, 2006

Was malnutrition a new phenomenon in the region? Earlier studies indicated that this was not the case. JELLIFFE and BENNETT (1962) showed in their pediatric study of the Lugbara children that growth retardation was already prevailing in the region in the sixties. Protein-energy malnutrition was also present but at a low prevalence level. Nutritional surveys carried out in West Nile since 1987 are summarised in table 3.1.2. They sampled children aged 0 to 59 months except the one of MATERIA ET AL. (1995) which excluded those younger than six months. The geographical target areas were not identical. Their results are thus hardly comparable. Nevertheless they give an idea of how the nutritional situation evolved over the time.

Tab. 3.1-2 Trends in child malnutrition prevalence, West Nile 1987-2006

Survey Area	Sample Size	Date	Results			Source
			Stunting	Underweight	Wasting	
Arua	1066	1987	42.4%	24.8%	3.0%	VELLA ET AL., 1992
West Nile ⁷	209	1989	44.9%	33.1%	3.9%	MOH & MACRO, 1989
Arua	514	1992	49.2%	-	4.7%	MATERIA ET AL., 1995
Arua	245	2005	32.0%	25-30%	8.0%	VINCK, 2006
West Nile ⁸	156	2006	37.7%	16.6%	8.3%	UBOS & MACRO, 2007

Regarding stunting, the conditions seemed to be at their worst during the war and in the years following resettlement of the displaced natives. Studies undertaken between 1987 and 1992 indicated stunting prevalence ranges over 40 percent, corresponding to severe public health problems (MATERIA ET AL., 1995; MOH & MACRO, 1989; VELLA ET AL., 1992). Compared to this period, the prevalence found around the time of our study indicated an improvement of the situation (UBOS & MACRO, 2007; VINCK, 2006). The trends were not as clear regarding underweight. The prevalence seemed to have always oscillated within ranges of mild to moderate importance in Arua. In contrast and similarly to the national trends, wasting showed low prevalence in the past and emerged as a significant public health problem only recently.

Child Nutritional Status in Arua Refugee Settlements, West Nile

Our study took place within the refugee settlements of the Arua district. Unfortunately very few data on stunting or underweight were available for the refugee population. The available data came from a survey carried out in 1994 in Koboko, a refugee camp that received a massive influx of refugees in the mid of 1992 and that was closed by the end of 1996

⁷ Arua, Moyo, Nebbi districts

⁸ Adjumani, Arua, Koboko, Nyadri, Nebbi & Yumbe districts

(ORACH, 1999). The survey revealed a very high prevalence of stunting and a high prevalence of underweight during this period. Some 48.9 percent of the children had a low height-for-age and 36.7 percent had a low weight-for-age.

Although this study points out that stunting and underweight were serious public health problems among refugees, nutritional data were generally available only for wasting. These data were provided by small scale emergency nutrition surveys undertaken by the District Directorate of Health Services of Arua (DDHS) since 2002 and by various non governmental organisations (NGO) operating all over the district before. The surveys were organised on a regular basis with the aim of monitoring the activities in the settlements. They applied the standard World Health Organization EPI methodology (WHO, 1991). Their results are detailed in table A2.1 provided in annex A2. Most of the original reports could not be obtained but the results were made available through the UNSSCN website.

The prevailing wasting prevalence was again analyzed using the WHO criteria for public health severity and summarised as a graph (figure 3.1.6).

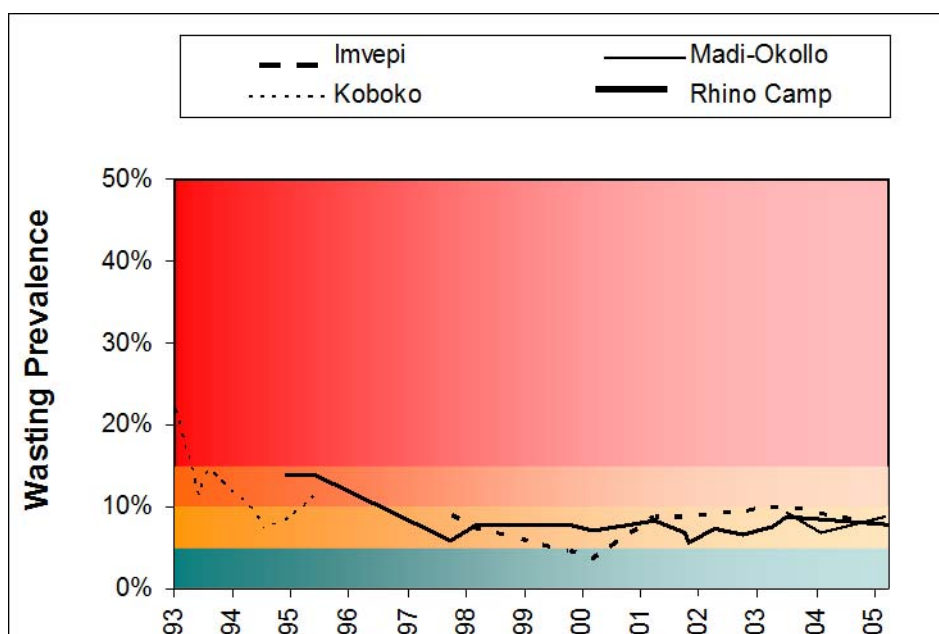


Fig. 3.1-6 Trends in prevalence of wasting 1993-2005, Arua refugee settlements⁹

The curve for Koboko showed that wasting was a severe public health problem in the camp in 1993. The prevalence was over 30 percent. The situation somewhat improved in the

⁹ Diagram built from the author based on figures from the reports cited in annex A2

following times. It nevertheless further oscillated between prevalence of medium to high levels. In Rhino Camp, the prevalence of wasting was also very high in 1995. There was a significant improvement since then and the prevalence remained within a stable and medium range. The situation was not much different in Madi-Okollo and Imvepi settlements where the wasting prevalence was within the medium range of five to ten percent as well. The situation appeared to be stable and there was no tendency towards lower prevalence levels.

In total, wasting remained at critical levels among refugees of Arua and had to be tackled. It yet represented a public health problem of mild magnitude.

3.1.4 An Area with Microfinance Institutions

This section provides a brief overview of the regulatory environment and of the types of microfinance institutions (MFIs) present in the Arua District during the sample period. The institutions were identified through formal interviews with operational staff of ten MFIs and consultations with four non-MFI organisations in November 2004 and later from 5th to 11th April 2005. The respondents were mostly interviewed individually but sometimes also in a group. The author compiled the gathered information in a report¹⁰.

Microfinance Environment

Several microfinance institutions were operating in Arua. According to their legal status, they belonged to the formal, the semi-formal and the informal sector.

Formal financial institutions are regulated and supervised by the Bank of Uganda (BoU). They are of three types: Commercial banks (Tier 1) and credit institutions (Tier 2) which are licensed by the Financial Institutions Act 2004 and Micro-finance Deposit Taking Institutions (Tier 3) which fall under the Microfinance Deposit-Taking Institutions (MDI) Act 2003 (STASCHEN, 2003). In Arua, the formal banking sector consisted of five commercial banks (STANBIC, CERUDEB, DFCU, Coop Bank, UCB), one Postal bank (Post bank), two Insurance companies (EXCEL, United) and two MDIs (Pride, FINCA). So far, only CERUDEB, Coop Bank, Post bank, Pride and FINCA were offering micro-financial services.

Tier-4 institutions are *semi-formal microfinance institutions* that are not regulated by the BoU. They can gain the legal status of Non-Governmental Organisations (NGOs), Companies, cooperatives, etc. and fall under specific legislations and licensing authorities according to their corporate status. Savings & Credit Cooperative Societies (SACCOS) are co-operative

¹⁰ Yeo, A.E. (2005, September). *Microfinance Institutions in Arua District, Uganda: Institutional Survey in April 2005* (Unpublished report). Giessen: ZEU .20p.

societies engaged in microfinance business. The Registrar of Cooperatives, one staff of the production office in Arua was in charge of their registration. In April 2005, about 100 co-operatives were registered in this office, of them four were SACCOS: Arudi, Ayivu, Koboko United and West Nile Teachers. Six other SACCOS were identified: Bidibidi, Omugo, Vurra patriotic, Yumbe Farmers, Upper-Madi and Oli Division. The savings and credit cooperatives got their capital from membership fees, shares and savings. There were also a number of local or international NGO-MFIs operating in the district like WENWA, PARUDA, CEFORD, CREAM, PROMIC Arua Diocese, JRS Rhino Camp and DED refugee-program.

The *informal microfinance sector* of Arua was made of various institutions which did not have any form of registration or only were registered at district or sub-county level for administrative purpose. This type of registration confers no corporate status and those organisations that are not incorporated under any law can be considered as informal (STASCHEN, 2003). Informal institutions were of several types: Accumulating Savings and Credit Association (ASCAs), Rotating Savings and Credit Association (ROSCAs), Money lenders and Community-Based Organisations (CBOs).

Microfinance in Arua Refugee Settlements: The DED Loan Program

Of the formal or semi-formal microfinance institutions, only the DED refugee program and JRS Rhino Camp were targeting refugees. JRS Rhino Camp (Jesuites Refugee Services) provided basic pastoral care/services and adult literacy to the refugee community of Rhino Camp settlement. The promotion of Income Generating Activities (IGA) by JRS Rhino Camp started in 1998¹¹. In April 2004, the Women's empowerment/ Income Generating Program started again with the recruitment of a credit officer. The IGA activities targeted refugee women. Loans were offered to 65 women's groups (10 old and 55 new groups) made up of 165 women.

DED Arua refugee program was a program run by the German Development Service with the aim of administrating the three Arua refugee settlements: Rhino camp, Imvepi and Madi-Okollo. It had one office in Arua town and one in each of the three settlements. The program offered services in education, health, agriculture/forestry/environment, administration, community services, construction of infrastructures, and also services for supporting Income Generating Activities (IGA). The activities of IGA promotion started in 1996. The overall objective of the IGA sector was to empower refugees and nationals within the catchments area and give them the opportunity to work and generate income so that they would be able to maintain their dignity, care for their household and access basic services. The activities

¹¹ Yeo, A.E. (2005, September). *The role of microfinance for nutrition security in the context of crisis: The case of the Jesuits Refugees Services in Arua, Uganda. Survey from 31 November to 1st December 2004.* ZEU

consisted in the provision of extension services and loan facilities (loan revolving program) and the promotion of skills training. They were managed by a loan officer and several assistants and trainers. A total of 855 individuals participated in the DED loan revolving program. They represented about four percent of the whole adult population living in the settlements. Women represented 60 percent of the DED participants. The percentage of female participants varied by refugee settlement and was of 33 percent in Madi-Okollo, of 57 percent in Imvepi and of 63 percent in Rhino Camp.

3.2 SAMPLING

3.2.1 Sampling Frame, Sampling Units & Sampling Size

The following sampling strategy was applied:

- *Sampling Frame:* Households¹² with members of the DED loan program and neighbouring households as comparison group.
- *Sampling Units:* DED members and non-members, their households and children 6-59 months living in their households.
- *Sampling Size:* The initial sample included 235 respondents. The analysis was yet restricted to respondents from households with children aged 6-59 months. The analysis sample included 141 respondents from 139 households with 205 children (figure 3.2-1).

¹² A household is "a collection of people living and eating together" (CHEATER, 2003:115)

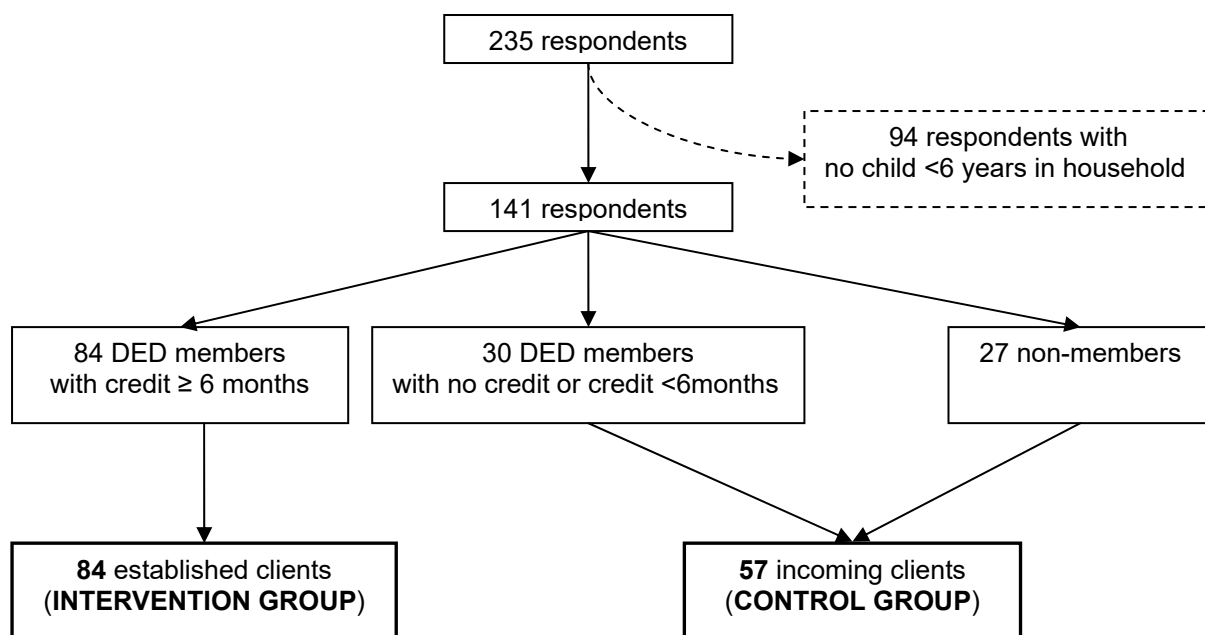


Fig. 3.2-1 Sampling Strategy

3.2.2 Sampling Procedure

Sampling Scheme

A two stage cluster sampling following the scheme:

- *Selection of the locations:* The villages were selected randomly from the list of villages where the DED loan program is operating. When a village was selected, all villages of the corresponding zone were included in the sample. Villages were selected until the estimated and wished number of respondents was reached.
- *Selection of the respondents:* All DED members (incoming or established; male or female) living in the visited villages and present at the moment of the survey were interviewed and their households were visited. In addition, for every fifth DED household that was visited, the nearest neighbouring household was also visited. In these households without DED-members, the first adult met (male or female) was interviewed as respondent.
- *Selection of the children within the households:* In each randomly selected household, all children with a length between 65 and 110 cm and without disability were included in the survey. These children were identified using a quick stick indicating 65 cm, 85 cm and 110 cm. It was assumed that they were between the age of 6 to 59 months.

- *Selection of Index children:* Among all selected children of a given household, the youngest child aging between 6 and 59 months was considered as the index child of the household. Care-related practices were assessed for this specific child.

Non-independence due to cluster effect

The 205 children are nested under 139 households which are nested under three refugee settlements. The assumption that errors of the models should be independent might therefore be violated. In order to account for the settlement cluster, the fixed effect approach was applied (COHEN ET AL., 2003: 539–544, HAYES, 2013: 434-435). This procedure consisted in including the dummies for two of the settlements as covariates in all regressions. Any effect due to location could therefore be removed from estimates of the coefficients and standard errors in the models. This fixed effect approach is recommended for large clusters, where the number of clusters is small relative to the total sample size. For the household cluster, the data structure (one to two children in each household and 139 households relative to 205 children) is not an ideal cluster structure for either the fixed effect approach or the multilevel model. The decision was therefore made to ignore the data structure. The calculation of the ICC (Intra-class correlation) reveals however that there is a household effect. About 25 percent of the variance might be attributed to differences between households, a fact to bear in mind while interpreting the data.

3.3 DATA COLLECTION

A Cross-sectional Design

A cross-sectional quantitative household survey was conducted from 21st February to 2nd March 2005 in three refugee settlements of Arua District, Northern Uganda with established and incoming clients of the DED loan program.

Survey Team

The survey team comprised five interviewers and one supervisor. Thirty interviews (20 to 40) were conducted on average each day which corresponds to six interviews (between three and ten) per interviewer per day. Interviews took forty minutes on average. The survey team reflected the ethnic and language composition of the study population and presented a diversity of gender. The author received a four-months training at PlanetFinance Paris on Microfinance, impact methodologies and statistical analysis.

Survey Instruments

The survey's goal was to assess the impact of the loan programme in terms of individual socio-economic empowerment, household wealth, household nutrition security and child nutritional status. A household questionnaire was developed based on the theoretical model and hypotheses (DED Household Questionnaire in Annex A1). Data were collected on demographic characteristics of the respondent, micro-financial services, socio-economic information on the household, sources of income and empowerment, household's diet, household's needs and crises and child's nutrition. Pilot-tests were undertaken with the microfinance institutions FINCA in Arua town and JRS in Rhino camp settlement.

Ethical Considerations

The study was approved by the Uganda National Council for Science and Technology in Kampala. Research permissions were also obtained from the Office of the Prime Minister (OPM), UNHCR (United Nations High Commissioner for Refugees) and DED (German Development Cooperation) offices in Arua. Consentment was obtained verbally from the respondents, who were informed on the purpose of the survey and the voluntary and confidential nature of the interviews.

3.4 INDICATORS

In order to assess the sequence of the process of "transformation" of microfinance intervention into child nutritional status, the key variables have been ordered at different hierarchical levels. The *inherent* level embraces the intervention variable (microfinance) and the inherent covariates. The *distal* (or basic) level includes the factors close to the intervention and distant to the ultimate outcome, namely individual income and psycho-social power. The *proximal* (or immediate) level comprises the factors close to the ultimate outcome and distant to the intervention, namely household diet, health care and child feeding practices. The *intermediate* level stands between the proximal and the distal level and takes into account the household wealth status. The *ultimate* level is the level of the ultimate outcome variable: the child nutritional status.

Core variables represent the key variables used for the multivariate regression analysis. In addition *secondary* variables have been assessed for a better descriptive analysis. Some core variables are indices constructed on the basis of the secondary variables. An overview of the indicators applied for the survey is given in table 3.4.1. Core variables are written in bold.

Tab. 3.4-1 Core and secondary indicators for the survey

DOMAIN	SUB-DOMAIN	INDICATOR
Outcome Variable Y (Child level)		
CHILD STATUS	NUTRITIONAL	Child Height-for-Age Optimal nutritional status
		Height-for-age z-score Height-for-age z-score \geq -2SD (yes/no) Weight-for-age z-score \geq -2SD (yes/no) Weight-for-height z-score \geq -2SD (yes/no)
Treatment Variable X (Respondent level)		
MICROFINANCE	Intervention	DED Credit > 6 months (yes/no) Participation in DED
	Loan characteristics	Loan amount Frequency of Loans Repayment Period Interest Rate
	Satisfaction	Satisfaction with DED Services, suggestions
Mediators at a Distal Level 1: M ₁ et M ₂ (Respondent Level)		
INDIVIDUAL ECONOMIC EMPOWERMENT	SOCIO- Individual Income	Monthly Income (Ush) Subjective Change in Income Income Diversification Enterprise Characteristics
	Individual Social Power	Social Power Index Gender Attitude Household Decisions' Making Participation in Groups Workload/time availability, social support
	Personal Power	
	Relational Power	
	Collective Power	
	Other Social Aspects	
Mediators at an Intermediate Level 2: M ₃ (Household Level)		
HOUSEHOLD STATUS	ECONOMIC Household Wealth	Subjective Wealth (better off /same /worse) Assets Monthly Expenditures Subjective Change in Housing Type of Housing
	Housing	
	Coping Capacity	Subjective change in coping ability Nature of Coping Strategies
Mediators at a Proximal Level 3: M ₄ , M ₅ et M ₆ (Household Level)		
HOUSEHOLD NUTRITION SECURITY	Household Diet	Diet Index (ideal/middle/bad) Meal Frequency Dietary Diversity Index Subjective Change in Diet
	Child Feeding Practices	Child Feeding Practices Index (ideal/middle / bad) ever breastfed early breastfeeding initiation continued breastfeeding at 20 months receiving solid food
	Household Health Care	Health Care Index (ideal/middle/bad) Hygiene, sanitation, Access to facilities Type and prevalence of infections
Moderator W & Covariates I_i (Respondent & Household Levels)		
MODERATOR =GENDER	Respondent Sex	Sex of Respondent (female/male)
INHERENT CHARACTERISTICS	Household Demographic Profile	Household Size Experience of Shocks last Year (yes/no) Highest Level of Education (years)
	Child Demographic Profile	Child Sex (female/male) Child Age (months)
	Location	Madi-Okollo settlement (yes/no) Imvepi settlement (yes/no)

3.4.1 Outcome Variable: Child Nutritional Status

Core Indicator: The outcome variable Y is the child nutritional status expressed as height-for-age z-score. The height-for-age z-score is calculated by dividing the difference between the observed height of a child of a given age and the median height of the reference population of that age by the standard deviation value of the reference population. Height-for-age is a long-term indicator which reflects the linear growth of the child. It is an indicator of chronic malnutrition (stunting). The z-score values of the surveyed children were compared to the WHO Child Growth Standards (WHO, 2006). For calculating the height-for-age index, it has been necessary to assess the following raw body parameters at all children aged 6 to 59 months: height, age and sex. The children older than two years were measured by standing and those younger than two in the lying position. Standard portable, wooden measuring height boards were used with a standard error of plus/minus 0.1 centimeters. The body measurements were performed by a team of two measurers for each child. In order to assure the accuracy of anthropometric data and minimize errors, the interviewers were trained to measure children. Spot checks on measurement techniques were made by an experienced anthropometrist during the field survey. The child sex was determined by checking the health cards or by physical observation. The child age was reported in months. It was calculated based on birth dates of children, which was probed carefully and obtained from health cards whenever possible.

Secondary Indicators: For the descriptive analysis, child nutritional status is expressed using both cut-off-based prevalences and z-score summary statistics (mean, standard deviation, standard error) for all indices (weight-for-age, height-for-age and weight-for-height). Regarding the dummies for normal height-for-age, normal weight-for-age or normal weight-for-height, a child receives the value one if its z-score equals or is above minus two standard deviations. He/she receives the value zero if its height-for-age z-score is below minus two standard deviations. The weight was assessed by using a hanging Salter/Sprint scale calibrated from 0-25 kg. The precision was of plus/minus 0.1 kg.

3.4.2 Intervention Variable: Microfinance

The survey has a quasi-experimental design. The microfinance “treatment” variable X is an independent variable which takes the value one for microfinance intervention and the value zero for the control group. Microfinance intervention is defined as having received a credit from the DED loan programme for more than six months. Established borrowers are compared to a control group made up of eligible individuals not having received a loan yet or having received a loan only recently. As six months is the official time required to pay back

the loan, borrowers who received their loans for less than six months are supposed to be still in the process of paying it back and are considered as not having benefited from their loans yet. The conditions for receiving microcredits from DED are 1) applying for a credit; and 2) having a business or being in a group with a business or business project.

3.4.3 Mediators at Distal Level: Individual Income & Social Power

Two variables are considered as potential mediators at a distal level: the individual income and the individual social power.

Individual Income

Core Indicator: Individual income (M_1) is assessed through the monthly profit levels of the respondents expressed in Ugandan Shillings¹³.

Secondary Indicators: For the descriptive analysis, the following aspects of economic empowerment were also assessed: subjective change in income, income diversification and enterprise characteristics like ownership, employment, capital, duration of enterprise, use of profits.

Individual Social Power

Core Indicator: Social power (M_2) is measured through a composite index of psycho-social power that takes into account the three dimensions: gender attitudes, involvement in household decisions and social engagement (cf. ROWLANDS 1997). Scores based on these three factors were derived by adding the scores for thirteen items and by dividing this sum by thirteen. The social power index ranges from zero to one. Its internal reliability was tested through the Cronbach's alpha coefficient.

Secondary Indicators: Gender attitudes were measured through opinions about four statements reflecting a lower status of women in the society (MENON, RUEL, ARIMOND, & FRESUS, 2003: 62). Households' decision making was assessed through questions about involvement in seven key decision areas. The degree of social engagement was assessed at respondent level through questions related to participation in social activities and to leadership positions. For each of these dimensions, a score was calculated by adding positive responses and dividing the sum by the maximal number of items. The three secondary indices of social power range from zero to one. Their internal reliability was tested through the Cronbach's alpha coefficient.

¹³ 1 EUR = 2400 Ugandan Shillings.

3.4.4 Mediator at Intermediate Level: Household Wealth

One variable M_3 is considered as potential mediator at an intermediate level: the household wealth status.

Core Indicator: The household wealth status was assessed through a *subjective wealth* variable. Respondents were asked how they would describe the wealth of their household within their community: as better off than most people (value one), as about the same as most people (value zero) or as a bit worse off than most people (value minus one).

Secondary Indicators: Asset ownership and household expenditures were assessed as complementary indicators of household wealth. For assessing asset ownership, respondents were read a list of items (house, bicycle, radio, car) and of domestic animals (cow, goat, pig, chicken, sheep) and were asked if anyone in their household owns any of the items and how many. For assessing *household expenditures*, respondents were asked how much they would estimate that their household spent on the following per month: food, education, health, transport, special event, housing and savings. Household's monthly expenditures were adjusted for intrahousehold inequalities (household age and composition effects) using adult equivalence scales.

3.4.5 Mediators at Proximal Level: Household Diet, Health & Child Feeding

At a proximal level, household nutrition security is considered to mediate microfinance effect on child nutritional status. It is measured through three aspects: household diet (M_4), child feeding practices (M_5) and health care (M_6).

Household Diet

Core Indicator: Household diet was expressed as a *diet summary index* taking the value minus one for a poor diet, zero for a middle diet and plus one for an ideal diet. This composite indicator was calculated based on the household meal frequency and dietary diversity on the previous day (similar to WHO, 2008:7). The "ideal diet" category refers to households with the minimum food frequency (three meals or more per day) and a fully balanced diet (dietary diversity index =4). The "middle diet" category describes the proportion of households with the minimum food frequency and a dietary diversity index equaling three. Households in the "poor diet" category have a food frequency of less than three meals per day.

Secondary Indicators: The *meal frequency* is based on the respondent report and includes both meals and snacks consumed by any household member the day preceding the

interview. The minimum number of meals is defined as three times per day. Concerning food diversity, the types of foods eaten by the household members the day before the interview were assessed and put in categories according to their nutrient contents: Fruits, greens, vegetables, pumpkin, carrots were considered as vitamin-rich; fish, meat, eggs, milk, peas/beans were considered as protein rich; oil/fat, groundnuts were considered as fat rich; and tubers, grains, bread were seen as carbohydrates-rich foods. A *dietary diversity index* ranging from zero to four was then constructed based on the number of food categories present in the diet. A dietary diversity index of four was equivalent to a fully balanced diet. Households with a value of three or more were categorized as having the minimum dietary diversity. *Subjective change in diet* was assessed by asking the respondent if he perceived a worsening, an improvement or no change in household diet during the twelve months preceding the survey.

Child Feeding Practices

Core Indicator: Child feeding practices were expressed as a *Child Feeding Index* (CFI) taking the value one for ideal feeding practices, the value zero for middle practices and the value minus one for bad practices. The child feeding index was constructed based on the following criteria: ever breastfed, early breastfeeding initiation, continued breastfeeding at 20 months and receiving solid foods (WHO, 2008). Positive answers regarding all four aspects were summed up. An additive score equalling four was equivalent to an ideal child feeding practice; a score equalling two to three was considered as a middle practice and a score of zero to one was judged as bad. The internal reliability of the Child Feeding Index was tested through the Cronbach's alpha coefficient.

Secondary Indicators: The *Children Ever Breastfed* indicator measures the proportion of children aged 6-60 months who were ever breastfed. The *Early Initiation of Breastfeeding* indicator describes the proportion of children aged 6 to 60 months who were put to the breast within twenty-four hours of birth. Both indicators are based on historic recall.

Household Health Care

Core Indicator: Household health care practices were expressed as a *Health Care Index* taking the value one for ideal feeding practices, the value zero for middle practices and the value minus one for bad practices. The health care index encompasses the preventive, curative and environmental dimensions of health care. Positive answers regarding the following seven key practices were summed up: treatment of sick children at health centre, full immunization, antenatal care, sensitisation on nutrition, cleanness of the compound, safe drinking water and ownership of latrine. A household obtaining the maximal score of seven was considered as having ideal health care practices. With a score comprised between five

and six, the practices were regarded as middle practices and with a score below five they were seen as bad. The internal reliability of the Household Health care Index was tested through the Cronbach's alpha coefficient.

Secondary Indicators: The *Child Treatment at Health Centre* Indicator takes the value one for children brought to health centre while sick and for children who were not sick in the last two weeks. It takes the value zero when the index child was not brought to health centre despite having suffered from diarrhoea, fever, cough/cold or shortness of breath in the last two weeks. The *Full Immunization* Indicator was adjusted for age according to the Ugandan MOH/UNEPI National immunization Schedule (MOH, 2003) and measures the proportion of children full vaccinated with BCG (at birth), polio (at birth or within two weeks), DPT (six weeks), Measles (\geq nine months) and who received Vitamin A supplementation. The *Antenatal* Care Indicator indicates the proportion of caregivers who did use antenatal care during their last and current pregnancy. The Compound Cleanliness indicator takes the value one when the household compound was evaluated as clean or very clean according to a spot observation of the interviewer. It takes the value zero for satisfactory, dirty or very dirty compounds. The *Nutrition Sensitization* Indicator expresses the proportion of caregivers who did ever receive information about the nutrition requirements of children. The *Drinking Water* Indicator takes the value one for households obtaining drinking water mainly from a borehole and it takes the value zero for households drinking from a river. The *Pit Latrine Indicator* points to a positive practice when the household has an own latrine and for a negative one when it shares the pit latrine with other households or do not have any.

3.4.6 Moderator & Covariates: Gender & Inherent Characteristics

Gender Moderator: The gender variable W describes the sex of the respondent. It was considered as moderating microfinance effect on child nutritional status. This variable takes the value one for a female respondent and the value zero for a male respondent.

Covariates: Covariates are independent variables influencing child nutritional status without being influenced by microfinance. They could also explain some differences in the height-for-age of the children and were controlled for in multivariate analyses. Five variables describing inherent characteristics of the household, of the child and of their geographical location were considered as covariates: the household size, the household education level, the child age, the child sex and the refugee settlement. The *household size* was derived from the number of people who lived together and shared the same food at least once a day, including the respondent. The highest level of education was assessed for each household member and converted into years of education. Uganda's formal education system follows the four-tier

educational model: seven years of primary education, four years of ordinary level secondary education, two years of advanced level secondary education and the tertiary level of education. The *household education* variable corresponds to the highest years of education attained by any individual of the household. The *household shock* variable indicates the experience of shocks by the household in the twelve months preceding the survey. The respondents were asked if during the last twelve months, anything had happened to their household which had a serious negative effect on how the household operates. The variable takes the value one when the household had experienced some kinds of shock and the value zero for those households with no shock in the preceding year. The *child age* is expressed in months. The *child sex* takes the value one for girls and the value zero for boys. The *household location* variable refers to the refugee settlement where the household lives. This variable is specified as a cluster variable with three units. It takes the value one for Rhino Camp, the value two for Imvepi and the value three for Madi-Okollo settlement. Rhino camp is used as the reference while Imvepi and Madi-Okollo dummies are included as additional predictors in all linear models generated as part of analysis. The objective is to remove any effect due to cluster from estimates of the coefficients and standard errors in the model according to the "fixed effect approach" (COHEN ET AL., 2003: 539–544, HAYES, 2013: 434-435).

3.5 DATA ANALYSIS

3.5.1 Data Processing

The questionnaires were checked by the investigator on the field and missing or suspect answers were clarified and rectified day by day. Data entry, check of data entry and data cleaning were performed by the main researcher using *SPSS 12*. Extreme values were detected using boxplot diagrams especially for the monetary variables (household expenditures, profits). Extreme or missing values were rectified using Expectation-Maximisation imputation (EM imputation). The underestimation of variances is often seen as a limit of this regression-based single imputation approach (GRAHAM, 2012: 52). But given the very low rate of extreme or missing values in the sample (<1%), this underestimation should not be noticeable.

WHO ANTHRO software (WHO, 2007) was used to calculate standard deviations of anthropometric z-scores from the WHO child growth standards. The data were then exported to SPSS using the Macro *WHO IGROWUP SPSS*. The z-scores were not available in the following cases: 1) child's age was below six months or above 60 completed months, 2) child's age was unknown, 3) child's length was lower than 45 cm or higher than 110 cm and his/her age was less than 24 months and 4) child's height was lower than 65 cm or higher

than 120 cm and his/her age was 24 months or older. Children with missing z-scores for height-for-age were excluded from the survey.

Data analysis was performed using *SPSS 19* with integration of the macro *PROCESS* (HAYES, 2012b).

3.5.2 Descriptive & Bivariate Analysis

Descriptive statistics in the form of proportions and means were produced for all core and secondary indicators.

These indicators were further disaggregated and reported for the following *comparison groups*: well-nourished versus malnourished children, microfinance intervention group versus control group. Within these comparison groups as well as for the whole sample, differences according to the gender of the respondent (basic level) were also identified.

Group differences were detected using non-parametric *statistical tests* (table 3.5.1). Observations of categorical variables were compared using the asymptotic significance of the Pearson chi-square test. If one or more frequencies were lower than five, the exact significance of the Fisher's Exact Test was calculated. For observations of the metric variables, the first step consisted in testing for homogeneity of variance for each dependent variable using the Levene test. Then, for variables with significantly different variances, the non-parametric Kruskal–Wallis test was used to analyze group differences. For all other metric variables one-way ANOVAs were performed.

Tab. 3.5-1 Non-parametric statistical tests for the bivariate analysis

Categorical Variables		Metric Variables		
Frequencies		Normality test of Distribution		
<i>All Frequencies >5</i>	<i>Some frequencies < 5</i>	<i>Non-normal</i>	<i>Normal</i>	
			Levene test	
			<i>Unequal variance</i>	<i>Equal variance</i>
Pearson Chi-test	Fisher's Exact test	Kolmogoroff Smirnov-Test	Kruskal-Wallis test	One-way ANOVA

3.5.3 Multivariate Regression Analysis

Regression analysis was also used to compare groups. This approach differs from the bivariate analysis as more than two variables can be added in the analysis and as it implies directionality (LOCKWOOD, DE FRANCESCO, ELLIOT, BERESFORD, & TOOBERT, 2010). It offers the advantages to control for factors that could also explain a group difference (covariates). A

predictor or independent variable (X) is defined, and it is related to the dependent or outcome variable (Y). This provides a regression coefficient, which is a measure of the effect of the predictor on the outcome. A test is performed to determine the probability or p value that the observed difference occurred by chance. If the p value equals or is higher than 0.10, the relationship between predictor and outcome is considered as non-significant. A p value lower than 0.01, indicates that the effect is highly significant. A p value between 0.01 and 0.05 indicates a moderately significant effect and a p value between 0.05 and 0.10 a lowly significant effect.

Regression analysis was used for measuring *the total effect* of microfinance on child nutritional status (section 4.1.4). The relationship between microfinance and child nutritional status was established using a linear regression model labeled as *regression 0.1*. In this model, the dependent variable Y (height-for-age z-score) is regressed on the independent variable X (microcredit for more than six months) and on inherent covariates W (respondent's sex) and I_k (location, household size, education level, household shock, child age and child sex) as follows:

$$Y = i_{y^*} + c_1X + c_2W + c_{1k1}I_k + e_{y^*} \quad (0.1).$$

Multivariate regressions were also applied for the mediation and moderation analyses. Mediation and moderated mediation procedures are explained in the next sections (3.5.4 and 3.5.5, respectively).

3.5.4 Multivariate Simple Mediation Analysis

Mediation, Direct, Indirect, total Effect

One objective of the study is to test the mediating effect of the following six factors M_j : individual income, individual social power, household wealth, household diet, child feeding practices and household health care. In order to achieve this objective, statistical mediation procedures based on multivariate regressions were applied. In particular, the simple mediation model has been selected. This model was operationalised as "Model No. 4" for SPSS (HAYES, 2012b). The conceptual and statistical models are presented in figure 3.5.1.

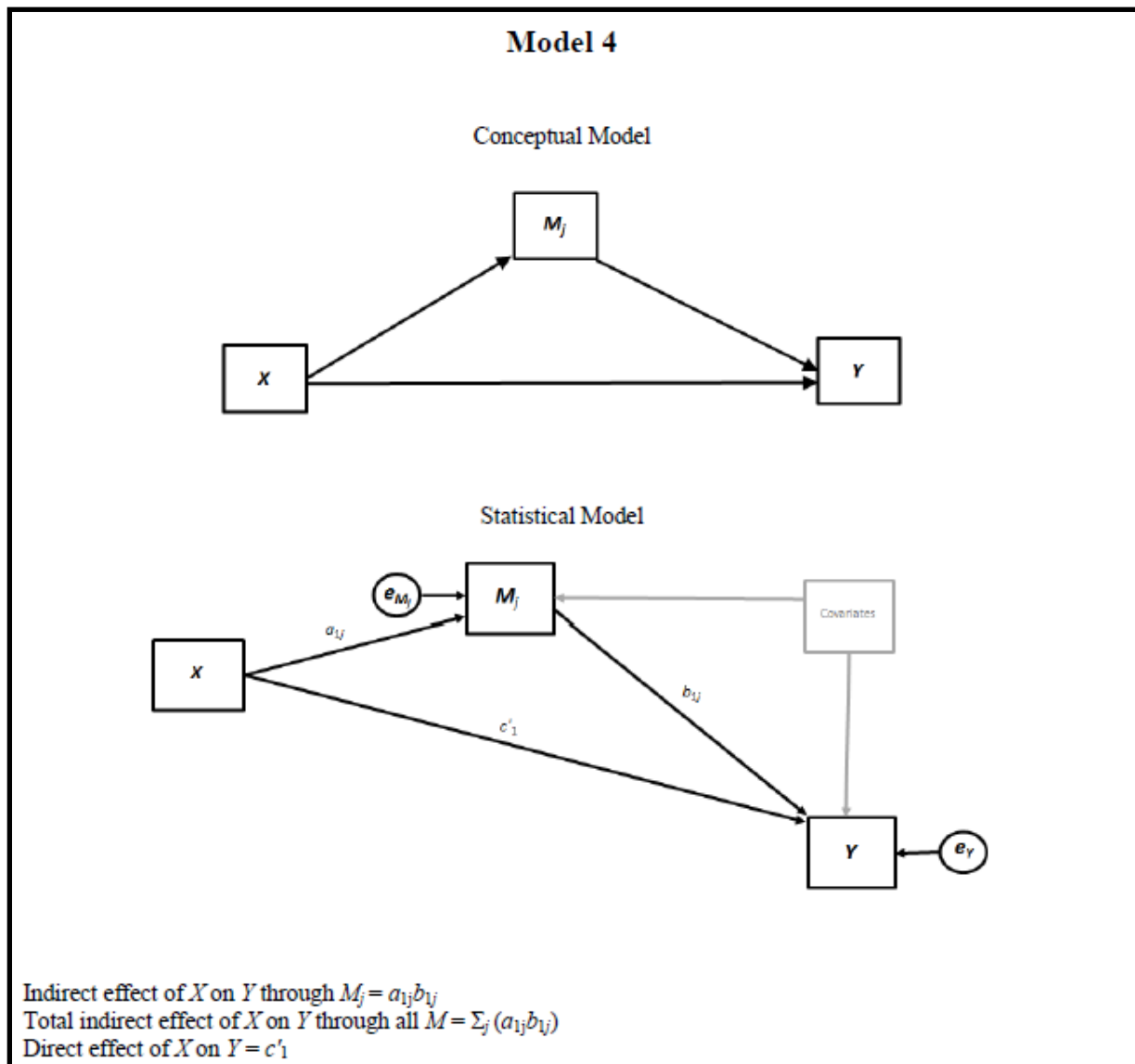


Fig. 3.5-1 Simple mediation: conceptual & statistical models (X=Predictor; M=Mediator; Y=Outcome, HAYES 2012b)

Mediation analysis is typically used to answer analytical questions of ‘how’. The objective is to determine the extent to which some hypothetical causal variable X influences some outcome Y through one or more mediator variables M_j . (HAYES, 2012a). As depicted in figure 3.5.1, the predictor X is modeled to influence the outcome Y directly as well as indirectly through the mediator variable M_j , which is causally located between X and Y . The direct and indirect effects of X are derived from two regression models: one linear regression estimating M_j from X : ($M_j = i_{Mj} + a_{1j}X + e_{Mj}$) and a second linear regression estimating Y from both X and M_j ($Y = i_{Yj} + c'_1X + b_{1j}M_j + e_{Yj}$). The direct effect of X on Y is estimated with c'_1 in the second equation. The indirect or mediating effect of X on Y through M is estimated as $a_{1j}b_{1j}$. The direct and indirect effects of X on Y sum to yield the total effect of X on Y .

Multiple & Multilevel Mediators

In order to assess the sequence of the process of “transformation” of microfinance intervention into child nutritional status, the variables have been ordered at different hierarchical levels: 1) the distal model tests the mediating effect of individual income and psycho-social power; 2) the intermediate model tests the mediating effect of the household wealth status; and 3) the proximal model tests the mediating model of household diet, health care and child feeding practices. At distal and proximal levels, multiple mediators operate in parallel.

In an attempt to better understand how microfinance affects each of the mediators, mediation analyses have also been run with the six factors (individual income, individual social power, household wealth, household diet, child feeding practices and household health care) as outcome variables.

The regression models run for the mediation analysis are summarised in table 3.5.2.

Statistical Inference about the indirect effect

Bootstrapping has been used as inferential method for testing hypotheses about indirect effects. It consists in constructing confidence intervals for a relative indirect effect by repeatedly estimating all the coefficients in the mediation model using the two equations in each bootstrap sample (1,000 bootstrap samples). Bootstrapped confidence intervals for the indirect effect were generated with a bias-corrected level of confidence of 99 percent, 95 percent and 90 percent, respectively.

If the bias-corrected 99% bootstrap percentile confidence interval failed to include 0, then the p-value was deemed to be less than 0.01, and the effect was said to be *highly significant*. If the 99% bootstrap percentile confidence interval included 0, then the bootstrapped confidence intervals were generated with a confidence level of 95 percent.

If the bias-corrected 95% bootstrap percentile confidence interval failed to include 0, then the p-value was deemed to be less than 0.05, and the effect was said to be *moderately significant*. If the 95% bootstrap percentile confidence interval included 0, then the bootstrapped confidence intervals were generated with a confidence level of 90 percent.

If the bias-corrected 90% bootstrap percentile confidence interval failed to include 0, then the p-value was deemed to be less than 0.10, and the effect was said to be *lowly significant*. If the 90% bootstrap percentile confidence interval included 0, then the p-value was deemed to be more or equal to 0.10, and the effect was said to be *not significant*.

Tab. 3.5-2 Summary of regression models for the simple mediation analysis

	Child Nutritional Status				Individual Income	Individual Social Power	Household Wealth		Household Food Security			Household Child Care			Household Health Security		
A. OUTCOME VARIABLE	Height-for-age z-score (Y)				Monthly Profits in Ush (M ₁)	Social Power Index (M ₂)	Perceived Wealth Index (M ₃)		Diet Summary Index (M ₄)			Child Feeding Index (M ₅)			Health Care Index (M ₆)		
B. REGRESSION MODEL	Linear				Linear	Linear	Linear		Linear			Linear			Linear		
C. LABEL	0.1	1.1	2.1	3.1	0.2	0.3	0.4	1.4	0.5	1.5	2.5	0.6	1.6	2.6	0.7	1.7	2.7
D. PREDICTING VARIABLES																	
Microfinance Intervention																	
Credit since more than 6 months	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Level 0: Inherent Factors																	
Madi-Okollo Settlement	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Imvepi settlement	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Household Size	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Highest HH Education Level (yrs)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Shock	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Female Respondent	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Child is female	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Child Age	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Mediation at Level 1:																	
Monthly Profits in Ush		√	√	√				√		√	√		√	√		√	√
Social Power		√	√	√				√		√	√		√	√		√	√
Mediation at Level 2																	
Household Wealth			√	√							√			√			√
Mediation at Level 3																	
Diet Index				√													
Child Feeding Index				√													
Health Care Index				√													

√: inclusion of the variable in the model; Sample= 205 children in all regressions

3.5.5 Multivariate Moderated Mediation Analysis

Simple Moderation, Conditional Effect

One objective of the study is to test the moderating effect of respondent's sex on the relation between microfinance and child nutritional status. In order to achieve this objective, statistical moderation procedures based on multivariate regressions were applied.

The simple moderation model has been selected for testing gender moderation of the total effect of microfinance on nutritional status. This model was operationalized as "Model No. 1" for SPSS (HAYES, 2012b). The conceptual and statistical models are presented in figure 3.5.2.

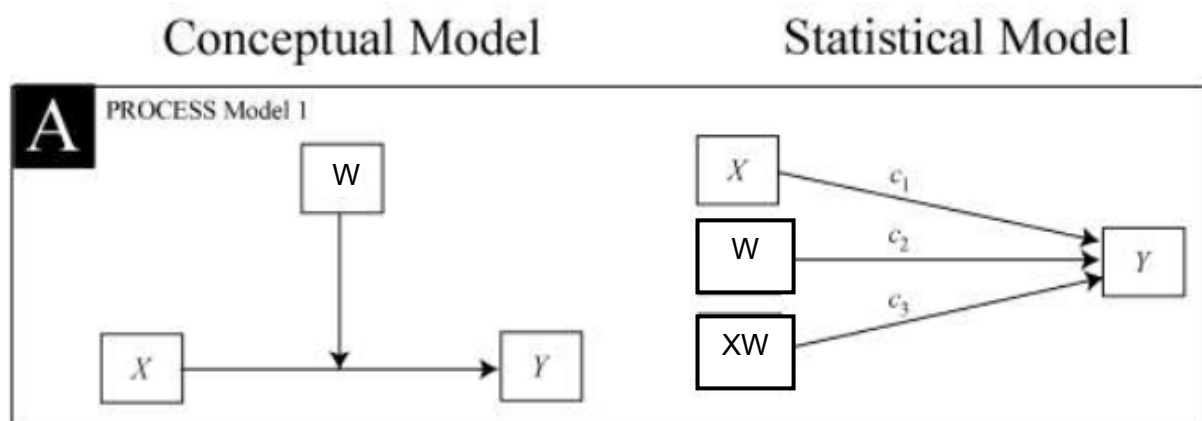


Fig. 3.5-2 Simple moderation analysis: conceptual & statistical models (X=Predictor; W= Moderator; Y=Outcome; Source: HAYES 2012b)

Moderation analysis is typically applied to answer analytical questions of when. The goal is to determine whether the sign or the significance of the effect of some hypothetical variable X on outcome Y depends on the values of a moderator variable. The moderating effect of sex (W) on the relation between microfinance (X) and child nutritional status (Y) is tested by adding the interaction term "microfinance x sex" (XW) in the equation of the regression estimating Y from both X and W : $Y = b + b_{X2}X + b_{W2}W + b_{XW}XW + b_{li2}I + e_{Y2}$. The conditional effect of microfinance on empowerment is calculated for women and for men based on the formula: conditional effect of X on $Y = b_{X2} + b_{XW}Y$.

Moderated Mediation Analysis

In order to better understand gender moderation of microfinance on child nutritional status, the moderation of the mediation processes had been tested at each level. For this aim, the statistical model described as “First Stage and Direct Effect Moderation Model” was selected (EDWARDS & LAMBERT, 2007). This model is operationalized as "Model No. 8" for SPSS (HAYES, 2012b). The moderated mediation model is depicted in figure 3.5.3.

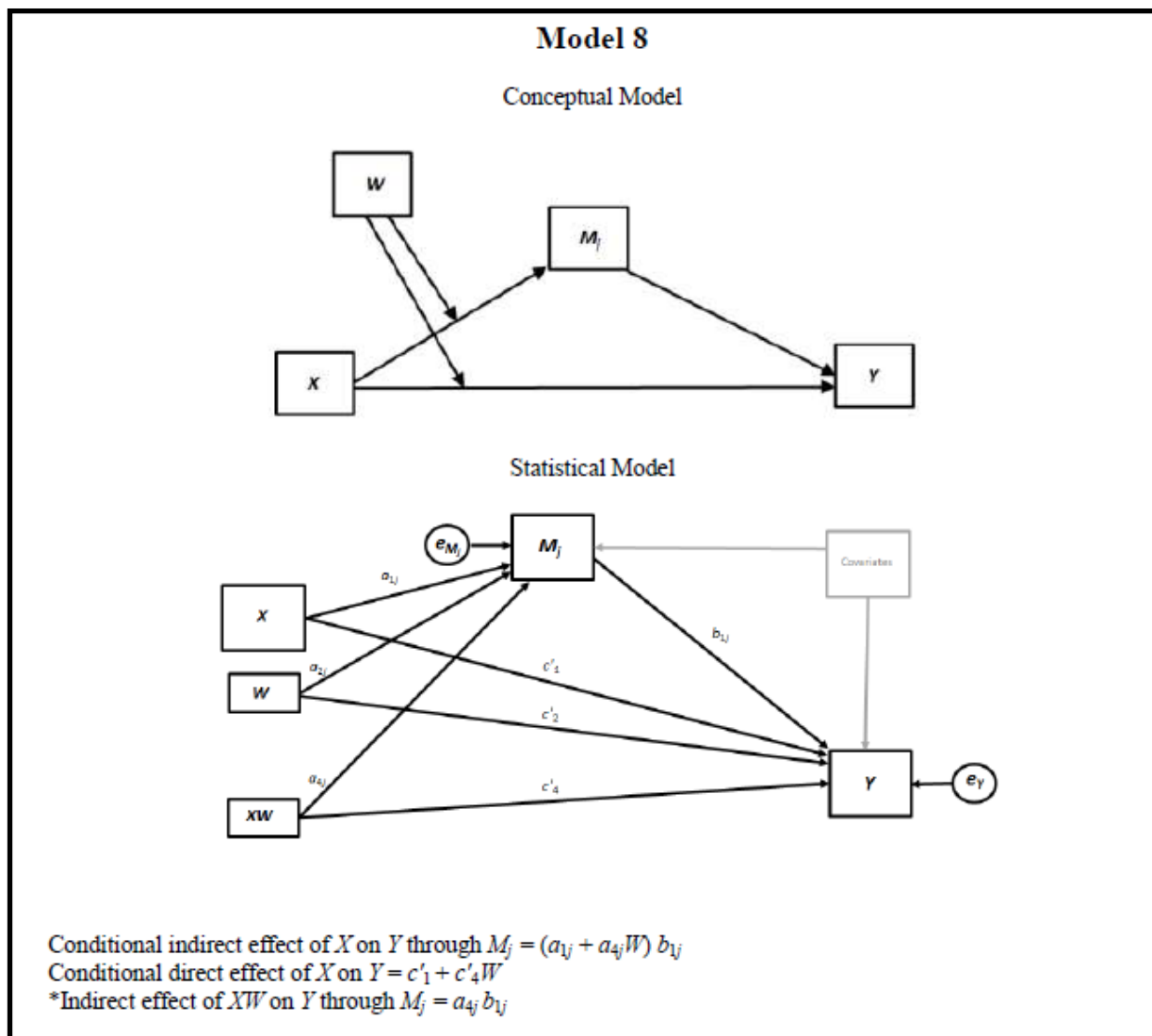


Fig. 3.5-3 Moderated mediation analysis: conceptual & statistical models (X=Predictor; W= Moderator; M=Mediator; Y=Outcome; Source: HAYES 2012b)

The regression models used for the simple moderation analysis and for the moderated mediation analysis are summarised in table 3.5.3.

Tab. 3.5-3 Summary of regression models for the moderated mediation analysis

	Child Nutritional Status				Individual Income	Individual Social Power	Household Wealth	Household Food Security	Household Child Care	Household Health Security
A. OUTCOME VARIABLE_i	Height-for-age z-score (Y)				Monthly Profits (Ush)	Social Power Index	Perceived Wealth Index	Diet Summary Index	Child Feeding Index	Health Care Index
B. REGRESSION MODEL	Linear				Linear	Linear	Linear	Linear	Linear	Linear
C. LABEL	0.8	1.8	2.8	3.8	0.9	0.10	1.11	2.12	2.13	2.14
D. PREDICTING VARIABLES										
Microfinance Intervention										
Credit since more than 6 months	√	√	√	√	√	√	√	√	√	√
Level 0: Inherent Factors										
Madi-Okollo Settlement	√	√	√	√	√	√	√	√	√	√
Imvepi settlement	√	√	√	√	√	√	√	√	√	√
Household Size	√	√	√	√	√	√	√	√	√	√
Highest HH Education Level (yrs)	√	√	√	√	√	√	√	√	√	√
Shock	√	√	√	√	√	√	√	√	√	√
Female Respondent	√	√	√	√	√	√	√	√	√	√
Child is Female	√	√	√	√	√	√	√	√	√	√
Child Age	√	√	√	√	√	√	√	√	√	√
Mediation at Level 1:										
Monthly Profits in Ush		√	√	√			√	√	√	√
Social Power		√	√	√			√	√	√	√
Mediation at Level 2										
Household Wealth			√	√				√	√	√
Mediation at Level 3										
Diet Index				√						
Child Feeding Index				√						
Health Care Index				√						
Gender Moderation										
Gender x Microfinance	√	√	√	√	√	√	√	√	√	√

√: inclusion of the variable in the model; Sample= 205 children in all regressions; HH: Household

3.5.6 Reporting

The results are reported using tables, figures and path diagrams. Tables, figures and path diagrams are based on the own DED survey and they are built from the author unless the source is cited differently.

Effect Size Measures

Effect sizes are reported in tables as estimates of the unstandardised regression coefficient B plus its 95 percent confidence interval (CI) as well as the standardised coefficient beta (β). Following COHEN (1988:82) standards, they are interpreted as trivial, small, medium and large when the standardised coefficient is lower than 0.1, is between 0.1 and 0.3, is between 0.3 and 0.5, and is higher than 0.5, respectively.

For indirect effects which are products of two effects, these benchmarks are squared (KENNY, 2014). Thus, a trivial indirect effect size is a standardised value lower than 0.01, small is between 0.01 and 0.09, medium is between 0.09 and 0.25, and large is higher than 0.25. The standardised values correspond to the Completely Standardized Indirect Effect (PREACHER & KELLEY, 2011) which is reported in tables in addition to the Unstandardised Indirect Effect and its 95 percent bootstrapped confidence interval (95% BootCI). When the indirect effect is lowly or highly significant, the corresponding 90 percent bootstrapped confidence interval or the 99 percent bootstrapped confidence interval are also reported in the text.

Visualising Effects through Graphs

Microfinance effect on child nutritional status is visualized by plotting the mean predicted values for height-for-age z-score against the observed values for microfinance intervention x. These predicted values are derived from the linear regressions of the height-for-age z-score.

















Microfinance effect on the potential mediators is visualized by plotting the mean predicted values for the mediators (m_i -predicted) against the observed values for microfinance intervention ($x = \text{zero or one}$). The predicted values for the mediators are derived from the linear regressions of the mediating variables for each value of the independent variable X.

The inherent covariates were set to their sample mean when deriving the predicted values. The 95 percent confidence intervals of the estimated marginal means are also plotted (95% upper and lower limits). The data were processed using the statistical software SPSS 19.

Visualising Effects through Path Diagrams

Flow Diagrams are used to report the results of the different effects tested in the regressions. These diagrams are labeled *Result 1* to *Result 5*. The color, the style and the weight of the lines vary to help visualizing the sign, the size and the significance of the tested effect. The arrows indicate the direction of effects. A diagram legend is given in table 3.5.4.

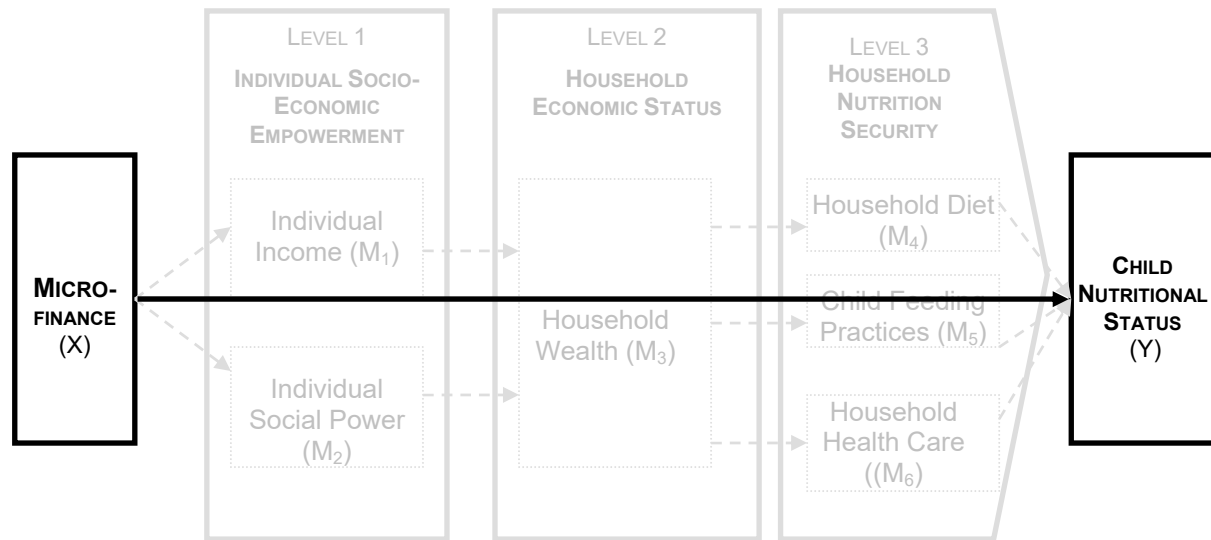
Tab. 3.5-4 Representation of effects on path diagrams

Effect size	Sign of Effect			
	Positive		Negative	
	Statistical Significance		Statistical Significance	
	Non-significant	Significant	Non-significant	Significant
Trivial				
Small				
Medium				
Large				

Non significant effect: $p \geq 0.10$ or 90%BootCI includes zero; Significant effect: $p < 0.10$ or 90%BootCI does not include zero

4 EMPIRICAL EVIDENCE

4.1 MICROFINANCE TOTAL EFFECT ON CHILD NUTRITIONAL STATUS



Model 1 : Microfinance total effect on child nutritional status

This section describes the demographic characteristics of the sample population at household, respondent and child levels and presents the use and satisfaction of microfinance services. It then draws a picture on the nutritional status of children. The two last parts are attempts to establish the relationship between microfinance and child nutritional status using either bivariate or multivariate analyses.

The main hypothesis being tested is:

H1: Microfinance has a positive and significant total effect on child nutritional status.

4.1.1 Demographic Characteristics

The demographic characteristics of the study population are given in table 4.1.1 for the sample of respondents, households and children.

Tab. 4.1-1 Demographic characteristics at respondent, household and child Level

Indicators	Mean & Proportions
Respondent Level	(N=141)
Is female	62%
Age in years	32.99
Is married	89%
Has formal education	74%
Is a refugee	93%
Years in settlement	9.03
Number of alive children	4.97
Has a business	90%
Lives in Rhino Camp Settlement	69%
Lives in Imvepi Settlement	25%
Lives in Madi-Okollo Settlement	6%
Household Level	(N=139)
Household size	7.47
Number of children	5.06
Age of head of household in years	36.29
Head has formal education	84%
Head is female	24%
Highest level of education in the household in years	9.00
Shock	77%
Demographic shock	75%
Economic shock	39%
Natural shock	48%
Child Level	(N=205)
Child age in months	31.97
Child Is female	46%

Respondent's Inherent Characteristics. Initially, a total of 235 respondents were sampled. This analysis is yet restricted to the 141 respondents living in households with children aged between six months and five years. Their demographic profile is given in table 4.1.1 as mean values or proportions. On average respondents were about 33 years old and had four children. The majority was married (89 percent of all respondents) and had some kind of formal education (74 percent). Most of them were refugees from Sudan living in the settlement for about nine years. Some seven percent were natives from Uganda who were also living in the refugee settlements for a mean of eleven years. The nationals were either from the Lugbara, Madi or Kakwa tribes (71 percent, 24 percent and 5 percent, respectively). Refugees belonged mostly to the Kakwa (44 percent), Pojulu (17 percent), Kuku (11 percent), Luo (9 percent) or Madi tribes (four percent). Other tribes like Dinka, Muru, Bari, Kaliko, etc. represented only a minority in our sample (twelve percent in total). The respondents were unequally distributed between the three refugee settlements. Some 69 percent were from Rhino Camp, 25 percent from Imvepi and 6 percent from Madi-Okollo. Women represented 62 percent of the sample. Comparison tests indicate significant educational gaps between men and women, with a significantly higher proportion of women

who did not receive any kind of formal education or having been at secondary school or university.

Household Demographic Characteristics: A total of 139 households with an average of seven members (minimum: 3, maximum: 18) and five children (minimum: 1, maximum: 13) were visited. The heads of these households were aged between 21 and 80 years and had an average of 36 years old. The majority of them (84 percent) had some kind of formal education and 24 percent were women. The highest level of education in the household varied between zero and 17 years and had a mean of nine years.

Household Shocks: Respondents were asked if in the last twelve months anything had happened to their household which had a serious negative effect on how the household operates. According to their responses, 77 percent of the households were affected by one (38 percent) or more (39 percent) shock events in the year before the survey. According to the type of assets affected by the shock, three types of shocks were identified: demographic, natural and economic shocks. Demographic shocks are events which negatively affect human resources. Chronic illness or death of a family member, recent migration, marriage or new members in the household are examples of events which might cause labour problems or modify the household composition or size. With a proportion of 75 percent of the households experiencing this kind of event, demographic shocks represented the most frequent type of shock affecting the households. Natural shocks affect natural resources and result in harvest failure. They comprise covariant events like too much rain and drought or idiosyncratic events like fire, pest and invasion of grasshoppers or wild animals. About half of the households (49 percent) experienced such shocks in the year before the survey. Economic shocks are those events with a direct negative impact on physical and financial assets. They comprise money or equipment losses due to fire, theft, breakdowns, unpaid lending or market fluctuations. Some 39 percent of the households reported having been negatively affected by economic shocks.

Child Characteristics: A total of 205 children between six and sixty months old were living in the visited households. Figure 4.1.1 shows the distribution of the children population by age and sex. There were slightly more boys than girls (54 percent versus 46 percent). Children's average age was 32 months old. Children younger than one year old or between two and three years old were slightly less represented compared to the other age groups. The sex

distribution was relatively similar across age classes, except for the four to five years old aging groups which had considerably less female than male children.

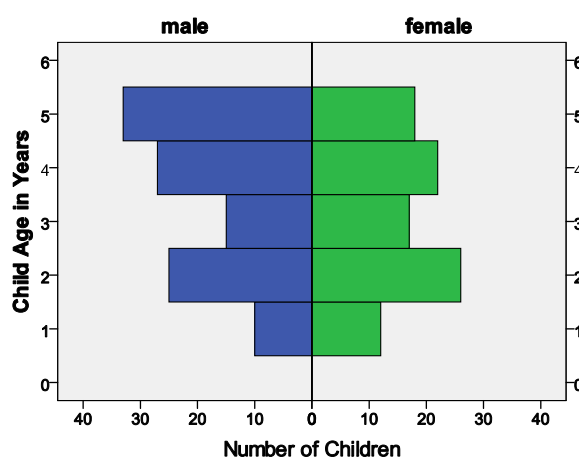


Fig. 4.1-1 Children distribution by age and sex

4.1.2 Microfinance Intervention

Treatment versus Control Groups: This analysis was restricted to the 141 respondents living in households with children aged between six months and five years old. From these 141 respondents, sixty percent were from the microfinance intervention group and forty percent from the control group (table 4.1.2). Microfinance intervention is defined as having received a credit from the DED loan program for more than six months. The 84 established borrowers are compared to a group made of 57 individuals who had not received a loan yet or had received a loan only recently. At the child level, microfinance intervention is defined as living in a household with an established DED borrower. A total of 205 children aged between six months and five years were living in the households visited. Some 62 percent of the children were benefiting from microfinance. The control group included 78 children who represented 38 percent of the sample.

Tab. 4.1-2 Microfinance comparison groups at respondent, household and child level

Level	Total	Intervention	Control
Respondents	141	84 (60%)	57 (40%)
Households	139	83 (60%)	56 (40%)
Children	205	127 (62%)	78 (38%)

Program Membership: Of the 141 respondents, 114¹⁴ were members of the DED program (cf. fig 3.2-1). They participated in the DED program since an average of 51 months (minimum: 24 days; maximum: 12 years). Only five of them (four percent) participated as individuals. The big majority belonged to groups with a minimum of two, a maximum of 25 and an average of five members. The groups organised internal meetings on a regular basis. The frequency of internal meetings varied between having no meeting at all to meetings thrice per week. It was twice per month on average. The majority of the members met either monthly or every two weeks (75 percent). Features of membership in DED program are detailed in table 4.1.3 for all members. Comparisons between men and women show no significant difference across gender in terms of participation in the DED program. Only the proportion of individual members is significantly lower among women ($p<0.05$).

Tab. 4.1-3 Characteristics of program membership: group means

	Whole Sample N=114 members	Women N=72	Men N=42	p
Groups versus individuals				
Group member	96%	99%	90%	**
Individual member	4%	1%	10%	
Duration in MFI in months	50.9	49.2	53.8	
<12 months	4%	3%	7%	
12-24 months	15%	15%	13%	
> 24 months	81%	82%	80%	
Monthly frequency of meetings	1.8	2.0	1.6	
Less than once per month	9%	9%	9%	**
Once monthly	27%	20%	39%	
Twice per month	48%	53%	39%	
More than twice per month	15%	16%	10%	

* $p<0.10$; ** $p<0.05$; *** $p<0.01$; MFI: Microfinance Institution

Characteristics of Loans: Characteristics of the loans are given in table 4.1.4 for all borrowers and by gender group. Of the respondents, 99 had received at least one loan. For those who received a loan, the number of loans delivered varied between one and four credits and was 1.7 on average. The last loan amount varied between 100,000 and 2,000,000 Ugandan shillings¹⁵ (Ush) per group (mean: 422,300 Ush) and between 10,630 Ush and 360,000 per member equivalent (mean=82,940 Ush). Duration since the first loan was of an average of 40.3 months and oscillated between 1.6 months and seven years. The average and official

¹⁴ 84 established members from the intervention group plus 30 new members from the control group.

¹⁵ 1 EUR = 2400 Ugandan Shillings at time of survey.

time required to pay back the loan was of six months. Among the borrowers, only a few clients (19 percent) reported a repayment period differing from six months and varying from one to 12 months. The frequency of repayment was monthly for 94 percent of the borrowers and on average. The average interest rate was one percent monthly and six percent for the total repayment period. In our sample, 80 percent of the borrowers paid the official interest rate of six percent in total. The others needed either longer or shorter to repay and paid more or less than six percent in total (5 and 16 percent of the respondents, respectively). Comparison tests revealed significant differences between women and men according to the loan amount they received. In fact the amount women received for their last loan was significantly lower (72,350 versus 102,840 Ush, $p<0.10$).

Tab. 4.1-4 Characteristics of loans: group means

	Borrowers Sample N=99¹⁶	Women N=64	Men N=35	p
Number of loans	1.7	1.8	1.6	
Months since 1 st loan	40.3	38.1	44.4	
Group last loan amount (Ush)	422,300	399,830	463,400	
Individual last loan amount (Ush)	82,940	72,350	102,840	*
Individual Savings (Ush)	140,550	111,470	205,190	
Total interest rate (%)	5.9	5.9	6.0	
Repayment Frequency (per month)	1.0	1.0	0.9	
Repayment Length in months	6.1	6.1	6.0	

* $p<0.10$; ** $p<0.05$; *** $p<0.01$

Satisfaction with Microfinance Services: Respondents who used microfinance services from DED were asked about their satisfaction with the products offered. They evaluated each of the seven criteria by answering either “yes” or “no” or “neither yes or no”. These answers were coded one, minus one and zero, respectively. A total satisfaction index was calculated for each respondent by adding the scores of all criteria and by dividing the obtained value by the number of criteria (seven). The mean values are portrayed in figure 4.1.2 for female and male borrowers. It appears that respondents’ total evaluation was positive on average. The mean value of 0.1 tends however more to zero than to one, revealing a partial rather than full satisfaction. Of the seven criteria, full satisfaction is shown only for internal meetings frequency (mean=0.8). Respondents were partially satisfied with the interest rate, the repayment frequency and access to loans (mean=0.2, 0.1 and 0.1, respectively). They showed partial dissatisfaction for the repayment period, the number of credits and the loan

¹⁶ 99 respondents had received at least one loan.

amount (means =-0.1, -0.3 and -0.1, respectively). Comparisons across gender reveal that women's satisfaction for DED loan services was comparable to men.

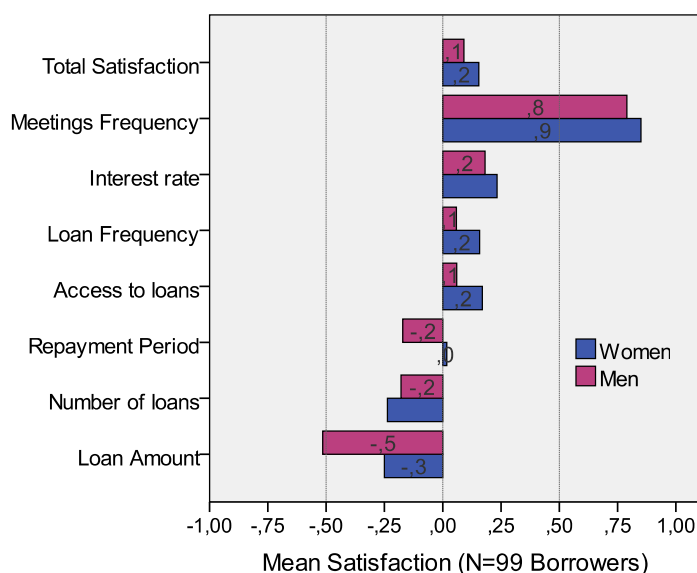


Fig. 4.1-2 Satisfaction with microfinance services

Purpose of Loans: Although other types of loans (consumption, agricultural, staff loans) were offered in the district, DED proposed to the refugees business loans only. All the borrowers of the sample invested their last loan in income generating activities. They bought either equipment or stock or both for their business. Loans were used for other purposes as well by 22 percent of the borrowers. Buying food and repaying the loan represented the most frequent use of the loans, after business investment (15 and 14 percent of the borrowers, respectively). Loans were also spent for medical care, schooling, clothing and emergency (respectively eight, eight, four and two percent of the borrowers). Utilisation of loans is described in figure 4.1.3 for both men and women.

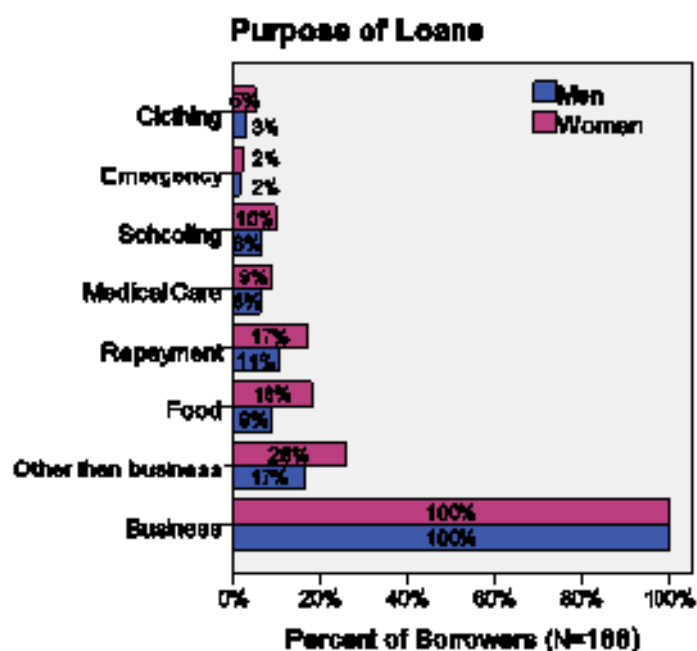


Fig. 4.1-3 Purpose of Loans

4.1.3 Child Nutritional Status

A total of 205 children aging between six and sixty months old were anthropometrically measured. Their nutritional status is expressed in height-for-age, weight-for-age and weight-for-height z-scores deviations from the WHO child growth standards. The descriptive statistics of the z-scores are given in table 4.1.5. The z-score distribution curves can be found in annex A2 (figure A2.1).

Tab. 4.1-5 Child Nutritional Status: Z-scores descriptive statistics

	Height-for-Age z-score	Weight-for-age z-score	Weight-for-height z-score
N	205	204	203
Mean [95% C.I.*]	-1.00 [-1.22 - -0.78]	-0.50 [-0.67 - 0.34]	0.05 [-0.13 - 0.23]
% below-2SD [95% C.I.]	26.8% [20.7-32.9%]	7.3% [5.5 - 9.2%]	4.9% [3.7 - 11.0%]
% below-3SD [95% C.I.]	8.8% [4.9-12.7%]	2.9%	2.4%
Min - Max	-5.67 to 3.89	-4.66 to 4.35	-4.33 to 4.04
Standard Deviation (SD)	1.61	1.18	1.28

*C.I. confidence interval

The mean z-scores indicate a clear deficit in height-for-age but only limited evidence of underweight and wasting. In fact the entire children *height-for-age* z-scores distribution has shifted downward compared to the normal distribution. The average child deviates one unit negatively from the normal z-score. For 26.8 percent of the children, the deficit was excessive, as their z-score was below the conventional benchmark of minus two standard deviations. These children were considered as stunted. Some 8.8 percent had a z-score even lower than minus three standard deviations. Those last cases were severely stunted. With an average z-score of respectively minus 0.5 and plus 0.05, the *weight-for-age* and *weight-for-height* z-scores' distributions were closer to the WHO "normal" reference population¹⁷. Some 7.3 and 4.9 percent of the children were respectively underweight and wasted. Severe cases of these malnutrition forms were rare: 2.9 percent for severe underweight and 2.4 percent for severe wasting.

The standard deviations were of respectively 1.61, 1.18 and 1.28 for the observed height-for-age, weight-for-age and weight-for-height z-scores. These values are comprised in the expected ranges of standard deviations of the z-score distributions for all three anthropometric indicators and this is an indication of good data quality (MEI & GRUMMER-STRAWN, 2007). The width of the 95% confidence interval is within 30 percent of the estimated prevalence of stunting and underweight but not for wasting. The survey is thus sufficiently precise and the sample size sufficiently large for the first two measures of malnutrition (PRUDHON & SPIEGEL, 2007).

What about the extent of malnutrition as a public health problem? Figure 4.1.4 compares the prevalence of stunting, underweight and wasting to the WHO criteria for public health severity.

¹⁷ The WHO Child Growth Standards are derived from an international sample of healthy breastfed infants and young children raised in environments that do not constrain growth (de Onis et al. 2006).

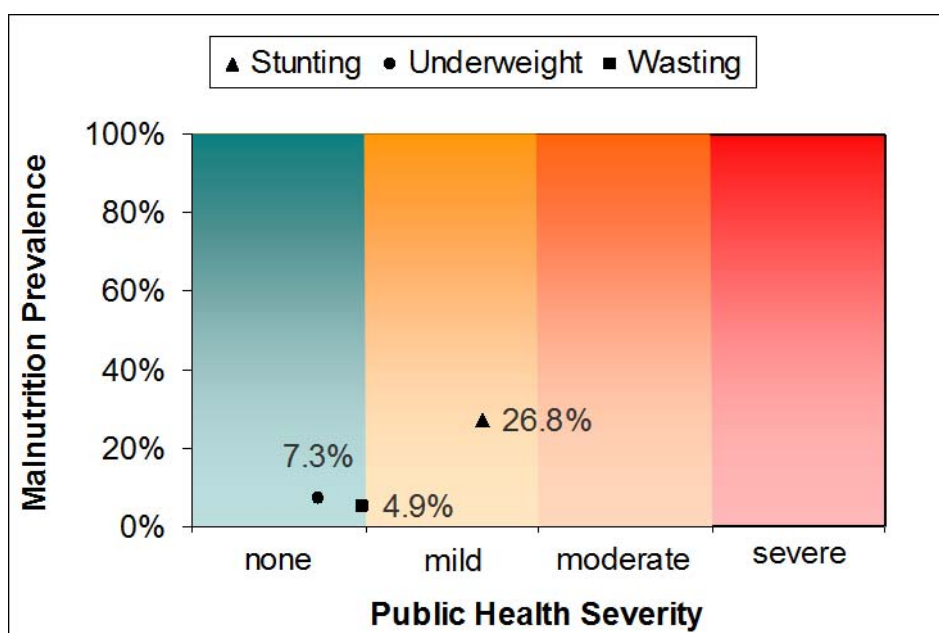


Fig. 4.1-4 Public health severity of child malnutrition, DED study - 2005¹⁸

It appears that stunting represented a public health problem in our child population. A prevalence range between 20 and 30 percent indicates that the problem was of mild magnitude. In contrast, underweight had prevalence lower than ten percent and wasting lower than five percent. This is considered low according to international conventions.

Hence, underweight and wasting existed among the sampled children but they did not have the same severity level as stunting. This was the case also in the general population (chapter 3.1.3, page 19). Stunting represented the major problem in the settlements, in the region and at national level. There was however a difference in the degree of severity of the malnutrition problem. In our sample, wasting and underweight were at lower prevalence than the trigger levels and did not necessarily call for action. This was not the case in the general population. Underweight and wasting were of mild magnitude but they still represented public health dilemmas. The degree of severity of stunting was also lower than the one found in West Nile or in Uganda. This might be an indication that our sample represented a specific population where malnutrition was not as severe as it is in the general population.

Stunting was thus the major problem in our sample. It is considered as the core indicator of child nutritional status in the rest of our analysis.

¹⁸ Diagram built from the author based on the results of the own DED survey

4.1.4 Microfinance & Child Nutritional Status: Bivariate Analysis

Demographic Characteristics: A non-parametric comparison of inherent characteristics of the group of children with an optimal height-for-age and those with a low height-for-age is given in table 4.1.6.

Tab. 4.1-6 Demographic factors by children's nutritional status: group means & proportions

Inherent Factors	All (N=205)	Children Height for Age		p
		OK (N=150)	<-2SD (n=55)	
Child mean age (months)	31.97	32.45	30.68	
Child is female	46%	50%	36%	*
Mean household size	7.47	7.58	7.16	
Mean highest level of education in the household ((years)	9.00	9.06	8.81	
Household Shock	74%	71%	82%	
Respondent is female	62%	63%	58%	
Rhino Camp settlement	69%	71%	64%	
Imvepi settlement	25%	25%	25%	
Madi-Okollo settlement	6%	4%	11%	

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

The figures show that well-nourished and malnourished children did not differ inherently at household, respondent or community level. The only significant difference regarded the sex of the child. The group of well-nourished children had a higher proportion of girls compared to malnourished children and this difference is significant at the ten percent level ($p < 0.10$).

Child Nutritional Status & Microfinance: Bivariate Analysis

The relationship between microfinance and nutritional status could be tested by comparing the children anthropometric z-scores and the deriving malnutrition prevalence across intervention and control group. The results are illustrated in figure 4.1.5 for height-for-age and in table A2.2 for different possible anthropometric indicators.

Figure 4.1.5 shows that children in the control group had a *height-for-age* z-score distribution further away from the normal distribution than children in the intervention group. In fact the height-for-age z-score was on average higher for children in the intervention group and this difference is significant at the five percent level. The mean value was of minus 1.3 in the control group and of minus 0.8 in the intervention group. The stunting prevalence was of “only” 18.9 percent in the intervention group compared to 39.7 percent in the control group. This prevalence difference is highly significant ($p < 0.01$). The stunting prevalence in the intervention group is considered low while the encountered prevalence in the control group is above 30 percent and thus evaluated as alarming. From a positive perspective, it also means that in the intervention group, 81.1 percent of the children deviated positively from the minus two standard deviations benchmark while this was the case for only 60.3 percent of the children in the control group.

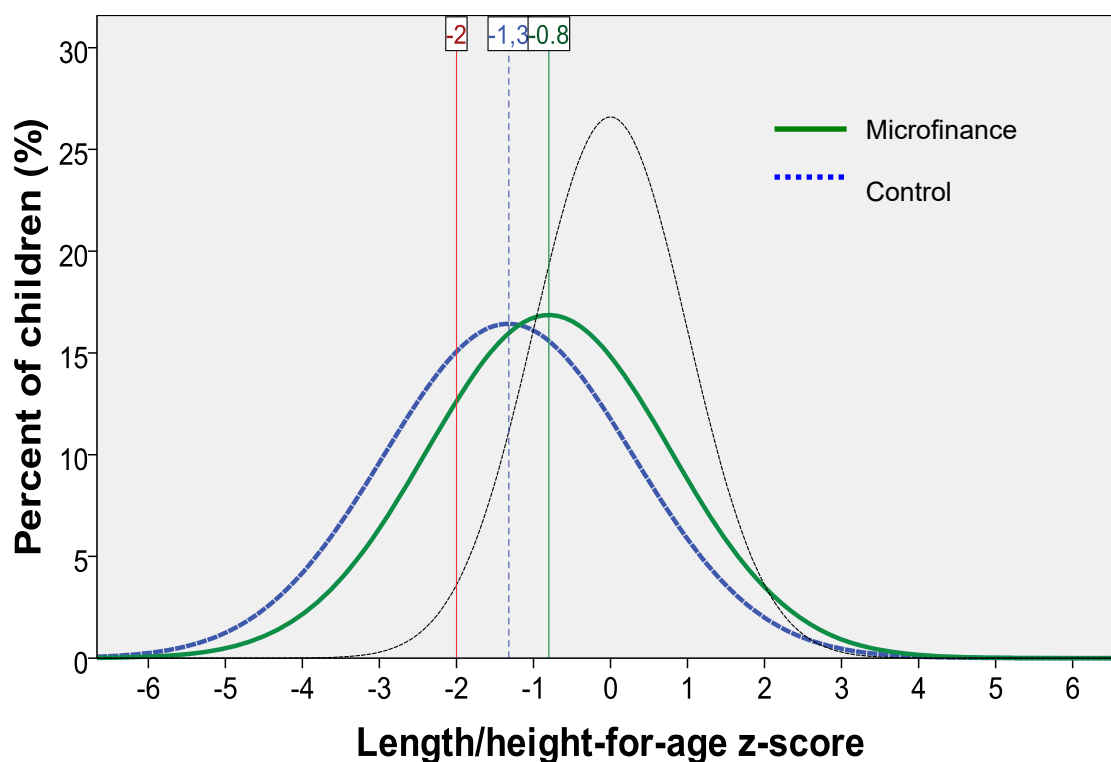


Fig. 4.1-5 Children nutritional status by microfinance profile: - z-scores distribution

4.1.5 Microfinance Total Effect on Child Nutritional Status: Multivariate Analysis

The bivariate analysis confirmed the hypothesis that microfinance is positively and significantly related to child nutritional status. However this conclusion was based on testing simple bivariate cause and effect relationships between indicators of microfinance and of nutritional status and did not take into account the fact that effects can not be absolutely independent of contextual and personal inherent factors.

A linear regression taking into account child age and sex, gender of the respondent, household shock and size as potential influencing parameters confirms the ameliorative total effect of microfinance on nutritional status (regression 0.1 in table 4.1.7).

Tab. 4.1-7 Microfinance's total effect on height-for-age: linear regression estimates

		Outcome Variable Y: Child Height-for-Age z-score (0.1)				
<i>Microfinance Intervention</i>		Coeff. B	SE	95%CI	p	Coef. β
X	Credit since ≥ 6 months	c'_1 0.456	0.242	-0.021 to 0.933	0.061*	0.138
Level 0: Inherent Factors						
	Imvepi Settlement	0.194	0.262	-0.322 to 0.710	0.459	0.052
	Madi_Okollo settlement	-0.161	0.516	-1.177 to 0.856	0.756	-0.023
	Household Size	0.036	0.048	-0.059 to 0.130	0.460	0.055
	Household Education Level	0.099	0.041	0.017 to 0.180	0.018**	0.176
	Shock	-0.565	0.266	-1.088 to -0.041	0.035**	-0.154
	Female Respondent	0.194	0.232	-0.265 to 0.652	0.406	0.059
	Child Age	0.002	0.007	-0.011 to 0.016	0.751	0.022
	Child Sex	0.358	0.225	-0.085 to 0.801	0.113	0.111
	Constant	-2.414	0.554	-3.507 to -1.321	0.000***	
	$R^2_{Y,X}=0.094$				0.021	
	N=205 children					

* $p<0.10$; ** $p<0.05$; *** $p<0.01$

In fact, the coefficient sign was positive for the microfinance intervention variable, which indicates an ameliorative effect. The p value for the difference in nutritional status along the microfinance variable was lower than 0.10, which indicates a lowly significant effect ($p=0.061$). This significant microfinance effect is a small one as inferred from a beta value comprised between the Cohen benchmarks of 0.1 and 0.3 ($\beta=0.138$). The regression also shows that household shocks affect the nutritional status of children significantly and negatively ($p<0.05$) while higher education levels in the family affect it positively ($p<0.05$).

Figure 4.1.6 shows that the predicted children height-for-age z-score weakly increased from the control group to the intervention group.

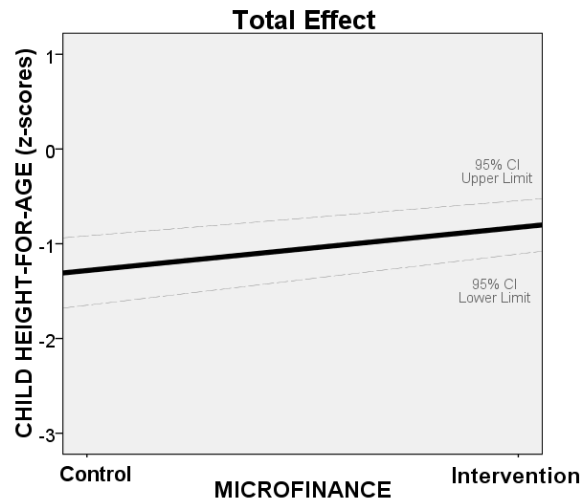


Fig. 4.1-6 Microfinance total effect on child nutritional status (205 children)

4.1.6 Concluding Remarks

The multivariate total effect analysis confirms the hypothesis that microfinance has a significant independent and ameliorative effect on child nutritional status. This effect is lowly significant and small (unstandardised effect=0.456; 95%CI: -0.021, 0.933; $p=0.061$; standardised effect=0.138).

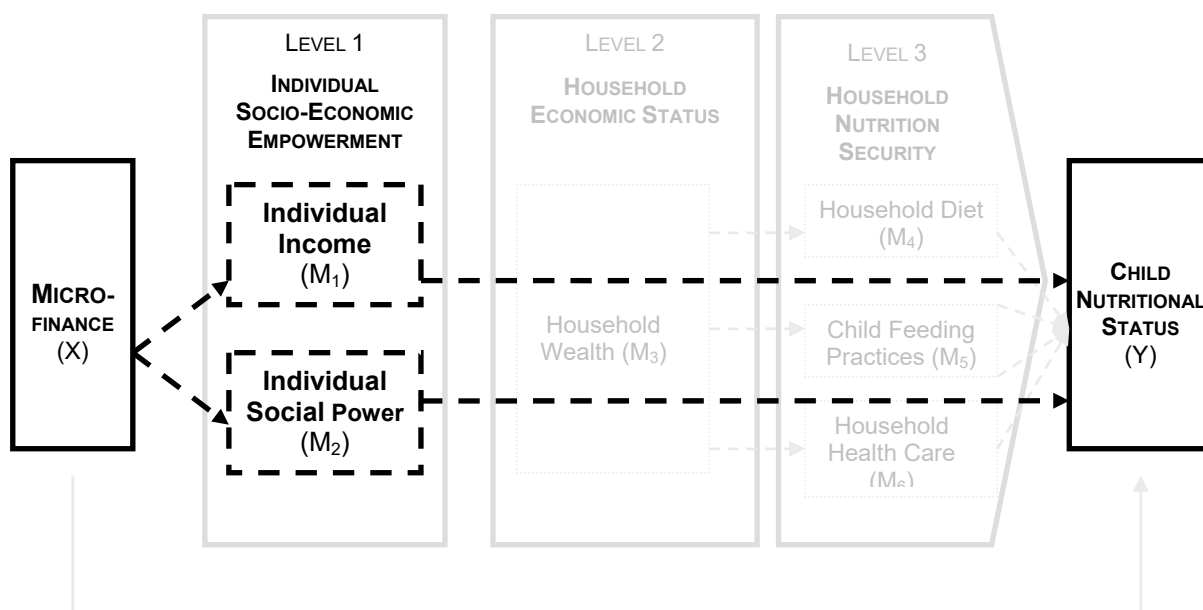
Main Total Effect

Microfinance $\xrightarrow{*}$ Nutritional Status

Result 1 : Microfinance total effect on child nutritional status is positive & significant

In order to better understand the effect of microfinance on child nutritional status, it is also necessary to inquire the pathways through which microfinance impacts nutritional status. The next step of our analysis will thus consist of evaluating how microfinance effect on child nutritional status is mediated, and particularly if this effect materialises through socio-economic empowerment of the respondent.

4.2 MEDIATION AT A DISTAL LEVEL: INDIVIDUAL SOCIO-ECONOMIC EMPOWERMENT



Model 2 : Mediation of microfinance effect on child nutritional status at a distal level

The purpose of this section is to test the potential role of individual social empowerment as mediator between microfinance and nutritional status. The analysis is based on a simple mediated model (Model 2). At first, individual income and social power are described and the effect of microfinance on both factors is tested through bivariate and first stage regression analyses. In a second stage, the effect of individual income and social power on child nutritional status is assessed and their mediated effect derived. The results are summarised in a diagram as concluding remarks (Result 2).

The main hypothesis being tested is:

H2: At a distal level, microfinance influences child nutritional status through individual socio-economic empowerment.

This central hypothesis can be divided in the following part hypotheses:

- *H2.1 Microfinance effect on nutritional status is mediated through individual Income*
- *H2.2. Microfinance has an ameliorative effect on individual Income*
- *H2.3 Individual Income has an ameliorative effect on child nutritional status*
- *H2.4 Microfinance effect on nutritional status is mediated through individual social power*
- *H2.5 Microfinance has an ameliorative effect on individual social power*
- *H2.6 Individual social power has an ameliorative effect on child nutritional status*

4.2.1 Individual Income

Descriptive & Bivariate Analysis

This section is a descriptive and bivariate analysis of economic power and its relationship to microfinance. It aims at testing hypothesis H2.2.3. Economic activities run by the respondents are described in table 4.2.1 for the 141 respondents living in households with children under five as well as by microfinance and nutritional categories.

Tab. 4.2-1 Income by microfinance & nutritional profile: group means & proportions

	All (N=141)	Microfinance		p	Child Height-for-Age		p
		Interv. (N=84)	Control (N=57)		OK (N=150) ^a	<-2SD (N=55) ^a	
Respondent Level							
Level of Income							
Monthly Profits in Ush (mean)	31800	32830	30290		35780	27350	
Characteristics of Income Generating Activities							
<i>Has an Income</i>	91%	94%	86%		90%	89%	
<i>Number of Income Generating Activities</i>	1.55	1.64	1.42	**	1.54	1.58	
<i>Duration of Enterprise (months)</i>	65.52	66.97	62.90		67.47	64.72	
<i>Owns business alone</i>	62%	64%	58%				
<i>Loan as Capital</i>	17%	26%	4%	***	18%	11%	
<i>Help in business activities</i>	51%	61%	37%	***	56%	47%	
<i>Use Profits for Food</i>	80%	83%	75%		79%	80%	
<i>Use Profits for Health</i>	53%	60%	44%	*	57%	55%	
Subjective Change in Income	0.14	0.15	0.14		0.22	0.05	
<i>Improved</i>	37%	39%	35%		44%	29%	*
<i>Stayed the same</i>	40%	37%	44%		35%	47%	
<i>Worsened</i>	23%	24%	21%		21%	24%	

*p<0.10, **p<0.05 and ***p<0.01; ^a: The sample of children is compared here (155 + 55=205 children)

Income Level: Economic power was measured by assessing the level of business profits which vary from zero to 200,000 Ugandan Shillings (Ush) per month. Profits were of 31,800 Ugandan shillings on average (table 4.2.1). Of the sample, half earned less than 20,000 Ush monthly, 75 percent earned less than 40,000 and 90 percent less than 80,000 Ush. The monthly profits of the respondents are illustrated in figure 4.2.1. The intervention group had a higher mean level of profits than the control group but the difference was less than 3,000 Ugandan shillings (32,830 versus 30,290 Ush, p>0.10). The mean level of profits was higher in the group of well-nourished children compared to the malnourished group (35,790 versus 27,350). The difference is yet not statistically significant (p>0.10). Non parametric tests

reveal significant differences in monthly profits according to the respondent sex ($p<0.01$). The level of profits of women is significantly lower than that of men. In fact, the mean profits were 25,590 Ush among women while they were more than 40,000 Ush by men. Figure 4.2.1 illustrates this gender difference in income level. Men had a median income which was twice that of women (25,000 versus 12,000 Ush). There were also apparent differences in income level according to marital status ($p<0.05$), education level ($p<0.01$) and type of activity ($p<0.10$). Profits were significantly higher by men (45,170 versus 24,680 by women) and by respondents with higher levels of education: The mean profits were of 47,400 Ush for respondents with a secondary school or university level while they were of only 27,300 Ush for those with a primary school level and of 20,700 Ush for those without formal education. Profits were also significantly higher among married respondents (34,450 versus 14,800 Ush). Regarding types of business, the highest mean profits were found in handicraft activities, followed by trading and catering, respectively. The profits were the lowest among respondents brewing alcohol.

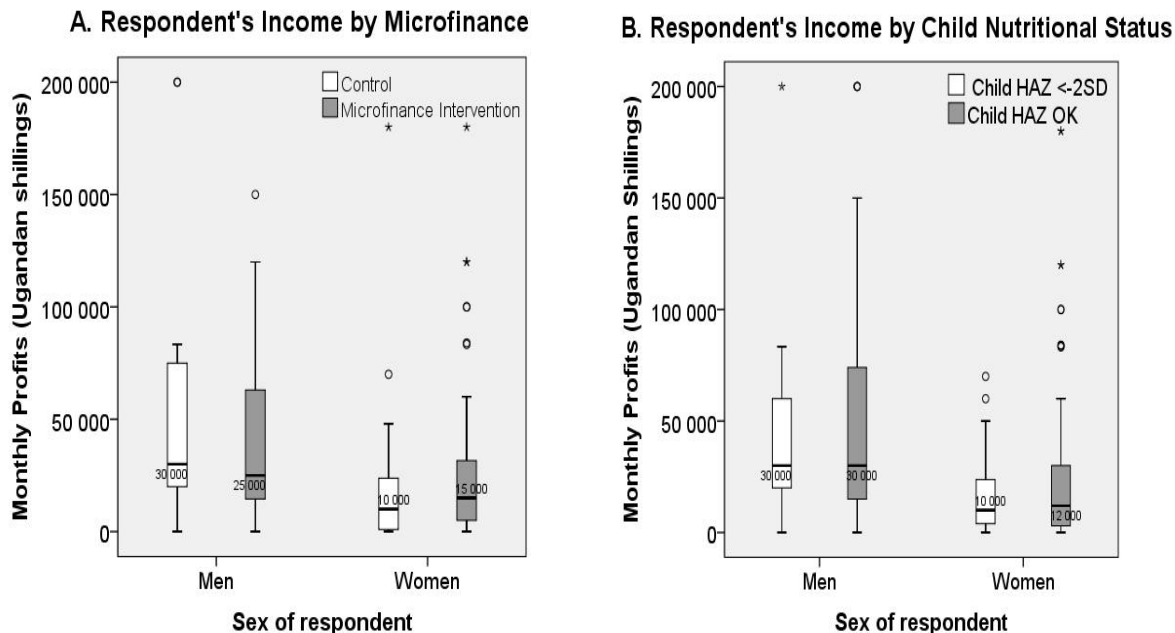


Fig.4.2-1 Individual income by microfinance, child nutritional status & gender (N=141 respondents)

Income Generating Activities: A closer investigation of the characteristics of income generating activities shows that most of the respondents (91 percent) earned their own money. The number of income generating activities varied between zero and three activities and is 1.6 on average. Some 65 percent had two or more sources of income. For some eleven percent of them, one source of income was a regular or odd job but for the majority money was earned from an enterprise activity solely. The most important business activities were trading (55 percent of the respondents), farming (42 percent), small industry or handicraft (26 percent), brewing of alcohol (18 percent) and catering (16 percent). Trading activities consisted of petty trade of fish or items like sugar, soap, onions, fuel, charcoal, etc. Farming comprises cultivation and selling of either food crops like cassava, beans, maize, groundnuts, millet, sorghum (23 percent of the respondents) or of cash crop like sesame (37 percent). Some respondents also reared and sold animals (six percent). Small industry included activities like tailoring, carpentry, bicycle repair, pottery or grinding mills. Some 62 percent of the respondents were the owner of their enterprise activity. The others owned the business together with partners not in households (24 percent) or household members (four percent). Some 49 percent of the respondents did not receive help for their business activity. The others were helped by household members (33 percent) or people from outside (18 percent). Respondents with a business started their activity 62.5 months (5.2 years) ago on average (min: 1.7 months; max: 20 years). For starting their activity two third of them (66 percent) got the capital mostly from their own savings. The rest borrowed from an institution (13 percent) or a friend (6 percent). Business products were mostly sold to local consumers (48 percent) or at the market (37 percent). A small proportion (eight percent) sold its products to local traders. Economic characteristics of the respondents were compared by microfinance categories. They are described in table 4.2.1. Some significant disparities exist across categories regarding the type of business run. There were significantly more traders ($p<0.01$) and farmers ($p<0.10$), and significantly less respondents brewing alcohol ($p<0.05$) or doing handicraft ($p<0.10$) among microfinance beneficiaries. Respondents in the intervention group tended to diversify their source of income more often than respondents in the control group (1.6 versus 1.4 activities, $p<0.10$). They also had more often other people who help them ($p<0.01$). Comparisons across nutritional categories show no significant differences in the characteristics of income generating activities run by the respondents. The only significant difference relates to the running of catering as business activity ($p<0.10$). The proportion of children living in a household with a respondent involved in catering is significantly higher among well-nourished than among malnourished (17 versus only seven percent). Comparisons across gender categories show that women tended to diversify their income more often than men (1.7 activities versus 1.4 activities, $p<0.10$). The size of their business was in contrast significantly smaller than that of men. This is demonstrated by a significantly

lower proportion of women having other people who help them or share ownership of the business activity ($p < 0.05$ and $p < 0.01$, respectively). The type of business activity also varied significantly between men and women with catering or brewing of alcohol being typical business activities of women ($p < 0.05$ respectively).

Use of Profits: The respondent's use of profits was assessed. It appeared that profits were most often invested in food or medical care (89 percent of the respondents), followed by school, enterprise, clothing, savings, housing and emergency, respectively. The use of profits is described in figure 4.2.2.A by microfinance category. Respondents in the microfinance intervention group used profits more often for food, health, school and enterprise than respondents from the control group. The difference was significant only for health ($p < 0.10$) and for school ($p < 0.01$). Figure 4.2.2B describes the areas in which profits were used for each of the nutritional categories. It appears that well-nourished children have a significantly higher proportion of respondents investing their profits in schooling ($p < 0.05$) and a significantly lower proportion using profits for savings ($p < 0.10$) and housing ($p < 0.10$). Women used profits more often for health or for food, but the difference is not significant across gender ($p > 0.10$).

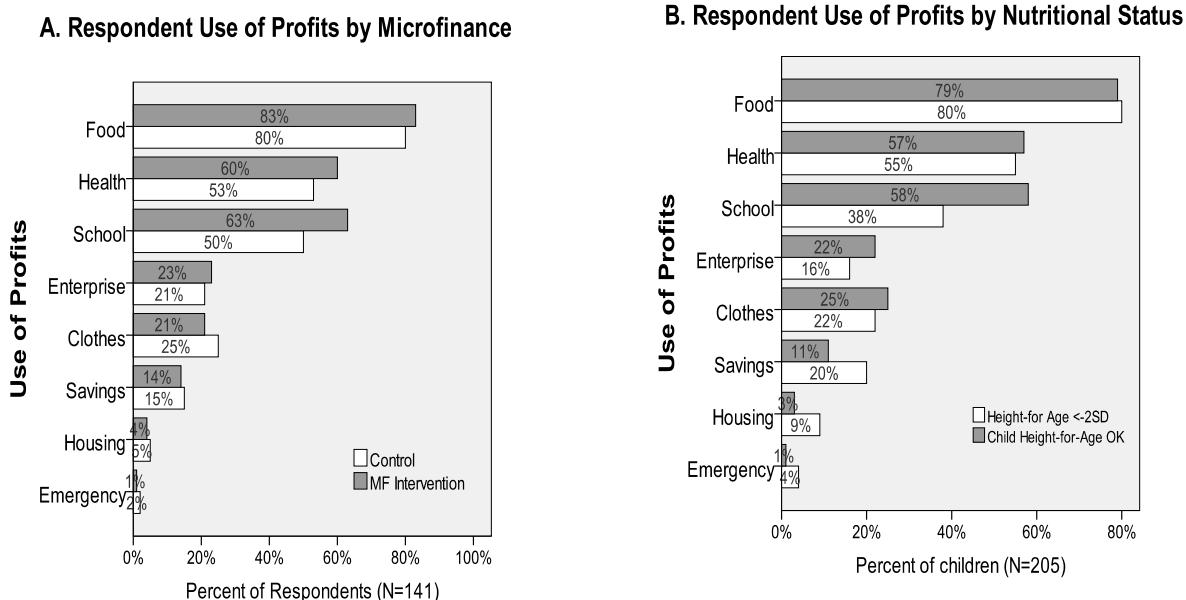


Fig. 4.2-2 Use of profits by microfinance & nutritional status

Subjective Economic Empowerment: Respondents' perception of change in income was assessed. The mean subjective change in income was positive but low (0.14 on a scale from minus one to plus one). Some 35 percent felt an economic empowerment, 44 percent felt no change and 21 percent had an impression of worsened income. Comparisons between microfinance categories indicate that the differences in perception of income change are statistically not significant ($p>0.10$). Comparisons between the group of well-nourished and of malnourished children show that respondents feeling an improvement in income are significantly more represented among well-nourished (44 percent versus 29 percent, $p<0.10$). The differences in perceived income change are illustrated in figure 4.2.3.

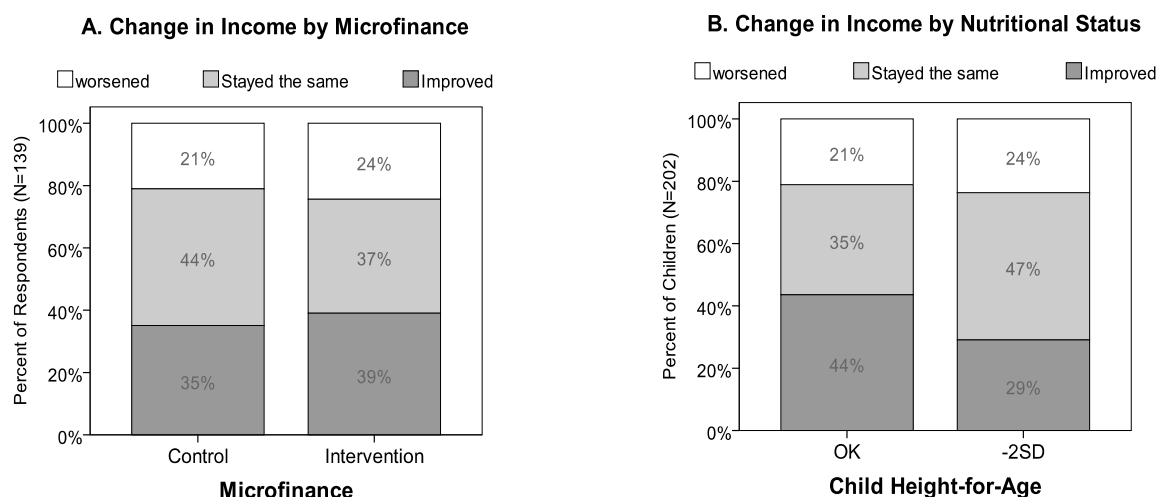


Fig. 4.2-3 Subjective economic empowerment by microfinance & nutritional status

Microfinance Effect on Individual Income: First Stage Multivariate Analysis

Microfinance effect on income is tested through a linear regression taking into account gender of the respondent, household and children inherent factors (regression 0.2 in table 4.2.2).

Tab. 4.2-2 Microfinance effect on individual income: linear regression estimates

		Outcome Variable M ₁ : Monthly profits in Ush (0.2)			
Predictors		Coeff. B	SE	95%CI	p
Microfinance Intervention					
X	Credit since ≥ 6 months a ₁₁	2040.365	7344.265	[-12444 - 6524]	0.781
Level 0: Inherent Factors					
	Madi-Okollo Settlement	-12752.603	15656.152	[-43629 - 8124]	0.416
	Imvepi settlement	185.895	7945.598	[-15484 - 15856]	0.981
	Household Size	- 533.035	1456.132	[- 3404 - 2338]	0.715
	Household Education Level	2615.667	1254.598	[141 - 5089]	0.038**
	Shock	3876.32	8064.395	[-12028 - 9780]	0.631
	Female Respondent	-29597.983	7055.403	[-43512 - -15683]	0.000***
	Child Age	- 112.699	209.999	[- 526 - 301]	0.592
	Child Sex	- 80.320	6829.216	[-13548 - 13388]	0.991
	Constant	32248.773	16834.117	[- 951 - 65449]	0.057*
	R ² _{M1,X} =0.119				0.003***
	N=205 children				

*p<0.10;**p<0.05;***p<0.01

The positive sign of the coefficient a₁₁ indicates that microfinance effect on recipient's income might be ameliorative. The t-test shows however that this effect is not significant (p>0.10). What mattered for individual income was the sex of the respondent and the education level. Women tended to have a lower income and this relation is significant at one percent level. Profits are positively and significantly associated with higher education levels in the family (p<0.05). The other covariates did not affect income significantly.

Microfinance trivial effect on income is illustrated in figure 4.2.4 by plotting the mean predicted values for monthly profits by microfinance category holding all other covariates at their mean. The regression line shows that profit levels increase from the control group to the intervention group but this increase is extremely weak.

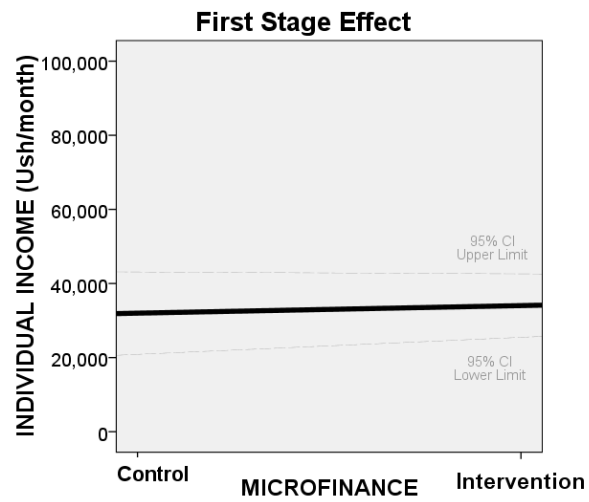


Fig. 4.2-4: Microfinance effect on individual Income (N=205 children)

4.2.2 Individual Social Power

Descriptive & Bivariate Analysis

This section is a descriptive and bivariate analysis of social power and its relationship to microfinance. It aims at testing hypothesis H2.3.2. Respondent's profile according to different social power dimensions are given in table 4.2.3.

Tab. 4.2-3 Individual social power by microfinance & nutritional profile: group means & proportions

Inherent Variables	All	Microfinance			Child Height-for-Age	
		Interv.	Control	p	OK	<-2SD
Respondent Level	(N=141)	(N=84)	(N=57)		(N=150) ^a	(N=55) ^a
Personal Power	0.92	0.92	0.91		0.91	0.94
Disagree "Only men should take important decisions" (1)	87%	89%	84%		85%	93%
Disagree 'Women should accept being beaten to maintain peace in the household'(1)	94%	98%	89%	**	93%	96%
Disagree 'It is better to send a boy to school than a girl' (1)	96%	93% _a	100% _b	**	97%	95%
Agree "Partner should help at home if woman works outside" (1)	91%	89% _a	93% _b		89%	93%
Has a full positive gender attitude (4/4)	73%	74%	72%		71%	78%
Relational Power	0.90	0.91	0.88		0.88	0.90
Involved in all decisions areas	63%	68%	56%		57%	65%
Involved in all decisions regarding health/food	76%	77%	74%		73%	75%
Infant feeding in the first year of life (1)	82%	82%	81%		79%	82%
Taking children for medical care (1)	90%	90%	89%		88%	93%
Food expenditures everyday (1)	94%	94%	93%		92%	91%
Involved in all decisions in other areas	77%	81%	72%		74%	80%
Buying clothes for the children (1)	91%	94%	86%		91%	93%
Sending children to school (1)	88%	90%	84%		89%	87%
Buying important things for the family (1)	89%	88%	89%		85%	89%
How to spend your income (1)	95%	98%	91%	*	94%	94%
Collective Power	0.40	0.43	0.34		0.39	0.40
Participates in social activities (1)	55%	61%	46%	*	54%	56%
Leader in social activities (1)	25%	26%	23%		24%	25%
Cumulative Social Power Scale	0.74	0.76	0.71		0.73	0.75
High Social Power (score ≥0.80)	14%	15%	11%		13%	19%
Medium Social Power (score 0.4-0.79)	84%	82%	87%		84%	81%
Low Social Power (score<0.40)	3%	3%	2%		2%	0%
Subjective Change in Decision's Making	0.30	0.28	0.33		0.32	0.26
Improved	32%	32%	32%		35%	27%
Stayed the same	63%	62%	65%		61%	71%
Worsened	3%	5%	0%	*	3%	2%

*p<0.10, **p<0.05, ***p<0.01; ^a: The sample of children is compared here (155 + 55=205 children)

Gender Attitudes: Personal power was tested through respondent's opinion regarding different statements related to gender role. The proportion of respondents who agreed or disagreed to the statements is given in table 4.2.3. Of the respondents, 96 percent disagreed that it is better to send boys than girls to school, 94 percent disagreed that a woman should accept being beaten to maintain peace at home, 91 percent agreed that partners should help at home if women work outside and 87 percent disagreed that only men should take important decisions. A gender attitude scale was constructed based on the responses of the respondents with four gender equality related statements corresponding to a full positive gender attitude. Accordingly 73 percent of the respondents had a full positive attitude to women. The mean women attitude scale was 0.92. Attitudes towards women were similar across gender categories and for each of the statements ($p>0.10$). Gender attitudes are described in the second and third columns of table 4.2.3 from the microfinance perspective. Gender attitudes were generally similar across microfinance categories. This is demonstrated by non significant differences in the mean gender attitude scale and in the proportion of respondents with a full positive gender attitude ($p>0.10$ respectively). Some significant differences exist for specific statements. Microfinance beneficiaries had a more negative attitude towards gender equality in sending children to school and a more positive attitude against women violence ($p<0.05$ respectively). The group of children with a good height-for-age was compared to the malnourished group according to the gender attitude of the respondent living in their household (fifth and sixth columns of table 4.2.3). Non-parametric tests show no significant differences according to respondent personal power.

Household's Decision Making: Respondents were asked about who usually takes decisions in their household in specific areas: the respondent alone, the partner alone or both jointly. An index was constructed based on positive responses for involvement in the seven following household decision-making areas: daily food expenditures, important purchases, how to spend their income, taking children for medical care, sending children to school, buying clothes for children and infant feeding in the first year of life. The decisionmaking scale was generally high (0.90 on average). Some 63 percent of the respondents had the maximal score of one, meaning that they are involved in all decisions areas (table 4.2.3). Overall, the decision-making score does not vary significantly between microfinance comparison groups ($p>0.10$) and between well-nourished and malnourished children ($p>0.10$).

A closer observation of specific decision areas shows that in each area, decisions were taken by the respondent alone in less than 50 percent of the cases. Depending on the

specific area between 41 and 58 percent of the respondents participated jointly with their partner in the decisional process. Microfinance participation is significantly associated with involvement in decisions only for the area related to spending income. Here there is a lowly significant difference with 98 percent of the established clients being involved in how to spend their income compared to 91 percent in the control group ($p < 0.10$). Involvement in specific decisional areas was similar across nutritional categories ($p > 0.10$, respectively). Comparisons between well-nourished and malnourished children and between microfinance beneficiaries and non-beneficiaries are illustrated in figure 4.2.5 according to the respondent involvement in household decisions.

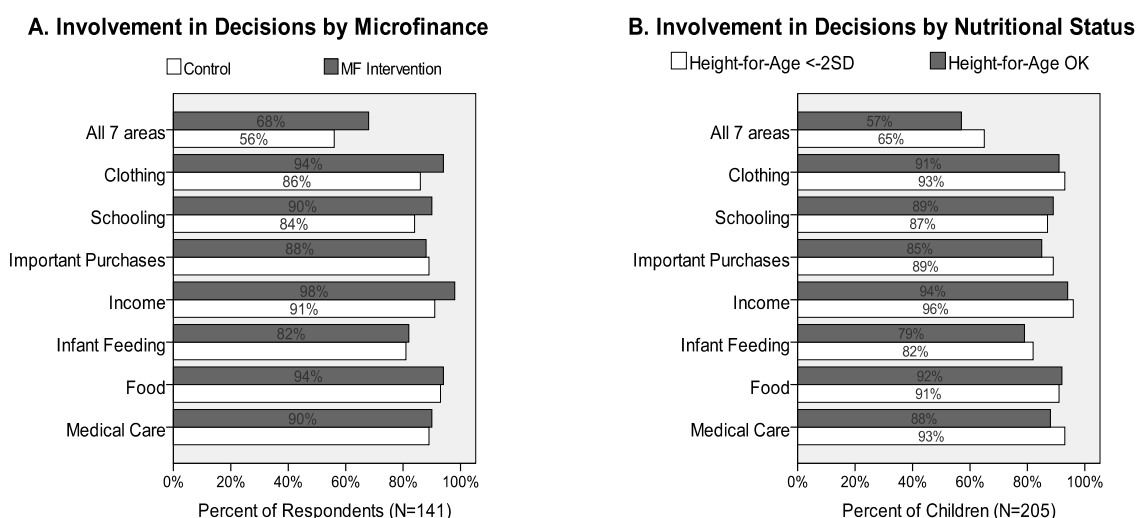


Fig. 4.2-5 Respondent decisional power by microfinance & nutritional status

Household's Decision Making by Gender: Figure 4.2.6 portrays decision making power by gender categories. Globally women had a significantly higher relational power as they were involved in more decisional areas than men (mean = 0.89 versus 0.82). They had a significantly higher decision involvement in areas related to food and health (86 versus 47 percent, $p < 0.00$) while men had a higher decision involvement in other decision areas (90 versus 82 percent, $p < 0.05$). A closer observation reveals that there are three areas where women were significantly more involved than men: medical care, daily food expenditures and infant feeding ($p < 0.00$, $p < 0.05$ and $p < 0.00$, respectively). Men were significantly more often

involved than women in decisions regarding sending children to school (90 versus 82 percent, $p < 0.05$).

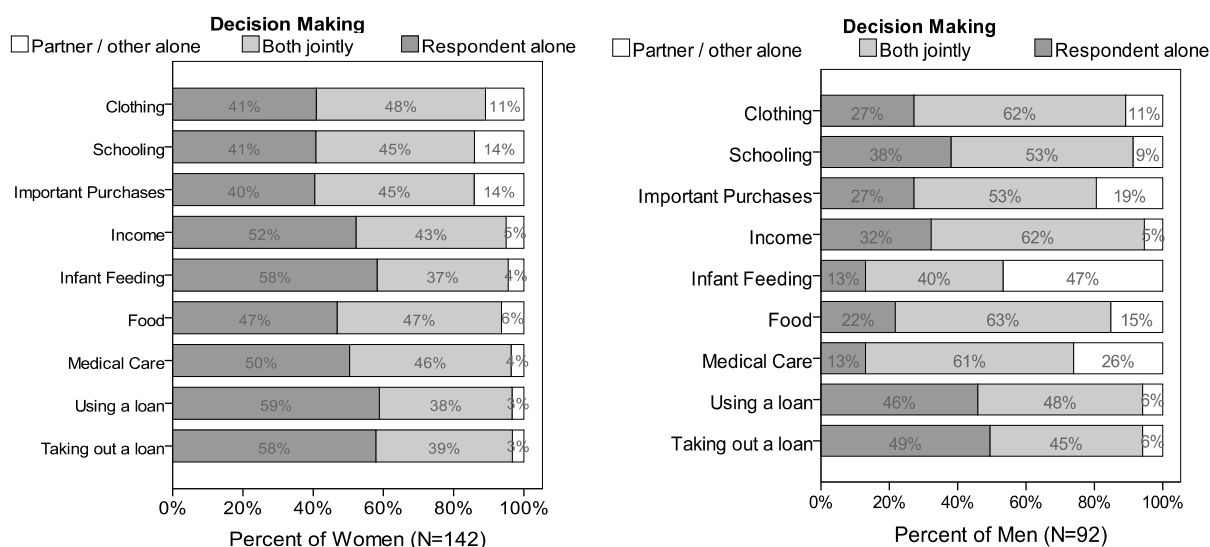


Fig. 4.2-6: Household decision areas by gender

Subjective Relational Empowerment: Respondents were asked about their perception of change in household decision's making. In the year preceding the survey, 32 percent of the respondents had noticed an improvement in their ability to take decisions in the household. For 63 percent there was no change and three percent had an impression of worsened involvement in decision making. The mean subjective change was of 0.30 which is positive but not very high. Perceptions of change in decision's making were compared between microfinance beneficiaries and the control group. Figure 4.2.7.A shows that the proportion of respondents feeling an improved decisional power was exactly the same in both groups (32 percent). Yet respondents feeling a worsening in their involvement in household decisions were represented only among established clients (five versus zero percent, $p < 0.10$). Comparisons across nutritional categories indicate that differences in subjective change in decision making are statistically not significant ($p \geq 0.10$). These comparisons are illustrated in figure 4.2.7.B.

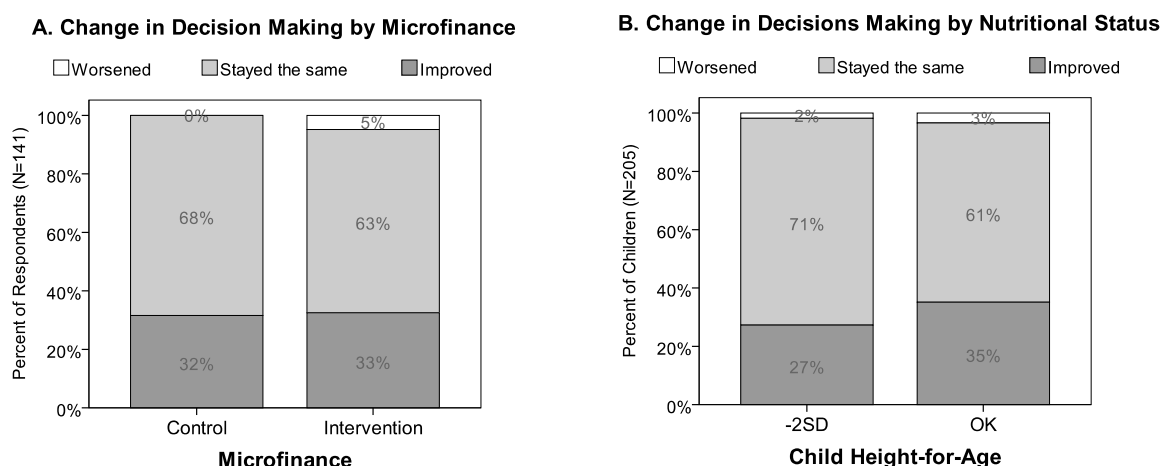


Fig. 4.2-7 Subjective relational empowerment by microfinance & nutritional status

Additional statistical analyses compared perceptions of change in decision making between female and male respondents. It appears that disparities existed between men and women with regard to subjective decision empowerment. In fact, less than one fourth of the women felt a positive change in decision-making while this was the case for 60 percent of the men. Nobody perceived a worsening in decision power among men while this was the case for about half of the women. The difference across gender is statistically significant at a level of one percent.

Social Engagement: Social engagement was measured by participation in community activities and by leadership position. In the sample, more than half of the respondents (55 percent) was socially engaged. Respondents were members of different kinds of organizations. Some participated in formal camp administration committees like the food, water, education or security committees. Others participated in church activities either as members, leaders or they have other functions like assistant, usher or treasurer. Several were engaged as volunteers in social activities at community level: community facilitators, traditional birth attendants, peace groups, etc. A total of 25 percent were leaders, chairpersons in their organizations (high social engagement). Some 30 percent participated also in community organizations but just as members or with a secondary function like assistant, treasurer, etc. (middle social engagement). The mean social engagement scale was 0.39. Comparisons by microfinance profile show that established microfinance clients had a higher mean social collective power score (0.43 versus 0.34); they participated more often in social activities (61 versus 46 percent) and had more often leadership positions (26

versus 23 percent). The statistical tests show, however, that these differences are significant only for global participation in social activity ($p < 0.10$). The social engagement of the respondents is illustrated in Figure 4.2.8A for the microfinance intervention group and for the control group. Comparisons of respondent collective power by child nutritional status show that the well-nourished group had a lower respondent's collective power score (0.39 versus 0.40), a lower proportion of respondents who participated in social activities (54 versus 56 percent) or had a leadership position (24 versus 25 percent). But in all these aspects the difference is too small to be statistically significant ($p > 0.10$). This similarity in social engagement across nutritional categories is illustrated in Figure 4.2.8 B. Further, statistical comparisons by gender show disparities in social engagement between men and women and indicate that men used to participate more often in social activities than women (71 versus 44 percent, $p < 0.00$) and they used to have more often leadership positions (44 versus 12 percent, $p < 0.00$). Some 57 percent of the socially engaged men were leaders while this was the case for only 28 percent of all socially engaged women. The mean social engagement index was 0.28 for women and 0.55 for men ($p < 0.00$).

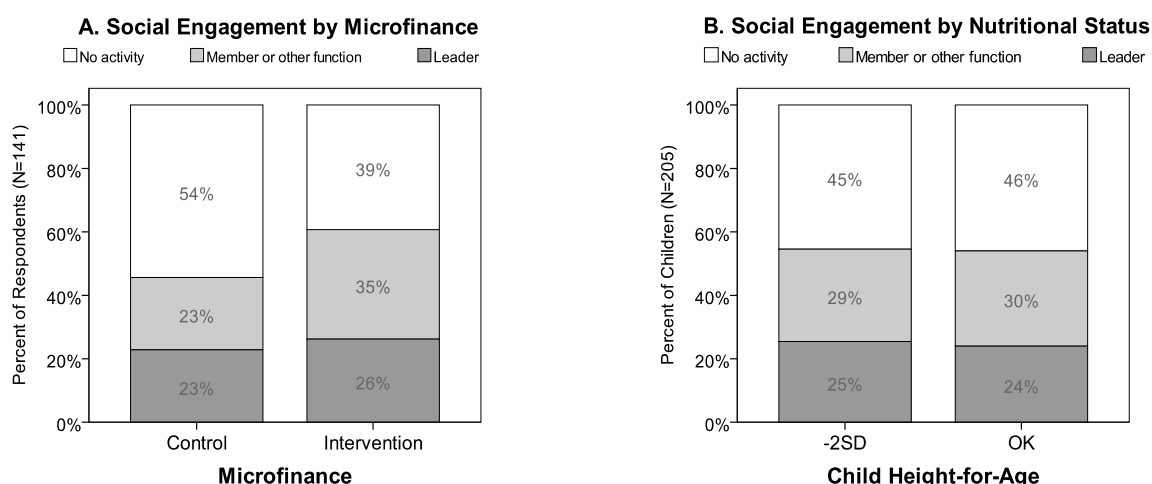


Fig. 4.2-8 Respondent collective power by microfinance & nutritional status

Cumulative Social Power: A cumulative social power index was constructed by adding the scores of the three main empowerment dimensions: personal, relational and collective power. Respondents were categorized as having a low, a medium or a high social empowerment profile based on the final score (table 4.2.3). The mean social power was 0.74 in the study population corresponding to a medium empowerment level. The typical respondent had a high personal power, a high relational power and a low collective power. The cumulative social power was compared by microfinance category (figure 4.2.9A). The group of established clients had a higher mean social power score (0.76 versus 0.71) and a

higher proportion of respondents with a high social power (19 versus 11 percent). These differences were however statistically not significant ($p>0.10$). Comparisons between well-nourished and malnourished children regarding the cumulative social power of the respondent living in their households indicate that in the well-nourished group, the cumulative social power score was lower (0.73 versus 0.75) and the proportion with a high social power index was also lower (13 versus 19 percent). These differences are statistically not significant ($p>0.10$). Figure 4.2.9B shows that the global social power of the respondents was similar in the group of well-nourished and malnourished children.

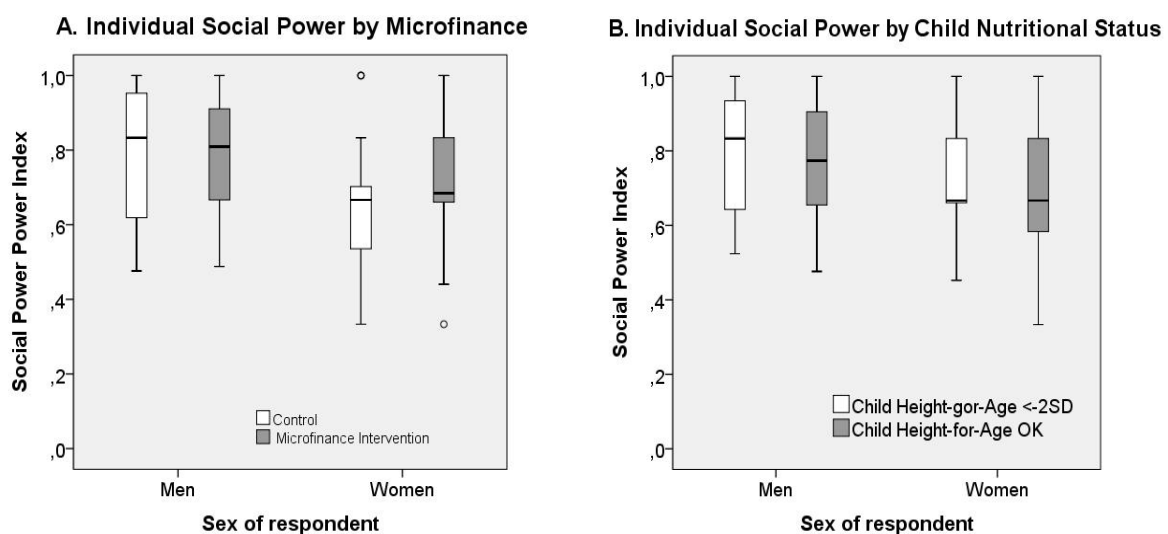


Fig. 4.2-9 Individual social power by microfinance & nutritional status

Microfinance Effect on Individual Social Power: First Stage Multivariate Analysis

Microfinance effect on social empowerment was tested through a linear regression of the social power score controlling for respondent gender, household shock, household size, child sex and age. The results are given in table 4.2.4 (regression 0.3). The positive sign of the coefficient a_{12} indicates that microfinance main effect on recipient's social power might be ameliorative. But this effect is not significant according to the parametric analysis ($p>0.10$). Female gender acts as an influential negative predictor ($p<0.01$). Significant and ameliorative determinants of social power are household shocks, size and education level ($p<0.01$, $p<0.05$ and $p<0.01$, respectively).

Tab. 4.2-4 Microfinance effect on individual social power: linear regression estimates

		Outcome Variable M_2 Cumulative Social Power index (0.3)				
Predictors		Coeff. B	SE	95% CI	p	Coef. β
Microfinance Intervention						
X	Credit since ≥ 6 months	a_{12} 0.009	0.023	-0.036 to 0.054	0.701	0.026
Level 0: Inherent Factors						
	Madi-Okollo Settlement	-0.059	0.048	-0.154 to 0.037	0.228	-0.083
	Imvepi Settlement	0.002	0.025	-0.047 to 0.050	0.942	0.005
	Household Size	0.010	0.005	0.001 to 0.019	0.024**	0.153
	Household Education Level	0.015	0.004	0.007 to 0.023	0.000***	0.261
	Shock	0.072	0.025	0.022 to 0.121	0.005***	0.190
	Female Respondent	-0.070	0.022	-0.113 to -0.027	0.002***	-0.205
	Child Age	-0.001	0.001	-0.002 to 0.001	0.307	-0.066
	Child Sex	-0.033	0.021	-0.075 to 0.008	0.116	-0.101
	Constant	0.544	0.052	0.442 to 0.647	0.000***	
	$R^2_{M2,X}=0.243$				0.000***	
	N=205 children					

* $p < 0.10$, ** $p < 0.05$ & *** $p < 0.01$

Microfinance' trivial effect on social power is illustrated in figure 4.2.10. As can be seen, the regression line along the microfinance status is almost a constant.

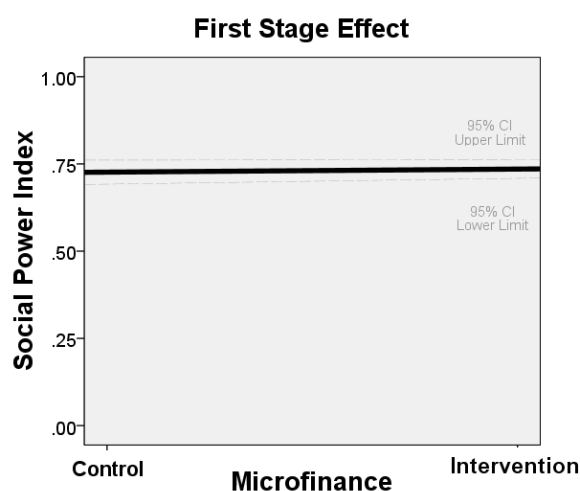


Fig. 4.2-10 Microfinance effect on individual social power (N=205 children)

4.2.3 Simple Mediation Analysis at a Distal Level

Tab. 4.2-5 Microfinance effect on height-for-age at distal level: linear regression estimates

		Outcome Variable Y: Child Height-for-Age z-score					
Predictors			(1.1)				
			Coeff. B	SE	95% CI	p	Coef. β
X	Microfinance Intervention						
	Credit since ≥ 6 months	c'_1	0.461	0.243	-0.0018 to 0.940	0.059*	0.139
	Level 0: Inherent Factors						
	Madi-Okollo Settlement		-0.193	0.520	-1.219 to 0.832	0.711	-0.028
	Imvepi settlement		0.195	0.263	-0.323 to 0.713	0.458	0.053
	Household Size		0.041	0.049	-0.055 to 0.138	0.398	0.064
	Household Education Level		0.107	0.043	0.022 to 0.193	0.014**	0.191
	Shock		-0.525	0.272	-1.061 to 0.012	0.055*	-0.143
	Female Respondent		0.155	0.247	-0.332 to 0.643	0.530	0.047
	Child Age		0.002	0.007	-0.012 to 0.016	0.793	0.019
	Child Sex		0.339	0.227	-0.109 to 0.787	0.137	0.105
		Level 1: Mediators					
M ₁	Respondent's Monthly Profits in Ush	b_{11}	0.001	0.000	0.001 to 0.001	0.986	0.001
M ₂	Respondent's Social Power	b_{12}	-0.564	0.773	-2.088 to 0.961	0.467	-0.058
	Constant		-2.109	0.695	-3.479 to -0.738	0.003***	
	$R^2_{Y,XM1M2}$ =0.097					0.045**	
	N=205 children						

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$,

Effect of Individual Income & Social Power on Nutritional Status: Second Stage Multivariate Analysis

The effect of individual social or economic power on child nutritional status can be derived from the linear regression (1.1) of the child height-for-age z-score along social power, monthly profits and other inherent covariates (table 4.2.5). It equals the coefficients b_{1j} which is positive for individual income ($b_{11}=0.001$) and negative for social power ($b_{12}=-0.564$). For both factors the effect on child nutritional status is not significant ($p > 0.10$, respectively).

Indirect Effect of Microfinance on Nutritional Status at a Distal Level

The indirect effect of microfinance on child height-for-age through a mediator M_j equals $a_{1j}b_{1j}$ which is 0.001 for individual income and -0.005 for social power (table 4.2.6). The mediated effect through individual income is thus positive. The effect through social power is negative. These indirect effects are statistically not significant according to bootstrapped confidence intervals at a bias-corrected confidence level of 90 percent. In fact, the bootstrapped confidence intervals include zero for both mediators. Thus, the regression analysis does not confirm that microfinance effect on child nutritional status is mediated by either individual income or social power.

Tab. 4.2-6 Mediation of microfinance effect on height-for-age at distal level

Model	Estimate	SE	p	95%		Standardised Estimate
				Lower CI	Upper CI	
MODEL 0 WITHOUT MEDIATOR						
MF→HAZ (c)	0.456	0.242	0.061*	[0.057	- 0.856]	0.138
DISTAL MODEL 1						
Direct effect: MF→HAZ (c'₁)	0.461	0.243	0.059*	[0.060	- 0.862]	0.139
Total indirect effect (c- c'₁)	-0.005	0.029		[-0.067	- 0.032] ^a	-0.001 ^b
Individual Income M₁						
MF → PROFITS (a₁₁)	2040.365	7344.265	0.781	[-12444	- 16524]	0.020
PROFITS → HAZ (b₁₁)	0.001	0.000	0.986	[0.001	- 0.001]	0.001
Indirect effect (a₁₁ b₁₁)	0.0001	0.015		[-0.023	- 0.026] ^a	0.000 ^b
Social Power M₂						
MF → POWER (a₁₂)	0.009	0.023	0.701	[-0.036	- 0.054]	0.026
POWER → HAZ (b₁₂)	-0.564	0.773	0.467	[-2.088	- 0.961]	-0.058
Indirect effect (a₁₂ b₁₂)	-0.005	0.024		[-0.084	- 0.012] ^a	-0.001 ^b

*lowly significant,**moderately significant;***highly significant; a: 90%BootCI also includes zero (b: Completely Standardized Indirect Effect)

4.2.4 Concluding Remarks

The mediation analysis of microfinance effect on child nutritional status at distal level shows that:

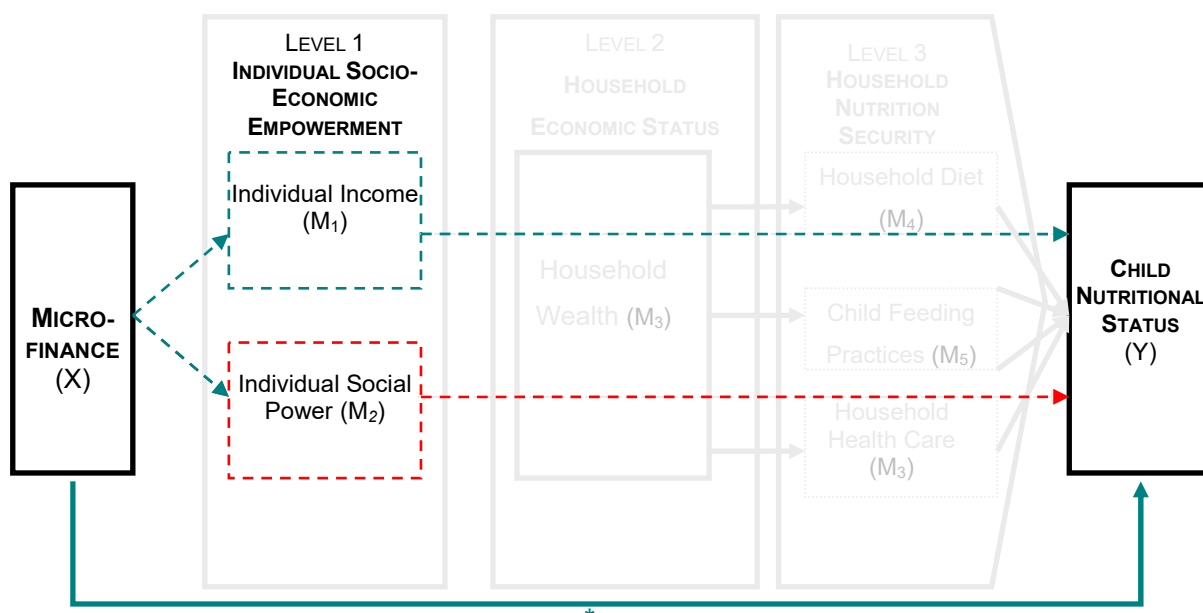
- Microfinance effect on nutritional status is neither mediated through individual income nor through social power (95%BootCI=[-0.023 to 0.026] & [-0.084 to 0.012], respectively)
- Microfinance effect on individual income is not significant ($p>0.10$)
- Microfinance effect on individual social power is not significant ($p>0.10$)
- The effect of individual income on child nutritional status is not significant ($p>0.10$)
- The effect of individual social power on child nutritional status is not significant ($p>0.10$)
- Microfinance direct effect at distal level is still lowly significant, ameliorative and small ($B=0.461$; 95%CI: 0.060, 0.862; $p=0.059$; $\beta=0.139$)

The bivariate analysis shows that:

- Microfinance beneficiaries have a more negative attitude towards gender equality in sending children to school and a more positive attitude against violence against women ($p<0.05$ respectively).
- There are more established clients involved in decisions on how to spend their income compared to the control group ($p<0.10$).

- Women are significantly more involved than men in decisions regarding medical care, daily food expenditures and infant feeding ($p < 0.00$, $p < 0.05$ and $p < 0.00$, respectively). Men are significantly more often involved than women in decisions regarding sending children to school ($p < 0.05$).
- Less women feel a positive change in decision-making than men ($p < 0.01$).
- Men participate more often in social activities than women ($p < 0.00$) and they have leadership positions more often ($p < 0.00$).

The following diagram illustrates the results of the mediation analysis at a distal level. The dash arrows represent non-significant effects; the solid line indicates a significant direct effect. The lines are red when the effect is negative. They are green when the effect is positive.



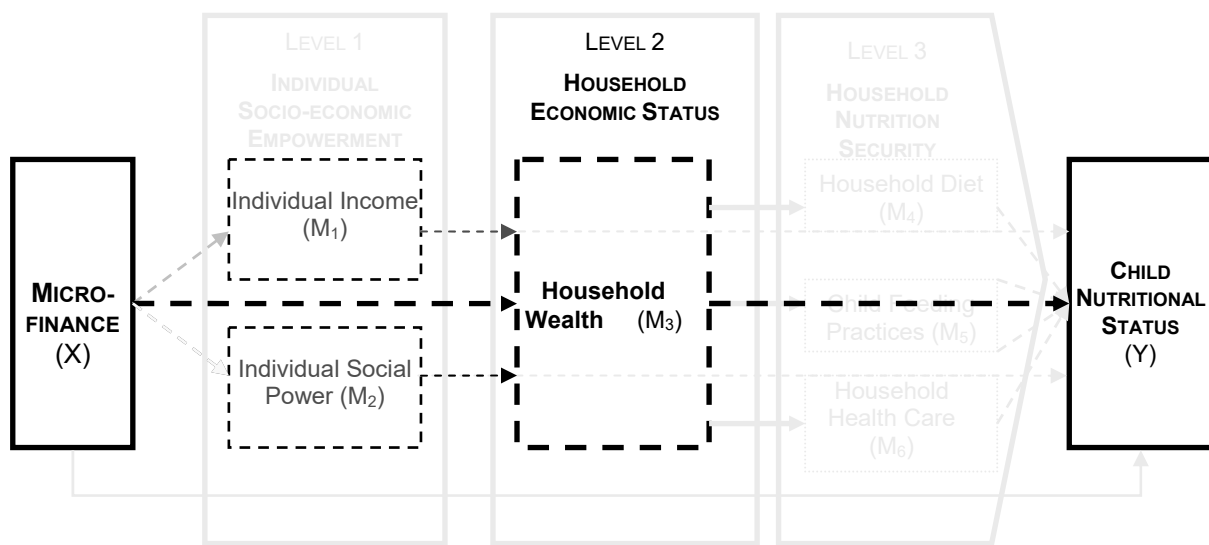
Result 2 : Mediation of microfinance effect on child nutritional status at a distal level

In summary, the mediation analysis at a distal level does not confirm an indirect effect of microfinance on child nutritional status through individual income or social power. The results suggest that the ameliorative and significant effect of microfinance on child nutritional status corresponds to a full direct and unmediated effect.

In the next section, we will extend the distal model by considering an additional potential mediator at an intermediate level: household wealth.

4.3 MEDIATION AT AN INTERMEDIATE LEVEL: HOUSEHOLD ECONOMIC STATUS

This section aims at testing the mediating role of household wealth for microfinance effect on nutritional status. The analysis is based on a simple mediational model (Model 3). At first, household wealth is described and microfinance effect on household wealth is tested using bivariate and first stage regression analyses. In a second stage, the effect of household wealth on child nutritional status is assessed and its mediated effect derived. The results are summarised in a diagram as concluding remarks (Result 3).



Model 3 : Mediation of microfinance effect on child nutritional status at an intermediate level

The main hypothesis being tested is:

H3: At an intermediate level, microfinance influences child nutritional status through higher household economic status.

The following third hypotheses will be also tested:

- *H3.1 Microfinance has an ameliorative effect on household wealth*
- *H3.2 Household wealth has an ameliorative effect on child nutritional status*
- *H3.3 microfinance effect on household wealth is mediated through individual income and social empowerment*

4.3.1 Household Wealth

Descriptive & Bivariate Analysis

Wealth status was measured through the following three variables: subjective wealth, asset ownership and household expenditures. They are described in table 4.3.1 for the whole household sample as well as by microfinance and child nutritional status.

Tab. 4.3-1 Household wealth by microfinance & nutritional profile: group means & proportions

	All (N=139)	Microfinance Interv. (N=83)	Control (N=56)	p	Child Height-for-Age OK (N=150) ^a	<-2SD (N=55) ^a	p
Perception of wealth	0.27	0.36	0.14	*	0.35	0.15	*
<i>Better off</i>	43%	49%	34%	*	49%	33%	**
<i>The same</i>	41%	37%	46%		37%	49%	
<i>Worse off</i>	16%	13%	19%		14%	18%	
Material Asset Ownership							
<i>Bicycle/Motorcycle</i>	72%	75%	68%		75%	73%	
<i>Radio</i>	60%	61%	59%		64%	62%	
<i>Cows (mean)</i>	0.99	0.94	1.05		0.73	1.45	*
<i>Goats/Sheep//Pigs (mean)</i>	7.23	7.54	6.77	*	7.56	6.25	
<i>Poultry (mean)</i>	8.19	8.79	7.32		8.59	6.27	*
Household expenditures							
Monthly Consumption	38514	41122	34647		40422	33647	
Expenditures/Adult Ush (mean)							
Monthly Savings/Ad Ush (mean)	9102	8974	9301		9306	8114	
Monthly Food Expenditures/Ad. Ush (mean)	18479	19618	16792		19066	16531	

*p<0.10; **p<0.05; ***p<0.01, ^a: The sample of children is compared here (155 + 55=205 children)

Subjective Wealth: Of the households 43 percent perceived themselves as better off, 41 percent as the same as others and 16 percent as worse off. The mean wealth perception is significantly higher in both the microfinance intervention group and the group of well-nourished children than in the comparison groups (p<0.10 respectively). The proportion of subjectively rich households was 49 percent in the microfinance intervention group compared to only 34 percent in the control group. Some 49 percent of the well-nourished children were living in rich households compared to only 33 percent of the malnourished.

Asset Ownership: Regarding asset ownership, 72 percent had a bicycle or a motorcycle, 60 percent a radio and 96 percent had domestic animals. Well-nourished children were living in households with a significantly lower number of cows (0.7 versus 1.5 among malnourished; p<0.10) and a significantly higher number of poultry (8.6 versus 6.3; p<0.10). Households benefiting from microfinance have a significantly higher number of goats, sheep or pigs (7.5 versus 6.8 in the control group; p<0.10).

Households' Expenditures: Households' expenditures were adjusted for intrahousehold inequalities (household age and composition effects) using adult equivalence scales. The total monthly expenditures per adult equivalent varied between 0 and 173,750 Ugandan Shillings (Ush). They were 41,100 Ush on average. Households saved between zero and 100,000 ush monthly and 9,100 on average. The households spent most of their money for food (51 percent of their expenditures on average) followed by education (20 percent), transport (14 percent) and health (13 percent). The monthly food expenditures were 18,480 Ugandan Shillings. Household expenditures did not vary significantly neither by microfinance nor by nutritional status.

Microfinance Direct Effect on Household Wealth

Microfinance Direct Effect on household wealth was tested through a linear regression of the perceptive wealth status controlling for basic and immediate factors (respondent sex, location, household shock, household size, child sex, child age, individual income and individual social power). The results are given in table 4.3.2 (regression 1.4). The regression analysis shows a highly significant positive effect of microfinance on household wealth ($p < 0.01$ and a_{13} has a positive sign). This effect is small according to cohen standards ($\beta = 0.190$). Other significant and ameliorative determinants of household wealth are higher education levels in the family, higher individual income and social power ($p < 0.05$, $p < 0.01$, $p < 0.01$ respectively). Being a woman act as influential negative predictor ($p < 0.10$).

Tab. 4.3-2 Microfinance direct effect on household wealth: linear regression estimates

		Outcome Variable M ₃ Household Perceived Wealth (1.4)				
Predictors		Coeff. B	SE	95%CI	p	Coef. β
X	Microfinance Intervention					
	Credit since ≥ 6 months	a_{13} 0.280	0.097	0.088 to 0.472	0.004***	0.190
	Level 0: Inherent Factors					
	Madi-Okollo Settlement	-0.547	0.208	0.137 to 0.957	0.009***	0.179
	Imvepi Settlement	0.227	0.105	0.020 to 0.435	0.032**	0.137
	Household Size	-0.019	0.020	-0.057 to 0.020	0.333	-0.065
	Household Education Level	0.037	0.017	0.003 to 0.071	0.033**	0.149
	Shock	0.065	0.109	-0.149 to 0.280	0.549	0.040
	Female Respondent	-0.194	0.099	-0.389 to -0.001	0.051*	-0.132
	Child Age	0.004	0.003	-0.001 to 0.010	0.128	0.097
	Child Sex	0.133	0.091	-0.046 to 0.313	0.144	0.093
	Level 1: Immediate Factors					
M ₁	Monthly Profits in Ush	0.0001	0.0001	0.0001 to 0.0001	0.008***	0.177
M ₂	Social Power	0.911	0.309	0.301 to 1.520	0.004***	0.210
	Constant	-1.035	0.278	-1.584 to -0.487	0.000***	
	R ² M ₃ ,X,M ₁ M ₂				0.000***	
	N=205					

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

Microfinance effect on household wealth is illustrated in figure 4.3.1. The regression line demonstrates higher predicted wealth status among those households benefiting from microfinance intervention compared to the control group.

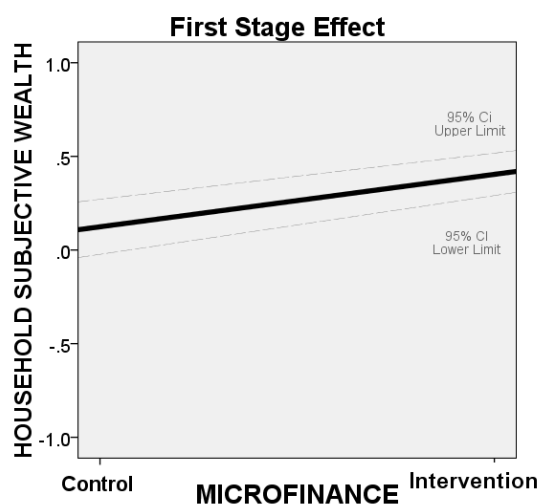


Fig. 4.3-1 Microfinance effect on household wealth (N=205 children)

Microfinance Indirect Effect on Household Wealth

The mediation of microfinance effect on household wealth has also been analysed.

Tab. 4.3-3 Microfinance total effect on household wealth: linear regression estimates

		Outcome Variable M_3 Household Perceived Wealth (0.4)			
Predictors		Coef. B	SE	95%CI	p
X	Microfinance Intervention				
	Credit since ≥ 6 months	0.293	0.101	0.094 to 0.493	0.004***
	Level 0: Inherent Factors				
	Madi-Okollo Settlement	0.461	0.216	0.035 to 0.886	0.034**
	Imvepi Settlement	0.230	0.109	0.014 to 0.445	0.037**
	Household Size	-0.011	0.020	-0.051 to 0.029	0.584
	Household Education Level	0.058	0.017	0.024 to 0.092	0.001***
	Shock	0.140	0.111	-0.079 to 0.359	0.208
	Female Respondent	-0.334	0.097	-0.525 to -0.142	0.001***
	Child Age	0.003	0.003	-0.002 to 0.009	0.247
	Child Sex	0.103	0.094	-0.083 to 0.288	0.276
	Constant	-0.457	0.232	-0.914 to 0.000	0.050*
$R^2_{M3,X}=0.201$					0.000***
N=205					

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$;

Estimates from regression 1.4 in table 4.3.2, regression 0.4 in table 4.3.3, regressions 0.2 in table 4.2.2 and 0.3 in table 4.2.4 do not confirm the hypotheses that microfinance effect on household wealth might be mediated through either respondents' income or social power. For each distal factor, microfinance mediated effect is positive but not significant according to 90 percent bias-corrected bootstrap tests. In fact, for both factors, the bootstrapped confidence intervals include zero ([minus 0.031 to 0.036] for income and [minus 0.022 to 0.052] for social power). Both factors are apparently not influenced through microfinance ($p \geq 0.10$). They do yet have an ameliorative affect on household wealth which is highly significant ($p < 0.01$, respectively) and small (standardised effect $\beta = 0.177$ and 0.210 , respectively). Estimates from the mediation analysis of microfinance effect on household wealth are summarised in table 4.3.4.

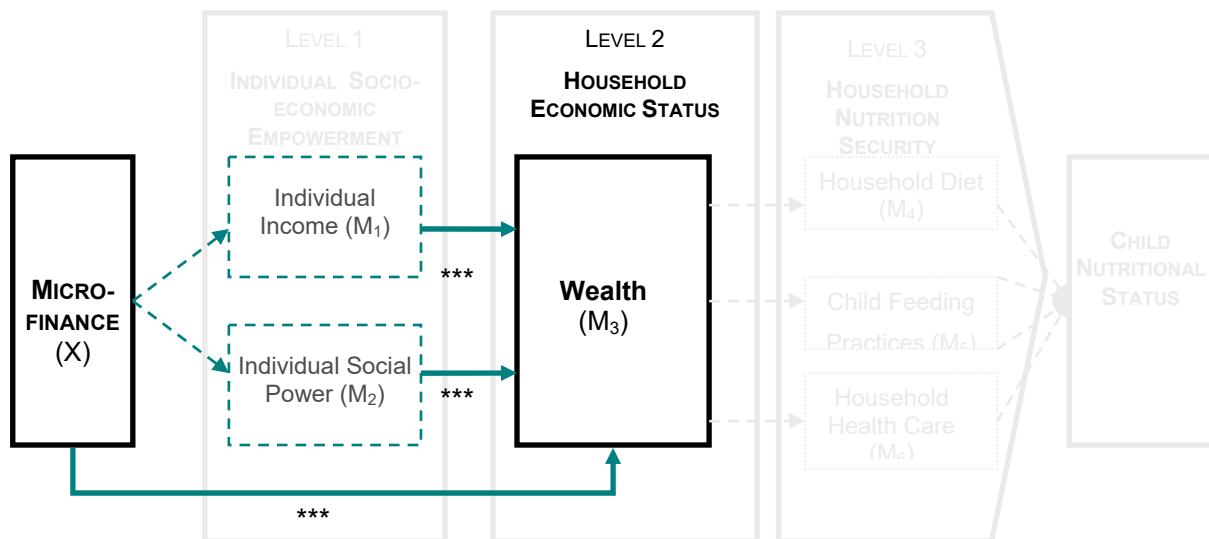
Tab. 4.3-4 Mediation of microfinance effect on household wealth

Model	Estimate	SE	p	95%		Standardised Estimate
				Lower CI	Upper CI	
MODEL 0 WITHOUT MEDIATOR						
MF→WEALTH (c_3)	0.293	0.101	0.004***	[0.126	- 0.460]	0.199
DISTAL MODEL 1						
Direct effect: MF→WEALTH (a_{13})	0.280	0.097	0.004***	[0.121	- 0.441]	0.191
Total indirect effect (c_3 - a_{13})	0.013	0.034		[-0.042	- 0.067]	0.009 ^b
Individual Income M₁						
MF → PROFITS (a_{11})	2040.365	7344.265	0.781	[-1244	- 16524]	0.020
PROFITS→WEALTH (b_{11})	0.0001	0.0001	0.008***	[0.0001	- 0.0001]	0.177
Indirect effect (a_{11} b_{11})	0.005	0.021		[-0.031	- 0.036]	0.004 ^b
Social Power M₂						
MF → POWER (a_{12})	0.009	0.023	0.701	[-0.036	- 0.054]	0.026
POWER →WEALTH (b_{12})	0.911	0.309	0.004***	[0.400	- 1.422]	0.210
Indirect effect (a_{12} b_{12})	0.008	0.022		[-0.022	- 0.052]	0.006 ^b

*lowly significant; **moderately significant; ***highly significant; b: Completely Standardized Indirect Effect

Summary

The following diagram illustrates microfinance effect on household wealth (result 3.1). The solid lines indicate a significant and small direct effect of microfinance on household wealth and of individual income or social power on household wealth. The analysis does not confirm an indirect effect of microfinance on household wealth through socio-economic empowerment at individual level.



Result 3.1 : Mediation of microfinance effect on household wealth

In particular, the mediation analysis of microfinance effect on household wealth shows that:

- Microfinance total effect on household wealth is highly significant, ameliorative and small (unstandardised effect=0.293; 95%CI: 0.126, 0.460; p=0.004; standardised effect=0.199)
- Microfinance direct effect on household wealth is highly significant, ameliorative and small (unstandardised effect=0.280; 95%CI: 0.121, 0.441; p=0.004; standardised effect=0.191)
- Microfinance indirect effect on household wealth through individual income is not significant (90%BootCI:-0.031, 0.036)
- Microfinance indirect effect on household wealth through individual social power is not significant (90%BootCI: 0.022, 0.052)
- Microfinance effect on individual income is not significant (p>0.10)
- Microfinance effect on social power is not significant (p>0.10)
- The effect of individual income on household wealth is highly significant, ameliorative and small (unstandardised effect=0.0001; 95%CI: 0.0001, 0.0001; p=0.008; standardised effect=0.177)
- The effect of individual social power on household wealth is highly significant, ameliorative and small (unstandardised effect=0.911; 95%CI: 0.400, 1.422; p=0.004; standardised effect=0.210).

4.3.2 Simple Mediation Analysis at an Intermediate Level

Tab. 4.3-5 Microfinance effect on height-for-age at intermediate level: linear regression estimates

		Outcome Variable Y: Child Height-for-Age z-score (2.1)					
Predictors		Coeff. B	SE	95%CI	p	Coef. β	
Microfinance Intervention							
X	Credit since ≥ 6 months	c'_1	0.385	0.247	-0.102 to 0.873	0.121	0.117
Level 0: Inherent Factors							
	Madi-Okollo Settlement		-0.341	0.527	-1.381 to 0.699	0.519	-0.050
	Imvepi settlement		0.134	0.265	-0.389 to 0.656	0.614	0.036
	Household Size		0.046	0.049	-0.050 to 0.143	0.342	0.071
	Household Education Level		0.097	0.044	0.011 to 0.183	0.027**	0.173
	Shock		-0.542	0.271	-1.078 to -0.007	0.047**	-0.148
	Female Respondent		0.208	0.249	-0.283 to 0.670	0.404	0.063
	Child Age		0.001	0.007	-.0131 to 0.014	0.922	0.007
	Child Sex		0.303	0.228	-0.146 to 0.752	0.185	0.094
Level 1: Distal Factors							
M ₁	Respondent's Monthly Profits in Ush	b_{11}	0.0001	0.0001	0.0001 to 0.0001	0.789	-0.020
M ₂	Respondent's Social Power	b_{12}	-0.810	0.788	-2.364 to 0.744	0.305	-0.083
Level 2 : Intermediate Factor							
M ₃	Household Wealth	b_{13}	0.270	0.179	-0.083 to 0.624	0.133	0.120
	Constant		-1.829	0.717	-3.243 to -0.414	0.012**	
	$R^2_{Y,XM1M2M3}$ =0.107					0.034**	
	N=205 children						

*p<0.10;**p<0.05;***p<0.01

Effect of Household Wealth on Nutritional Status: Second Stage Multivariate Analysis

The effect of household wealth on child nutritional status can be derived from the linear regression (2.1) of the child height-for-age z-score along with household wealth and other covariates at a distal and inherent level (table 4.3.5). It equals the value 0.270 of the coefficient b_{13} . The effect of household wealth on child nutritional status is positive but not significant ($p>0.10$).

Indirect Effect of Microfinance on Nutritional Status at an Intermediate Level

The indirect effect of microfinance on child height-for-age through household wealth equals $a_{13}b_{13}$ which has the positive value of 0.076 (table 4.3.6). This mediated effect is statistically significant at ten percent level according to bootstrap tests. In fact, the 90 percent bias-corrected bootstrapped confidence interval failed to include zero. It varies from plus 0.010 to plus 0.179. The regression analysis confirms that microfinance effect on child nutritional status is mediated through household wealth. This mediated effect is lowly significant and small (standardised effect=0.022).

Tab. 4.3-6 : Mediation of microfinance effect on height-for-age at intermediate level

Model	Estimate	SE	p	95%		Standardised Estimate
				Lower CI	Upper CI	
DISTAL MODEL 1						
Total effect: MF→HAZ (c'₁)	0.461	0.243	0.059*	[-0.018 -	0.940]	0.139
INTERMEDIATE MODEL 2						
Wealth M₃						
MF → WEALTH (a₁₃)	0.280	0.097	0.004***	[0.088 -	0.472]	0.190
WEALTH → HAZ (b₁₃)	0.270	0.180	0.133	[-0.083 -	0.624]	0.120
Direct effect: MF→HAZ (c'₁)	0.385	0.247	0.121	[-0.102 -	0.873]	0.117
Indirect effect (a₁₃ b₁₃)	0.076	0.051		[-0.001 -	0.227] ^{a*}	0.022 ^b

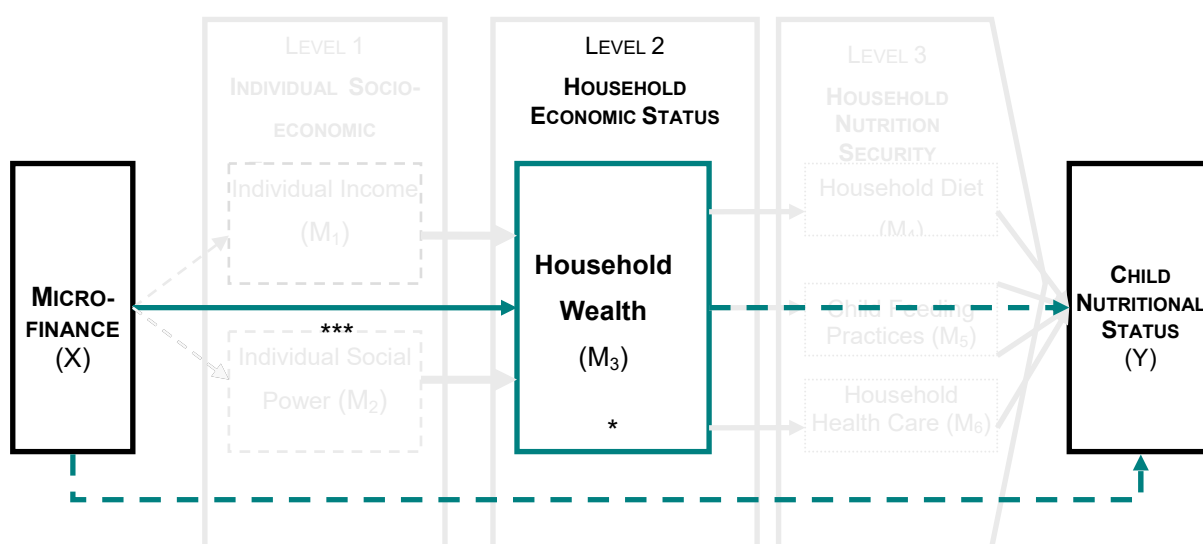
*lowly significant; **moderately significant; ***highly significant; a: 90%BootCI (0.010, 0.179) does not include zero;
b: Completely Standardised Indirect Effect

Summary

The mediation analysis at an intermediate level shows that:

- microfinance indirect effect on child nutritional status through household wealth is lowly significant, ameliorative and small (unstandardised effect=0.076; 90%BootCI: 0.010, 0.179; standardised effect=0.022)
- microfinance direct effect on child nutritional status at an intermediate level is not significant ($p>0.10$)
- microfinance effect on household wealth is highly significant, ameliorative and small (unstandardised effect= 0.280; 95%CI: 0.088, 0.472; $p=0.004$; standardised effect= 190)
- The effect of household wealth on child nutritional status is not significant ($p>0.10$)

The following diagram portrays the results of the analysis of household wealth as a potential mediator of microfinance effect on child nutritional status (result 3.2). The mediation analysis confirms the positive and mediating role of household wealth which is illustrated by the solid green line of the "wealth" box. This mediation of microfinance effect through household wealth is a full mediation as the direct effect at intermediate level is no longer significant.



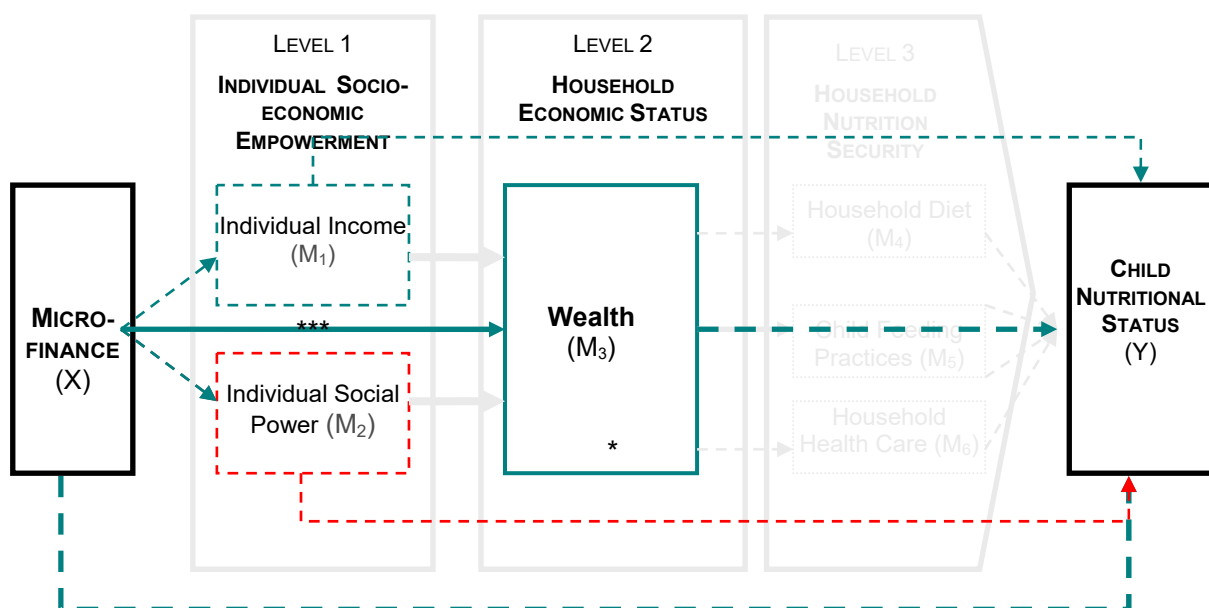
Result 3.2 : Mediation of microfinance effect on child nutritional status at an intermediate level

4.3.3 Concluding Remarks

The mediation analysis of microfinance effect on child nutritional status at distal and intermediate levels so far showed that:

- Microfinance effect on child nutritional status is significantly mediated through household wealth. This effect is lowly significant, ameliorative and small.
- Microfinance effect on household wealth is not significantly mediated through individual income.
- Microfinance effect on household wealth status is not significantly mediated through individual social power.
- Microfinance effect on household wealth is highly significant, ameliorative and small.
- Microfinance effect on individual income is not significant.
- Microfinance effect on social power is not significant.
- The effect of household wealth on child nutritional status is not significant
- The effect of individual income on child nutritional status is not significant
- The effect of individual social power on child nutritional status is not significant
- Microfinance direct effect on child nutritional status is lowly significant at distal level but no longer significant at intermediate level.

These results are illustrated on the following diagram (result 3.3).

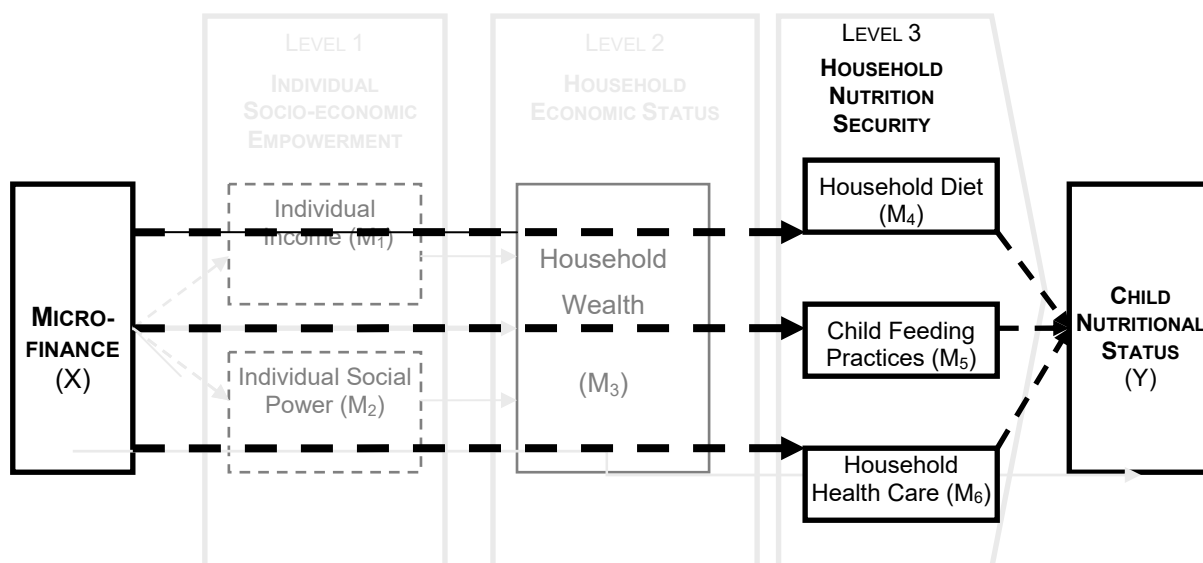


Result 3.3 : Mediation of microfinance effect on child nutritional status at distal & intermediate levels

The dashed lines indicate that there is no indirect effect of microfinance on child nutritional status through individual income or social power. The solid line confirms an indirect full effect through improved household wealth.

In the next section, we will consider an extended model which includes the following potential mediators at a proximal level: household diet, child feeding practices and health care.

4.4 MEDIATION AT A PROXIMAL LEVEL: HOUSEHOLD NUTRITION SECURITY



Model 4 : Mediation of microfinance effect on child nutritional status at a proximal level

At a proximal level, we hypothesize that microfinance influences child nutritional status through better household nutrition security in its three dimensions: household diet, health care and child feeding practices (Hypothesis H4). This central hypothesis can be divided in the following part hypotheses:

- *H4.1 Microfinance influences household diet*
- *H4.2 Microfinance influences child feeding practices*
- *H4.3 Microfinance influences household health care*
- *H4.4 Household diet influences child nutritional status*
- *H4.5 Child feeding practices influence child nutritional status*
- *H4.6 Household health care influence child nutritional status*
- *H4.7 Microfinance effect is mediated through household diet*
- *H4.8 Microfinance effect is mediated through child feeding practices*
- *H4.9 Microfinance effect is mediated through household health care*

The analysis exposed in this chapter consists in describing the nutritional situation of the sampled households and in testing each of the hypothesized effects in the corresponding following sub-sections.

4.4.1 Household Diet

Descriptive & Bivariate Analysis

Household diet has two aspects: a quantitative and a qualitative one. The quantitative aspect can be expressed as the frequency of meals taken by the family members during a day. The qualitative aspects include the diversity of food items that have been consumed. An index taking into account both dimensions is a good mean of categorising households according to their diet profile. This diet profile is given in table 4.4.1 for all 139 households as well as by microfinance and nutritional status.

Tab. 4.4-1 Household diet by microfinance & nutritional profile: group means & proportions

	All (N=139)	Microfinance		p	Child Height-for-Age	
		Interv. (N=83)	Control (N=56)		OK (N=150)	<-2SD (N=55)
Diet Summary index	-0.27	-0.18	-0.41	*	-0.25	-0.29
<i>Ideal Diet (index=1)</i>	17%	20%	13%		17%	16%
<i>Middle Diet (index=0)</i>	38%	41%	34%		40%	38%
<i>Bad diet (index=-1)</i>	45%	39%	54%	*	43%	45%
Meal Frequency	2.48	2.60	2.30	*	2.53	2.58
1 meal/day	18%	13%	25%	*	14%	22%
2 meal/day	27%	25%	29%		29%	24%
≥3 meals/day	55%	61%	46%	*	57%	55%
Dietary diversity Index	2.83	2.86	2.77		2.85	2.76
<i>Fully balanced diet (index=4)</i>	23%	25%	19%		22%	26%
<i>Minimum Dietary diversity (3 or 4)</i>	61%	60%	62%		64%	57%
<i>Dietary diversity=3</i>	38%	35%	43%		42%	31%
<i>Dietary diversity=2</i>	32%	36%	27%		31%	35%
<i>Dietary diversity=1</i>	4%	1%	7%		3%	7% *
<i>Carbohydrate-rich food</i>	94%	98%	90%	**	95%	89%
<i>Protein-rich food</i>	94%	94%	94%		93%	98%
<i>Fat-rich food</i>	53%	56%	50%		55%	46%
<i>Vitamin-rich Food</i>	41%	40%	43%		41%	42%
Subjective Change in Diet	-0.07	-0.05	-0.09		-0.05	-0.20
<i>Improved (1)</i>	27%	28%	25%		28%	22%
<i>No Change(0)</i>	40%	40%	39%		40%	36%
<i>Worsened(-1)</i>	33%	33%	34%		32%	42%

*p<0.1; **p<0.05; ***p<0.01

The results indicate that the household diet tended to be rather bad than ideal. The mean diet summary index was negative. Only 17 percent of the households had an ideal diet. The households took two meals per day on average. Some 45 percent did not manage to eat thrice daily. The results on the diet quality indicate that about one fourth had a fully balanced diet. Some 61 percent reached the minimum dietary diversity composed of at least three nutrient categories. The diet was generally rich in carbohydrate and in protein. Vitamin and fat-rich food were less frequent. The respondents were asked about their perception of change in the household's diet in the year preceding the interview. Their responses reveal that the diet tended to be worse on average. Only 27 percent felt an improvement in the diet quantity and quality.

A comparison along the microfinance variable shows that households benefiting from microfinance had a significantly better diet compared to controls. The microfinance group had a higher mean summary index, a lower proportion with a bad diet, a higher mean frequency of meals, a lower proportion with only one meal per day, a higher proportion with three meals per day and a higher proportion with a carbohydrate-rich diet. The difference was significant at five percent level for the indicator of carbohydrate-rich diet. It was lowly significant for the other indicators ($p < 0.10$).

A comparison between malnourished and well-nourished children indicates a significant difference only for the quality of the household diet. The group of malnourished children had a significantly higher proportion with a household diet composed of only one food category ($p < 0.10$). This could suggest that an unbalanced diet at household level could be a risk factor for child malnutrition.

Microfinance Direct Effect on Household Diet

Microfinance Direct Effect on household diet can be assessed from regression 2.5 in table 4.4.2 which takes into account all potential predictors of household diet at distal and intermediate levels. The positive sign of coefficient a_{14} indicates that microfinance direct effect on household diet might be ameliorative. This effect equals 0.244 and the t-test shows that it is significant at five percent level. It is considered as a small effect according to Cohen benchmarks ($\beta = 0.162$). Some inherent factors also affect household diet. The education level of the family members is a positive and significant predictor of a better household diet ($p < 0.05$). In contrast, female respondents and large families have a lower household diet level and this relation is highly significant.

Tab. 4.4-2 Microfinance effect on household diet at intermediate level: linear regression estimates

		Outcome Variable M_4 Diet Summary Index (2.5)					
Predictors			Coeff. B	SE	95%CI	p	Coef. β
Microfinance Intervention							
X	Credit since ≥ 6 months	a_{14}	0.244	0.100	0.046 to 0.442	0.016**	0.162
Level 0: Inherent Factors							
	Madi-Okollo Settlement		-0.214	0.214	-0.636 to 0.209	0.320	-0.068
	Imvepi Settlement		-0.154	0.108	-0.366 to 0.059	0.155	-0.091
	Household Size		-0.068	0.020	-0.107 to -0.029	0.001***	-0.229
	Household Education Level		0.044	0.018	0.009 to 0.079	0.013**	0.173
	Shock		-0.165	0.110	-0.383 to 0.052	0.136	-0.099
	Female Respondent		-0.409	0.101	-0.608 to -0.209	0.000***	-0.271
	Child Age		-0.001	0.003	-0.006 to 0.005	0.834	-0.013
	Child Sex		-0.075	0.093	-0.258 to 0.107	0.418	-0.051
Level 1: Distal Factors							
M_1	Monthly Profits in Ush	b_{11}	0.0001	0.000	0.000 to 0.000	0.408	-0.055
M_2	Social Power	b_{12}	-0.105	0.320	-0.737 to 0.526	0.743	-0.024
Level 2: Intermediate Factor							
M_3	Household Wealth	b_{13}	0.323	0.073	0.179 to 0.466	0.000***	0.315
	Constant		0.183	0.291	-0.392 to 0.758	0.531	
	$R^2_{M4, XM1M2M3}$					0.000***	
	N=205						

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Microfinance direct effect on household diet is illustrated in figure 4.4.1. The curve shows a clear increase in the level of the predicted diet from the control group to the intervention group.

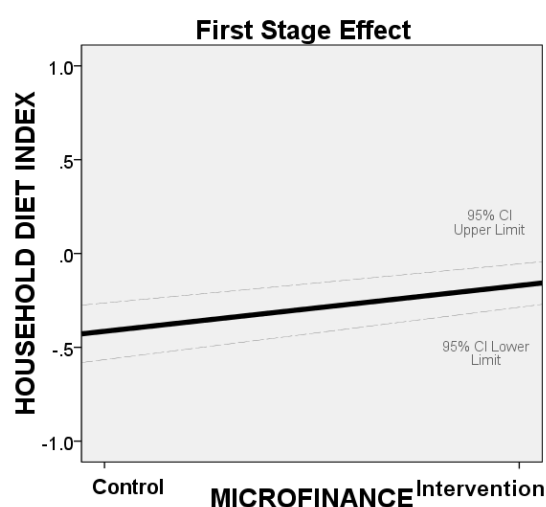


Fig. 4.4-1 Microfinance effect on household diet (N=205)

Microfinance Indirect Effect on Household Diet through Household Wealth

Mediation analyses based on estimates from regression 1.4, 2.5, and 1.5 (tables 4.3.2, 4.4.2, and 4.4.3, respectively) showed that microfinance effect on household diet might be mediated through household economic wealth. In fact, microfinance is a significantly ameliorative predictor of wealth (effect=0.280; $p<0.01$) and wealth is a significantly ameliorative predictor of household diet (effect=0.323; $p<0.01$). These effects are respectively small and medium as inferred from the beta coefficients ($\beta=0.190$; $\beta=0.315$, respectively). Bootstrap tests show a positive and highly significant indirect effect of microfinance on household diet through household wealth (indirect effect =0.090; %99BootCI [0.005, - 0.249]). This indirect effect is small according to Cohen benchmarks (standardised indirect effect=0.061). Microfinance's direct path to household diet remains nevertheless significant (direct effect=0.244; $p<0.05$). The direct effect is small ($\beta=0.161$). The indirect microfinance effect through household wealth is thus a partial one. According to the ratio indirect to total effect, household wealth mediates approximatively one fourth of the total effect of microfinance on household diet.

Tab. 4.4-3 Microfinance effect on household diet at distal level: linear regression estimates

		Outcome Variable M_4 Diet Summary Index (1.5)					
Predictors		Coeff. B	SE	95%CI	p	Coef. β	
X	Microfinance Intervention						
	Credit since ≥ 6 months	0.334	0.103	[0.131 - 0.537]	0.001***	0.222	
	Level 0: Inherent Factors						
	Madi-Okollo Settlement	-0.037	0.220	[-0.472 - 0.398]	0.866	-0.012	
	Imvepi Settlement	-0.080	0.111	[-0.300 - 0.139]	0.471	-0.048	
	Household Size	-0.074	0.021	[-0.115 - -0.033]	0.000***	-0.250	
	Household Education	0.056	0.018	[0.020 - 0.093]	0.002***	0.220	
	Shock	-0.144	0.115	[-0.372 - 0.083]	0.213	-0.086	
	Female Respondent	-0.471	0.105	[-0.678 - -0.265]	0.000***	-0.313	
	Child Age	0.001	0.003	[-0.005 - 0.007]	0.793	0.017	
	Child Sex	-0.032	0.096	[-0.222 - 0.158]	0.739	-0.022	
	Level 1: Distal Factors						
M_1	Monthly Profits in Ush	0.000	0.000	[0.000 - 0.000]	0.993	0.001	
M_2	Social Power	0.188	0.328	[-0.458 - 0.835]	0.566	0.043	
	Constant	-0.151	0.295	[-0.732 - 0.430]	0.609		
	$R^2_{M_4, X, M_1, M_2}=0.218$				0.000***		
	N=205						

* $p<0.1$; ** $p<0.05$; *** $p<0.01$

Microfinance Indirect Effect on Household Diet through Individual Income and Social Power

In contrast, estimates from regression 1.5 in table 4.4.3 and regressions 0.2 and 0.3 in tables 4.2.2 and 4.2.4 do not confirm the hypotheses that microfinance effect on household diet might be mediated through respondent's income or social power at immediate level. Both factors do not affect household diet significantly and are not apparently influenced through microfinance. Microfinance mediated effect through individual income is negative. The indirect effect through social power is positive. But for each individual factor, bootstrap tests indicate a non-significant indirect effect (90%BootCI: [-0.009, 0.010] for income and [-0.006, 0.027] for social power, respectively).

Tab. 4.4-4 Microfinance total effect on household diet: linear regression estimates

		Outcome Variable M_4 Diet Summary Index					
Predictors		(0.5)					
		Coeff. B	SE	95%CI		p	Coef. β
X	Microfinance Intervention						
	Credit since ≥ 6 months	0.336	0.102	[0.134	- 0.538]	0.001***	0.223
	Level 0: Inherent Factors						
	Madi-Okollo Settlement	-0.048	0.218	[-0.479	- 0.383]	0.825	-0.016
	Imvepi Settlement	-0.080	0.111	[-0.299	- 0.139]	0.471	-0.047
	Household Size	-0.072	0.020	[-0.112	- -0.032]	0.000***	-0.244
	Household Education	0.059	0.018	[0.025	- 0.094]	0.001***	0.232
	Shock	-0.131	0.113	[-0.353	- 0.091]	0.247	-0.078
	Female Respondent	-0.485	0.098	[-0.679	- -0.291]	0.000***	-0.322
	Child Age	0.001	0.003	[-0.005	- 0.006]	0.825	0.014
	Child Sex	-0.038	0.095	[-0.226	- 0.150]	0.687	-0.026
	Constant	-0.048	0.235	[-0.512	- 0.415]	0.838	
	$R^2_{M_4, X}=0.217$					0.000***	
	N=205						

*p<0.1; **p<0.05; ***p<0.01

Summary

Estimates from the mediation analysis of microfinance effect on household diet are summarised in table 4.4.5.

Tab. 4.4-5 Mediation of microfinance effect on household diet

	Estimate	SE	p	95%		Standardised Estimate
				Lower CI	Upper CI	
INTERMEDIATE MODEL 2						
Wealth M₃						
First Stage X→M ₃ (a ₁₃)	0.280	0.097	0.004***	[0.088 -	0.472]	0.190
Second Stage M ₃ →M ₄ (b ₁₃)	0.323	0.073	0.000***	[0.179 -	0.466]	0.315
Direct Effect X→ M ₄ (a ₁₄)	0.244	0.100	0.016**	[0.046 -	0.442]	0.162
Indirect Effect X→M ₃ →M ₄	0.090	0.038	-	[0.030 -	0.177]***a	0.061 ^c
Total intermediate Effect X→ M ₄	0.334	0.103	0.001***	[0.131 -	0.537]	0.222
Ratio indirect/Total Effect	0.270	0.003	-	[0.075 -	0.069]	-
DISTAL MODEL 1						
Individual Income M₁						
First Stage X→M ₁ (a ₁₁)	2040.4	7344.3	0.781	[-12444 -	16524]	0.020
Second Stage M ₁ →M ₄	0.000	0.000	0.993	[0.000 -	0.000]	0.001
Indirect Effect X→M ₁ →M ₄	0.000	0.007	-	[-0.017 -	0.013] ^b	0.000 ^c
Ratio indirect/Total Effect	0.000	0.029	-	[-0.052 -	0.054]	-
Social Power M₂						
First Stage X→M ₂ (a ₁₂)	0.009	0.023	0.701	[-0.036 -	0.054]	0.026
Second Stage M ₂ →M ₄	0.188	0.328	0.566	[-0.458 -	0.835]	0.043
Indirect Effect X→M ₂ →M ₄	0.002	0.010	-	[-0.011 -	0.031] ^b	0.001 ^c
Ratio indirect/Total Effect	0.005	0.043	-	[-0.041 -	0.119]	-
All Distal Mediators						
Direct Effect X→ M ₄	0.334	0.103	0.001***	[0.131 -	0.537]	0.222
Indirect Effect X→M ₁ ,M ₂ →M ₄	0.002	0.011	-	[-0.023 -	0.026] ^b	0.001 ^c
Total distal Effect X→ M ₄	0.336	0.102	0.001***	[0.134 -	0.538]	0.223
Ratio indirect/Total Effect	0.005	0.049	-	[-0.075 -	0.092]	-

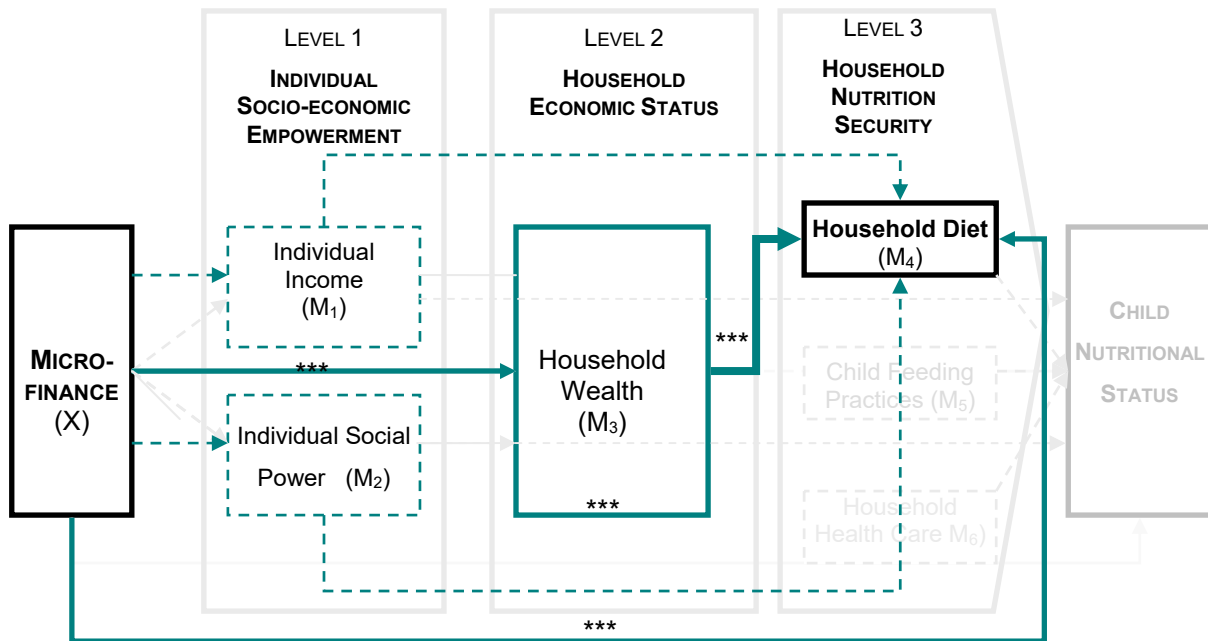
*lowly significant;**moderately significant;***highly significant; a : 99%BootCI also includes zero: [0.005, 0.249]; b: 90%BootCI does not include zero neither: for individual income (-0.09, 0.010) nor for social power (-0.006, 0.027) nor for both distal mediators (-0.012-0.024); c: Completely Standardized Indirect Effect

The mediation analysis of microfinance effect on household diet indicates that:

- Microfinance total effect on household diet is highly significant, ameliorative and small (unstandardised effect=0.336; 95%CI: 0.134, 0.538; p=0.001; standardised effect=0.223 in table 4.4.4).
- Microfinance effect on household diet is significantly mediated through household wealth. This effect is highly significant, ameliorative and small (unstandardised indirect effect: 0.090; 99%BootCI: 0.005, 0.249; standardised indirect effect: 0.061).
- The effect of household wealth on household diet is highly significant, ameliorative and medium (unstandardised effect=0.323; 95%CI: 0.179, 0.466; p=0.000; standardised effect=0.315).
- Microfinance effect on household wealth is highly significant, ameliorative and small (unstandardised effect=0.280; 95%BootCI: 0.088, 0.472, p=0.004; standardised effect=0.190).

- Microfinance effect on household diet is neither mediated through individual income nor through social power (90%BootCI=-0.009 to 0.010 and -0.006 to 0.027, respectively).

These results are illustrated on a diagram (result 4.1).



Result 4.1 Mediation of microfinance effect on household diet

The dashed lines show that microfinance effect on household diet is neither mediated through individual income nor through social power. The solid lines confirm a partial mediation through household wealth.

4.4.2 Child Feeding Practices

Descriptive & Bivariate Analysis

Child care was assessed by recording feeding practices for only one child per household. These 139 index children are the youngest children of the household aged between 6 and 60 months. Children breastfeeding and feeding practices¹⁹ are described in table 4.4.6 for the whole sample as well as by presence or absence of stunted children and established borrowers in the household.

Tab. 4.4-6 Child feeding practices by microfinance & nutritional profile: group means & proportions

	All (N=139)	Microfinance		p	Child Height-for-Age		p
		Interv. (N=83)	Control (N=56)		OK (N=150)	<-2SD (N=55)	
Child Feeding Index	0.27	0.25	0.30		0.33	0.22	
<i>Ideal Feeding Practice (Score=4)</i>	29%	28%	32%		33%	25%	
<i>Middle Feeding Practice (Score 2-3)</i>	68%	70%	66%		66%	71%	
<i>Bad Feeding Practice (Score 0-1)</i>	2%	2%	2%		1%	4%	
Child Feeding Practices							
Ever Breastfed (1)	99%	99%	100%		100%	98%	
Breastfeeding Initiation ≤ 24h (1)	57%	58%	55%		57%	56%	
Continued Breastfeeding 2 years(1)	85%	84%	86%		91%	75%	***
Complementary Foods (1)	68%	67%	68%		66%	71%	

*p<0.1;**p<0.05;***p<0.01

All index children but one (99 percent) had ever been breastfed. Breastfeeding was initiated between 30 minutes and 60 days within birth (average: 41.9 hours). Some 14 percent of the children were breastfed in the hour following their birth and in total 57 percent within 24 hours. According to the 24-hour recall, 48 percent of the children were not breastfed at the time of the survey. Among those children already weaned, the breastfeeding duration varied between zero and 48 months and was of an average of 22 months. None of the children were exclusively breastfed. Two third received solid foods either in addition to breast milk (complementary breastfeeding: 31 percent) or without breast milk (35 percent). The rest was receiving only water or other liquids like tea, sweet water or milk either in addition to breast milk (predominant or mixed breastfeeding: 21 percent) or just so (10 percent). Fifteen percent were no longer breastfed although younger than 20 months.

¹⁹ The child feeding indicators are adjusted for age according to the official WHO recommendations (WHO, 2007). Breastfeeding patterns, complementary feeding and assistance to eat vary significantly according to the age of the index child.

A child feeding index was constructed based on the following four criteria: ever breastfed, early breastfeeding initiation, continued breastfeeding at 20 months and receiving solid foods. According to this index, the majority of the index children benefited from middle feeding practices (68 percent). Only 29 percent had ideal feeding practices. A comparison along the microfinance or the nutritional status profile of the children shows that there were no significant differences in the child feeding index. Only the specific practice of prolonged breastfeeding varied significantly between well-nourished and malnourished children ($p < 0.00$). In fact 25 percent of the malnourished children did not benefit from a prolonged breastfeeding while this was the case for only nine percent among the well-nourished ones.

Microfinance Direct Effect on Child Feeding Practices: First Stage Multivariate Analysis

Microfinance direct effect on child feeding practices can be assessed from regression 2.6 in table 4.4.7 which takes into account all potential predictors of child feeding. The negative sign of coefficient a_{15} indicates a deteriorative effect of microfinance on child care. This effect equals -0.137 and the t-test shows that it is significant at the ten percent level. It is a small effect according to Cohen benchmarks ($\beta = -0.136$). Some inherent factors like the presence of household shocks also adversely affect child feeding practices. These negative effects are highly significant and of medium size ($p < 0.01$; $\beta = -0.384$). In contrast, household wealth represents a positive and lowly significant predictor of child care ($p < 0.10$).

Tab. 4.4-7 Microfinance effect on child feeding practices at intermediate level: linear regression estimates

		Outcome Variable M_5 Child Feeding Index (2.6)					
Predictors		Coeff. B	SE	95%CI	p	Coef. β	
Microfinance Intervention							
X	Credit since ≥ 6 months a_{15}	-0.137	0.070	[-0.275 - 0.001]	0.052*	-0.136	
Level 0: Inherent Factors							
	Madi-Okollo Settlement	-0.600	0.149	[-0.894 - -0.306]	0.000***	-0.289	
	Imvepi Settlement	-0.230	0.075	[-0.378 - -0.082]	0.002***	-0.204	
	Household Size	0.015	0.014	[-0.012 - 0.043]	0.265	0.078	
	Household Education	0.019	0.012	[-0.006 - 0.043]	0.131	0.110	
	Shock	-0.428	0.077	[-0.579 - -0.276]	0.000***	-0.384	
	Female Respondent	0.021	0.070	[-0.118 - 0.159]	0.771	0.020	
	Child Age	0.003	0.002	[-0.001 - 0.007]	0.186	0.087	
	Child Sex	0.042	0.064	[-0.085 - 0.168]	0.519	0.042	
Level 1: Distal Factors							
M_1	Monthly Profits in Ush	0.000	0.000	[0.000 - 0.000]	0.531	0.044	
M_2	Social Power	-0.275	0.223	[-0.714 - 0.164]	0.219	-0.093	
Level 2: Intermediate Factor							
M_3	Household Wealth	0.088	0.051	[-0.012 - 0.188]	0.085*	0.129	
	Constant	0.553	0.203	[0.154 - 0.953]	0.007***		
$R^2_{M5, XM1M2M3} = 0.228$					0.000***		
N=205							

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Microfinance direct effect on child feeding practices is illustrated in figure 4.4.2. The curve shows a clear decrease in the level of the predicted child feeding index from the control group to the intervention group.

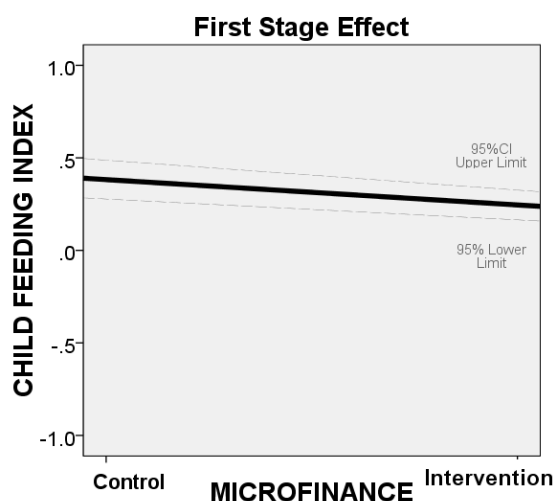


Fig. 4.4-2 Microfinance effect on child feeding practices (N=205)

Microfinance indirect Effect on Child Feeding Practices through Household Wealth

Mediation analyses based on estimates from regressions 1.4 and 2.6 (tables 4.3.2 and 4.4.7) show that microfinance effect on child feeding practices might be mediated through household economic wealth. In fact, microfinance is a significant ameliorative predictor of wealth (effect=0.280; $p<0.01$) and wealth is a significant ameliorative predictor of child feeding practices (effect=0.088; $p<0.10$). Bootstrap tests show a positive and significant indirect microfinance effect on child feeding practices through household wealth (indirect effect =0.025; 95% BootCI=[0.000 to 0.069]). This effect is moderately significant and of small size (standardised indirect effect: 0.026). Microfinance's direct path to child feeding practices yet remains lowly significant (direct effect= minus 0.137; $p<0.10$). The indirect microfinance effect on child feeding practices through household wealth is thus a partial one. According to the ratio indirect to total effect, household wealth mediates about 22 percent of the total effect of microfinance on child feeding practices.

Tab. 4.4-8 Microfinance effect on child feeding practices at distal level: linear regression estimates

		Outcome Variable M ₅ Child Feeding Index (1.6)					
Predictors		Coeff. B	SE	95%CI	p	Coef. β	
Microfinance Intervention							
X	Credit since ≥ 6 months	-0.112	0.069	[-0.248 - 0.023]	0.104	-0.112	
Level 0: Inherent Factors							
	Madi-Okollo Settlement	-0.552	0.147	[-0.842 -0.262]	0.000***	-0.265	
	Imvepi Settlement	-0.210	0.074	[-0.357 - -0.063]	0.005***	-0.186	
	Household Size	0.014	0.014	[-0.014 - 0.041]	0.322	0.069	
	Household Education	0.022	0.012	[-0.002 - 0.046]	0.074*	0.129	
	Shock	-0.422	0.077	[-0.574 - -0.270]	0.000***	-0.378	
	Female Respondent	0.003	0.070	[-0.135 - 0.142]	0.961	0.003	
	Child Age	0.003	0.002	[-0.001 - 0.007]	0.131	0.100	
	Child Sex	0.053	0.064	[-0.074 - 0.180]	0.409	0.054	
Level 1: Distal Factors							
M ₁	Monthly Profits in Ush	0.000	0.000	[0.000 - 0.000]	0.334	0.067	
M ₂	Social Power	-0.195	0.219	[-0.626 - 0.237]	0.375	-0.066	
	Constant	0.462	0.197	[0.074 - 0.850]	0.020**		
	R ² _{M5,XM1M2} =0.216				0.000***		
	N=205						

*p<0.1;**p<0.05;***p<0.01

Microfinance Indirect Effect on Child Feeding Practices through Individual Income and Social Power

In contrast, estimates from regression 1.6 in table 4.4.8 and regressions 0.2 and 0.3 in tables 4.2.2 and 4.2.4 do not confirm the hypotheses that microfinance effect on child feeding practices might be mediated through either respondents' income or social power at distal level. Both factors do not significantly affect child feeding practices and they are not apparently influenced through microfinance. Microfinance mediated effect through individual income is positive. The indirect effect through social power is negative. But for each individual factor, bootstrap tests indicate a non-significant indirect effect (90%BootCI: [minus 0.007 to plus 0.017] for income and [minus 0.025 to 0.006] for social power).

Tab. 4.4-9 Microfinance total effect on child feeding practices: linear regression estimates

		Outcome Variable M_5 Child Feeding Index (0.6)					
Predictors		Coeff. B	SE	95%CI	p	Coeff. β	
X	Microfinance Intervention						
	Credit since ≥ 6 months	-0.113	0.069	[-0.248 - 0.023]	0.102	-0.112	
	Level 0: Inherent Factors						
	Madi-Okollo Settlement	-0.549	0.146	[-0.838 - -0.260]	0.000***	-0.264	
	Imvepi Settlement	-0.210	0.074	[-0.357 - -0.064]	0.005***	-0.186	
	Household Size	0.011	0.014	[-0.015 - 0.038]	0.403	0.058	
	Household Education	0.021	0.012	[-0.002 - 0.044]	0.078*	0.122	
	Shock	-0.433	0.075	[-0.582 - -0.285]	0.000***	-0.389	
	Female Respondent	-0.002	0.066	[-0.132 - 0.128]	0.971	-0.002	
	Child Age	0.003	0.002	[-0.001 - 0.007]	0.122	0.102	
	Child Sex	0.060	0.064	[-0.066 - 0.186]	0.351	0.061	
	Constant	0.377	0.157	[0.067 - 0.688]	0.017**		
	$R^2_{M_5, X} = 0.210$				0.000***		
	N=205						

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Summary

Estimates from the mediation analysis of microfinance effect on child feeding practices are summarised in table 4.4.10.

Tab. 4.4-10 Mediation of microfinance effect on child feeding practices

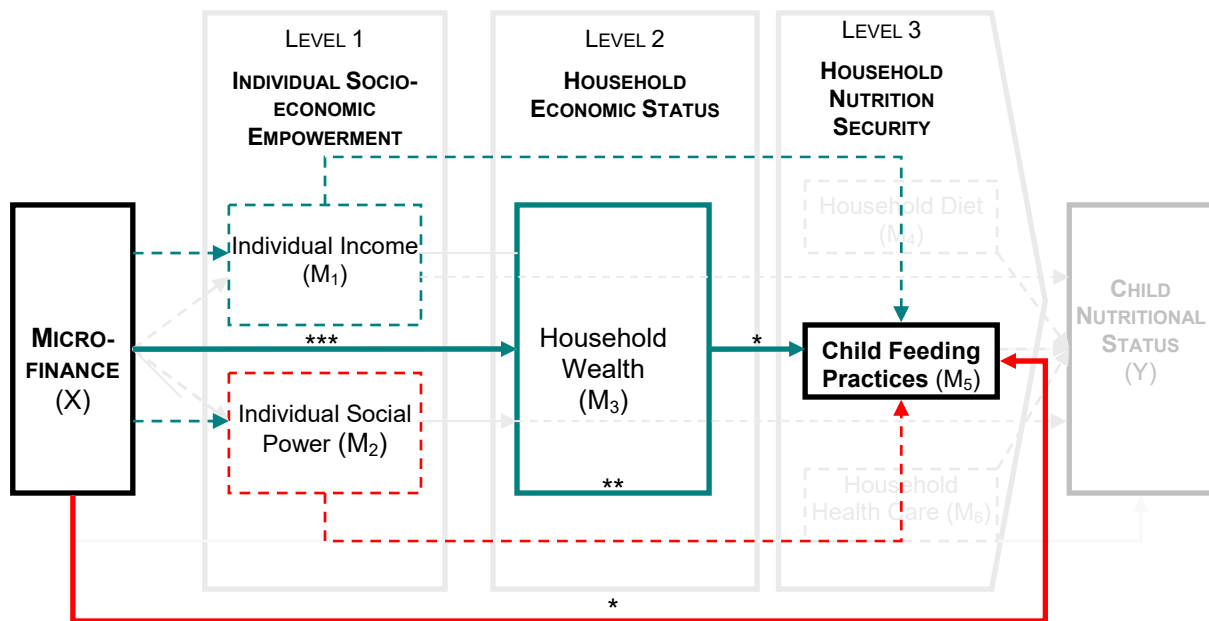
	Estimate	SE	p	95%		Standardised Estimate
				Lower CI	Upper CI	
INTERMEDIATE MODEL						
Wealth M_3						
First Stage $X \rightarrow M_3$ (a_{13})	0.280	0.097	0.004***	[0.088 - 0.472]		0.190
Second Stage $M_3 \rightarrow M_5$ (b_{13})	0.088	0.051	0.085*	[-0.012 - 0.188]		0.129
Direct Effect $X \rightarrow M_5$ (a_{15})	-0.137	0.070	0.052*	[-0.275 - 0.001]		-0.136
Indirect Effect $X \rightarrow M_3 \rightarrow M_5$	0.025	0.017	-	[0.000 - 0.069] ^{a**}		0.026 ^c
Total intermediate Effect $X \rightarrow M_5$	-0.112	0.069	0.104	[-0.248 - 0.023]		-0.112
Ratio indirect/Total Effect	-0.219	82.278	-	[-6.095 - 0.138]		-
DISTAL MODEL						
Individual Income M_1						
First Stage $X \rightarrow M_1$ (a_{11})	2040.365	7344.265	0.781	[-12444 - 16524]		0.020
Second Stage $M_1 \rightarrow M_5$	0.000	0.000	0.334	[0.000 - 0.000]		0.067
Indirect Effect $X \rightarrow M_1 \rightarrow M_5$	0.001	0.008	-	[-0.009 - 0.022] ^b		0.001 ^c
Ratio indirect/Total Effect	-0.012	0.658	-	[-1.206 - 0.125]		-
Social Power M_2						
First Stage $X \rightarrow M_2$ (a_{12})	0.009	0.023	0.701	[-0.036 - 0.054]		0.026
Second Stage $M_2 \rightarrow M_5$	-0.195	0.219	0.375	[-0.626 - 0.237]		-0.066
Indirect Effect $X \rightarrow M_2 \rightarrow M_5$	-0.002	0.007	-	[-0.025 - 0.007] ^b		-0.002 ^c
Ratio indirect/Total Effect	0.015	0.699	-	[-0.093 - 0.758]		-
All Distal Mediators						
Direct Effect $X \rightarrow M_5$	-0.112	0.069	0.104	[-0.248 - 0.023]		
Indirect Effect $X \rightarrow M_1, M_2 \rightarrow M_5$	0.000	0.010	-	[-0.022 - 0.016] ^b		0.000 ^c
Total distal Effect $X \rightarrow M_5$	-0.113	0.069	0.102	[-0.248 - 0.023]		-0.112
Ratio indirect/Total Effect	0.003	1.110	-	[-0.617 - 0.367]		-

*lowly significant; **moderately significant; ***highly significant; a: 99%BootCI includes zero; ; b: 90%BootCI also includes zero (for individual income, social power and both distal mediators); c: Completely Standardised Indirect Effect

The mediation analysis of microfinance effect on child feeding practices reveals that:

- Microfinance total effect on child feeding practices is not significant ($p > 0.10$ in table 4.4.9)
- Microfinance effect on child feeding practices is significantly mediated through household wealth. This indirect effect is moderately significant, ameliorative and small (unstandardised indirect effect: 0.025; 95%BootCI: 0.000, 0.069; standardised indirect effect= 0.026)
- Microfinance direct effect on child feeding practices is lowly significant, deteriorative and small (unstandardised effect= -0.137; 95%CI: -0.275, 0.001; $p = 0.052$; standardised effect=-0.136)
- The effect of household wealth on child feeding practices is lowly significant, ameliorative and small (unstandardised effect: 0.088; 95%CI: -0.112, 0.188; $p = 0.085$; standardised effect=0.129)
- Microfinance effect on household wealth is highly significant, ameliorative and small (unstandardised effect:0.280; 95%CI: 0.088, 0.472; $p = 0.004$)
- Microfinance effect on child feeding practices is neither mediated through individual income nor through social power (90%BootCI=-0.007 to 0.017 and -0.025 to 0.006, respectively).

In summary, the analysis confirms a partial mediation of microfinance effect on child feeding practices through improved household wealth. This effect is illustrated by solid lines in the following diagram (result 4.2). The direct microfinance effect on child feeding practices is also significant but deteriorative.



Result 4.2 : Mediation of microfinance effect on child feeding practices

4.4.3 Household Health Care

Descriptive & Bivariate Analysis

Health caring practices encompass curative practices, preventive practices and environmental hygiene. They are described in table 4.4.11 for the 139 households and index children.

Tab. 4.4-11 Household health care: descriptive & bivariate analysis

	All	Microfinance		p	Child Height-for-Age		p
	(N=139)	Interv. (N=83)	Control (N=56)		OK (N=150)	<-2SD (N=55)	
Health Care index	0.39	0.45	0.30	**	0.47	0.16	***
<i>Ideal health Care (index=1)</i>	45%	53%	34%	**	53%	24%	***
<i>Middle Health Care (index=0)</i>	48%	39%	63%	***	42%	69%	***
<i>Bad Health Care (index=-1)</i>	7%	8%	4%		5%	7%	
Child Illness in the 2 last weeks	78%	82%	73%		78%	82%	
Sick child to health centre	96%	95%	98%		99%	93%	**
Full Immunization + Vitamin A	81%	81%	82%		83%	71%	*
Use of Antenatal Care	99%	99%	98%		99%	100%	
Sensitization about nutrition	90%	89%	91%		89%	91%	
Clean compound	72%	76%	66%		76%	62%	**
Safe Drinking water	96%	99%	91%	**	97%	93%	
Pit Latrine	84%	86%	82%		87%	82%	

*p<0.1; **p<0.05; ***p<0.01

About three fourth of the children (78 percent) had diarrhea, fever, cough/cold and/or shortness of breath in the two weeks preceding the survey. Of those children four percent were not brought to a health centre despite being sick. The proportion of children not brought to a health centre despite illness is significantly higher among malnourished children (seven versus one percent; p<0.05). The immunization rates were adjusted for age according to the MOH/UNEPI National immunization Schedule (MOH, 2003). In total 81 percent of the children were fully immunized with BCG, polio, DPT and Measles (>9 months) and received vitamin A supplementation. Full immunization was significantly associated with adequate child nutritional status (p<0.10). Some 83 percent of the well-nourished children were living in households with full immunized children while this was the case for only 71 percent of the malnourished children. Almost all mothers (99 percent) used antenatal care during their last

pregnancy. Some 90 percent did ever receive information about the nutrition requirements of children either through health workers (87 percent²⁰) or through radio or print media (seven percent²⁰). Environmental hygiene was measured through the cleanliness of the compound, the use of safe water and the ownership of a pit latrine. About 72 percent of the households had a clean or very clean compound. This rate was significantly lower among malnourished children ($p<0.05$). Some 62 percent of the malnourished children lived in a clean or very clean compound compared to 76 percent among well-nourished children. Most of the households got drinking water from a safe source (borehole). Only four percent got it from rivers. The proportion of households drinking unsafe water was significantly lower among households benefiting from microfinance ($p<0.05$; one versus nine percent). Some 84 percent of the households owned a pit latrine. The rest was either sharing a pit latrine with other households (14 percent²⁰) or had no toilet (one percent²⁰).

A health index was constructed which encompasses the preventive, curative and environmental dimensions of health care. Accordingly, 45 percent of the households had ideal health care practices. Ideal health care practices were significantly correlated with both microfinance and nutritional status. In fact, 53 percent of the households in the microfinance intervention had ideal health care practices while this was the case for only 34 percent of the households in the control group ($p<0.05$). Some 53 percent of the well-nourished children were living in households with ideal health care while this proportion was only 24 percent among malnourished children ($p<0.01$). Middle health care practices were present in 48 percent of the households. They were significantly more frequent in the microfinance intervention group and in the group of well-nourished children ($p<0.01$ respectively). Ranging from minus one to plus one, the health index had a mean value of 0.34, meaning that households had globally a tendency to middle health care practices. The mean health index was significantly and positively associated with microfinance and good child nutritional status.

²⁰ according to own additional calculations

Microfinance Direct Effect on Household Health Care: First Stage Multivariate Analysis

Microfinance direct effect on household health care was tested through a linear regression of the health care index that controlled for respondent, household and children inherent factors as well as for potential mediators at immediate and intermediate levels (regression 2.7 in table 4.4.12).

Tab. 4.4-12 Microfinance effect on household health care at intermediate level: linear regression estimates

		Outcome Variable M_6					
		Health Care Index					
Predictors		(2.7)					
		Coeff. B	SE	95%CI		p	Coef. β
X	Microfinance Intervention						
	Credit since ≥ 6 months a_{16}	0.113	0.089	[-0.062 - 0.289]		0.205	0.092
	Level 0: Inherent Factors						
	Madi-Okollo Settlement	0.162	0.190	[-0.062 - 0.289]		0.205	0.092
	Imvepi Settlement	0.336	0.095	[0.148 - 0.524]		0.001***	0.244
	Household Size	0.053	0.018	[0.019 - 0.088]		0.003***	0.221
	Household Education	-0.015	0.016	[-0.046 - 0.016]		0.354	-0.070
	Shock	-0.034	0.098	[-0.227 - 0.159]		0.728	-0.025
	Female Respondent	0.077	0.090	[-0.100 - 0.253]		0.392	0.063
	Child Age	-0.001	0.003	[-0.006 - 0.004]		0.585	-0.038
	Child Sex	0.071	0.082	[-0.091 - 0.233]		0.388	0.059
		Level 1: Distal Factors					
M_1	Monthly Profits in Ush	0.000	0.000	[0.000 - 0.000]		0.004***	0.211
M_2	Social Power	-0.202	0.283	[-0.761 - 0.357]		0.477	-0.056
	Level 2: Intermediate Factor						
M_3	Household Wealth	0.015	0.065	[-0.113 - 0.142]		0.820	0.018
	Constant	0.007	0.258	[-0.501 - 0.516]		0.977	
	$R^2_{M_6, X M_1 M_2 M_3}=0.161$					0.001***	
	N=205						

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$

The regression analysis shows a positive but not significant effect of microfinance on household health care ($p > 0.10$). Significant and ameliorative predictors of health care include household size and individual income ($p < 0.01$, respectively).

Microfinance predicted effect on household health care is illustrated in figure 4.4.3. The regression line suggests higher predicted health care scores among those households benefiting from microfinance intervention compared to the control group. The difference has yet not proved statistically noteworthy.

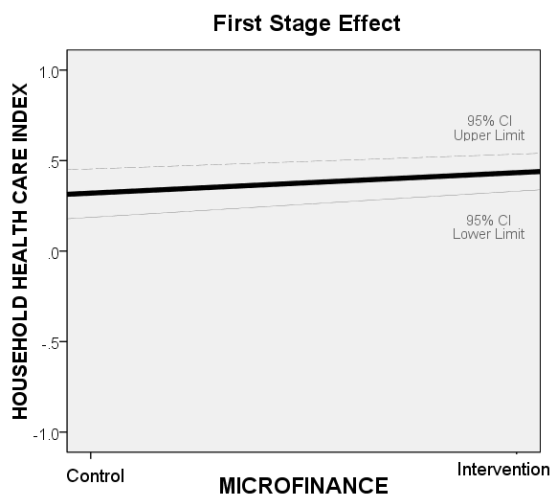


Fig. 4.4-3 Microfinance effect on household health care (N=205 children)

Microfinance indirect Effect on Household Health Care through Household Wealth

Mediation analysis of microfinance effect on household care through household wealth is based on estimates from regression 1.4 and 2.7 (tables 4.3.2 and 4.4.12). They show that microfinance effect on household health care might not be mediated through household economic wealth. Though microfinance is a significant ameliorative predictor of wealth (unstandardised effect $a_{13}=0.280$; $p<0.01$), the ameliorative effect of wealth on health care appears to be non significant (unstandardised effect $=0.015$; $p>0.10$). Bootstrap tests show a positive but not significant indirect microfinance effect on household health care through household wealth (unstandardised indirect effect $=0.004$; 90%BootCI: -0.029, 0.039). Microfinance's direct path to household health care is not significant either (direct effect $a_{16}=0.113$; $p>0.10$).

Tab. 4.4-13 Microfinance effect on household health care at distal level: linear regression estimates

		Outcome Variable M_5 Health care Index (1.7)					
Predictors		Coeff. B	SE	95%CI	p	Coef. β	
Microfinance Intervention							
X	Credit since ≥ 6 months	0.117	0.087	[-0.054 - 0.289]	0.179	0.096	
Level 0: Inherent Factors							
	Madi-Okollo Settlement	0.170	0.186	[-0.197 - 0.537]	0.362	0.067	
	Imvepi Settlement	0.340	0.094	[0.155 - 0.525]	0.000***	0.247	
	Household Size	0.053	0.017	[0.019 - 0.087]	0.003***	0.220	
	Household Education	-0.014	0.015	[-0.045 - 0.016]	0.366	-0.067	
	Shock	-0.033	0.097	[-0.225 - 0.159]	0.735	-0.024	
	Female Respondent	0.074	0.088	[-0.101 - 0.248]	0.404	0.060	
	Child Age	-0.001	0.002	[-0.006 - 0.004]	0.599	-0.036	
	Child Sex	0.073	0.081	[-0.087 - 0.233]	0.371	0.061	
Level 1: Distal Factors							
M_1	Monthly Profits in Ush	0.000	0.000	[0.000 - 0.000]	0.003***	0.214	
M_2	Social Power	-0.188	0.277	[-0.734 - 0.357]	0.496	-0.052	
	Constant	-0.008	0.249	[-0.498 - 0.483]	0.975		
	$R^2_{M_5, XM_1 M_2} = 0.160$				0.000		
	N=205						

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Microfinance Indirect Effect on Household Health Care through Individual Income and Social Power

Similarly, estimates from regression 1.7 in table 4.4.13 and regressions 0.2 and 0.3 in tables 4.2.2 and 4.2.4 do not confirm the hypotheses that microfinance effect on household health care might be mediated through either respondents' income or social power at distal level. Microfinance's mediated effect is positive through individual income and negative through social power. The bootstrap tests indicate non-significant indirect effects (90%BootCI: minus 0.034 to 0.041 for income and minus 0.020 to 0.006 for social power). Both proximal factors are not influenced by microfinance. Individual income affects household health care significantly and positively ($p < 0.01$). The influence of social power on health care is negative and statistically not important ($p > 0.10$).

Tab. 4.4-14 Microfinance total effect on household health care: linear regression estimates

		Outcome Variable M_5 Health care Index (0.7)					
Predictors		Coeff. B	SE	95%CI	p	Coef. β	
X	Microfinance Intervention						
	Credit since ≥ 6 months	0.121	0.088	[-0.054 - 0.295]	0.173	0.098	
	Level 0: Inherent Factors						
	Madi-Okollo Settlement	0.148	0.188	[-0.224 - 0.520]	0.433	0.058	
	Imvepi Settlement	0.340	0.096	[0.151 - 0.529]	0.000***	0.247	
	Household Size	0.050	0.018	[0.015 - 0.084]	0.005***	0.206	
	Household Education	-0.010	0.015	[-0.040 - 0.020]	0.504	-0.049	
	Shock	-0.037	0.097	[-0.228 - 0.155]	0.707	-0.027	
	Female Respondent	0.011	0.085	[-0.157 - 0.178]	0.900	0.009	
	Child Age	-0.001	0.003	[-0.006 - 0.004]	0.560	-0.040	
	Child Sex	0.079	0.082	[-0.083 - 0.241]	0.338	0.066	
	Constant	-0.027	0.203	[-0.427 - 0.373]	0.894		
	$R^2_{M_5, X}=0.121$				0.002***		
	N=205						

Summary

Estimates from the mediation analysis of microfinance effect on household health care are recapitulated in table 4.4.15.

Tab. 4.4-15 Mediation of microfinance main effect on household health care

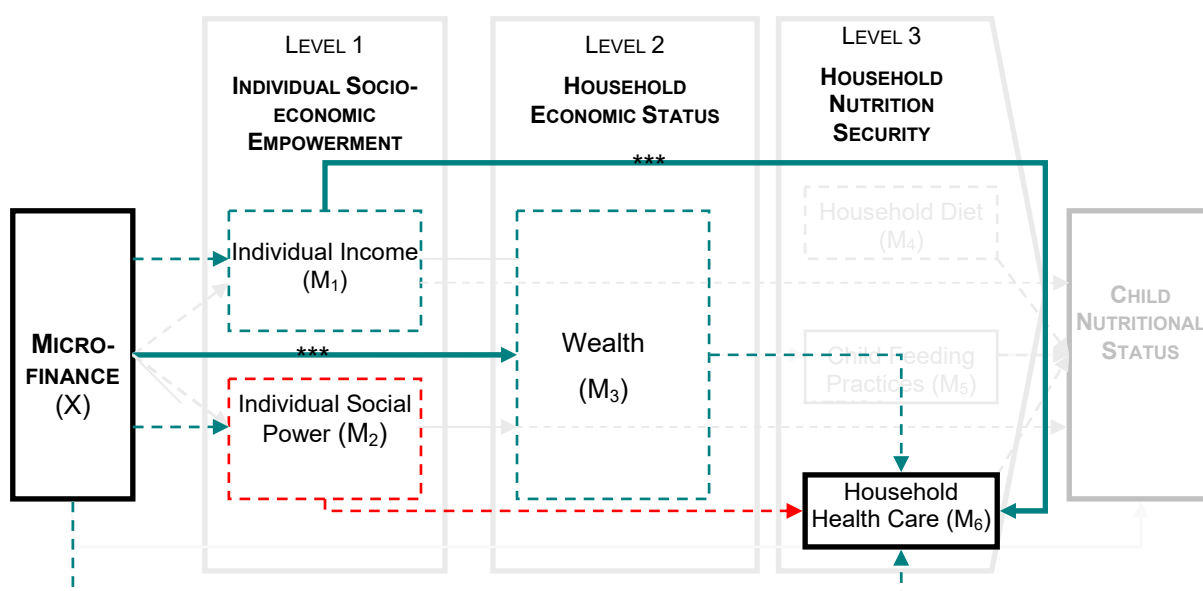
	Estimate	SE	p	95%		Standardised estimate
				Lower CI	Upper CI	
INTERMEDIATE MODEL						
Wealth M_3						
First Stage $X \rightarrow M_3$ (a_{13})	0.280	0.097	0.004***	[0.119 - 0.441]		0.190
Second Stage $M_3 \rightarrow M_6$ (b_{13})	0.015	0.065	0.820	[-0.092 - 0.121]		0.018
Direct Effect $X \rightarrow M_6$ (a_{16})	0.113	0.089	0.205	[-0.062 - 0.289]		0.092
Indirect Effect $X \rightarrow M_3 \rightarrow M_6$	0.004	0.021	-	[-0.034 - 0.050] ^a		0.003 ^b
Total intermediate Effect $X \rightarrow M_6$	0.117	0.087	0.179	[-0.054 - 0.289]		0.096
Ratio indirect/Total Effect	0.035	2.325	-	[-0.410 - 5.697]		-
DISTAL MODEL						
Individual Income M_1						
First Stage $X \rightarrow M_1$ (a_{11})	2040.365	7344.265	0.781	[-12444 - 16524]		0.020
Second Stage $M_1 \rightarrow M_6$	0.000	0.000	0.003***	[0.000 - 0.000]		0.214
Indirect Effect $X \rightarrow M_1 \rightarrow M_6$	0.005	0.023	-	[-0.043 - 0.050] ^a		0.004 ^b
Ratio indirect/Total Effect	0.044	5.807	-	[-1.299 - 1.757]		-
Social Power M_2						
First Stage $X \rightarrow M_2$ (a_{12})	0.009	0.023	0.701	[-0.036 - 0.054]		0.026
Second Stage $M_2 \rightarrow M_6$	-0.188	0.277	0.496	[-0.734 - 0.357]		-0.052
Indirect Effect $X \rightarrow M_2 \rightarrow M_6$	-0.002	0.008	-	[-0.027 - 0.010] ^a		-0.001 ^b
Ratio indirect/Total Effect	-0.014	2.247	-	[-3.393 - 0.123]		-
All Distal Mediators						
Direct Effect $X \rightarrow M_6$	0.117	0.087	0.179	[-0.054 - 0.289]		0.096
Indirect Effect $X \rightarrow M_1, M_2 \rightarrow M_6$	0.004	0.023	-	[-0.045 - 0.048] ^a		0.003 ^b
Total distal Effect $X \rightarrow M_6$	0.121	0.088	0.173	[-0.054 - 0.295]		0.098
Ratio indirect/Total Effect	0.030	7.001	-	[-1.452 - 1.833]		-

*lowly significant; **moderately significant; ***highly significant; ; a: 90%BootCI also includes zero (-0.029, 0.039 for household wealth, -0.034, 0.041 for individual income, -0.020, 0.006 for social power, -0.035, 0.040 for both distal mediators); b: Completely Standardised Indirect Effect

The mediation analysis of microfinance effect on household health care showed that:

- Microfinance total effect on household health care is not significant ($p > 0.10$ in table 4.4.14)
- Microfinance's effect on household health care is neither mediated through household wealth nor through individual income nor social power (90%BootCI: -0.029, 0.039 for household wealth; -0.034, 0.041 for income and -0.020, 0.006 for social power, respectively).
- Microfinance direct effect on household health care is not significant ($p > 0.10$)
- The effect of individual income on household care is highly significant, ameliorative and small (unstandardised effect=0.0001; 95%CI: 0.00001, 0.00001; $p=0.003$; standardised effect=0.214).

These results are illustrated on the following diagram (result 4.3). The dashed lines show that microfinance effect on household health care is neither mediated through household wealth nor through individual income nor through social power. The solid lines illustrate a significant ameliorative effect of microfinance on household wealth and of individual income on household health care.



Result 4.3 : Mediation of microfinance effect on household health care

4.4.4 Simple Mediation Analysis at a Proximal Level

The estimates of the linear regression of the child-height-for-age z-score on microfinance, inherent factors and all potential mediators are given in table 4.4.16. This regression as well as regressions 2.5, 2.6 and 2.7 of respectively household diet (table 4.4.2), child feeding (table 4.4.7) and household care (table 4.4.12) are used to analyse the mediation of microfinance effect on child nutritional status at proximal level.

Tab. 4.4-16 Microfinance effect on height-for-age at proximal level: linear regression estimates

		Outcome Variable Y Child Height-for-Age z-score (3.1)					
Predictors		Coeff. B	SE	95%CI	p	Coef. β	
Microfinance Intervention							
X	Credit since ≥ 6 months c'_{14}	0.370	0.253	[-0.129 - 0.868]	0.145	0.112	
Level 0: Inherent Factors							
	Madi-Okollo Settlement	-0.488	0.546	[-1.564 - 0.588]	0.372	-0.071	
	Imvepi Settlement	-0.069	0.278	[-0.618 - 0.481]	0.806	-0.018	
	Household Size	0.009	0.052	[-0.093 - 0.111]	0.866	0.013	
	Household Education	0.113	0.044	[0.026 - 0.201]	0.011**	0.202	
	Shock	-0.578	0.290	[-1.150 - -0.005]	0.048**	-0.158	
	Female Respondent	0.095	0.259	[-0.415 - 0.605]	0.713	0.029	
	Child Age	0.001	0.007	[-0.012 - 0.015]	0.845	0.014	
	Child Sex	0.257	0.227	[-0.191 - 0.705]	0.259	0.080	
Level 1: Distal Factors							
M ₁	Monthly Profits in Ush	0.000	0.000	[0.000 - 0.000]	0.417	-0.062	
M ₂	Social Power	-0.745	0.785	[-2.293 - 0.803]	0.343	-0.077	
Level 2: Intermediate Factors							
M ₃	Household Wealth	0.328	0.187	[-0.041 - 0.697]	0.081*	0.146	
Level 3: Proximal Mediators							
M ₄	Household Diet b_{14}	-0.188	0.179	[-0.542 - 0.166]	0.297	-0.086	
M ₅	Child Feeding Practices b_{15}	-0.048	0.256	[-0.553 - 0.456]	0.850	-0.015	
M ₆	Household Health Care b_{16}	0.483	0.200	[0.087 - 0.878]	0.017**	0.179	
	Constant	-1.771	0.724	[-3.200 - -0.342]	0.015**		
	$R^2_{Y, XM1M2M3M4M5M6} = 0.137$				0.017**		
	N=205						

*p<0.1; **p<0.05; ***p<0.01

Effect of Household Nutrition on Child Nutritional Status: Second Stage Multivariate Analysis

The main effect of household nutrition security on child nutritional status can be derived from the linear regression 3.1 of the child height-for-age z score along all potential predictors (table 4.4.16). It equals the coefficient b_{1j} which is positive for household health care but negative for child feeding practices and household diet ($b_{16} = 0.483$, $b_{15} = -0.048$ and $b_{14} = -0.188$, respectively). Only the ameliorative effect of household health care appears to be significant ($p < 0.05$).

Indirect Effect of Microfinance on Nutritional Status at a Proximal Level

The indirect effect of microfinance on child height-for-age through a mediator M_j equals $a_{1j}b_{1j}$. It has the value minus 0.046 for household diet, 0.030 for child feeding practices and 0.055 for household health care (table 4.4.17). The mediated effect through household diet is thus negative while it is positive for child feeding practices and household health care. These effects are yet statistically not significant according to bootstrap tests (90%BootCI: minus 0.163 to 0.012 for household diet; minus 0.041 to 0.078 for child feeding practices and minus 0.008 to 0.155 for household health care, respectively). The regression analysis does not confirm that microfinance effect on child nutritional status is mediated by factors at a proximal level.

Tab. 4.4-17 Mediation of microfinance effect on height-for-age at proximal level

	Estimate	SE	p	95%		Standardised Estimate
				Lower CI	Upper CI	
PROXIMAL MODEL						
Household Diet M₄						
First Stage X→M ₄ (a ₁₄)	0.244	0.100	0.016**	[0.046 -	0.442]	0.162
Second Stage M ₄ →Y (b ₁₄)	-0.188	0.179	0.297	[-0.542 -	0.166]	-0.086
Indirect Effect X→M ₄ →Y (a ₁₄ b ₁₄)	-0.046	0.051	-	[-0.191 -	0.025] ^b	-0.013 ^c
Ratio indirect/Total Effect	-0.119	12.345	-	[-2.673 -	0.356]	-
Child Feeding Practices M₅						
First Stage X→M ₅ (a ₁₅)	0.137	0.070	0.052*	[-0.275 -	0.001]	-0.136
Second Stage M ₅ →Y (b ₁₅)	-0.048	0.256	0.850	[-0.553 -	0.456]	-0.015
Indirect Effect X→M ₅ →Y (a ₁₅ b ₁₅)	0.007	0.038	-	[-0.058 -	0.101] ^b	0.002 ^c
Ratio indirect/Total Effect	0.017	4.954	-	[-0.353 -	1.247]	-
Household Health Care M₆						
First Stage X→M ₆ (a ₁₆)	0.113	0.089	0.205	[-0.062 -	0.289]	0.092
Second Stage M ₆ →Y (b ₁₆)	0.483	0.200	0.017**	[0.087 -	0.878]	0.179
Indirect Effect X→M ₆ →Y (a ₁₆ b ₁₆)	0.055	0.053	-	[-0.017 -	0.218] ^b	0.016 ^c
Ratio indirect/Total Effect	0.142	10.041	-	[-0.102 -	4.367]	-
All Proximal Mediators						
Direct Effect X→ Y (c' ₁)	0.370	0.253	0.145	[-0.129 -	0.868]	0.112
Indirect Effect X→M ₄ ,M ₅ ,M ₆ →Y	0.015	0.085	-	[-0.141 -	0.216] ^b	0.004 ^c
Total proximal Effect X→ Y	0.385	0.247	0.121	[-0.102 -	0.873]	0.117
Ratio indirect/Total Effect	0.040	16.100	-	[-1.012 -	2.349]	-

*lowly significant; **moderately significant; ***highly significant; b: 90%BootCI also includes zero (-0.163, 0.012 for household diet, -0.041, 0.078 for child feeding practices, -0.08, 0.155 for household health care, -0.122, 0.153 for all proximal mediators); c: Completely Standardised Indirect Effect

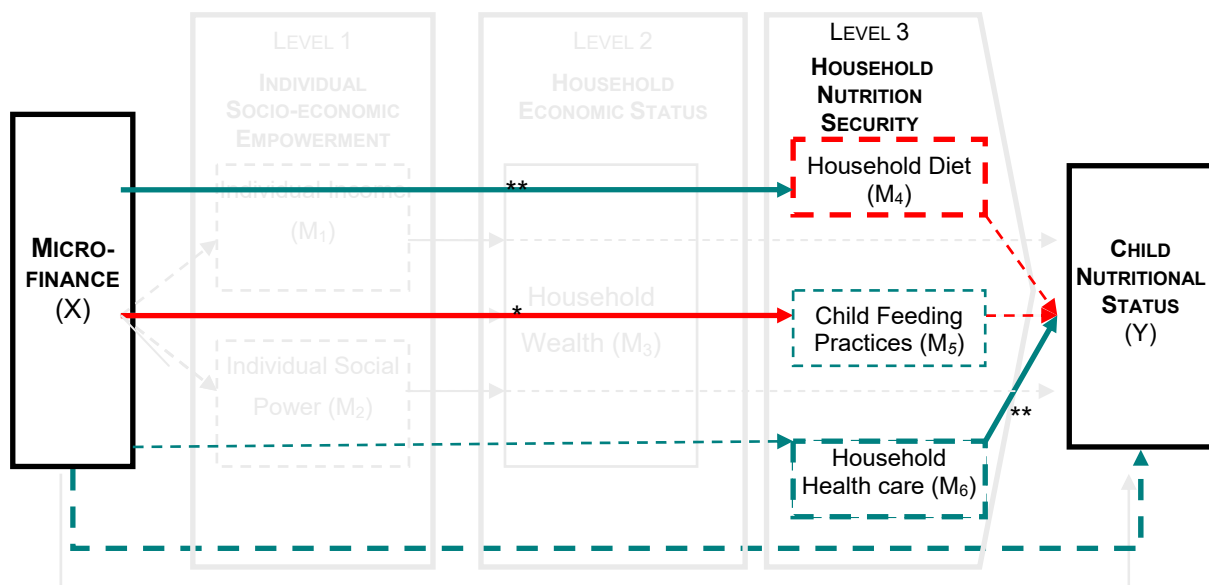
Summary

The second stage mediation analysis of microfinance effect on child nutritional status at a proximal level shows that:

- Microfinance effect on child nutritional status is neither significantly mediated through household diet, nor through child feeding practices nor through health care (90%BootCI: [-0.163, 0.012], [-0.041, 0.078] and [-0.008, 0.155], respectively).

- At proximal level, microfinance direct effect on child nutritional status is not significant ($p>0.10$).
- The effect of household diet on child nutritional status is not significant ($p>0.10$).
- The effect of child feeding practices on child nutritional status is not significant ($p>0.10$).
- The effect of household health care on child nutritional status is moderately significant, ameliorative and small (unstandardised effect= 0.483; 95%CI: 0.087, 0.878; $p=0.017$; standardised effect=0.179).
- Microfinance effect on household diet is moderately significant, ameliorative and small (unstandardised effect: 0.244; 95CI: 0.046, 0.442; $p=0.016$; standardised effect= 0.162).
- Microfinance effect on child feeding practices is lowly significant, deteriorative and small (unstandardised effect: 0.137, 95%CI: -0.275, 0.001; $p=0.052$; standardised effect=-0.136).
- Microfinance effect on household health care is not significant ($p>0.10$).

These results are summarised on the following diagram (result 4.4).



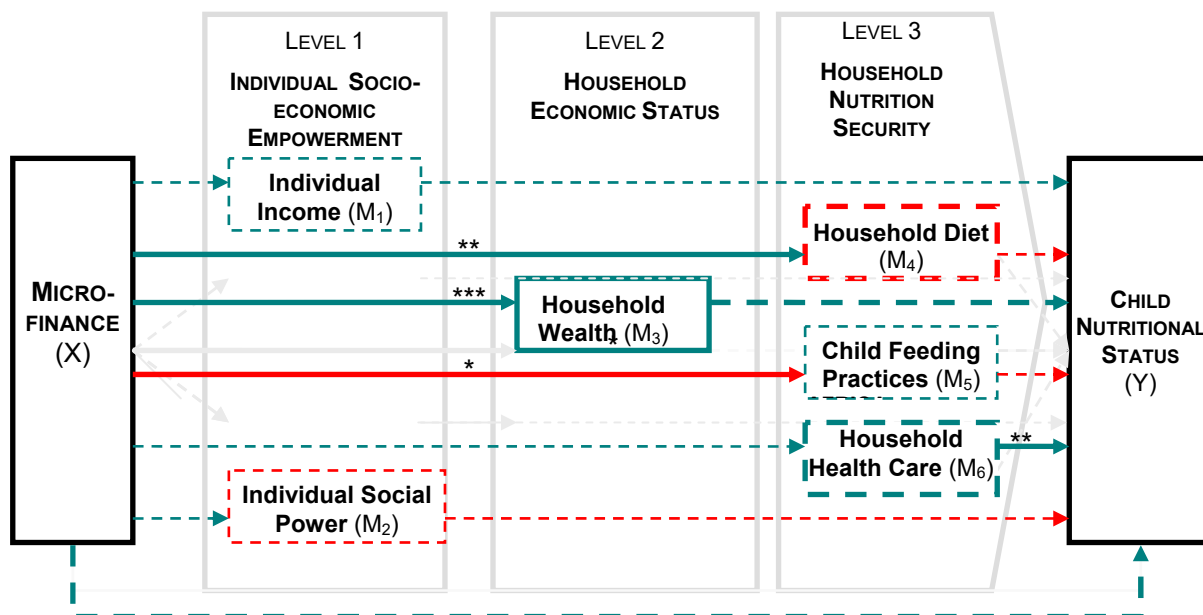
Result 4.4 : Mediation of microfinance effect on child nutritional status at proximal level

The solid lines suggest that microfinance might significantly improve household diet and deteriorate child feeding practices, but at a proximal level child nutritional status is essentially influenced by household health care. The dashed lines indicate that none of the proximal factors mediates microfinance effect on child nutritional status. There is no effect of microfinance on health care and no effect of household diet or child feeding practices on child nutritional status.

4.4.5 Concluding Remarks

The results of the mediation analyses are summarised in the following diagram (Result 4.5).

Mediation of microfinance effect on child nutritional status could be confirmed only for household wealth. Microfinance has a significant ameliorative effect on household wealth and household diet and a significant deteriorative effect on child feeding practices. There is no effect of microfinance on individual income, social power and household health care. Household health care has a significant ameliorative proximal effect on child nutritional status while none of the other potential mediators affects child nutritional status significantly.

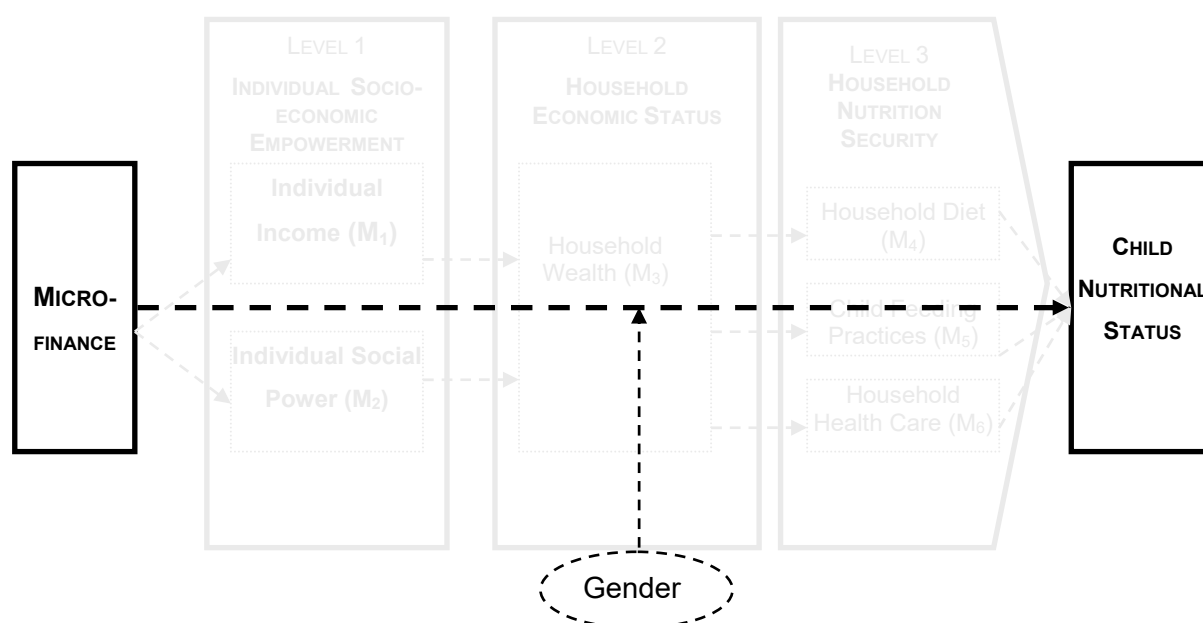


Result 4.5 : Mediation of microfinance effect on child nutritional status at distal, intermediate & proximal levels

4.5 GENDER MODERATION OF MICROFINANCE EFFECT ON CHILD NUTRITIONAL STATUS

This chapter aims at testing if there are some differences in microfinance effect on child nutritional status between men and women. In a first section, the moderating effect of gender is tested for the total effect of microfinance effect on child nutritional status. In order to better understand gender moderation of microfinance on child nutritional status, the moderation of the mediational processes has also been tested at each level. The second section tests gender moderation of microfinance effect on each of the potential mediators: individual income, individual social power, household wealth, household diet, child care and household health care. This analysis is called “first stage moderation analysis”. In a third section, gender moderation of the mediation of microfinance effect on child nutritional status is analyzed. Gender moderation is tested by adding an interaction term (Gender x Microfinance) in the different regressions run in former sections for testing main effects. The new regressions estimated for the moderation analysis are given in tables A2.3 and A2.4 presented in Annex A2.

4.5.1 Total Effect Moderation Analysis



Model 5 : Gender moderation of microfinance total effect on child nutritional status

This section tests the moderating effect of gender on microfinance effect on child nutritional status. The main hypothesis being tested is:

H5: Microfinance's positive effect on child nutritional status is stronger when the microfinance participant is female.

Differences across gender in microfinance total effect on child nutritional status were tested through a linear regression of the height-for-age z-score that controls for gender interaction and potential inherent covariates. The regression results are given in table A.2.4 in annex A2 (regression 0.8) and summarised in table 4.5.1.

Tab. 4.5-1 Gender Moderation of microfinance total effect on nutritional status

	Estimate	SE	p	95%		Standardised Estimate
				Lower CI	Upper CI	
TOTAL CONDITIONALEFFECT X→Y						
Men	0.612	0.391	0.119	-0.159	1.384	0.185
Women	0.363	0.304	0.233	-0.236	0.962	0.110
Differences	-0.249	0.490	0.612	-1.215	0.718	-0.076

*p<0.1;**p<0.05;***p<0.01

The regression shows that microfinance total effect on child nutritional status is positive but non significant among men as well as among women ($p > 0.010$, respectively). There is a higher total microfinance effect among men. But the difference between both groups is not significant as demonstrated by a p value of the gender and microfinance interaction term being higher than 0.10 ($p = 0.612$). These results are illustrated in figure 4.5.1.

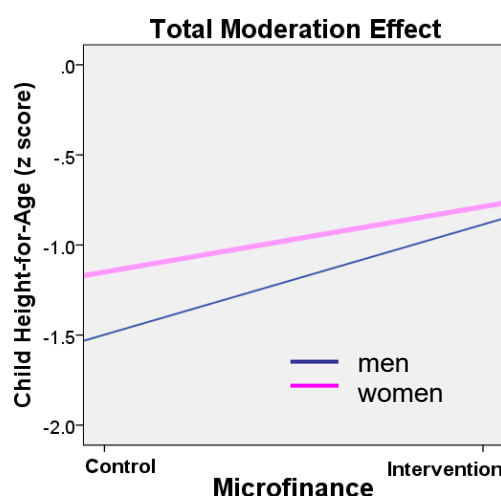


Fig. 4.5-1 Microfinance total effect on nutritional status by gender (N=205 children)

4.5.2 First Stage Moderation Analysis

Gender differences in microfinance effect on each of the potential mediators were tested through a linear regression controlling for gender interaction and potential inherent covariates. The results are given in table A2.3 in annex A2: regression 0.9 for individual income, 0.10 for individual power, 1.11 for household wealth, 2.12 for household diet, 2.13 for child feeding practices and 2.14 for household health care. The regression estimates are summarised in table 4.5.2.

Tab. 4.5-2 Gender moderation of microfinance effect on potential mediators

First Stage Effect ($X \rightarrow M_i$)	Estimate	SE	p	95%		Standardised Estimate
				Lower CI	Upper CI	
DISTAL MODEL						
Individual Income M_1						
Men	-2346.957	11880.053	0.844	[-25777.6 -	21083.7]	-0.023
Women	4655.007	9222.083	0.614	[-13533.4 -	22843.4]	0.046
Differences	7001.964	14884.456	0.639	[-22354.2 -	36358.1]	0.069
Social Power M_2						
Men	-0.028	0.037	0.443	[-0.100 -	0.044]	-0.083
Women	0.031	0.028	0.281	[-0.025 -	0.087]	0.090
Differences	0.059	0.046	0.201	[-0.032 -	0.150]	0.174
INTERMEDIATE MODEL						
Wealth M_3						
Men	0.295	0.157	0.062*	[-0.015 -	0.606]	0.201
Women	0.271	0.122	0.028**	[0.029 -	0.512]	0.184
Differences	-0.025	0.198	0.901	[-0.415 -	0.365]	-0.017
PROXIMAL MODEL						
Household Diet M_4						
Men	0.426	0.160	0.008***	[0.110 -	0.741]	0.282
Women	0.136	0.125	0.279	[-0.111 -	0.382]	0.090
Differences	-0.290	0.199	0.147	[-0.683 -	0.103]	-0.193
Child Feeding Practices M_5						
Men	-0.272	0.111	0.015**	[-0.491 -	-0.052]	-0.270
Women	-0.056	0.087	0.516	[-0.228 -	0.115]	-0.056
Differences	0.215	0.138	0.122	[-0.058 -	0.488]	0.215
Household Health Care M_6						
Men	0.102	0.142	0.474	[-0.179 -	0.383]	0.083
Women	0.120	0.111	0.283	[-0.100 -	0.339]	0.097
Differences	0.017	0.177	0.922	[-0.332 -	0.367]	0.014

lowly significant; **moderately significant; ***highly significant

The analysis of the first stage effect of microfinance on each potential mediator shows that among women, microfinance makes a significant difference for only the household wealth status which significantly improves ($p < 0.05$), while microfinance is significantly related to better household wealth, better household diet and worse child feeding practices among men ($p < 0.10$, $p < 0.01$, $p < 0.05$, respectively). Microfinance effect on household wealth is lowly significant for men ($p < 0.10$) while it shows a higher significance level for women ($p < 0.05$). But in general the observed differences between men and women could not be confirmed statistically as the interaction terms were not significant in any of the regressions.

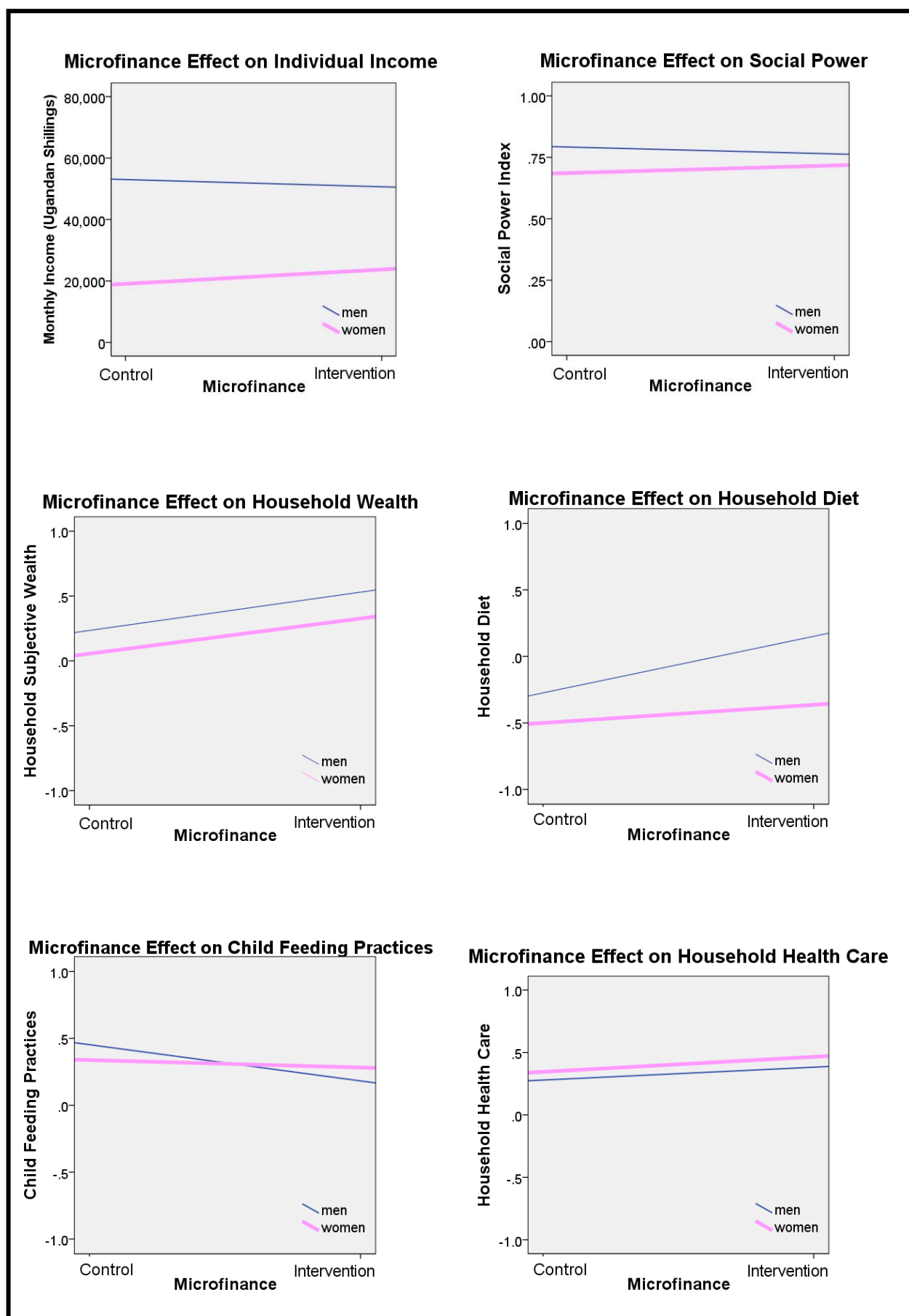


Fig. 4.5-2 Microfinance effect on the potential mediators by gender

The gender conditional effect of microfinance is illustrated for each potential mediator by plotting the mean predicted values for the mediators by microfinance and gender holding all other covariates at their mean (figure 4.5.2). Even if differences between men and women are statistically not significant, it is possible to observe some difference in the size of microfinance effect along the gender variable. This is particularly true for household diet and child feeding practices. In fact, the slopes illustrate a trivial effect of microfinance on household diet among women while this ameliorative effect is stronger among men. Regarding child feeding practices, the deteriorative effect of microfinance is particularly strong among men compared to women

4.5.3 Moderated Mediation Analysis

Gender moderation of the mediation processes between microfinance and child nutritional status have been tested based on the regression estimates in both table A2.3 and A2.4: regressions 0.9 and 1.8 for individual income, 0.10 and 1.8 for individual power, 1.11 and 2.8 for household wealth, 2.12 and 3.8 for household diet, 2.13 and 3.8 for child feeding practices and regressions 2.14 and 3.8 for household health care.

The conditional indirect effect of microfinance on child height-for-age through each of the six potential mediators has been tested according to bootstrap tests at distal, intermediate and proximal level.

Moderated Mediation at Distal Level

The results of the “moderated mediation analysis” at distal level are summarised in table 4.5.3.

Tab. 4.5-3 Moderated mediation of microfinance effect on nutritional status at distal level

	Estimate	SE	p	95%	
				Lower CI	Upper CI
DIRECT EFFECT $X \rightarrow Y$					
Men	0.597	0.393	0.131	[-0.178 -	1.373]
Women	0.379	0.306	0.216	[-0.224 -	0.983]
Differences	-0.218	0.494	0.660	[-1.192	0.757]
INDIRECT EFFECT $X \rightarrow M_i \rightarrow Y$					
Individual Income M_1					
Men	0.000	0.028	-	[-0.054 -	0.055]
Women	0.000	0.015	-	[-0.032 -	0.035)
Social Power M_2					
Men	0.015	0.043	-	[-0.033 -	0.167]
Women	-0.016	0.035	-	[-0.145 -	0.021]

*effect is lowly significant; **effect is moderately significant; ***effect is highly significant

The bootstrapped tests do not confirm neither individual income nor social power as mediators for microfinance effect on nutritional status. This is true among men as well as among women. In fact, the bootstrapped confidence intervals include zero at a bias-corrected level of 90 percent, 95 percent or 99 percent.

Moderated Mediation at Intermediate Level

The gender-sensitive analysis of the mediation process at intermediate level confirms that the household wealth status mediates significantly microfinance effect on nutritional status among either women or men. At a bias-corrected level of 90 percent, the bootstrapped confidence intervals failed to include zero, which is an indication of a moderately significant effect. The interval varies from 0.000 to 0.243 for men and from 0.012 to 0.217 for women²¹ (table 4.5.4). This indirect effect through household wealth is similar between men and women (0.080 versus 0.073). The p value of the interaction term confirms no difference in the mediation process between men and women regarding household wealth ($p=0.669$). The direct effect of microfinance is not significant in each gender population at intermediate level ($p=0.192$ for men and 0.322 for women).

Tab. 4.5-4 Moderated mediation of microfinance effect on nutritional status at intermediate level

	Estimate	SE	p	95%		Standardised Estimate
				Lower CI	Upper CI	
DIRECT EFFECT $X \rightarrow Y$						
Men	0.518	0.396	0.192	[-0.263 -	1.298]	0.156
Women	0.306	0.309	0.322	[-0.303 -	0.915]	0.093
Differences (c_3')	-0.211	0.493	0.669	[-1.183 -	0.760]	-0.064
INDIRECT EFFECT $X \rightarrow M_i \rightarrow Y$						
Household Wealth M_3						
Men	0.080	0.070	-	[0.000 -	0.243]*	
Women	0.073	0.057	-	[0.012 -	0.217]*	

*effect is lowly significant;**effect is moderately significant;***effect is highly significant

Moderated Mediation at Proximal Level

The analysis of moderated mediation at proximal level indicates that none of the proximal factors mediates microfinance effect on nutritional status among either men or women. The bootstrapped confidence intervals displayed at a 95 percent level in table 4.5.5 include zero for each potential mediator. The intervals also include zero at a bias-corrected level of 90

²¹ At a 95% level of confidence, BootCI varies from -0.033 to 0.461 for men and from -0.012 to 0.431 for women

percent or 99 percent expressing statistically non significant indirect effects. The direct microfinance effect on child nutritional status remains non significant for men or women ($p=0.183$ and $p=0.375$ respectively) and this direct effect is similar in both groups (p of the interaction term equals 0.584).

Tab. 4.5-5 Moderated mediation of microfinance effect on nutritional status at proximal level

	Estimate	SE	p	Lower CI	Upper CI	Standardised Estimate
DIRECT EFFECT $X \rightarrow Y$						
Men	0.545	0.408	0.183	[-0.259 -	1.349]	0.165
Women	0.274	0.308	0.375	[-0.334 -	0.881]	0.083
Differences	-0.271	0.495	0.584	[-1.248	0.705]	-0.082
INDIRECT EFFECT $X \rightarrow M_i \rightarrow Y$						
Household Diet M_4						
Men	-0.085	0.088	-	[-0.337 -	0.043]	-
Women	-0.027	0.044	-	[-0.175 -	0.019]	-
Child Feeding Practices M_5						
Men	0.008	0.073	-	[-0.153 -	0.157]	-
Women	0.002	0.027	-	[-0.035 -	0.085]	-
Household Health Care M_6						
Men	0.050	0.073	-	[-0.075 -	0.241]	-
Women	0.058	0.062	-	[-0.037 -	0.225]	-

*effect is lowly significant; **effect is moderately significant; ***effect is highly significant

4.5.4 Concluding Remarks

The simple gender moderation analysis shows that:

- Microfinance total effect on child nutritional status is positive but non-significant for men as well as for women ($p>0.10$, respectively). The gender difference is not significant ($p>0.10$).

The first stage moderation analysis shows that:

- Microfinance effect on individual income is positive and not significant for neither men nor women ($p>0.10$);
- Microfinance effect on social power is not significant for neither men nor women ($p>0.10$). The tendency is yet negative for men and positive for women.
- Microfinance effect on household wealth is positive and significant for both men and women. The significance level is yet higher for women ($p<0.05$ and $p<0.10$, respectively);

- Microfinance effect on household diet is positive for both men and women, but it is only significant for men ($p < 0.01$ and $p > 0.10$, respectively).
- Microfinance effect on children feeding practices is significant and negative for men while it is non-significant and negative for women ($p < 0.05$ and $p > 0.10$, respectively).
- Microfinance effect on household health care is non significant and positive for both men and women ($p > 0.10$).

The moderated mediation analysis shows that:

- Microfinance mediation through individual income is not significant and positive for both men and women (90%BootCI includes zero);
- Microfinance mediation through social power is not significant for both men and women (90%BootCI includes zero). Yet the tendency is positive for men and negative for women.
- Microfinance mediation through household wealth is positive and significant for both men and women (90%BootCI does not include zero for both women and men).
- Microfinance mediation through household diet is non significant and negative for both men and women (90%BootCI includes zero).
- Microfinance mediation through child feeding practices is non significant and positive for both men and women (90%BootCI includes zero).
- Microfinance mediation through household health care is non significant and positive for both men and women (90%BootCI includes zero).

The differences between men and women were statistically not significant for all tests ($p > 0.10$).

5 DISCUSSION

5.1 GENERAL METHODOLOGICAL ISSUES

5.1.1 Definition of Child Nutritional Standards

A fundamental goal of this work is to assess the factors determining child nutritional status and to test if microfinance is an effective household's mechanism for achieving optimal nutritional status. An important initial step was to diagnose if there was a nutritional problem at child level and based on the comparison between households with or without nutritional problems to check if microcredits represented effective strategical options. The diagnosis was established by contrasting the height of the sampled children to international standard heights of children from the same age and sex group (WHO, 2006). When a child was deviating more than two units negatively from the normal z-score, he was considered as malnourished and his family as confronted with pediatric malnutrition. Such a definition of nutritional standards raises several issues. They relate mainly to 1) the use of height-for-age rather than micronutrient status or other indicators of macronutrient deficiencies, 2) the use of international standards rather than standards defined at local level or from the households themselves.

Low height-for-age has been applied as an indicator of malnutrition, although it does not represent the most important nutritional problem in the region. The analysis of the nutritional public health problems in West Nile suggests that micronutrient deficiencies might represent more severe problems in the study population (figure 3.1.5). There is thus a high probability that a big number of children classified as well-nourished according to their height-for-age status had in reality anemia or other micronutrient deficiencies. Yet the use of an indicator of macronutrient deficiency was justified by the practicability of anthropometric assessment and the time and financial constraints of the survey. Diagnoses of micronutrient deficiencies often require laboratory analyses which are more difficult to put in place in terms of logistics and of financial, physical or human resources. Micronutrient assessments at community level are therefore less frequent than anthropometric surveys.

In a previous analysis, an attempt has been made to analyze the role of microfinance for each of the three anthropometric indicators: height-for-age, weight-for-age and weight-for-height. This has added to the complexity of the analysis. For the sake of clarity, the decision was made to focus on only one indicator. Height-for-age has been preferred over other indicators of macronutrient deficiencies. The reasons are that: 1) it is an indicator of long-term deficiency which captures better nutritional outcomes of socio-economic factors, 2) it represents a more severe problem in the study region, 3) it represents a critical problem in

the sample while this is not the case for weight-for-height and weight-for-age and 3) the width of the 95% confidence interval is within 30 percent of the estimated prevalence of stunting and underweight but not for wasting, indicating a survey sufficiently precise and a sample size sufficiently large for the first two measures of malnutrition (PRUDHON & SPIEGE, 2007).

The WHO standards have been used as reference for establishing malnutrition. They describe the optimal growth of children under five years and certainly represent the best and most robust tool for assessing children malnutrition everywhere (WHO, 2006). Yet, when the aim of a survey is not just to depict the nutritional situation but to discover which strategical options work in a specific context, it might be important to also assess deviance from local standards. In this case, positive deviants are children who deviate positively from the 'norm' for that population and not just those who deviate positively from 'optimal' growth. This difference in definition is important as the set of determinants for optimal growth might be different from the set of determinants for positive deviance (SHEKAR, HABICHT, & LATHAM, 1992). The concept of positive deviance is increasingly applied for discovering effective nutritional strategies in impoverished environments and for designing and improving programs accordingly (ZEITLIN, GHASSEMI, & MANSOUR, 1990). It would have been interesting to test not only the ameliorative effect of microfinance on the nutritional status of the sample children but also to inquire if it acts as a protective factor from negative deviance.

Children's nutritional standards have been defined according to international conventions but do these externally defined standards correspond to the particular standards of the families? This question is important because standards give an orientation for action. And if a mother has the impression that her child is well-nourished although he is not according to external standards, she might not have an improvement of the child's nutritional status as her goal. One assumption of this study is that families want to achieve better child nutritional status. But is it true? And what do they mean by "better"? It might have been useful to inquire the household attitudes towards child nutritional status and standards. As studies show that mothers can have an accurate perception of the nutritional status of their children (LAZZERI ET AL., 2006; MONETTE, SÉGUIN, GAUVIN, & NIKIÉMA, 2007), such qualitative insights could have ideally complemented the quantitative survey. It was the case for a microfinance survey in Mali (DE GROOTE ET AL., 1996). One could also imagine to control for such motivational factors in a regression or to test for their moderating effect by achieving optimal nutritional status.

5.1.2 Quantitative, Crosssectional & Quasi-experimental Design

The study is characterized by its quantitative, cross-sectional and quasi-experimental nature. These features can be seen as limiting in comparison to qualitative designs better adapted for capturing social mechanisms, to randomized designs eliminating selectivity bias and to longitudinal studies better suited to follow long-term impacts. Nevertheless there was an attempt to overcome these limits.

One major quantitative method versus mixed methods

In this thesis, only one method – a quantitative household survey - was applied to answer the research question. Yet increasingly authors argue for a mix of methods because it provides more perspectives on the phenomena being studied (EASTERBY-SMITH, 1991: 31 as cited in PERRY 2011; GABLE, 1994). Others remind that within the time and other resource constraints of most theses, it might be advisable to consider only one major method which suits the research problem and associated research gaps (PERRY, 2011). In our case, although initially planned and although important time resources had been invested in the development of qualitative survey instruments, personal constraints did not allow going back to the survey region and undertaking a qualitative survey with a couple of households. Such in-depth interviews might have given more insights into the mechanisms involved in the ‘transformation’ of microfinance into better child nutritional status. They would have ideally complemented the quantitative structured interviews which can provide only limited answers when it comes to better understand complex mechanisms. In an attempt to compensate for this lack, open-ended questions and questions on the subjective improvement felt by the respondents in different household domains have been incorporated in the questionnaire (Annex A1). Indices have been constructed which integrate several dimensions of the observed phenomena (cumulative social power, child feeding, diet, health care indices). The author also ran several complementary surveys based on secondary data from the literature, from microfinance institutions and from formative/evaluation studies undertaken for the GTZ food and nutrition security project in Arua. These studies have been partly analyzed and summarised in different reports. They represent an interesting field for further research on the subject²².

²² YEO, A.E. (2005). *Formative research: Health workers semi-structured interview on Nutrition knowledge and practices In refugee-hosting sub-counties of Arua, Uganda* (Unpublished report) ; YEO, A.E. (2005). *Formative research: focus group discussions on nutritional and child care practices in refugee-hosting sub-counties of Arua, Uganda* (Unpublished report) ; Yeo A.E. 2005. *Formative research: Positive deviance inquiry on nutritional and child care practices in refugee-hosting sub-counties of Arua, Uganda* (Unpublished report).

Cross-sectional versus longitudinal design

Longitudinal studies survey the same individuals in several rounds and over a long period (two to three years in general). They are ideal to capture long-term impacts through a before/after comparison of the household situation in different domains. Yet, they present the disadvantages of being highly demanding in terms of budget, statistical expertise and time (HULME, 2000). The present study had a single cross-sectional design, meaning that the respondents were interviewed only once. It had the advantage of fitting into the financial and time constraints put on this study. It also suits the explorative purpose of the study which aimed at detecting interesting significant associations that could serve as more specific hypotheses for future longitudinal investigations. Nevertheless, the option of going back in the study region and of interviewing the same households in a second round had been analyzed. This option was judged difficult to implement. In fact, the signing of a peace agreement in Sudan in 2005 led to an acceleration of repatriation processes in the West Nile region. It was thus unlikely to find the same households in a follow-up study. For measuring impact, a with/without design was rather adopted which assigned the households to either a microfinance intervention or a control group.

Quasi-experimental versus randomised design

Randomised trials consist of a random selection of respondents and in their subsequent random assignment to comparison groups. They are considered the most rigorous method for impact evaluation because any difference between the comparison groups can be confidently attributed to the impact (BAUCHET, MARSHALL, STARITA, THOMAS, & YALOURIS, 2011). In contrast, quasi-experimental surveys select the respondents on the basis of their participation in microfinance institutions. The quasi-experimental design is applied because a random selection requires a very large sample in order to get a representative sub-sample of participants. Yet quasi-experimental surveys are more likely to generate selection bias. In fact, they compare microfinance participants to non-participants who are two types of people. Those who choose to participate likely have more entrepreneurial spirit, more tolerance for risk and other characteristics. Their success might not only be the result of microfinance. In order to correct for selectivity bias, the study rather compares established to incoming clients, who are supposed to differ from the former only by not having received a credit for longer than six months. Yet, one might argue that there might also be some reasons, why one takes a credit at certain points in life or not (KARLAN, 2001).

5.1.3 Sampling & Representativeness

The study is based on data collected in a specific geographical and insitutional context. The refugee settlements of Arua district in Uganda have been selected as study area. Within these settlements, only communities where the DED loan program was operating have been visited. The DED members were over-sampled and over-sampling bias are not corrected for in the statistical analysis. Thus, the descriptive statistics obtained in the survey are not representative of the general population of the refugee settlements, but of a sub-population with a high proportion of participants in the DED loan program. The overall descriptives should therefore be interpreted with caution.

Furthermore, the survey focused on one type of institution only: a semi-formal loan program. The statements gathered from the analysis are only valid for this particular institution, and not for microfinance in the form of informal loans or microcredits from more formal banks.

The focus on only villages where the DED microfinance institution had clients is also likely to have produced selection bias as the control group might be contaminated by contact with the treatment group.

5.1.4 Statistical Mediation & Moderation Procedures

The mediation and moderation procedures and particularly their operationalisation for SPSS (HAYES, 2012a) have been very useful for getting insights into the process through which microfinance contributes to child nutritional status. Yet they present several limitations, namely the requirement of using the same covariates in all equations and the unavailability of an operationalised model with multiple mediators operating in parallel for some and in serial for the others.

Same covariates in all the equations

It was technically not possible to specify separate *sets of covariates* for different treatment/mediator/outcome combinations although it is obvious that the different outcome variables do not have exactly the same determinants. So we used the same covariates in all equations and had for example to specify child sex or age as potential predictors of individual income although these inherent factors probably affect the ultimate outcome “child nutritional status” without affecting proximal or intermediate factors. This lack of flexibility in the specification of covariates is a limitation of the SPSS Macro "PROCESS".

Statistical inference in mediation analysis

We used *bootstrap confidence intervals* for making statistical inferences about indirect effects in statistical mediation analysis. Other available methods include causal step approach (BARON & KENNY, 1986), sobel test, Monte Carlo and distribution of the product. Bootstrapping has several advantages. It has superior statistical characteristics and performance; it is easy to implement in existing software such as SPSS, and it does not assume the normality of the sampling distribution of the indirect effect (HAYES & PREACHER, 2013).

Causal inference

Mediation is a causal phenomenon, yet causability can not be established by a statistical model (HAYES & PREACHER, 2013). Statistics only ascertain whether a relation between variables is likely to exist, and of what magnitude. The statistical results thus do not prove causability but they help in establishing the soundness of the logical arguments described in the theoretical framework (Model 0).

Inherent characteristics have been taken into account in the model. Yet it should be noted that an important limitation of this study is that information on participation in other microfinance programs and in aid programs is missing in the model. Such factors are also likely to affect household processes and child nutritional status.

5.2 CONCLUSIONS ON SPECIFIC RESEARCH ISSUES

This section discusses the main results and their theoretical implications. The following hypotheses have been empirically tested:

- H1. Microfinance has a positive and significant total effect on child nutritional status.
- H2: At a distal level, microfinance influences child nutritional status through individual socio-economic empowerment.
- H3: At an intermediate level, microfinance influences child nutritional status through higher household economic status.
- H4: At a proximal level, microfinance influences child nutritional status through better household diet, health care and child feeding practices.
- H5: Microfinance's positive effect on child nutritional status is stronger when the microfinance participant is female.

5.2.1 Mediating Role of Individual Socio-economic Empowerment

Even if the statistical tests globally suggest that individual income and social power are not significant mediators of microfinance effect on nutritional status, some relations between individual income, household wealth and health care suggest that improvement in individual income might be a key strategy for household nutrition security.

Regarding individual income, the mediation analysis shows that:

- Microfinance effect on nutritional status is not mediated through individual income.
- Individual Income has a non-significant effect on child nutritional status.
- Microfinance effect on individual income is not significant.
- The effect of individual income on household wealth is significant and ameliorative.
- Individual income has a significant and positive effect on household health care.
- Microfinance effect on individual income is not significant for either men or women.
- Microfinance mediation through individual income is not significant for both men and women.

These relations indicate that *microfinance affects child nutritional status without increasing individual income, which itself makes no difference for child nutritional status, but contributes to improve household wealth and household health care.*

Methodological issues

Although a pre-analysis of extreme values using boxplot diagrams showed coherent data, measurement bias cannot be totally excluded when it comes to assess monetary income. Recall and response bias are likely to occur. Moreover, levels of profits were assessed for one enterprise activity, - the main one – but not for all activities. So profits might represent only a part of the total income of the respondent. It has also been suggested that gender, age, season and type of activities are important components of income (DE GROOTE, 1997). Disagregating the data along these components might have yielded differential effects. In this study, it was only done for gender and the gender difference was tested only for microfinance effect on individual income, not for paths linking individual income to child nutrition or other potential outcomes. The omission of seasonal variations is an important limit as studies indicate that income smoothing rather than income levels might matter for microfinance effect. Despite these limits, the results reflect a common reality that is worth explaining.

Microfinance might not improve income

The classical expectation that microcredits could serve as capital for initiating or expanding a business, that would result in more individual income did not hold in our study. There was no

relation between mature credits and profit levels. In fact, this hypothesis implies that borrowers invest their whole loans in enterprises, an assumption which was not always verified in the sample. Some 22 percent of the borrowers used parts of the loans for other purposes, mainly food consumption and loan repayment. Using microcredits as consumptive rather than productive assets might be an explanation for the lack of evidence of raised income through microcredits. But it also points out the fact that the direct use of credits for consumption and particularly for consumption smoothing might be a more effective household strategy against poverty. The microfinance industry has to be adjusted toward supporting such resilience strategies by offering a mix of loans and other services and more flexibility to accommodate the use of microfinance for consumption smoothing rather than income generation (DUNFORD, 2013). The classical microfinance theory also implies that micro-entrepreneurs manage the business for major returns. This assumption holds if sufficient management skills and capital are available (DUNFORD, 2012). And the generalized low overall returns of microenterprises prove that these conditions are often not prevailing. In this survey, the program participants showed most dissatisfaction with the loan amount, which was judged tiny in comparison of what they demanded for (figure 4.1.2). Microfinance providers have to take this into account and adjust the loans to the needs of the microentrepreneurs to assure profitability. Some studies support the theory that microcredits might not induce the expected income growth. But there was also evidence of improved individual incomes as the result of access to credits (DE GROOTE, 1998), suggesting that other issues might also matter.

Microfinance might improve income, but rather at household than at individual level

The results reveal that microcredits might lead to better household wealth without increasing income at individual level. The hypothesis that credits would improve incomes at individual level implies that borrowers have control over loans. Empirical evidence challenges this assumption by showing that individuals and particularly women do not always control their loans directly (GOETZ & GUPTA, 1996). A loan might be taken by an individual and used by other family members, leading to no change in income for that particular individual but an overall economic improvement for the family. One other explanation would be that borrowers invest their loans in rather collective family enterprises than individual businesses. Such cases were encountered in the sample. But they were not frequent. Only four percent of the respondents share their business with other family members. The majority (62 percent) owns their business alone. The study yet shows that household wealth is partially explained by higher individual profits. The relation was positively significant.

Household health care might be determined by income at individual level rather than at household level

The mediation analysis suggests a direct link between higher individual income and better health care while no similar relation was found for household wealth (result 4.3). The fact that individual rather than household resources improve the household health situation suggests that intrahousehold allocation might proceed according to the collective rather than the unitary model (HAZARIKA & GUHA-KHASNOBIS, 2008). The health care index in this study includes positive practices regarding treatment of children in health centres, full immunization and antenatal care. Such strategies might require financial resources and it is likely that particularly money controlled by the mother would be invested for such goals. This means that if the goal is to improve household health security, which is known to directly affect child nutritional status, improvement in the individual economic situation of the caregiver might be a key strategy.

Individual social power might improve household wealth

The statistical analysis demonstrates the following associations:

- Microfinance effect on nutritional status is not significantly mediated through individual social power.
- Microfinance effect on individual social power is not significant.
- The total effect of individual social power on child nutritional status is not significant .
- The effect of individual social power on household wealth is significant and ameliorative.
- Microfinance effect on social power is not significant for both men and women . The tendency is yet negative for men and positive for women. Gender differences are statistically not significant.
- Microfinance mediation through social power is not significant for both men and women ($p > 0.10$, respectively). Yet the tendency is positive for men and negative for women. Gender differences are statistically not significant.

These results denote that *microcredits affect child nutritional status without increasing individual social power, which itself contributes to an improved household wealth, but makes no difference for child nutritional status.*

5.2.2 Mediating Role of Household Economic Status

The mediation analysis at an intermediate level shows that:

- Microfinance effect on child nutritional status is significantly and positively mediated through household wealth.

- Household wealth has a non-significant effect on child nutritional status.
- Microfinance total effect on household wealth is significant and ameliorative.
- Microfinance direct effect on household wealth is significant and ameliorative.
- Microfinance direct effect on child nutritional status at an intermediate level is significant and ameliorative.
- Microfinance indirect effect on household wealth through individual income is not significant.
- Microfinance indirect effect on household wealth through individual social power is not significant.
- The effect of individual income on household wealth is significant and ameliorative.
- The effect of individual social power on household wealth is significant and ameliorative.
- Microfinance effect on household wealth is positive and significant for both men and women. The significance level is yet higher for women ($p < 0.10$ and $p < 0.05$, respectively); gender differences are statistically not significant.
- Microfinance mediation through household wealth is positive and significant for both men and women.. Gender differences are statistically not significant ($p > 0.10$).

This means that microfinance improves the household economic situation and this improvement leads to better nutritional status at child level. Economic improvement at household level is related to both economic and social empowerment at individual level, which are themselves not related to microfinance. Microfinance improves household wealth for both men and women. The mediating effect is confirmed for both sexes.

The mediation analysis confirms the expectation that household wealth would act as a mediator between microfinance and child nutritional status. Yet, a deeper investigation using moderated mediation procedures indicates that this mediating effect deploys particularly among women.

Microfinance might improve household wealth, particularly for women and even without improving female income

The study could not confirm an improvement in female income as a result of borrowing. Yet, it suggests that microcredits in the hands of women could have a different effect on their family wealth than credits taken by men. The significance level of microfinance effect on household wealth status was higher for women. This suggests gender-sensitive use of credits. The data show that a higher proportion of women use part of their loans directly for acquiring household goods. Some 26 percent of the female borrowers diverted loans from

their initial productive purpose and used it rather for education, food and other household related expenditures (figure 4.2.4). This was the case for only 17 percent among men who more frequently tend to invest the whole loan in their business. This consumptive use of credits might not be an ideal and effective strategy to raise individual profits. But it might be effective in improving the whole situation of the family by smoothing consumption (DUNFORD, 2013). Data from Brazil support this hypothesis, as unearned income under control of mothers had more than 20 times bigger effects on child survival than paternal income (THOMAS, 1990).

5.2.3 Mediating Role of Household Nutrition Security

The second stage mediation analysis of microfinance effect on child nutritional status at immediate level shows that microfinance effect on child nutritional status is not significantly mediated through proximal factors.

Microfinance improves household diet

The process analysis of microfinance effect on child nutritional status through household diet indicates that:

- Microfinance effect on child nutritional status is not significantly mediated through household diet.
- Microfinance total effect on household diet is significantly ameliorative.
- Household diet has a non-significant effect on child nutritional status .
- Microfinance effect on household diet is significantly and positively mediated through household wealth.
- Microfinance effect on household diet is neither mediated through individual income nor through social power.
- Household wealth has a significant and ameliorative effect on household diet.
- Microfinance direct effect on household diet is significant and ameliorative.
- Microfinance effect on household diet is positive for both men and women, but it is only significant for men ($p < 0.05$ and $p > 0.10$, respectively). Gender differences are statistically not significant.
- Microfinance mediation through household diet is non significant for both men and women. Gender differences are statistically not significant ($p > 0.10$).

This means that *microfinance improves the household diet by improving the household economic situation, but an improved diet at household level does not imply a better nutritional status for children. Microfinance effect on the household diet is only confirmed for men.*

The relation between microfinance and household diet is obvious. When their economic resources increase, households might tend to increase and diversify their meals. Financial assets might be used to improve access to food by improving food production or by increasing the capacity to buy enough and high-quality food.

In a refugee context where the strategy is to gradually reduce food aid, this suggests that the promotion of loan programs could effectively contribute to increase self-reliance. In fact, a study conducted in a drought affected area of Ethiopia shows that female participation in microfinance programs results in an improved household diet and a lower likelihood to be food aid recipient (DOOCY ET AL., 2005). A positive effect of microfinance on household diet was also found in Bangladesh. Members of the Grameen Bank increased food intake and added food of higher quality to the normal family diet (RAHMAN, 1987 as cited in QUANINE, 1989). In Malawi, female access to credits appears to increase household expenditures on food (HAZARIKA & GUHA-KHASNOBIS, 2008).

Thus, microfinance improves household food security, but this improvement does not explain why children from households with mature credits are nutritionally better off than those from control households. This is plausible as children do not necessarily share the family diet and even in this case, the quantity and the quality they receive might be different. This raises the question of child care and of intra-household resources allocation, which represent essential predictors of children nutritional status (ENGLE, MENON, & HADDAD, 1999).

Microfinance might worsen child feeding practices

Regarding child feeding practices, the mediation and moderation analysis has established the following relations:

- Microfinance effect on child nutritional status is not significantly mediated through child feeding practices.
- Microfinance effect on child feeding practices is positively and significantly mediated through household wealth.
- Child feeding practices have a non significant effect on child nutritional status.
- Microfinance direct effect on child feeding practices is significant and deteriorative.
- Microfinance total effect on child feeding practices is not significant.
- Household wealth has a significant ameliorative effect on child feeding practices.
- Microfinance effect on child feeding practices is neither mediated through individual income nor through social power. The tendency is yet positive for income and negative for social power.
- Microfinance effect on child feeding practices is significant and negative for men while it is non-significant and negative for women ($p < 0.05$ and $p > 0.10$, respectively); Gender differences are statistically not significant.

- Microfinance mediation through child feeding practices is non significant and negative for both men and women; Gender differences are statistically not significant ($p > 0.10$).

These results suggest that *microfinance affects child feeding practices through two ways: an indirect and a direct path. The indirect effect consists in an improvement in household economic conditions that positively affect child feeding practices. In contrast, there is an unfavorable direct effect of microfinance on child feeding practices, so that the total effect is no more substantial, but maintains the negative tendency. Child feeding practices do not considerably influence children's nutritional status. Microfinance deteriorative effect on child feeding practices is only confirmed for men.*

A direct and negative relation has been found between mature credits and child feeding practices. An indepth moderation analysis showed that this effect was less pronounced for women. In fact, it was expected that participation in microfinance programs would result in increased resources at household level, which in turn would lead to an improvement of proximal determinants of child nutritional status. Yet, the study showed negative linkages between microfinance participation and child feeding practices. Three issues might be central in explaining the negative microfinance outcomes: care, time and education. In fact, one could expect that group participation which is typical for microfinance would stimulate more social support from peers with regard to child care. But the reality shows that borrowing also means having less time for children, since borrowers are micro-entrepreneurs and having a business is a time-consuming activity. There is also the fact that, what matters most in child care are not material resources. ENGLE, MENON, and HADDAD (1999) define resources for care as caregiver education, knowledge and beliefs, caregiver physical health and nutritional status, caregiver mental health and self-confidence, autonomy and control of resources, workload and time availability, and family and community social support. Some of these resources like self-confidence or autonomy are linked to social empowerment, which was not substantially improved by microfinance in our study. An important care resource is education. In fact, credit programs intergrating education services on nutrition and child care are more likely to induce positive changes for child care than pure microfinance models. In Ghana, children from participants experienced significantly greater improvement in the nutritional practices promoted by the Credit with Education program (MKNELLY & DUNFORD, 1998). This means that such complementary interventions might mitigate the negative effects of the credits and the entrepreneurial activity on care.

Household health care improves child nutritional status

The mediation analysis at proximal level produced the following results:

- Microfinance effect on child nutritional status is not significantly mediated through household health care.
- Household health care has a significant and ameliorative effect on child nutritional status.
- Microfinance effect on household health care is not significant.
- Microfinance total effect on household health care is significant and positive.
- Microfinance effect on household health care is neither mediated through household wealth nor through individual income nor social power .
- Individual income has a significant and positive direct effect on household health care.
- Microfinance effect on household health care is non significant for both men and women . Gender differences are statistically not significant.
- Microfinance mediation through household health care is non significant for both men and women ($p>0.10$, respectively); Gender differences are statistically not significant ($p>0.10$).

The results indicate that *in total, microfinance improves the health conditions of the family. But it is unclear how this happens since household wealth which is improved by microfinance does not affect household health care while individual income which is not related to microfinance improves health care. Improved household health and sanitation conditions have a positive influence on child nutritional status.*

An important result of this study is the confirmation that health and sanitation conditions at household level directly affect child nutritional status. The bivariate analysis suggests that particularly the cleanness of the compound, curative treatment in health centres and full immunization are important determinants. The mediating role of household health care is not statistically confirmed. Yet there is a relation between microfinance and health care and there is a relation between health care and child nutritional status. This might indicate that health care might be the most determinant factor at a proximal level. The analysis suggests that what matters for improved health conditions at household level are not the general economic conditions of the family but an improved income at the individual level.

6 CONCLUSION & IMPLICATIONS

This research was an attempt to describe microfinance outcomes for child nutrition in the specific context of refugee settlements in Uganda. It has given both methodological and theoretical insights as summarised below.

Methodological Implications

Mediation and moderation procedures were applied to study household and intervention processes in general and nutritional processes in particular. These relatively new procedures proved useful to answer analytical questions of 'how' and 'when' and better understand what determines child nutritional status at household level. This study confirms their relevance for nutrition research and is an incentive for wide use (LOCKWOOD ET AL., 2010). Future studies might consider innovative statistical tools that take into account the use of separate sets of covariates, of multicategorical predictors and of a model with multiple mediators operating in parallel for some and in serial for the others,

The empirical approach included a household survey with a cross-sectional, quasi-experimental and quantitative design. These features can be seen as limiting in comparison to qualitative designs better adapted for capturing social mechanisms, to randomized designs eliminating selectivity bias and to longitudinal studies better suited to follow long-term impacts. There is thus a need to test the hypotheses with more robust instruments and to consider a mixed approach in future research.

This research was also characterized by its interdisciplinary nature and a focus on nutrition and the household. It might contribute to the construction of a research-based ecotrophological identity, which is according to JARRE (2000) not always apparent. Such 'self-image' of ecotrophology can develop only if significant sub-areas like nutritional sciences and household sciences are integrated.

Theoretical Implications

This project evidenced that in a refugee setting, microfinance can enhance a child nutritional status by improving his/her household wealth without affecting the socio-economic empowerment at the individual level. In this context, what really matters for a child nutritional status is his/her household health security, which is considerably influenced by the individual income. The overall effect of microfinance on the child nutritional status is not substantially influenced by gender, although there might be some gender differences in the underlying

mediational mechanisms. In fact, among men, microfinance negatively affects child care and positively affects household diet while these effects are not noticeable for women.

This research has particularly shown that:

- Microfinance affects child nutritional status without increasing individual income, which itself makes no difference for child nutritional status, but contributes to improve household wealth and household health security.
- Microfinance affects child nutritional status without increasing individual social power, which itself, makes no difference for child nutritional status, but contributes to improve household wealth.
- Microfinance improves the household economic situation and this improvement leads to better nutritional status at child level. Economic improvement at household level is related to both economic and social empowerment at individual level, which are themselves not related to microfinance.
- Microfinance improves the family diet by improving the household's economic situation, but an improved diet at household level does not imply a better nutritional status for children.
- Microfinance affects child feeding practices through two ways: an indirect and a direct path. The indirect effect consists in an improvement in household economic conditions that positively affect child feeding practices. In contrast, there is an unfavorable direct effect of microfinance on child feeding practices, so that the total effect is no more substantial, but maintains a negative tendency. Children feeding practices do not considerably influence child nutritional status.
- In total, microfinance improves the health conditions of the family. But it is unclear how this happens since household wealth which is improved by microfinance does not affect household health care while individual income which is not related to microfinance improves health care. Improved household health and sanitation conditions have a positive influence on child nutritional status.

These observations are summarised as a diagram (Result 4.5 on page 117). They have implications on the nutritional practice. They indicate that microfinance programs are appropriate in specific crises-affected areas; and there is a need for nutritionists to find a way to combine loans with effective health programs for such contexts. The results suggest proposing loans to both men and women. They also advocate for projects targeting rather households than individuals.

Further research is needed as the results of this study are valid only for the specific semi-formal microfinance institution analysed and for the particular context of refugee settlements in West Nile. It is necessary to test the gathered theories in other contexts. It might be useful to also study the moderation effect of other factors that could also alter the effect of microfinance on nutritional status. Future research could analyse the moderating effect of household shocks, of different microfinance technologies or of the refugee status.

The theoretical framework guiding this research is influenced by a welfarist conception of microfinance that contrasts an institutionalist approach. In fact, we share the view that microfinance -like any other institution - has to put the welfare of human beings at the bottom of each action. Nevertheless, institutional sustainability is a legitimate concern and future research on microfinance impact might integrate a cost-efficiency analysis of the microfinance institution.

We also adopted a broad vision of nutrition that differs from a reductionist biomedical approach. This thesis confirms the social dimension of child nutrition and advocates for a household perspective to inquiry nutritional processes. The ecotrophological paradigm and particularly the personal and social system theory of the household developed by SCHWEITZER (2006) open ways for future investigations of the research problem.

SUMMARY

BACKGROUND AND PURPOSE: This thesis is the result of a thorough search for effective and sustainable solutions to the problem of pediatric malnutrition. Two considerations have led to the research problem. Firstly, the fact that malnutrition is not only a physiological problem, but also the result of complex socio-economic conditions at household level. Secondly, the potential of microfinance services as poverty alleviation tools. The question was the following: If microfinance services prove to be effective for improving the socio-economic situation of the families, should they not be used as suitable instruments of nutrition security at household and child level? This research aimed at investigating whether, how and when microfinance services effectively contribute to improve child nutritional status.

THEORETICAL APPROACH: It was hypothesised that such a positive effect would deploy more often in the case of female borrowers and through an indirect path. Microfinance contribution to child nutritional status should mainly be explained by improved income and social power at individual level, which would in turn lead to better economic status at household level. An improved household wealth was supposed to have a positive impact on household food and health security and on child care.

EMPIRICAL APPROACH : These hypotheses were tested drawing upon data from a cross-sectional, quasi-experimental survey among refugee households from the West Nile region of Uganda. Regression-based moderation and mediation procedures were applied as statistical tool.

EMPIRICAL EVIDENCE: The statistical analysis showed that children from households who benefited from microfinance had a significantly better height-for-age than control groups. This effect was mainly mediated through better household wealth, but not through individual socio-economic empowerment. At a proximal level, what really mattered for child nutritional status was household health security, which was considerably influenced by individual income. Gender differences in microfinance overall effect on child nutritional status were not substantial in this context, although the underlying mediational mechanisms might differ. In fact, among men, microfinance negatively affected child care and positively household diet while those effects were not noticeable for women.

IMPLICATIONS: This thesis suggests that microfinance might be an appropriate tool for improving child nutrition in specific crisis-affected settings. It confirms the social dimension of child nutrition and advocates for a household perspective to inquiry nutritional processes.

KEYWORDS : Microfinance, Child nutritional status, Nutrition security, Uganda, Mediation, Moderation, Gender, Household, Children, Crises, Refugees, West Nile

ZUSAMMENFASSUNG

HINTERGRUND UND ZIEL: Diese Dissertation ist das Ergebnis einer grundlegenden Suche nach effektiven und nachhaltigen Lösungen für das Problem der pädiatrischen Unterernährung. Zwei Feststellungen haben zum Forschungsproblem geführt. Zum einen, die Tatsache, dass Unterernährung nicht nur ein physiologisches Problem, sondern auch die Folge von komplexen sozioökonomischen Gegebenheiten auf der Ebene der Haushalte darstellt. Zum anderen, die Popularität von Mikrofinanzdienstleistungen als Armutsbekämpfungsmaßnahmen. Die Frage war die folgende: Wenn sich Mikrofinanzdienstleistungen als wirkungsvoll für die Verbesserung der sozioökonomischen Lage der Familien erweisen, sollten sie nicht als geeignete Instrumente der Ernährungssicherung auf Haushalts- und Kinderebene eingesetzt werden? Diese Doktorarbeit beschäftigte sich damit, zu erforschen ob, wie und wann Mikrofinanzdienstleistungen tatsächlich zur Verbesserung des Ernährungsstatus von Kindern beitragen.

THEORETISCHER ANSATZ: Die empirische Literatur wies einen solchen positiven Effekt nur in einzelnen Fällen und unter bestimmten Bedingungen auf. Insbesondere das Geschlecht des Kreditnehmers schien von Bedeutung zu sein, wobei Frauen öfter den gewünschten Effekt begünstigten als Männer. Die Verbindung von Kredit zur Kinderernährung sollte sich hauptsächlich durch ein verbessertes Einkommen und soziale Macht auf der individuellen Teilnehmerebene erklären, die wiederum zur besseren wirtschaftlichen Lage des ganzen Haushalts führte. Ist der Haushalt weniger arm, so ist mit positiven Auswirkungen für die Nahrungs- und Gesundheitsversorgung zu rechnen.

EMPIRISCHER ANSATZ: Diese Hypothesen wurden aufgrund von querschnitts-, quasi-experimentellen Haushaltsdaten aus Flüchtlingssiedlungen in der West Nile Region in Uganda überprüft. Regressionsbasierte Modulations- und Mediationsverfahren wurden für die statistische Analyse angewandt.

EMPIRISCHE ERGEBNISSE: Die statistische Analyse zeigt, dass Kinder der mikrofinanzteilnehmenden Haushalte tatsächlich eine bedeutsam bessere Körpergröße für das Alter aufweisen. Die Wirkung ist hauptsächlich durch den Wohlstand der Familie übermittelt, nicht aber über das individuelle sozioökonomische 'Empowerment'. Auf proximaler Ebene sind für den Ernährungsstatus der Kinder die gesundheitlichen Bedingungen der Familie am meisten von Bedeutung. Es waren für die gesamte Wirkung von Mikrofinanzdienstleistungen auf den Ernährungsstatus keine Geschlechtsunterschiede festzustellen. Doch zeigen einige Prozesse Besonderheiten. Für Männer haben Mikrokredite negative Auswirkungen auf die Kinderfürsorge und positive Auswirkungen auf die Haushaltsdiät. Beide Beziehungen waren bei Frauen unbedeutsam.

SCHLUSSFOLGERUNGEN: Diese Arbeit zeigt, dass Kleinkredite geeignete Instrumente zur Verbesserung der Ernährung von Kindern aus Krisengebieten darstellen können. Sie bestätigt die soziale Dimension von Kinderernährung und setzt sich für eine Haushaltsperspektive zur Untersuchung von Ernährungsprozessen ein.

KEYWORDS: Microfinanzdienstleistungen, Ernährungsstatus, Kinder, Ernährungssicherung, Uganda, Mediation, Modulation, Geschlecht, Haushalt, Kinder, Krisen, Flüchtlinge, West Nile.

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ANNEXES

Annex A1: DED Household questionnaire

Annex A2 Complementary Tables & Figures

ANNEX A1 DED HOUSEHOLD QUESTIONNAIRE

Interview by: _____	Date of interview (mm/dd/yy) : / /
Time Start Interview: _____	Time finish Interview: _____

Introduce yourself; explain the purpose of the survey and the voluntary and confidential nature of the interview

A. DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENT

DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENT

- HA1. Name of respondent: _____
- HA2. Sex: ☐ Male ☐ Female
- HA3. Age: _____ years old ☐ 99 Don't know
- HA4. Marital status: ☐ Married/free union ☐ Widowed ☐ Separated/divorced ☐ Single
- HA5. Highest Level of education: _____ ☐ 99 Don't know
- HA6. Status: ☐ Refugee ☐ National
- HA7. How long are you leaving here? _____ years/months/date
- HA8. What tribe are you? ☐ Lugbara ☐ Madi ☐ Kakwa ☐ Aringa ☐ Alur ☐ Lingala
☐ Kiswahili ☐ Luo ☐ Dinka ☐ Lotuko ☐ Lucibara ☐ Other, specify _____
- HA9. What is your religion?: ☐ Roman catholic ☐ Protestant ☐ Muslim ☐ other,specify _____
- HA10. Number of children (*alive*): _____

B. MICROFINANCE (only clients)

- HB1. Characteristics of Microfinancial services
- HB2. What's the name of your credit group? _____ ☐ 2 individual
- HB3. When did you joined the credit group/DED?: _____ months or years
- HB4. What is your amount of current savings?: _____
- HB5. Have you already received a loan from DED. ☐ 1 Yes ☐ 0 No
- HB6. IF YES, Date of first credit _____
- HB7. IF YES, How did you use the last loan you took ? (*Do not read. Multiple answers possible.*)

Invest the loan in a business, please specify _____	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 DK
Buy food for your household	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 DK
Buy clothes or other household items	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 DK
Pay for medical visits or buy medicines	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 DK
Pay school expenses	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 DK
Use it for an emergency	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 DK
Use it to repay the loan	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 DK
others, please specify _____	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 DK

	HB8. What is ?	HB9. Are you satisfied with...?			HB10. Sug gestion for?
Number of credits		<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 Neither yes or no	
First loan amount		<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 Neither yes or no	
Last loan amount		<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 Neither yes or no	
Repayment period		<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 Neither yes or no	
Frequency of Loan Payment		<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 Neither yes or no	
Conditions of access		<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 Neither yes or no	
Interest Rate		<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 Neither yes or no	
Frequency of group meetings		<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	<input type="checkbox"/> 99 Neither yes or no	

Have you already taken a loan from someone or an institution other than DED... ☐ Yes ☐ No

IF YES, which one? _____

Where/from whom could you borrow money if you are in need? _____ ☐ Nobody

C. SOCIO-ECONOMIC INFORMATION

HOUSEHOLD SIZE AND COMPOSITION

Household= those who live together and share the same food at least once in a day, including you

Who heads your household? ☐ Self ☐ Wife ☐ Husband ☐ Daughter

☐ Son ☐ Sister ☐ Brother ☐ Other, please specify _____

Households members (head of household should be no. 1)

Name	Sex	Age (years or months)	Highest education Level of	Occupation
1.	<input type="checkbox"/> M <input type="checkbox"/> F			
2.	<input type="checkbox"/> M <input type="checkbox"/> F			
3.	<input type="checkbox"/> M <input type="checkbox"/> F			
4.	<input type="checkbox"/> M <input type="checkbox"/> F			
5.	<input type="checkbox"/> M <input type="checkbox"/> F			
6.	<input type="checkbox"/> M <input type="checkbox"/> F			
7.	<input type="checkbox"/> M <input type="checkbox"/> F			
8.	<input type="checkbox"/> M <input type="checkbox"/> F			
9.	<input type="checkbox"/> M <input type="checkbox"/> F			
10.	<input type="checkbox"/> M <input type="checkbox"/> F			

If more than 10 household members, continue on the back

HOUSEHOLD ASSETS AND QUALITY OF HOUSING

Observe the walls of the house: what are they made of? (*spot observation*)

☐ unburned mud bricks ☐ burnt bricks ☐ mud with wattle ☐ poles

☐ Other, please specify: _____

Observe the roof of the house: What is it made of? (*spot observation*)

☐ grass ☐ iron sheets ☐ Other, please specify: _____

Observe the cleanliness of the compound: ☐ very clean ☐ clean ☐ satisfactory ☐ dirty ☐ very dirty

Where does your household mainly obtain drinking water?

☐ Bore-hole ☐ Protected well ☐ open well ☐ River/stream ☐ In-house tap
☐ Piped to the compound ☐ public stand pipe ☐ Other, please specify _____

What type of toilet facilities does your household mainly use?

☐ Own Pit latrine ☐ Shared pit latrine ☐ Bush/no toilet
☐ Own flush toilet ☐ Shared flush toilet ☐ Other, please specify _____

During the last 12 months, would you say that your housing conditions has

☐ Worsened ☐ stayed the same ☐ improved ☐ Don't know

Now I have some questions about items that your household might own. I will read a list of items and I would like you to indicate if you or anyone in your household owns any of these items and how many?

House	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	_____
Bicycle/motorcycle	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	_____
Radio	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	_____
Car	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	_____

Do you rear domestic animals? ☐ 1 Yes ☐ 0 No

IF YES, which ones and how many do you rear?

			Size
Cows	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	_____
Goats	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	_____
Pigs	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	_____
Chicken	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	_____
sheeps	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	_____
Fish farming	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	_____
Other, please specify	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	_____

Do you own land ? ☐ 1 Yes ☐ 2 No, land is rented ☐ 3 No, land is allocated ☐ 4 no land at all
IF yes, how many acres do you have ? _____ acres

How much would you estimate that your household spent on the following per month: *In ug shillings*

Food	_____
Education (fees, school expenses...)	_____
Health and Medical Care	_____
Transport	_____
Special event (birth, burial, wedding, etc..)	_____
Rent of house	_____
Savings	_____

How would you describe the wealth of your household within this village? ☐ 1 About the same as most people ☐ 2 A bit better off than most people ☐ 3 A bit worse off than most people ☐ 99 Don't know

D. SOURCES OF INCOME AND EMPOWERMENT

ECONOMIC ACTIVITIES

Do you earn your own money? ☐ 1 Yes ☐ 0 No

IF YES, what were your most important sources of income in the last year?

Activity 1	_____
Activity 2	_____

Is this first enterprise activity...? (*Read answers and enter only one.*)

☐ 1 Primarily your own enterprise ☐ 2 a business partnership with others not in your household
☐ 3 Primarily an enterprise belonging to a member of your household

When did the business start? _____ ☐ 99 Don't know

What was your major source of capital for starting the enterprise? ☐ 1 Own savings ☐ 2 Loan from MFI ☐ 3 Loan from friends/relatives ☐ 4 other, please specify _____ ☐ 99 Don't know

Where do you sell your products?

☐ 1 Local consumers/passers-by ☐ 2 Market/shop ☐ 3 Local traders ☐ 4 othersSpecify ☐ 99 Don't know

Who helps you with your enterprise activities? ☐ 1 Children of the household ☐ 2 other family members

☐ 3 Someone outside the family ☐ 3 Nobody

What is your profit ? _____ ug shillings per month/per week/

During the last 12 months, in what ways (give the **three** principal ways) did you use the profit from your enterprise activity? Tell me the one you used the most money for first. *(Do not read answers.)*

Buy food,	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No
buy clothing	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No
health-related costs	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No
Pay school expenses	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No
Pay for housing improvements	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No
Reinvest in my enterprise	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No
Spend it for emergency	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No
Save	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No
Other (specify): _____	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No
Don't know	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No

During the 12 last months , would you say that the income you have been able to earn has...

☐ 1 Worsened ☐ 2 stayed the same ☐ 3 improved ☐ 99 Don't Know

EMPOWERMENT

Do you receive help for the following tasks/household chores?

Cooking	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	
Fetching water, fuel	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	
Caring, feeding, bathing for youngest child	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 0 No	

In your household, who usually takes decisions regarding ...

	I alone	partner alone	Both jointly	Other, please specify
Food expenditures everyday	<input type="checkbox"/> 2	<input type="checkbox"/> 0	<input type="checkbox"/> 1	_____
Buying important things for the family	<input type="checkbox"/> 2	<input type="checkbox"/> 0	<input type="checkbox"/> 1	_____
How to spend your income	<input type="checkbox"/> 2	<input type="checkbox"/> 0	<input type="checkbox"/> 1	_____
Taking the children for medical care	<input type="checkbox"/> 2	<input type="checkbox"/> 0	<input type="checkbox"/> 1	_____
Sending children to school	<input type="checkbox"/> 2	<input type="checkbox"/> 0	<input type="checkbox"/> 1	_____
Buying clothes for the children	<input type="checkbox"/> 2	<input type="checkbox"/> 0	<input type="checkbox"/> 1	_____
Taking out a loan	<input type="checkbox"/> 2	<input type="checkbox"/> 0	<input type="checkbox"/> 1	_____
Using a loan	<input type="checkbox"/> 2	<input type="checkbox"/> 0	<input type="checkbox"/> 1	_____
Infant feeding in the first year of life	<input type="checkbox"/> 2	<input type="checkbox"/> 0	<input type="checkbox"/> 1	_____

During the last 12 months, would you say your involvement in household decision-making has

☐ 2 worsened ☐ 1 stayed the same ☐ 0 improve ☐ 99 Don't know

Do you agree with the following statements....?

	Agree	Disagree	Don't know
Only men should take important decisions	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 99
A woman should accept being beaten to maintain the peace in her home	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 99
It is better to send a boy to school than a girl	<input type="checkbox"/> 0	<input type="checkbox"/> 1	<input type="checkbox"/> 99
Partner should help at home if woman works outside home	<input type="checkbox"/> 1	<input type="checkbox"/> 0	<input type="checkbox"/> 99

Do you feel there is not enough time to ...

care for children	<input type="checkbox"/> 1 Never	<input type="checkbox"/> 2 Sometimes	<input type="checkbox"/> 3 Often
do daily work	<input type="checkbox"/> 1 Never	<input type="checkbox"/> 1 Sometimes	<input type="checkbox"/> 1 Often

Do you participate in community groups and activities/village organisations?

☐ Yes, please specify _____

☐ No ☐ Don't know

E. HOUSEHOLD'S VULNERABILITY AND NUTRITION

HOUSEHOLD DIET

Where do you get food from? ☐ Own cultivation ☐ WFP ☐ purchase in market ☐ Exchange
☐ other, specify _____

During the last 12 months, was there ever a time when it was necessary for your household to eat less or eat less well either because of a lack of food or a lack of money to buy food?/

☐ Yes ☐ No ☐ Don't know

IF YES, How long did this period last? _____ Number of months ☐ Don't know

IF YES, what were the reasons why you didn't always have enough to eat?

What did your household do to get through this difficult situation? *(Read answers. Multiple answers possible.)*

Rely on less preferred and less expensive foods?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Borrow food, or borrow money to buy food?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Purchase food on credit?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Rely on help from relative or friend outside household	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Limit portions at mealtimes?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Reduce number of meals eaten in a day?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Sold personal property	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Self or someone else in family left area to seek employment	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Other, please specify: _____	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Don't know	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Yesterday, did you or anyone in your household consume ...

Any food before a morning meal	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
A morning meal	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
Any food between morning and midday meals	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
A midday meal	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
Any food between midday and evening meals	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
An evening meal	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
Any food after the evening meal	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK

Yesterday, did you or anyone in your household consume *(circle the ones referred to)*...

Chapatti/bread	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
Pigeon peas/cowpeas/ beans/peas	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
Maize/Millet/Sorghum/Rice/Simsim	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
Pumpkin/red or yellow yams/carrots/ red sweet potatoes	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
Maatooke/Cassava/Yams/Sweet potatoes	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
Greens/Other vegetables	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
Groundnuts	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
Milk/Milk tea/Milk products	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
Eggs	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
Meat/offal/poultry	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
Fish/seafood	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
Food mixed with oils, fat, butter, Ghee	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK
Fruits	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> DK

During the last 12 Months, would you say that your household diet has...

☐ 1 Worsened ☐ 2 stayed the same ☐ 3 improved ☐ 99 Don't know

HOUSEHOLD NEEDS AND CRISIS

We would like to discuss your households needs and problems, and also, learn about what you do to cope with them.

What are the main needs and worries of your household ? (please rank according to importance)

Need 1	<hr/>	<input type="checkbox"/> 99 Don't know
Need 2	<hr/>	

During the last 12 months, has anything happened to this household which has a serious negative effect on how the household operates?

			If yes, give brief details
Serious ²³ illness of an household member	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No	<hr/>
Death of an household member	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No	<hr/>
Cessation of a reliable source of income to the household	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No	<hr/>
Drought/ natural disaster	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No	<hr/>
Unexpected large payment had to be made	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No	<hr/>
Financial shocks	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No	<hr/>
Business losses	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No	<hr/>
New individual joined household	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No	<hr/>
Other	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No	<hr/>
No event	<input type="checkbox"/> 1 Yes	<input type="checkbox"/> 2 No	<hr/>

How did you respond to these shocks?

During the last 12 months, would you say that your household's ability to survive this kind of crisis has... ☐ 1 worsened ☐ 2 stayed the same ☐ 3 improved ☐ 99 don't know

F. INFORMATION ON CHILD'S NUTRITION AND HEALTH

Index child= last child between 6 months and five years

CHILD'S HEALTH

Has [name] had diarrhoea, fever, cough/cold and/or shortness of breath in the last two weeks?

☐ 1 Yes ☐ 0 No ☐ 99 Don't know

IF YES, did you take [name] to health services? ☐ 1 Yes ☐ 0 No ☐ 99 Don't know

Did [name] get immunised? ☐ 1 Yes ☐ 0 No ☐ 99 Don't know

IF YES, which vaccination did [name] get? ☐ 1 Polio ☐ 2 measles ☐ 3 BCG ☐ 4 DPT ☐ 5 Vitamin A

²³ (Chronic illness': persistent/recurring illness lasting three months or more which has decreased an individual's productivity)

CHILD FEEDING PRACTICES

Did you ever breastfeed [name]? ☐ Yes ☐ No ☐ Don't know

How long after birth did you first put [name] to the breast? _____ hours/days

Yesterday have you breastfed [name]? ☐ Yes ☐ No ☐ Don't know

When did you stopped breastfeeding [name]? _____ months

Yesterday has [name] received any of the following?

Plain water	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
Sweetened or flavored water	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
Fruit juice	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
Tea or infusions	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
Tinned, powdered or fresh milk	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
Other liquids	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know
Mushy or solids foods	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Don't know

Does anyone help the child to eat? ☐ Yes ☐ No ☐ child doesn't eat yet ☐ Don't know

What does caregiver do when child refuses to eat : *multiple answer possible, do not read*

Nothing (child left alone)	<input type="checkbox"/> Yes	<input type="checkbox"/> No
play with	<input type="checkbox"/> Yes	<input type="checkbox"/> No
try to persuade	<input type="checkbox"/> Yes	<input type="checkbox"/> No
force	<input type="checkbox"/> Yes	<input type="checkbox"/> No
change food	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Not a problem	<input type="checkbox"/> Yes	<input type="checkbox"/> No
other	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Did you use antenatal care during your last or current pregnancy? ☐ Yes ☐ No ☐ Don't know

Did you ever receive information about the nutrition requirements of children?

☐ Yes ☐ No ☐ Don't know

IF YES, source of information

(Community) health worker	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Radio or television	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Print media: leaflets, newspapers, posters, or billboards	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Other, please specify _____		

ANTHROPOMETRY: INDEX CHILD + ALL CHILDREN < 5 YEARS IN THE HOUSEHOLD

	Age/Date of Birth	Sex	Weight	Height	MUAC
a.Index Child	_____months/: mm/dd/yy	<input type="checkbox"/> M <input type="checkbox"/> F	_____,____kg	_____,____cm	_____,____cm
b.Child#2	_____months/: mm/dd/yy	<input type="checkbox"/> M <input type="checkbox"/> F	_____,____kg	_____,____cm	_____,____cm
a.Child#3	_____months/: mm/dd/yy	<input type="checkbox"/> M <input type="checkbox"/> F	_____,____kg	_____,____cm	_____,____cm
b.Child#4	_____months/: mm/dd/yy	<input type="checkbox"/> M <input type="checkbox"/> F	_____,____kg	_____,____cm	_____,____cm

End express thanks for their time, answer any questions or concerns they may have regarding the interview

Verification by:	Date of verification (mm/dd/yy) : / /
Data entry by :	Date of data entry (mm/dd/yy) : / /
Checked by:	Date of data check (mm/dd/yy) : / /

Annex A2: Complementary Tables and Figures

Tab. A2.1 Trends in Wasting Prevalence in Arua refugee settlements

Settlement	Date	sample	Wasting		Source
			Severe	Global	
Rhino Camp	06-oct	327	6,1	8,5	DDHS Arua 2006/10
	nov-05				DDHS Arua, 11/05
	03-nov	900	1,4	7,6	DDHS 2003/11b
	mai-03			6,2	DDHS. 2003
	02-nov			7,2	DDHS. 2002
	mai-02			5,6	DDHS. 2002
	01-nov			8,1	ACF-F. 2001
	01-avr				DED in WFP 25 May 2001
	nov-00				? in WFP 25 May 2001
	oct-00		1,1	8,3	WFP 11-12/00; UNHCR 13/11/00 in RNIS 32/33, April 2001
	mai-00			5,9	ACF-F. 2000
	oct-98			9,7	
	mai-98			5,9	ACF-F.1998
	juil-95			13,9	EPICENTRE. 1995.
Imvepi	06-nov	401	4,2	10,1	DDHS Arua 2006/10
	03-nov	450	2,0	10,0	DDHS. 2003/11a.
	juin-02	556	0,5	8,6	DDHS-A 2002/06
	01-nov			8,8	AAH-USA. 2001
	mai-00			3,7	AAH-USA. 2000
	oct-98			5,4	AAH-USA. 1998
	mai-98			5,8	ACF-F. 1998
	04-sept	412	1,2	6,8	DED 2004/10
	févr-04	549	2,6	8,8	DED.2004/02
Koboko	mai-99			8,5	Orach, 1999
	janv-96		1,1	11,2	MSF-H. 1996/02 in RNIS 14, February 1996
	juil-95			8,2 or ? 8,8 as reported in RNIS 14, feb 96	EPICENTRE. 1995.
	févr-95			7,2	MSF-H. 1995
	déc-94		6,8	9,7	MSF-H Dec 94
	juil-94			12,2	MSF-H. 1994
	mai-94				SCF 15.07.94 in RNIS 6, Aug 1994
	mars-94			14,6	MSF-H. 1994
	janv-94		1,8	11,4	MSF-H 25/1/94 in RNIS 3, Feb 1994
	août-93			22,0	? MUAC survey in RNIS 2, Decr 1993
	avr-95		2	6,9	Epicentre 24/07/95 in (RNIS 12, Oct 1995)
	03-nov	600	7,3	19,3	DDHS 2003/11
Rhino camp & Imvepi			7,9	2,8	DDHS Arua, 11/05

Source: www.unscn.org / RNIS/ own compilation

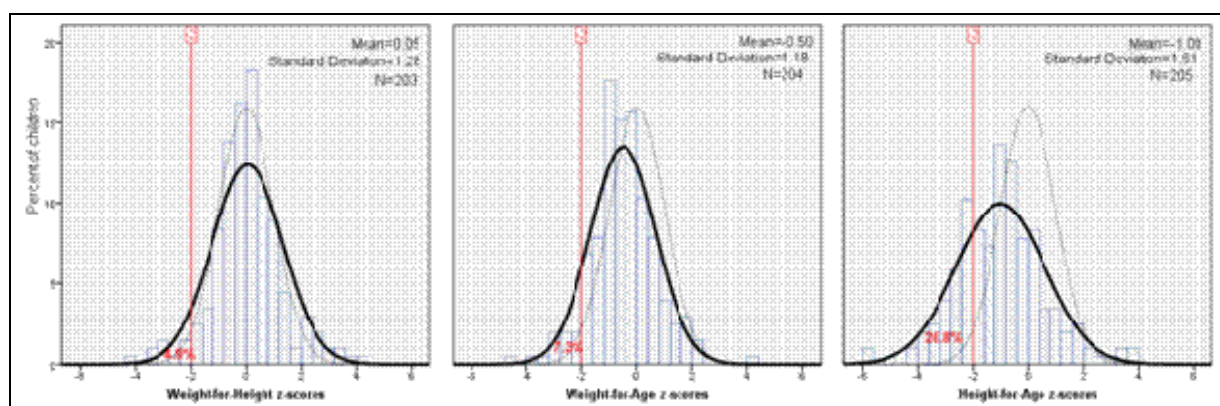


Fig. A2.1: Children's nutritional Status - z-scores distribution, DED study 2005

Tab. A2.2: Child nutritional status by microfinance profile: group means & proportions

Inherent Variables	All (N=205)	Intervention group Established Members (N=150)	Control group			p
			All (N=55)	Incoming Members (N=41)	Non- Members (N=37)	
HAZ value	- 1.00	-0.80 ^a	-1.32 ^b	-1.62 ^b	-1.00 ^a	**
WAZ value	- 0.50	-0.40 ^a	-0.67 ^a	-1.05 ^b	-0.24 ^a	***
WHZ value	+0.05	0.08	0.01	-0.17	0.22	
Negative Deviance						
HAZ<-2SD dummy	26.8%	18.9% ^a	39.7% ^b	46.3% ^b	32.4% ^b	***
HAZ<-3SD dummy	8.8%	7.1%	11.5%	14.6%	8.1%	
% HAZ<-2 & ≥-3SD	18.0%	11.8%	28.2%	31.7%	24.3%	
HAZ<-1SD dummy	50.7% ^a	48.8% ^a	53.8% ^a	65.9% ^b	40.5% ^a	*
% HAZ<-1SD & ≥-2	23.9%	29.9% ^a	14.1% ^b	19.5% ^a	8.1% ^b	**
HAZ≤Mean dummy	50.7%	48.8% ^a	53.8% ^a	65.9% ^b	40.5% ^a	*
WAZ<-2SD dummy	7.3%	4.7% ^a	11.7% ^b	17.1% ^b	5.6% ^b	**
WHZ<-2SD dummy	4.9%	4.7%	5.3%	9.8%	0.0%	
Positive Deviance						
HAZ≥-2 SD dummy	73.2%	81.1% ^a	60.3% ^b	53.7% ^b	67.6%	***
HAZ≥-1SD dummy	49.3%	51.2% ^a	46.2%	34.1% ^b	59.5% ^a	*
% HAZ≥-1SD & ≤+1SD	40.5%	41.7%	38.5%	29.3%	48.6%	
HAZ>+1 dummy	8.8%	9.4%	7.7%	4.9%	10.8%	
HAZ>+2SD dummy	3.9%	5.5%	1.3%	0.0%	2.7%	
HAZ>+3 SD dummy	2.4%	3.9% ^a	0.0% ^b	0.0% ^a	0.0% ^a	*
HAZ>Mean dummy	49.3%	51.2% ^a	46.2% ^a	34.1% ^b	40.5% ^a	*

*p<0.1; **p<0.05; ***p<0.01

Tab. A2.3: Microfinance conditional effect on potential mediators: linear regression estimates

Predictors			Estimate	SE	p	95%CI	Coeff. β
OUTCOME VARIABLE M₁: INDIVIDUAL INCOME (0.9)							
X	Credit since ≥ 6 months	a_{11}	-2346.96	11880	0.844	[-25777 - 21083]	-0.023
W	Female Respondent	a_{21}	-33936.65	11621	0.004***	[-56855 - -11017]	-0.333
WX	Gender x Microfinance	a_{31}	7001.96	14884	0.639	[-22354 - 36358]	0.069
	Constant		35290.10	18064	0.052*	[-337.7 - 70917]	
	$R^2_{M1,YW(WX)}$				0.005***		
OUTCOME VARIABLE M₂: SOCIAL POWER (0.10)							
X	Credit since ≥ 6 months	a_{12}	-0.028	0.037	0.443	[-0.100 - 0.044]	-0.083
W	Female Respondent	a_{22}	-0.106	0.036	0.003***	[-0.177 - -0.036]	-0.312
WX	Gender x Microfinance	a_{32}	0.059	0.046	0.201	[-0.032 - 0.150]	0.174
	Constant		0.570	0.056	0.000***	[0.460 - 0.680]	
	$R^2_{M2,YW(WX)}$				0.000***		
OUTCOME VARIABLE M₃: HOUSEHOLD WEALTH (1.11)							
X	Credit since ≥ 6 months	a_{13}	0.295	0.157	0.062*	[-0.015 - 0.606]	0.201
W	Female Respondent	a_{23}	-0.179	0.160	0.264	[-0.493 - 0.136]	-0.121
WX	Gender x Microfinance	a_{33}	-0.025	0.198	0.901	[-0.415 - 0.365]	-0.017
M ₁	Monthly Profiits		0.000	0.000	0.008***	[0.000 - 0.000]	0.177
M ₂	Social Power		0.914	0.311	0.004***	[0.300 - 1.528]	0.211
	Constant		-1.048	0.296	0.001***	[-1.633 - -0.463]	
	$R^2_{M3,WM1M2(WX)}$				0.000***		
OUTCOME VARIABLE M₄: HOUSEHOLD DIET (2.12)							
X	Credit since ≥ 6 months	a_{14}	0.426	0.160	0.008***	[0.110 - 0.741]	0.282
W	Female Respondent	a_{24}	-0.225	0.161	0.164	[-0.543 - 0.093]	-0.150
WX	Gender x Microfinance	a_{34}	-0.290	0.199	.0147	[-0.683 - 0.103]	-0.193
M ₁	Monthly Profiits		0.000	0.000	0.425	[0.000 - 0.000]	-0.053
M ₂	Social Power		-0.064	0.320	0.841	[-0.696 - 0.568]	-0.015
M ₃	Household wealth		0.322	0.073	0.000***	[0.178 - 0.465]	0.314
	Constant		0.033	0.308	0.915	[-0.575 - 0.641]	
	$R^2_{M4,WM1M2M3(WX)}$				0.000***		
OUTCOME VARIABLE M₅: CHILD FEEDING PRACTICES (2.13)							
M ₂							
X	Credit since ≥ 6 months	a_{15}	-0.272	0.111	0.015**	[-0.491 - -0.052]	-0.270
W	Female Respondent	a_{25}	-0.115	0.112	0.305	[-0.336 - 0.106]	-0.115
WX	Gender x Microfinance	a_{35}	0.215	0.138	0.122	[-0.058 - 0.488]	0.215
M ₁	Monthly Profiits		0.000	0.000	0.551	[0.000 - 0.000]	0.041
M ₂	Social Power		-0.305	0.223	0.172	[-0.744 - 0.134]	-0.103
M ₃	Household wealth		0.089	0.051	0.081*	[-0.011 - 0.188]	0.130
	Constant		0.664	0.214	0.002***	[0.242 - 1.087]	
	$R^2_{M5,WM1M2M3(WX)}$				0.000***		
OUTCOME VARIABLE M₆: HOUSEHOLD HEALTH CARE (2.14)							
M ₂							
X	Credit since ≥ 6 months	a_{16}	0.102	0.142	0.474	[-0.179 - 0.383]	0.083
W	Female Respondent	a_{26}	0.066	0.144	0.647	[-0.217 - 0.349]	0.054
WX	Gender x Microfinance	a_{36}	0.017	0.177	0.922	[-0.332 - 0.367]	0.014
M ₁	Monthly Profiits		0.000	0.000	0.004***	[0.000 - 0.000]	0.211
M ₂	Social Power		-0.204	0.285	0.475	[-0.767 - 0.358]	-0.057
M ₃	Household wealth		0.015	0.065	0.820	[-0.113 - 0.142]	0.018
	Constant		0.016	0.274	0.952	[-0.525 - 0.558]	
	$R^2_{M6,WM1M2M3(WX)}$				0.001***		
N=205							

*p<0.1;**p<0.05;***p<0.01; the inherent factors (settlement dummies, household size, household shock, household education) are included as covariates in the regression, but their estimates are not reported)

Tab.A2 4: Gender moderation of microfinance on height-for-age: linear regression estimates

		Outcome Variable Y Child Height-for-Age z-score				
Predictors ^a		Estimate	SE	p	95%CI	Coef. β
INHERENT MODEL (0.8)						
X	Credit since ≥ 6 months	0.612	0.391	0.119	[-0.159 1.384]	0.185
W	Female Respondent	0.348	0.383	0.365	[-0.407 1.102]	0.105
WX	Gender x Microfinance	-0.249	0.490	0.612	[-1.215 0.718]	-0.076
	Constant	-2.522	0.595	0.000***	[-3.695 -1.349]	-
	$R^2_{X, YW(WX)}=0.095$			0.031**		
DISTAL MODEL (1.8)						
X	Credit since ≥ 6 months	c'_1 0.597	0.393	0.131	[-0.178 1.373]	0.181
W	Female Respondent	c'_2 0.293	0.399	0.463	[-0.493 1.080]	0.089
WX	Gender x Microfinance	c'_3 -0.218	0.494	0.660	[-1.192 0.757]	-0.066
M_1	Monthly Profiits	b_1 0.000	0.000	0.979	[0.000 0.000]	0.002
M_2	Social Power	b_2 -0.534	0.778	0.493	[-2.068 1.000]	-0.055
	Constant	-2.220	0.741	0.003***	[-3.682 -0.759]	-
	$R^2_{X, YWM1M2(WX)}=0.097$			0.063		
INTERMEDIATE MODEL (2.8)						
X	Credit since ≥ 6 months	c'_1 0.518	0.396	0.192	[-0.263 1.298]	0.156
W	Female Respondent	c'_2 -0.341	0.399	0.393	[-0.445 1.128]	0.103
WX	Gender x Microfinance	c'_3 -0.211	0.493	0.669	[-1.183 0.760]	-0.064
M_3	Household wealth	b_3 0.270	0.180	0.135	[-0.085 0.624]	0.120
	Constant	-1.938	0.762	0.012	[-3.441 -0.434]	-
	$R^2_{X, YWM1M2 M3(WX)}=0.108$			0.049**		
PROXIMAL MODEL (3.8)						
X	Credit since ≥ 6 months	c'_1 0.545	0.408	0.183	[-0.259 1.349]	0.165
W	Female Respondent	c'_2 0.261	0.398	0.513	[-0.525 1.046]	0.079
WX	Gender x Microfinance	c'_3 -0.271	0.495	0.584	[-1.248 0.705]	-0.082
	Household diet	b_4 -0.200	0.181	0.271	[-0.557 0.157]	-0.091
	Child feeding practices	b_5 -0.030	0.259	0.908	[-0.540 0.480]	-0.009
	Household health	b_6 0.485	0.201	0.017	[0.089 0.881]	0.180
	Constant	-1.919	0.774	0.014	[-3.447 -0.392]	-
	$R^2_{X, YWM1M2M3M4M5M6(WX)}=0.138$			0.024		
	N=205					

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; a: the inherent factors (settlement dummies, household size, household shock, household education) are included as covariates in the regression, but their estimates are not reported)

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